Unboxing virtual professional development for early childhood educators: Infusing User Experience (UX) with virtual adult learning theory (VALT)

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A dissertation

submitted in partial fulfillment of the

requirements for the degree of

Doctor of Philosophy

University of Washington

2021

Reading Committee:

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Program Authorized to Offer Degree:

College of Education

University of Washington

Abstract

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Educational Psychology

The purpose of this study was to explore the social validity of the STEAM Trunk Math study- a virtual professional development intervention approach for early learning educators. The aim of the intervention was to increase the knowledge, skills, and comfort level regarding the use of math in early learning settings. A quasi-experimental mixed-methods approach was used to assess the acceptability and importance of the goals, procedures, and outcomes of the intervention package. The research questions were: 1) Will math comfort and teacher attitudes about math change after participating in STEAM Trunk? 2) Is the STEAM Trunk a socially valid intervention? a) Will participants enjoy and feel like it was worth their time? b) Will they feel satisfied with this intervention and 3) How will teachers describe the influence of the STEAM

trunk intervention on their teaching practice? Participants included 70 early learning educators across the State of Washington over a six-month period. Qualitative results suggest that participants deemed the intervention package helpful in increasing their knowledge, skills, and confidence. Quantitative results from an exploratory factor analysis and subsequent regression support statistically significant change in educator's views about math. The combined results also unveiled sentiments of a user experience (UX) lens that may underlie degrees of social validity. The possibilities and potential of incorporating a UX perspective in the design of virtual professional development for the early learning workforce are discussed.

Keywords: Professional development, virtual professional development, user experience, early childhood teacher education

Table of Contents

List of Figures

List of Tables

Acknowledgments

First and foremost, I would like to express deep gratitude to my advisor, Dr. Gail Joseph for her unwavering support and belief in me. Her mentorship has reinforced my love for this work and her innovative vision has shown me that nothing is impossible. Her passion and dedication have shown me that indeed, small can be mighty. I would also like to express gratitude to my committee members, Dr. Allison Hintz, Dr. Kathleen Artman Meeker, Dr. Jason Yip, and Dr. Sylvia Bagley for their support and encouragement. Your feedback and guidance have made me a better researcher, educator, and learner.

To my friends and colleges within the College of Education and Cultivate Learning at the University of Washington. Thank you for the encouragement and support throughout the years. To my family who has been by my side every step of the way. To my sisters, Theresa and Tiffany Tse for their patience and grace. To my friends and extended family, Amy and Tony Chow, Abraham Vu, Brady Angeles, Cinthia Iris Palomina, Elane and Larenzo Jones, Hong and Saan Nguyen, Linh and Ben Chao, Min Hwangbo, Quyet and Dan Le, Ivy Lai, Rhoan Garnett, Rosalie Daggett, Tasha Battles, Tiffany Ng, Martez Johnson, Makaila Johnson, Makenna Johnson, Mrs., Paulette Chambers and Mr. Ernest Chambers, who kept telling me I could. Finally, to my Godsons and Goddaughter, Koti, Zephri Jojo and Narai whose smiles, laughter and love remind me why I do this work.

Dedication

To my parents, Wing Kai and Joanna Tse who sacrificed their education to help me pursue mine.

Chapter 1. Introduction

1.1 Why focus on the early learning workforce?

The early years are the most malleable years of a person's life (Center on the Developing Child, 2007; Ball, 1994; Thompson, 2016; Votruba-Drzal & Dearing, 2017). The human brain is about 25% its maximum formation when born and grows to about 92% its full size by the time a child is five years old (Lytle, 2016). This means that an individual's life trajectory is greatly shaped in the first five years of life (Shriver, 2001). From a bio-behavioral ecological perspective, a child's development is influenced, inhibited, or enhanced by their environment and particularly by the interactions that children have with the adults that surround them (Bronfenbrenner & Morris, 1998; Germain & Bloom, 1999; Shriver, 2001; Votruba-Drzal & Dearing, 2017). Parents and primary caregivers are the prominent influencers. However, in the United States, about two-thirds of children birth through five are in some type of non-parental care because all available parents are in the workforce (Child Care Aware of America, 2019; Workman & Jessen-Howard, 2018). On average, children are reported to spend about 36 hours in childcare every week (Child Care Aware of America, 2019). These numbers are even greater for disadvantaged and low-wealth families who may have to work non-traditional hours or work multiple jobs to make enough income to support their families. Unfortunately, the quality of non-parental care environments is not optimal for most children, especially for infants and toddlers (Gomez, Kagan & Fox., 2015; Helburn,1995; National Institute of Child Health and Human Development, 1996; 1999). A multisite study of 400 centers in four states found that most states have poor to mediocre quality (Helburn, 1995). This level of quality is particularly worrisome in relation to specific content areas such as early mathematics and science where many kindergarteners in the United States enter school unprepared to meet the academic challenges

related to mathematics (Bates, Latham, & Kim, 2011; Marchitello & Brown, 2015; Pew Research Center, 2015; Votruba-Drzal & Dearing, 2017; Weber-Mayrer, Piasta, & Pelatti et al, 2015). Despite these reports, the promising results from studies suggest that when early learning educators engage in meaningful professional development (such as coaching and reflecting on their own teaching), the quality of care increases and children can have better outcomes both cognitively and socially (Artman-Meeker et al., 2015; Buysse et al., 2009; Fuligni et al., 2009; NICHD, 1999). The influence that early educators have on the life trajectory of the young children in their care is why focusing on this workforce is important and necessary.

1.2 Why focus on early learning math?

In an interview with Bob Moses, an American educator, the founder of The Algebra Project- a math literacy program and civil rights activist, Joan Richardson summarized his views on math as a civil rights issue. Specifically that math skills are a gatekeeper to social and life opportunities (Richardson, 2009). Early math knowledge and skills have been shown to strongly predict not only later math achievement, but also predicts reading achievement better than reading itself (Denton & West, 2002; Duncan et al., 2007; Lerkkanen et al., 2005; Varol & Farran, 2006). In an increasingly technologically advanced society, math knowledge and skills are crucial for obtaining occupations that require analysis and reasoning skills. Jobs related to science, technology, engineering, arts, and math are usually more lucrative and more lucrative opportunities lead to other economic advances such as educational opportunities, career options, homeownership, and even impact generational wealth.

The problem is many young children enter kindergarten unprepared to meet the standards related to math readiness. Washington state uses a kindergarten entrance inventory called WaKIDS (Washington Kindergarten Inventory of Developing Skills) to learn about what

children know as they start the school year. The information from WaKIDS also helps teachers and parents identify the strengths and areas of improvement for their young learners. Data since the inception of WaKIDS has revealed that among the six areas assessed (social-emotional, physical, cognitive, language, literacy, and mathematics), mathematics consistently scores the lowest year after year (see table 1.1). When this data is broken down by gender and race, females and children that identify as African American, Native Hawaiian/Pacific Islander, American Indian and Alaska Native are the groups that score the lowest math. This essentially implies that students who identify as female and/or from one of the racial groups mentioned above, get hit twice with the data that suggests they are not on par with kindergarten entry standards (once because of the annual math readiness percentage and another because of their demographic).

Table 1.1

Percentages of students demonstrating characteristics of entering kindergarten

Learning and Development Area	Entry Year						
	2012	2013	2014	2015	2016	2017	2019
Cognitive	71.0%	75.0%	74.1%	74.6%	76.7%	71.6%	76.0%
Language	66.0%	71.0%	70.3%	78.9%	81.2%	71.6%	76.0%
Literacy	72.0%	79.0%	79.1%	80.9%	82.6%	77.5%	79.0%
Math	52.0%	54.0%	52.9%	60.8%	66.0%	66.0%	68.0%
Physical Development	79.0%	80.0%	78.0%	77.4%	78.8%	82.3%	86.0%
Social Emotional Development	74.0%	76.0%	74.3%	73.6%	70.2%	76.7%	79.0%

Note. Data for percentages from Washington Office of Superintendent of Public Instruction (https://www.k12.wa.us/archive/wakids-participation). Data from 2018 was not available.

One element that may be contributing to consistently low math readiness, may be the use of comprehensive early learning curriculums. The examination of the curriculum, Opening the World of Learning (OWL) found that out of 360-minute day, only 58 seconds were intentionally dedicated to math (Duncan et al., 2007; Lerkkanen et al., 2005; Varol & Farran, 2006). If you

calculate the average number of days in a school year, which is about 128 days, that equals two hours and four minutes of math per year!

In addition to the scarce amount of intentional math being taught in some early learning programs, providers themselves often express anxiety, discomfort, and a lack of confidence when it comes to teaching math. Anders and Rossbach (2015) found that preschool educator's emotional attitude (such as joy and interest in math interest) and pedagogical beliefs, predicts their sensitivity to math opportunities in play. They suggest that emotional attitudes as an element of professional development and competence must be recognized. Furthermore, educators who have negative experiences and/or beliefs about math have also been suggested to pass these negative feelings onto their students (Brady & Bowd, 2005). Brady and Bowd (2005) used the Mathematics Anxiety Rating Scale (MARS) to explore the relationship between pre-service teacher education student's experience with academic math and their future teaching practices. They found that females scored significantly higher on the anxiety rating scale compared to males. They also note that females were more likely to be ridiculed and offered less help during their formal math education when they had trouble. The cherry on top, and not in a good way is that the early learning workforce is comprised of primarily women. Low math readiness combined with teacher anxiety and gender bias is a recipe that must be changed.

1.3 The significance of professional development

Professional development (PD) for the early learning workforce is crucial in supporting the acquisition of professional knowledge, skills, and dispositions that ultimately affect child outcomes (Buysse et al., 2009; Copley & Padron, 1998; Fuligni et al., 2009; Schachter, 2015). This is particularly true for math because higher levels of math education, positive beliefs and confidence about math can help lower anxiety about teaching math (Brady & Bowd, 2005; Chen

et al., 2014). Foundational knowledge includes learning about competencies, standards and best practices that lead to positive child outcomes. Skills, include learning and seeing strategies used in the classroom that increase engagement or promote critical thinking. Dispositions include the acquisition of comfort and confidence around teaching and the reduction of feelings related to anxiety and fear associated with subjects such as math or science (Pelkowski et al., 2019; Vinson, 2001). However, there are gaps in the opportunity to engage in this type of PD that is more specific. Barriers and challenges related to distance, cost, and time for example mean that some educators do not experience high-quality, and evidence-based PD. An additional challenge is that the early workforce has historically been undervalued, underpaid, and overworked (Gomez et al., 2015). These individuals are often female, who may have their own children and families yet they choose to help educate other children. About 40% of the workforce are women of color or speak a language other than English that come from a variety of backgrounds. These women are often in the assistant or aid roles as opposed to a lead teacher role. The implication is that these women get paid even less or may have to work longer hours. Inequity stems from the makeup of this workforce by gender and race which can contribute to the inequities that their students will experience (Whitebook et al., 2018).

The increasing research on PD and early learning suggests that PD is important in ensuring that teachers are competent so that their students will reap the best outcomes (Fuligni et al., 2009; Schachter, 2015). Professional development for all areas of child development is needed, but mathematics in particularly is important because proficiency in mathematics for young children is the strongest predictor in later academic and life success (Clements et al., 2014; Li et al., 2015). The literature reveals that the disparity in math knowledge is apparent as early as three years old and this is particularly harmful to the children and families that come

from low-wealth and minoritized populations (Clements et al., 2014; Li et al., 2015). Math skills beyond the classroom can determine what career options are available (Richardson, 2009). Bob Moses, president, and founder of the Algebra Project describe math literacy as a barrier to economic arrangement. He referenced the times when African Americans were not allowed to read which prevented the acquisition of knowledge and skills needed to be a part of the "economic arrangement" (Richardson, 2009). Moses, states math literacy follows the same path and impedes economic opportunities if not cultivated. The salt to the wound is that many early learning educators have anxiety and low self-efficacy around their ability to teach mathematics to young children and therefore engage in very little intentional mathematics teaching (Beilock et al., 2010; Bursal & Paznokas, 2006; Gresham, 2018). Professional development that includes knowledge learning and coaching has been suggested to help educators gain more knowledge and skills in various content areas (Artman-Meeker et al., 2015; Buysse et al., 2009; Fuligni et al., 2009; NICHD, 1999). However, access to traditional face-to-face professional development is not always possible, equitable or widely accessible. Some of the cited barriers include the cost of PD, the quality of PD, the distance to training, inconvenient scheduling, and limited notice of opportunity (Gable & Halliburton, 2003).

Innovative, ubiquitous, and sustainable ways to deliver meaningful PD on topics such as mathematics should be explored so that more early educators have the skills, competence, and confidence in their work. Technology such as the internet, smart phones, laptops, and cameras can help deliver PD in a way that in-person methods cannot. However, as new methods of PD are developed, it is important that the design serves the needs of those who engage in it. In other words, it is important consider the acceptability of any PD program. If the people who are to engage in the PD do not find the experience valuable or a positive experience, it will be less

likely that the PD method or program will be effective. In short, PD is significant and necessary because it provides early educators the knowledge and skills, they need to be effective. Barriers and challenges to obtaining knowledge and skills should be addressed so that all educators and students are equipped with the best possible tools to succeed.

1.4 Accessing professional development

Although the need of PD is recognized, opportunities, especially those that result in credentials and degrees are not equitably attainable (Gable & Halliburton, 2003). The inequities begin with the early learning workforce historically being undervalued and traditionally thought of as babysitters and therefore not needing higher education (Gomez et al., 2015). The inequities extend to financial burdens that limit access to those that can afford or have resources to support degree or credential attainment (Gable & Halliburton, 2003).

In the last few decades, the educational requirements for early learning educators have increased as evidence-based research reveals the positive gains students can have when teachers have more training (Anderson & Mikesell, 2019; Artman-Meeker et al., 2015; Buysse et al., 2009; Fuligni et al., 2009; Gomez et al., 2015; Schachter et al., 2019; Weber-Mayrer et al., 2015). These increases in positive student gain can be seen within facilities, requiring degrees and certificates in their hiring process, and also embedded into quality rating and improvement systems (Gable & Halliburton, 2003; Gomez et al., 2015). As a result, more degree and certification programs have been created in higher-learning spaces as well as community-based organizations.

Courses that focus on early learning in higher education institutions have generated cohorts of student teachers that are equipped with an arsenal of knowledge and skills that they can use in the classroom (Joseph and Brennan, 2013). However, that collection of knowledge

and skills is typically presented in a classroom or lecture hall and not in the actual environments where they will work. When PD opportunities outside of the classroom are available, not all educators or their organization can support the financial cost of obtaining a degree or certificate. Even if financial affordability is not a concern, the geographical constraints of where families and jobs are located may mean that there are no facilities that offer these learning experiences. Additionally, the early learning workforce have their own childcare needs and schedules that limit their flexibility to take time off to attend a course (Gable & Halliburton, 2003). Though the barriers at first, sound like an individual obstacle, it is important to consider the structures and systems that perpetuate the barriers and trickle down to individuals. In the highly influential work, "Transforming the Workforce for Children Birth Through Age 8", the Institute of Medicine and the National Research Council (NRC) (2015) recommend that there should be unification of all the entities that contribute to our early learning workforce when it comes to PD. This includes direct providers, policy makers, those that establish and influence the infrastructure, the government and other funding agencies. This also means that these same entities should come together to address barriers and challenges to high quality PD.

Professional development (both pre-service and in-service) can look different across states, within states and even within programs with different funding streams, education or training requirement or facility type (e.g., childcare center, family home care or Head Start center) (Fuligni et al., 2009; Gomez et al, 2015; Lanigan, 2011). For example, early learning programs in public schools generally have had more formal professional requirements compared to private childcare programs or family childcares. As a result, access to high-quality professional development may not be the same. In other words, not all in the ECE workforce have the same PD opportunities either because requirements are different, high-quality options

do not exist in their area or there are geographic restrictions that prevent them from access. Other barriers include cultural and linguistic barriers (having PD available in multiple languages) and financial obstacles such as the expense of high-quality PD opportunities (Gomez et al., 2015).

The cost of higher education can be the deciding factor of the ability for some educators to attend courses. Members of the early learning workforce are some of the lowest paid professionals (Gomez et al., 2015; United States Bureau of Labor Statistics, 2018). The national estimated mean hourly wage for preschool teachers is $16.54 and $11.83 for childcare workers. This equates to an estimated annual wage of $34,410 and $24,610 respectively (United States Bureau of Labor Statistics, 2018). The average cost of an ECE professional obtaining a degree can consume a significant amount of their limited income. According to the College Board (2019), the average cost of a public two-year college degree is $3,660 and $10,230 for a four-year degree. If room and board is factored in, the total jumps to $12,320 and $21,370, respectively. These latter amounts are about one-third to over half the total annual salary. Online courses are an alternative to in-person courses but can still be costly for many in the workforce. According to Schachter et al. (2019) some online programs can cost $415 per credit hour. These amounts reveal the importance of developing innovative and cost-conscious high-quality PD options for the early learning workforce.

To address the barriers and challenges of access to high-quality PD researchers should think about how PD improvement can go beyond the childcare facilities, we must also address system level barriers. System level barriers include addressing funding for PD and the dissemination process of PD opportunities. There has been attention at the federal level to address the need for innovative system level solutions. For example, the Race to the Top – Early Learning Challenge Fund is one example of addressing PD at a system level. This fund provided

over one billion US dollars to 20 states to a.) cultivate knowledge and competencies for the workforce, b.) support the workforce in acquiring the cultivated knowledge and competencies and c.) partner with higher learning institutions to develop effective educators (Gomez et al., 2015). In the state of Washington, these three objectives have been met through various ways. The first is through the online growth of the Early Childhood and Family studies major at University of Washington. This online degree program has allowed early learning providers access to higher education opportunities that they might not have had previously due to time or geographic constraints. The knowledge and skills learned through higher-education courses not only better prepare educators, but also help to professionalize the field. For example, we would not expect a medical doctor to practice medicine without a degree because a degree reflects a certain amount of knowledge and training. This should be the same for those in the early learning workforce. We should recognize those in the early learning workforce with degrees or credentials as professionals because it indicates they have achieved a level of professional knowledge and skill. However, the barriers and challenges to obtaining a degree or credential should be evaluated and addressed. It is not to say that training received in pre- and in-service trainings should replace degree and credentialing processes. Rather, how can we provide the early learning workforce the same high-quality evidenced based, engaging, and meaningful PD as the approach used in higher education? In addition, how can we recognize the competencies educators gain through other credit barring opportunities beyond the tradition education routes? A future step could address how those in the workforce who demonstrate competency be acknowledged by a degree or certificate program through credit recognition. Although this latter point is beyond the scope of this dissertation, the innovative virtual approach to PD in this current work could inform future approaches to higher education.

1.5 The potential of virtual professional development

The ubiquity of technology in the 21st century can be a promising reality that can benefit the early learning workforce as virtual PD can address the infrastructural barriers of access and affordability while delivering high-quality PD resources to educators. Technology such as the internet, smart phones and tablets can be leveraged for their ability to reach a wider group of providers. Electronic or virtual coaching has risen to become a strong contender as a sustainable catalyst to deliver coaching for educators (Tainsh, 2016). Some common terms used to describe technology supported coaching have been, distant coaching, E-coaching, online coaching, web-based coaching, and virtual coaching. In the early learning field, all these terms have been used in some combination and usually refer to the use of the internet in some form in the coaching process. For example, the My Teaching Partner (MTP) program (Pianta et al., 2008), uses the term web-based professional development to describe their coaching program that relies on videos being uploaded online for a coach to view. The term E-coaching was used in a study that delivered training and support through video conferencing to help reduce the amount of challenging behavior in the classroom (Fettig et al., 2016). The term online professional development was used in study investigating the characteristics of family childcare providers that used the internet for their specific professional develop needs (Durden et al., 2016). Regardless of the term applied to describe coaching using technology, it seems all use the internet in some form. Thus, the term used from here forward will be virtual or online PD/coaching, but irrespective of term used will refer to the use of the internet in some form in the coaching process (via a computer or smart phone or smart device).

Traditional in-person coaching has been suggested to improve teacher practice and student learning (Snyder et al., 2018). However, in-person coaching can be costly, and efforts have been made to extend the benefits of in-person coaching in a virtual manner with some

success. For example, the My Teaching Partner (MTP) program (Kinzie et al., 2006; Pianta et al., 2008) engages educators and their assigned consultant or coach through a five-step coaching cycle every two weeks. The steps include: 1) educators recording a video from their classroom and uploading it on a website, 2) coaches reviewing the video and writing a prompt for the teacher to respond to, 3) having the educator review the video and respond to the prompt from the coach, 4) having the educator and coach discuss the prompt and the practice that was captured in the video and finally, 5) collaboratively come up with a summary and an action plan for the next cycle. The researchers found that this video-based process led to better gains in teacher-child interactions (Pianta et al., 2008).

Another educational approach from the EarlyEdU alliance addresses teacher preparation by disseminating relevant and practical course content to its members (who are often educators that have already been working in the field) in an asynchronous way. The up to date and researched informed material, allow faculty to focus their efforts on coaching learners to improve their practice (Sandall, Joseph & Porter, 2019). One study of an EarlyEdU course on early mathematics knowledge and skills in the general cognition and knowledge category, found students increased their use of mathematics language and their use of responsive math language and engaged in deeper reflection. The combination of reading material, opportunities to practice course content and assignments that focused on reflection enhanced education student use of intentional practices around math. Pre and post analysis found significant increase in students use of and recognition of instructional support. In addition, this study found change in teacher's awareness and comfort of teaching math (Boyd, 2016).

This approach is encouraging, but the problem is the vast majority of early leaning providers are not taking these courses. There are a multitude of reasons why this is the case, for example, the expense, lack of time and competing responsibilities.

1.6 Why the need to address the social validity of virtual professional development?

The introduction of the concept of social validity originated from the work in applied behavioral analysis, ABA (Wolf, 1978). At the time when work in ABA was beginning to grow, there was a need to justify the purpose and importance of the work. Wolf (1978) was pressed to think about how work in ABA could be considered important and who was responsible for determining this importance. He and his colleague suggested that the notion of importance of work that is *for* society could only be determined *by* the society/people/users/clients that is on the receiving end.

The potential of virtual professional development is promising, and the success and sustainability of virtual PD cannot be achieved unless the clients who are engaged in the PD find it important and acceptable (Wolf, 1978). Schwartz and Baer (1991) extend that social validity is not about evaluating a program's effectiveness. Instead, social validity is about evaluating a programs acceptability and viability. If clients do not accept or find value in the goals, procedure, and outcomes of a program or process, they will be less likely to engage. The potential lack of engagement contributes to less acceptability or *social validity* and could compromise program success (Wolf, 1978).

The idea of social validity is in some ways retrospective in that it is used to assess the value of a program or intervention after it has been created and/or implemented. But how do we address the design and creation of a program or process *before* it is implemented? I argue that the design process should begin by considering the user's needs, motivation, and internal

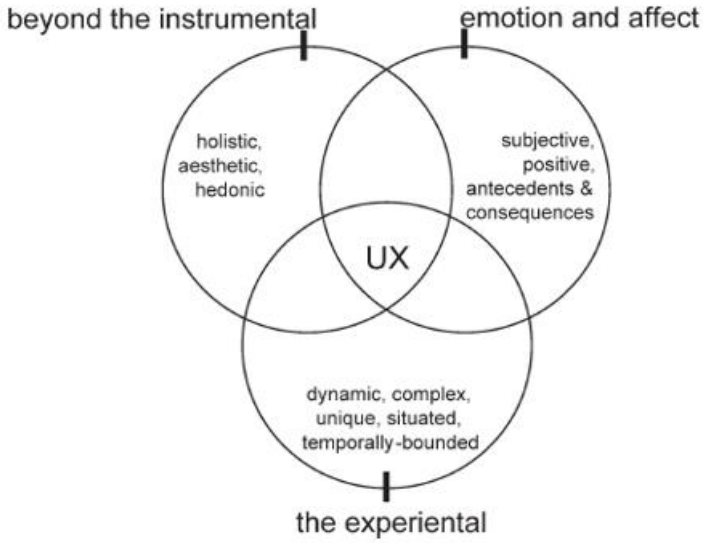
emotions proactively. In regard to virtual professional development for the early learning workforce, it might be beneficial to attend to these internal factors before, during, and after the design process. The concept of user experience (UX) from the field of human centered interaction (HCI) can be useful when thinking about the acceptability of virtual professional development. The definition of UX is complex and there is no single definition for what it means, but there does seem to be consensus that UX is about the entire experience when engaging before/during or after a process or product (Hassenzahl & Tractinsky, 2006; Norman, 2004). Technology related to virtual professional development can be thought of as a process and product for early educators. For example, positive emotions and experiences related to teaching and learning can help harness or hinder the success of product or delivery method. In other words, it is arguable that positive experiences with a process leads to more acceptability. Hassenzahl and Tractinsky (2006) suggest three facets of UX that focus on underlying human emotions in relation to technology; *beyond the instrument* such as the aesthetics or hedonistic nature of technology , the *emotions and affect* that arise when using technology (such as joy), and *the experiential* elements before and after engagement (e.g. a positive and memorable moment). Figure 1.1 provides an illustration from Hassenzahl and Tractinsky (2006) that demonstrates how these three facets are connected. A UX perspective compliments the ideas behind social validity because both concepts tap into the experience users have before and/or after engagement.

A UX perspective seems fitting in the development, implementation, and evaluation of virtual professional development because unlike in-person PD, virtual PD relies heavily on what technology offers. For example, watching videos, recording, and uploading videos, and engaging in reflection and feedback loops with others. I argue that users of virtual PD are interacting with

these different elements and as a result experience emotional impacts they might not even be aware of. Thus, it may be important to include a framework such as the one from Hassenzahl and Tractinsky (2006) that explores the underlying internal elements that are at the core of who we all are, humans.

Figure 1.1

Facets of UX



Note. Figure from Hassenzahl and Tractinsky (2006)

1.7 The significance of the present study

As this dissertation is being written, the nation and the world is going through a pandemic not experienced in a century. In the beginning of the 2020, the world as people experienced it severely changed. To slow the spread of a Corona virus known as COVID-19, many schools across the nation were required to transition to remote learning for the remaining school year. The new virtual world meant that students had to learn from home, teachers had to teach from home and all things related to education had to be quickly converted to a virtual platform if it was not already done so. This included professional development of the education workforce and

of particular of interest here, the early learning workforce. As a result, the research questions here are particularly pertinent in a time when the need and demand for virtual professional development is on the forefront.

Professional development for the early learning workforce was already a concept that had been explored virtually. However, the pandemic increased the need because in-person professional development such as coaching was not encouraged to maintain social distance. Over the past few decades, professional development for the early learning workforce has been recognized as a topic that deserves focus. Traditional in-person professional development such as coaching, courses and workshops have found the potential of virtual components such as online courses, webinars, and social platforms to reach more educators. For example, instead of having to attend an in-person course, teachers could take a course online and be exposed to the same information as if they were in a physical classroom. The pandemic has bolstered an existing possibility of virtual professional development, but how do we ensure that the participants that engage with virtual professional development find the program and process acceptable?

This dissertation will begin with a literature review on professional development for the early learning workforce and the conceptual framework that provides the foundation to the STEAM trunk process and the research questions of interest. In addition, a review of why mathematics is the content area of focus is also discussed. A review of the theoretical framework called the intentional teaching framework (ITF) is incorporated to represent the hypothesized mechanism of change (Hamre et al., 2012a; Joseph & Brennan, 2013). The individual elements of the STEAM Trunk math study are described and connected to the conceptual and theoretical frameworks. Chapter three describes the methodology which encapsulates the data analysis plan and procedures to answer the research questions. Chapter four explains the data analysis. Chapter

five presents the results. Finally, chapter six provides a summary of findings, limitations, and discussion of the implications for the results, how the results can be mapped onto a user experience (UX) framework, why incorporating a UX perspective is suggested and what this contributes to the early learning field.

1.8 The STEAM Trunk math study

The STEAM Trunk math study is a virtual professional development intervention that has influence from a higher-learning course in the Early Childhood and Families Studies major in the state of Washington. Joseph and Brennan (2013) created a course where students learned specific evidence-based knowledge and skills that would prepare them for their work with young children. In this course, they used video and a video annotation tool to help students evaluate their own (and their peers) interactions with the children they worked with. They found that allowing students the time and tools to decipher what high-quality interactions looked like, the more meaningful and specific their feedback. They also found that the potential of video reflection could be extended beyond the classroom (Joseph and Brennan (2013). In addition, an education approach from the EarluEdU Alliance addressed teacher preparation by disseminating relevant and practical course content to its members in an asynchronous way (Sandall, Joseph & Porter, 2019). Through the alliances approach to develop, and distribute researched informed material, faculty members and other instructor can focus their attention on coaching learners to improve their practice. A study on one of the courses on early mathematics knowledge and skills, found students increased their use of mathematics language and their use of responsive math language and engaged in deeper reflection. Pre and post analysis found significant increase in instructional support. In addition, this study found change in teacher's awareness and comfort of teaching math (Boyd, 2016)

The success of the STEAM Trunk Math study (a virtual professional development intervention package) for early learning educators builds upon the findings from Boyd (2016) and the EarlyEdU Alliance. One aim of the intervention was to improve the knowledge, skills, and dispositions regarding the use of math in early learning settings. Specially, the disposition of comfort related to teaching mathematics was one important aspect of focus. To evaluate the STEAM Trunk study's success, a variety of methods and data points could be used. Quantitative data could provide information about pre-post differences in math comfort and qualitative data could provide a deeper understanding of participant experience. The hybrid nature of evaluating a tangible program/intervention and the intangible experience of human participants warrants the use of different methods.

A quasi-experimental mixed-methods approach was used to assess the acceptability and importance of the goals, procedures, and outcomes of the intervention package. There are many research questions that could be explored from the data for the STEAM Trunk math study, but in this first study I restricted the focus to uncovering the experiences of the participants. The goal of the questions presented here was to explore what the STEAM trunk participants thought of their experience with this PD approach and how they believed it changed their teaching. In addition, examination of surveys related to participants feelings about math, investigates whether change in participants disposition (as measure by a math comfort survey) were experienced. Another research question was to explore the extent to which teachers perceive the STEAM Trunk Math Study to be valuable professionally and personally. The research questions were as follows.

1.) Will math comfort and teacher attitudes about math change after participating in STEAM Trunk?
2.) Is the STEAM Trunk a socially valid intervention?

a. Will participants enjoy and feel like it was worth their time?

b. Will they feel satisfied with the intervention?

3.) How will teachers describe the influence of the STEAM trunk intervention on their teaching practice?

The aim of these questions was to explore how participants experienced the STEAM Trunk math program (the description of program or intervention will used interchangeable throughout this paper). The virtual delivery of PD could not be timelier for the moment when this nation and the world grapples with how to provide students with high-quality education as the world seeks to contain and eradicate this virus. A critical factor in ensuring students experience high-quality education is professional development. In a time during a pandemic when face-to-face trainings and workshops are discouraged and even prohibited in some instances, virtual PD can be a sustainable and safe option. The potential of virtual PD can be great, but it can only be meaningful and potentially scalable if it includes elements of social validity such as acceptability and viability from the participants.

To answer these questions, a quasi-experimental mixed-methods approach was used to assess the acceptability and participant experience of this program. A mixed-method approach was chosen as the methodology because participants provided both scaled and open-ended responses to survey questions that asked about the effectiveness of the program and how it may have impacted their teaching. Scaled responses offer an objective look into any changes that were present. Specifically, to see if teacher's math comfort (a form of disposition) changed during pre to post survey. Open-ended responses carry much richer detail and give researchers a glimpse into the experiences of participants and could help improve the program in the future. The hypothesis was that the focus on mathematics would help educators feel more comfortable

in the subject area. In addition, educators were hypothesized to have positive views regarding the process of this innovative PD method. The ideas of social validity and UX are helpful in exploring the acceptability of this program. For example, were the goals, outcomes and process of the program supported (Wolf, 1978)? A mixed-method approach can help explore the complexities of human experiences and how those experiences affect a program's acceptability and viability (Schwartz & Baer, 1991). The viability of the STEAM Trunk math could provide information on ways to develop and disseminate meaningful virtual PD effectively and efficiently to the early learning workforce.

Chapter 2. Literature review

2.1 Defining professional development

Professional development (PD) for the early educators is critical for obtaining the knowledge and skills necessary to work with young children (Artman-Meeker et al., 2015; Buysse et al., 2009; Fuligni et al., 2009; Gomez et al., 2015; Hamre et al., 2012a) Not only is this statement supported by research, those in the early learning workforce (e.g. center-based providers and family child care providers) agree that training and education is necessary before providing child care (Gable & Halliburton, 2003). PD for the early learning workforce is generally acquired in two ways; pre-service and in-service trainings (Gomez et al., 2015). Pre-service trainings usually refer to the education and activities that teachers participate in before they begin their work in their classrooms or learning environments. These trainings are often completed in a higher-learning environment or in a process that results in a certificate, credential, or degree (Gomez et al., 2015). In-service trainings are activities that take place as teachers are working in their classrooms or learning environments such as trainings or workshops, for

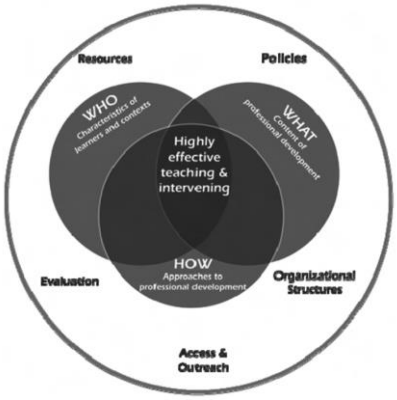
example (Gomez et al., 2015). In-service trainings have been crucial in helping the early learning workforce progress their knowledge and skills as they continue their work with children (Campbell & Malkus, 2011; Hamre et al., 2012b; Pianta & Mashburn, 2008). These continual trainings are particularly important for the workforce because as the research on early learning grows and improves, so does the knowledge and skills of what best practice should be. In-service trainings have traditionally involved face-to-face trainings, workshops and/or in-person coaching and mentoring efforts (Hemmeter et al., 2011; Knight, 2009; Kraft & Blazar, 2017; Rock et al., 2011; Schachter, 2015; Snyder et al., 2011) and can vary from a few hours to a series of gatherings over the course of months or the entire school year.

Both pre-service and in-service trainings are important because PD for early learning teachers has been recognized as an effective way to increase the quality of classroom instruction and is one of the most effective ways to improve students learning (Anderson & Mikesell, 2019; Artman-Meeker et al., 2015; Buysse et al., 2009; Fuligni et al., 2009; Gomez et al., 2015; Schachter et al., 2019; Weber-Mayrer et al., 2015). Regardless of the type of training (pre-service or in-service) there has been a recommendation that PD should be high-quality. The National Professional Development Center on Inclusion (NPDCI) supports a conceptual framework developed by Buysse et al. (2009) that defines professional development for the early learning field (see figure 2.1). Buysse et al. (2009) suggest that highly effective teaching and learning should consider the who, the what the how. The who, defines the characteristics of the learners and the context in which they are learning. The what, defines the content of the professional development (for example, mathematics, science, or literacy) and the how, defines the approach to professional development (Buysse et al., 2009). They express that when PD is created, implemented, or evaluated, it is important to think through each of these three

components and how they are being included. This framework serves as the foundation for the development of the STEAM Trunk math study program (Buysse et al., 2009).

Figure 2.1

Professional Development Framework



2.1.1 The Who

Buysse et al. (2009) define the "who" as the practitioners that are engaged in the day-to-day work in the early childhood field. This can include those that provide direct service like teachers, family childcare providers, family, friends, or those that provide technical assistance to the direct service providers like coaches or technical assistants. For the STEAM Trunk math study, the "who" encompassed of the recruited individuals that had direct contact with young children in the learning environment on a regular basis (lead teachers, assistant teachers, family child providers/directors).

When thinking about *the who,* it is important to name some characteristics and demographics for the practitioners and child care providers in mind because they have unique needs. In the 2018 early childhood workforce index (Whitebook et al., 2018), it is noted that this workforce is made of primarily women who often have their own children and families they need

to take care of while taking care of others. In addition, this workforce has historically been underpaid and under recognized. Although their work in educating young learners is becoming more valued, this workforce has not and still struggles to be recognized and compensated on the same level as their K-12 counterparts. In addition, these individuals often work long hours, have inconsistent work schedules due to childcare demands and have less education compared to K-12 educators. If we breakdown this workforce by race and language, women of color make up about 40% of the total and these women are more likely the aides or assistants as opposed to a lead teacher role. In short, we have a workforce where women of color are at the bottom (in terms of education and pay) *and* we have girls of color being the least prepared in math (when we know math is the strongest predictor of later math and reading achievement). This is a disastrous recipe that perpetuates the dire situation that exists in our early learning workforce and education system.

The adult learning theory of andragogy coined by Malcom Knowles (1973) can be useful to understand the learning needs of the adults that makeup the early learning workforce. The needs of adult learner's influence what and how early learning educators choose to engage with professional development opportunities. How adults engage and experience PD inform the development subsequent PD opportunities. Andragogy is defined as the method and practice of teaching adult learners (Knowles, 1973) as opposed to pedagogy. Knowles (1980) suggests five assumptions of adult's learners that lead to four principles of andragogy based on these five assumptions. The five assumptions are 1) adults have a sense of self-concept (as opposed to children) and thus able to guide their own learning; 2) adults are assumed to have prior experiences that they can use in their new learning; 3) adults are ready to learn; 4) adults are problem solvers and want to learn information that will help them solve problems they are

facing; and 5) adults are driven by internal motivation. From these five assumptions, Knowles (1984) list four principles that should be considered when designing learning experiences for adults: 1) that adults should choose the content of their learning; 2) adults should make connections to their prior experience; 3) content should be relevant to their work; and 4) content should be relevant to the problems that adults want to solve. The assumptions and principles of andragogy are helpful when thinking about professional development for early learning educators because first, educators are typically adults and, second, professional development opportunities usually have the goal of teaching relevant content. Regarding the assumptions, all five can be applied to early learning educators. For example, early learning educators are aware (self-concept) of the area(s) they may be less confident in (e.g., teaching mathematics to young children). Furthermore, they are likely to know that they want to learn more about the areas of interest (readiness to learn and intrinsic motivation) so that they can better teach mathematics to their students (problem solver). Then as the educators go through professional development trainings, they can use their prior knowledge and experiences of being a student and an educator to help them process new learning. The four principles of andragogy in this framework are also relevant to professional development for early learning educators based on Knowles (1980) assumptions that adults have self-concept and are intrinsically motivated to solve problems, it seems reasonable that educators themselves should first choose what they are learning (e.g., mathematics for example). Furthermore, if adults are encouraged to think about their own prior experiences as either students or educators, they can draw upon the experiences and strategies that have been effective or ineffective in their own learning or work. The third principle that content of adult learning should be relevant to work, captures the essence of professional development which is to help cultivate the more knowledge and expertise for one's work. The

fourth and final principle of andragogy, that the content of adult learning should be relevant to the problems the adult wants to solve is also closely tied to the goals of professional development because of the nature of the goal of professional development. For example, if an educator or a group of educators is trying the solve the problem of becoming more comfortable with teaching mathematics then the content and focus of the professional development should be relevant in providing knowledge or helping them become more comfortable. In summary, the who in Buysse et als. (2009) framework can be described and understood with the theory of andragogy and vice versa (see table 2.1).

Table 2.1

Crosswalk of andragogy and the professional development framework

Principles of Andragogy (Knowles, 1980)	Professional Development Conceptual framework (Buysse et al. 2009)		
	Who (characteristics and context of learners)	What (content of professional development)	How (approaches to professional development)
Adults should choose the content of their learning	Early educators have prior/existing experiences and needs that are different from children as learners	Educators should have the option to choose content of their learning so that it is meaningful	Educators should choose a method of learning that fits their need and learning style
Adults should make connections to their prior experience	PD should consider the educator's learners prior knowledge and experiences in design	The content of PD should relate to educators' prior knowledge and/or experience	The PD approach could consider educators prior knowledge and experiences
Content should be relevant to their work	PD context should be relevant to the educator's work	PD content should be relevant to the educator's work	The delivery of PD content should be applicable the educator's work
Content should be relevant to the problems that adults want to solve	Content should be relevant to the educator's that are participating in the PD	Content of PD should be relevant to the problem educators wants to solve (e.g. learning how to incorporate mathematics into transition times)	The approach to PD should facilitate the transfer of knowledge into the educator's practice

Note. Principles of andragogy from Knowles (1980) and professional development framework is from Buysse et al. (2009).

2.1.2 The What

The what of professional development considers the knowledge, skills and dispositions that are the focus of the PD (Buysse et al., 2009). Depending on the topic area of need at a

particular moment or timeframe in the school year, educators can choose a topic or content area that is most relevant or applicable. This content area of choice can be related andragogy because adults need to choose the content of their own learning for it to be meaningful and relevant to their work.

Mathematics was the content area of emphasis for the STEAM trunk math study. Mathematics was chosen as the focus first season of Circle Time Magazine (Joseph et al., 2016) because multi-year data from the Washington Kindergarten Inventory of Developing Skills (Washington Office of Superintendent of Public Instruction, 2013, 2014, 2015, 2016, 2017, 2019) reveal that out of the six areas that are assessed at kindergarten entry (cognitive, language, literacy, math, physical and social emotional development), math was consistently the area where children had the lowest expected skill level at kindergarten entry (see table 1.1).

In addition to math consistently being the development area with the lowest percentage of kindergarten readiness, inequities related to gender, race and ethnicity also reveal a disparity in preparedness. Girls and children of Hispanic/Latino of any race(s), American Indian/Alaskan Native (AIAN), and Black/African American demonstrate the lowest percentages of characteristics across years. This suggests that girls and children from racially marginalized communities are at a greater risk of not being prepared for kindergarten and beyond. Proficiency in math is a gatekeeper to academic and life achievement (Anderson, 2007; Clements & Sarama, 2019; Cohrssen & Tayler, 2016; Ginsburg et. al., 2008; Richardson, 2009; Valero, 2018). Valero (2018) states that “mathematics education is critical because it can both empower or oppress” one’s opportunities in life (p. 104). Bob Moses explains that math literacy is a matter of civil rights because math skills beyond the classroom can determine what career options are available which ultimately affect social opportunities (Richardson, 2009). When we dissect the WaKIDS

data by race and gender, we see that children who are Hispanic/Latino, American Indian/Alaskan Native (AIAN), Black/African American, and girls score the lowest within math. If left unaddressed or status quo, these groups will continually experience oppressed social opportunities.

Knowledge of and proficiency with mathematical concepts and skills are important for all children at an early age because these subject-matter competencies support later mathematical learning (Clements & Sarama, 2019). For example, young children's ability to count and know that the last number they said represents the quantity of the entire set (cardinality) is a precursor to later arithmetic. In addition to core concepts and skills, mathematics also promotes executive functioning skills that are critical for general learning and life success. Executive functioning skills related to mathematics include the ability to attention shift (switching between mental state while at the same time ignoring mental interruptions to the task at hand), have cognitive flexibility (the ability to consider alternate ways/methods or reasons as a solution), engage in inhibitory control (suppressing an initial response to allow for the consideration of other/better solutions) and update working memory (Clements & Sarama, 2019). In other words, maintaining and at the same time updating information in ones' active memory based on the current task (Clements & Sarama, 2019). The executive functioning skill of attention shifting can be evident in the same example of the child counting because the child must first count (one type of attention) and at the same time remember that the end goal is to know what the final count is (second type of attention). Finally, mathematics has the built-in opportunities to help young children become critical thinkers and persistent learners which are other forms of critical executive functioning skills. For example, when a preschool teacher asks a four-year-old to explain how she knows the waffle at breakfast is a square and not a rectangle, the child must

explain her thinking and reasoning. Or when a child is frustrated in the block area because her tower keeps falling, and the teacher says “hmm I wonder what you can do differently at the bottom of your tower to help it become more stable? Let us try again together”, the child learns persistence. These experiences of critical thinking and perseverance build up a child’s ability to persist in the face of academic and social challenges later in life.

Children who have less exposure to opportunities for critical thinking and other executive functioning skills may find mathematics to be more difficult. Less exposure and less successful mathematical experiences can lead to decreased confidence as a math learner or worse a learner in general. Those that experience continual problems with mathematics in the early and primary grades are less likely to graduate from high school or enter college (Clements et al., 2014; Li, et al., 2015). And this disparity in math knowledge is apparent as early as three years old (Clements et al., 2014). There are clear downstream effects of this disparity on an individual level, but we also see impacts on a national and societal level. National data shows many kindergarteners in the United States continually lag other countries in mathematical knowledge and education (Bates et al., 2011; Pew Research Center, 2015; Votruba-Drzal & Dearing, 2017; Weber-Mayrer et al., 2015). This is a concern because success in mathematics has been referenced as a subject area that not only predicts later academic success for individuals, but it also bolsters success in the workforce for society (Anderson, 2007; Clements & Sarama, 2019; Cohrssen & Tayler, 2016; Ginsburg et al., 2008; Richardson, 2009; Valero, 2018). In addition, our future citizens need to be prepared to meet the demands of an increasingly technological and STEAM focused economy. Children who are negatively impacted are more likely children from low-wealth families, those of racial, cultural, and linguistic minority groups or children with learning

difficulties and disabilities (Clements et al., 2014; Li et al., 2015). The inequities related to race, gender and economic status should not be a factor that forecasts their future success.

One way to address the lack of math preparedness when children enter kindergarten is to ensure early learning educators have the knowledge and skills required to engage young children in math learning. Buysse et als. (2009) PD framework is helpful in designing PD programs or processes. For this current study, the *what* regards the knowledge, skills and dispositions around mathematics. The *who* in the early childhood world are the adults that engage in professional development. Research has suggested that many early learning educator's express anxiety and discomfort around teaching mathematics as opposed to other areas such as literacy (Anderson, 2007; Clements & Sarama, 2019; Germeroth & Sarama, 2017; Gresham, 2018; Oppermann et al., 2016). The dispositions of the educators themselves is an important element to explore because the anxieties and fears around teaching mathematics to young children can negatively impact if and how mathematics in embedded into the early learning environment. Thus, the low level of kindergarten math readiness, coupled with early learning educators' anxiety and discomfort with teaching math, suggests PD regarding the knowledge, skills and dispositions of mathematics are important to explore.

2.1.3 The How

The *how* refers to "the organization and facilitation of learning experiences" (Buysse et al., 2009, p. 239). In other words, by what means is the content from the "what" (math knowledge, skills, and disposition) being delivered and experienced by the "who" (adult early educators). The STEAM Trunk math study was a packaged intervention that offered virtually organized and facilitated PD experience designed to focus on math. The core components of the STEAM Trunk math study created by Joseph (2016) (Circle Time Magazine, STEAM Trunks

and the Coaching Companion) were a packet approach to address math knowledge, skills, and dispositions of early learning educators. To learn about the acceptability, viability and sustainability of this virtual PD package, the experiences and opinions of the participants are critical to examine. Participant responses provide information about whether they liked the program, and if so why or why not? The responses can reveal information about user experience and levels of social validity (Hassenzahl & Tractinsky, 2006; Norman, 2004; Wolf, 1978) which can help guide the refinement or development of future PD.

It is important to note, in addition to the virtual components, another component that was key to the program was building upon teacher-coach relationships that were already present. Relationships are the core of who we are as human beings and there is no exception when it comes to professional development. Safe relationships between educators and coaches can help open the door to new ideas and behaviors. The STEAM trunk study was designed with the acknowledgment of existing relationships between educators and their coaches. Relationship-based professional development (RBPD) leverages relationships to support the growth and development of early learning educators (Abrams & Chu, 2016). The guiding principles of RBPD emphasize the importance of the educator's participation in continuous cycles of inquiry and self-awareness, embracing researched based methods in their work, supporting collaboration, and building on the adult's individual strength.

The principles of RBPD are exemplified through a cycle of inquire into a coaching model that harnesses the heart of relationships in helping providers grow. This process is called Practice-Based Coaching (Snyder, Hemmeter, & Fox, 2015). Practice-based coaching (PBC) builds on the guidelines of RBPD by focusing on the strengths of coaching relationships to focus on specific teaching practices. Within the PBC framework, there are three components. The first

is shared goal and action planning, the second is focused observation and the third is reflection and feedback. All three of these components are experienced in a cyclical fashion within the context of the relationship between the educator and the coach. The goal of going through these components is to increase the awareness of an educators' practice and to increase reflection to continually provide a positive experience both for the educator and their students. The tenants of RBPD can be developed, supported, and extended virtually when intentionally included in the "how" (the organization and facilitation of a learning opportunity).

Within RBPD, coaching is a component that helps increase a teacher or coachees use of complex skills, develop professional growth, and increase self-efficacy as a teacher (Artman-Meeker et al., 2015; Gore et al., 2017; Rudd et al., 2009; Whitaker et al., 2007). Coaching is a form of professional development that honors the need for educators to have time to reflect, converse, explore and practice new ways of thinking about how they teach (Joyce & Showers, 2002; Knight, 2009). There have been different types of coaching that have been identified in the literature such as peer coaching, mentoring, instructional coaching, cognitive coaching, content coaching and practice-based coaching. In the early learning field, coaching that is collaborative and provides many opportunities to be observed and receive feedback on their own teaching has been recommended (Schachter et al., 2019).

Traditional coaching for early learning teachers typically involves face-to-face or shoulder-to-shoulder coaching (Artman-Meeker et al., 2015; Knight, 2009; Kraft & Blazar, 2017; Sandall et al., 2020) and can vary in the form of sessions that take a few hours to a series of gatherings over the course of months or the entire school year. This type of in-person professional development has been suggested to have a positive effect on student achievement and teacher-child interactions (Campbell & Malkus, 2011; Pianta & Mashburn, 2008).

Additionally, continual PD through coaching is a crucial element in ensuring high quality early education in all areas of development and especially regarding mathematics (Clements et al., 2015; Ginsburg et al., 2008; Gresham, 2018; Schachter et al., 2019).

Using the who, what, and how conceptual framework as a guide, the next step is to include an approach that will be used to deliver the content. In other words, we need to define the catalyst that will be used to provide the knowledge, skills and dispositions which define the "what".

2.2 The Intentional Teaching Framework

An effective professional development approach called the Intentional Teaching Framework (ITF) moves learners through a process of ‘‘knowing,’’ "seeing,’’ ‘‘doing,’’ and ‘‘reflecting" to improve (Hamre et al., 2012a; Joseph & Brennan, 2013). This framework provides a mechanism of change for how improvement can be achieved. In other words, this framework provides actionable steps in a cyclical manner to promote change. See figure 2.2 for a visual representation of the ITF (Hamre et al., 2012a; Joseph & Brennan, 2013).

Figure 2.2

The Intentional Teaching Framework

2.2.1 Know

Knowing, is the portion of the framework where information and new approaches about high-quality teaching and learning interactions are learned (Buysse et al., 2009; Hamre et al., 2012a; Joseph & Brennan, 2013). Hamre et al. (2012a) state that examples of this include gaining "knowledge of child development, knowledge of a range of effective teaching practices, knowledge of individual children's needs, content knowledge, [and] knowledge of self" (p.513). The way knowledge is gained can include a variety of ways to obtain knowledge. For the early learning workforce, examples include trainings, workshops, in-person courses at a higher-learning institution or online courses. Regardless of the format information is delivered, the goal is to provide the learner knowledge and understanding (Hamre et al., 2012b). In the STEAM trunk math study, the knowing element included information about what math can look like in an early learning setting, why math (specifically counting, measurement, geometry and spatial sense, and pattern) is important and how to bring math into the environment in a developmentally appropriate way. For example, information and strategies on how teachers can include math during mealtime by talking about the shapes of food (e.g., "your waffle is round"), or the spatial relation of the other people at the table (e.g., "can you pass the bowl *across* the table to your friend?"). The "knowing" component of the ITF aligns with the "what" element of Buysse et als. (2009) conceptual framework because it addresses the acquisition of knowledge and skills.

2.2.2 See

Seeing, is a part of the ITF where the teacher learns how to identify and describe effective teacher-child interactions in themselves and others (Hamre et al., 2012a). Joseph and Brennan (2013) expanded on the "seeing" component by including the ability to reliably identify

effective teacher-child interactions with a validated assessment tool. This is an important distinction because identifying an effective interaction without a validated lens could hinder the ability to accurately reproduce knowledge and skills. In the STEAM Trunk math study, the "seeing" element included teachers viewing video example of other educators' engagement in effect teacher-child interactions (Joseph, 2012). For example, a teacher watched a video clip of another teacher during snack time incorporate math into snack time by saying "you ate two of your crackers, now you only have one cracker left". This "seeing" component of the ITF, similar to the knowing component aligned with the "what" element of Buysse et als. (2009) PD framework by addressing the acquisition of knowledge and skills.

2.2.3 Do

Doing, is the portion of the ITF where the learner practices or enacts the skills on a topic in which knowledge is being developed (e.g., mathematics). Examples of this include "effective implementation of curricula, [and] ability to modify plans as needed in the moment to meet specific goals" (Hamre et al., 2012a, p.513). In the STEAM Trunk math study, the "doing" component includes opportunities for the teacher to practice implementing the skills they have learned and can identify in the knowing and seeing components. For example, if a teacher wanted to encourage a conversation about measurement during snack. The teacher might ask the children "which pitcher of milk do you think has more milk? Why do you think that? And how could we find out?" In asking these open-ended questions, the teacher is enacting on a skill that has been identified in the "knowing" component as being an approach to include the concept of measurement into mealtime. The "doing" component also aligns with the "what" element of Buysse et als. (2009) conceptual framework about PD because it helps the learner understand and apply a particular practice or skill.

2.2.4 Reflect

Finally, Hamre et al. (2012a) and Joseph and Brennan (2013) define reflecting as "actively examining" one's own teaching with the goal of improving actions in the future. This process of reflection can occur independently, with another individual or a combination of both. Examples of this can include internal or "guided reflections, [through] coaching/mentoring" (Hamre et al., 2012a, p.513). In the STEAM Trunk math study, participants were encouraged to engage in reflection with their current coach through a virtual web-based video annotation tool called the Coaching Companion (Joseph, 2012; Sandall et al., 2020). For example, a teacher uploaded a video of herself during mealtime talking to children about measuring milk and watches it back with her coach over a video conference. The teacher and the coach discuss how next time, the teacher can be even more intentional and have the milk in two liquid measuring cups so that the children can see that there is an objective way to find out which pitcher has more milk. During this time, the teacher is engaging in self-observation and planning for future improvement. The "reflecting" component of the intentional teaching framework also aligns with the "what" and "how" components of Buysse et als.' (2009) conceptual framework of PD by providing a method for the teacher to further grow their understanding of content related to teaching and learning. The components of the ITF (knowing, seeing, doing, and reflecting) together lead to improvement in the center of the model. The improvement in the center of the framework can relate to gaining content knowledge, skills and I also argue disposition. The third element in the "what" is about disposition and can be addressed through the ITF when the four components (know, see, do, and reflect) are cyclically engaged. Improvement because of engaging in reflection about new skills or approaches can change the disposition of the learner. For example, the teacher who has intentionally incorporated math talk into her mealtimes may

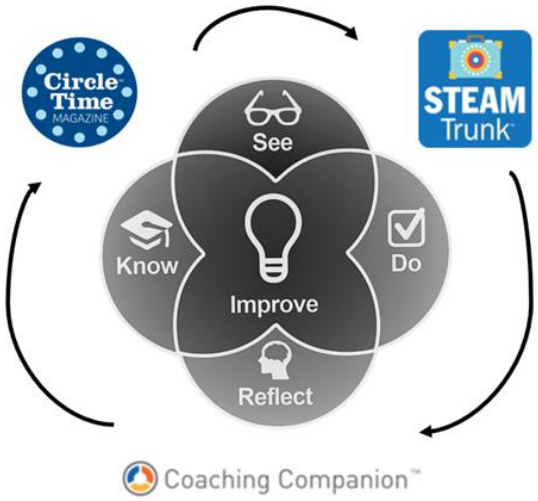
now have more knowledge and experience and have a more positive disposition (e.g., comfort or confidence) about bringing math into various times of the day.

The ITF approach can be used both in-person and virtually (Joseph & Brennan, 2013). This cycle of teaching and learning was used in a higher-learning course that focused on mathematics. A study of this course found student teachers increased their use of mathematics language and their use of responsive math language and engaged in deeper reflection. Pre and post analysis found significant increase in instructional support and change in teacher's awareness and comfort of teaching math (Boyd, 2017). The results from this study guided the EarluEdU approach (Sandall et al., 2019) and the formation of the alliance. This alliance addresses teacher preparation by disseminating relevant and practical course content inspired by the ITF to its members in an asynchronous way. Through the alliances approach to develop, and distribute researched informed material, faculty members and other instructor can focus their attention on coaching learners to improve their practice.

The three components of the STEAM Trunk study that replicated the EarlyEdU approach included a series of webisodes called Circle Time Magazine (show), STEAM trunks (curated box of early learning materials), and the Coaching Companion (video upload and annotation tool) as a documentation platform (see figure 2.3). Each of the components were innovatively combined to replicate the experience of course students. The combination of the three components formed the STEAM Trunk math study intervention package. Table 2.3 crosswalks the conceptual framework from Buysse et al. (2009) with the intentional teaching framework (Hamre et al., 2012a; Joseph & Brennan, 2013) and the STEAM Trunk components.

Figure 2.3

STEAM trunk theoretical framework



Note. Theoretical Framework of the Intentional Teaching Framework from Hamre et al., (2012a); Joseph (2016); Joseph and Brennan (2013). Circle Time Magazine and STEAM Trunk (Joseph, 2016); Coaching Companion (Joseph, 2012)

Table 2.2

Alignment matrix of STEAM Trunk, PD, and ITF framework

	Circle Time Magazine		STEAM Trunk and Coaching Companion	Coaching Companion
	Know	See	Do	Reflect
Who (characteristics of learners and contexts)	Providers and learners bring with them a variety of experience and knowledge that should be considered when developing ways to present knowledge.	Professionals vary widely in qualification, experience, race, culture, and ethnicity. Professionals serve equally diverse children and families, and it is important for providers to see specific teaching strategies in settings that reflect theirs.	Field experience and practice that aligns with a professional's characteristics and organizational context.	Importance of reflecting on one's own learning and how it can be improved for the future.
What (content of professional development)	Encompasses the knowledge, skills, and dispositions of content area. Both frameworks cite the importance of foundational knowledge on a topic	Importance of objectively being able to see effective practice and reliably engage in video analysis.	Opportunities to practice specific content knowledge, skills, and strategies in providers own setting.	Active review of one's own practice regarding knowledge and skills with a goal of improvement.
How (approaches to professional development)	Importance of focusing on content specific knowledge.	Focus on content specific professional practice that are aligned with instructional goals and learning standards by being able to reliably detect learning strategies.	Professional development is aligned with instructional goals.	Learning opportunities are intensive, and sustained

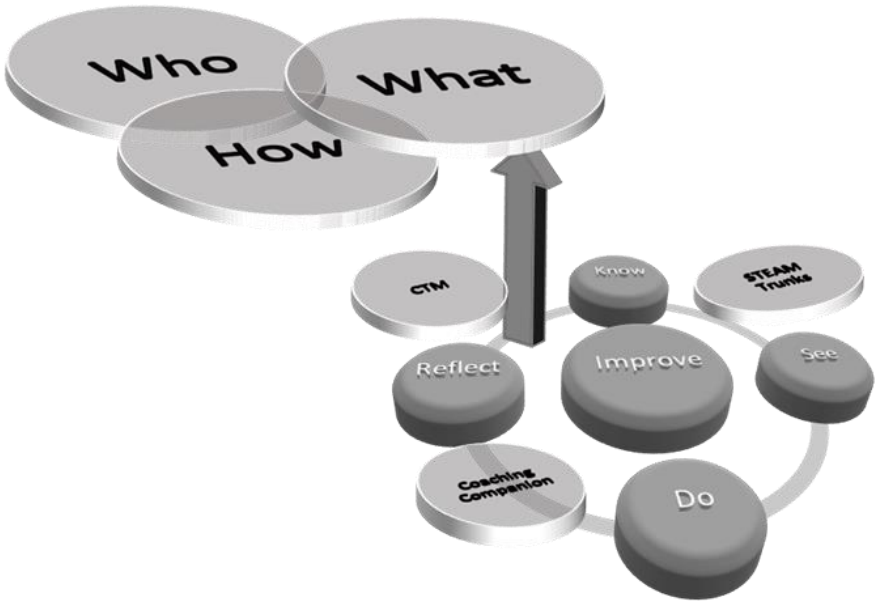
Note. Who, what, how descriptions from (Buysse et al, 2009), Intentional Teaching Framework components from (Hamre et al., 2012) and Joseph & Brennan (2013), Coaching Companion, Circle Time Magazine and STEAM Trunk from (Joseph, 2012, 2016)

A modified framework that combines the professional development framework and the ITF can be helpful in illustrating how the ITF fits within the who, what, how framework. Figure 2.4 illustrates a three-dimensional representation of the relationship between the professional development framework, the intentional teaching framework, and the components of the STEAM trunk math study. The top "layer" of the illustration shows the PD conceptual framework. Below the components of "what" and "how" is the intentional teaching framework. The what, refers to the knowledge, skills and disposition of a topic area that would be the focus

in the ITF cycle and the how, refers to the cyclical nature of the ITF. The layer surrounding the ITF are the virtual elements of the STEAM Trunk study. In other words, the ITF is the method that feeds *what* and *how* via the components of the STEAM Trunk math study (Circle Time Magazine, STEAM Trunks, and the Coaching Companion).

Figure 2.4

3- dimensional relationship between PD framework, ITF framework and STEAM components



2.3 Importance of math professional development

Many early learning providers express anxiety and lack of knowledge about teaching mathematics to young children in their care (Bates et al. 2011; Beilock et al., 2010; Cohrssen & Tayler, 2016; Gresham, 2018). Some research has cited providers own negative experiences with mathematics as a contributing factor to their anxiety about teaching mathematics (Anderson, 2007). These often-negative experiences can contribute to a provider's belief and action around what and how they teach mathematics to their students. Azim and Ahmen (2014)

succinctly capture this idea when they said, “teachers’ idea about the nature of mathematics provides scaffolding for their [own] philosophy of mathematics” (p. 8). And “teachers’ views about mathematics and mathematical knowledge are closely related to what they think about mathematics teaching and learning” (p. 11). Additional research has suggested that early learning teachers have the lowest self-efficacy around mathematics (compared to other content areas such as literacy) and that is evident in the limited number of mathematical activities that they provide in their classroom (Bates et al., 2011; Gerde et al., 2018). Additional research has noted that early learning providers feel that they do not have enough knowledge about how to teach mathematics (Cohrssen & Tayler, 2016). The anxiety and lack of comfort and confidence in teaching mathematics to young children is a reason that this topic was of focus. Professional development that helps early learning providers increase knowledge, skills, and disposition around mathematics specifically (as compared to general PD) is crucial to helping them feel more comfortable planning and implementing mathematics in their learning environments. Additionally, professional development that provides the opportunities for practice and reflection are important to include.

Chapter 3. Methodology

3.1 Research design

A quasi-experimental mixed-methods approach was used to assess the value and acceptability of the STEAM trunk math study. The seminal work of Montrose Wolf (1978) posits that intervention or programs only hold social importance if they are "judged by someone as having value to society" (p. 203). Wolf (1978) called these judgements *social validity* and defined three levels in which work should be evaluated: *the goals*- are they what society wants, the appropriateness of *the process*- are the procedure acceptable and *the outcomes* – are the client's content with the results. Schwartz and Baer (1991) expanded on this definition by stating that social validity is not about the effectiveness of a program, but instead about a program's acceptability and viability. The STEAM trunk math study was designed with evidence-based frameworks and years of research, but as the Wolf (1978) suggests, the ultimate gauge of any program's success is the experiences of and acceptance by its participants. If the participants did not like the process or felt like the STEAM Trunk program was a waste of their time, the program will likely not succeed. A mixed method approach was chosen as the methodology because understanding human experiences is complex and holds a diverse range of both quantitative and qualitative data.

Greene et al. (1989) suggest five purposes for using a mixed-method approach. The five are triangulation (looks for convergence from different methods), complementarity (looks to see if results from one method can be clarified or expansion upon by the other method), development (looks to see if results from one method can develop the other), initiation (intentionally looking for contradiction between the two methods) and expansion (strives to extend the scope of the question through different method and types of question.

The purposes of being complementarily and expansive seem reasonable to use a mixed-method approach to evaluate the STEAM Trunk program (Bronstein & Kovacs, 2013; Creswell, & Plano Clark, 2011; Greene et al., 1989). The STEAM Trunk study aligns with the notion of being complementarily because the quantitative and qualitative data in this study are different parts of the puzzle and together can provide a more holistic picture of the participants experience. The idea of expansion is also applicable to this study because the surveys were designed for participants to elaborate on their quantitative response. For example, a question on the post study survey asked, "Did you find the Circle Time Magazine episodes useful in your teaching practice?" The quantitative response options were either yes or no. The question immediately following the quantitative questions was an open-ended, follow-up question asking the participant to explain why they thought the episodes were useful in their teaching practice or not. This juxtaposition of close and open-ended questions allows the researcher to examine consistency or discrepancy between responses. For example, if a participant said, "yes" they thought the Circle Time Magazines episodes were helpful, but their open-ended response says "yes, but". This "yes, but" response can provide information to help the researcher understand why a component of the intervention was somewhat but not fully useful to a participant. Additionally, if a pattern emerges and there was multiple "yes, but" responses, then the result may not be considered outliers. However, if only one or two participants respond in this manner, their responses are no less important, but could change the pattern that emerges. Greene et al. (1989) describe it well when they wrote "qualitative methods [are] to assess program processes and… quantitative methods [are] to assess program outcomes" (p. 206) within the bounds of one study. Greene's definition of what to assess (process and outcomes) align well with the idea of social validity by Wolf (1978).

The timing and structure of the STEAM Trunk data collection process justifies another reason why a mixed method approach is appropriate. The data collection period can be described as both sequential and concurrent (Greene et al., 1989). It can be considered sequential because the pre and post math comfort surveys first asked questions that only yielded Likert scale responses (Likert, 1932). The poststudy survey was given after both pre and post math comfort surveys and asks participants yes/no, agree/disagree dichotomous responses as well as open-ended questions to explain their choice. However, the timing can also be considered concurrent because the intention and design of the study was to gather both types of data to obtain a holistic understanding of the acceptability and value of the STEAM trunk math study. The image of a continuous scale may be useful in thinking about where this study fits along the data collection timeline in a mixed method approach. The complex nature of reality and experiences of people when they are engaged in PD *are* a combination of synchronous and asynchronous experiences and thus fit a methodology that reflects this nature (Bronstein & Kovacs, 2013; Creswell, & Plano Clark, 2011; Greene et al., 1989).

The desire to understand how and why the STEAM Trunk math study was or was not acceptable can help improve the use of this virtual approach to PD for the early learning workforce. The potential of this virtual PD process could introduce an ala cart menu for the ECE workforce in terms of professional development for different topic areas (such as science, literacy, art etc.). If the participants in the study reported that they enjoyed the process of going through the STEAM Trunk elements, it could be a promising approach for other content areas and provide information about the potential to scale this approach to reach a wider audience. The overarching goal of this study was to investigate the acceptability and viability of the STEAM trunk math study intervention by asking:

1.) Will math comfort and teacher attitudes about math change after participating in STEAM Trunk?

2.) Is the STEAM Trunk a socially valid intervention?

   a. Will participants enjoy and feel like it was worth their time?

   b. Will they feel satisfied with this intervention?

3.) How will teachers describe the influence of the STEAM trunk intervention on their teaching practice?

The process of the intervention in which the participants went through and was surveyed on including the following procedure: watching CTM episodes, receiving a box of STEAM trunk materials that related to the episode, recording, and uploading their video examples and engaging in reflection and feedback with their coach on the Coaching Companion (Joseph, 2012, 2016). The concept of social validity is useful in the attempt to understand participant's experience. The goal, process and outcomes of an intervention or program can be reflected in the research questions. The *goal* was to have teachers go through the virtual professional development components. The *process* was about the acceptability of the program from participants perspective and the intended *outcome* was for participants to increase positive disposition towards math. Disposition in this study was defined as being related to developing comfort, confidence, excitement and or intentionality with math (Schwartz & Baer, 1991; Wolf, 1978).

3.1.1 Participant selection

This second year of the study was approved by the IRB as exempt via an addendum filed under the first year of the study (2017-2018). The first year of the study recruited only teachers and the researchers served as their coaches. The current study recruited the early learning teacher and their coach. Although the current study focuses on the teacher participants, the entire process

of recruitment (including both teachers and coaches) is described. Once the IRB exemption was approved, recruitment for the second year of the study began with the research team attending an annual statewide coach conference in the fall of 2018. The reason for starting the recruitment by asking coaches was to honor the existing relationships between coaches and coachees and to align the principles of the Relationship-Based Professional Development Standards (Abrams & Chu, 2016). A booth was set up in the conference exhibition hall where coaches could visit before, after and in-between conference sessions. Flyers explaining the study and an enrollment link were offered (see appendix B for flyer) and interested coaches were asked to provide their email address and/or phone number so that we could contact them. Coaches were asked to think of one to four providers on their current caseloads that they think would be interested or a good fit for this study. The coaches were asked to contact teachers they thought would be interested. In addition to recruiting from the conference, teachers that participating in the first year of the study informed other coaches and teachers about the opportunity. Two enrollment surveys were available for people who were interested, one for teachers and one for coaches in the Survey Monkey platform (www.surveymonkey.com). If a coach filled out the enrollment survey first, they were asked to list the names and email addresses of the teacher(s) they wanted to participate with them. They then reached out to the teacher(s) with any method they were comfortable with to confirm that the teacher(s) also wanted to participate. Once the teacher(s) confirmed that they wanted to participate, the researchers asked them to fill out an enrollment survey. This process was the same for a teacher that expressed interest first (if a teacher expressed interest first, the coach was contacted to confirm that they also wanted to participate). Teachers and coaches were informed that they could only be recruited into the study as a pair (every teacher much have a coach to participate with them). The reason for this was because each teacher needed a coach to

provide them feedback. The incentives offered for every participant (teacher and coach participant) in the study included four boxes of materials (STEAM Trunks) that they could keep even after the study concluded. In addition, each teacher was offered $100 gift card if they completed all elements of the study. Coaches were informed that they would also receive $100 for each teacher they worked with that completed all elements of the study. In short, that meant that each teacher participant at maximum would have received four boxes of STEAM trunk as well as a $100 gift card. Coaches could receive at maximum, four boxes of STEAM Trunks as well as up to $400. The difference between teacher and coach participant incentives were rationalized because it was believed that coaches existing relationships with teachers would harness more trust in the recruitment process. Another justification for the higher coach incentive was that coaches were asked to work with each teacher (if they had more than one) independently. This meant that a coach with four teachers, would be coaching each teacher separately, watch the videos from four individual teachers and provide separate feedback to four different teachers.

Once teachers and coaches completed the enrollment form, the researchers sent each participant a consent form that explained the purpose, risk, and benefits of the study. A total of 148 participants consented to be in the study, 42 coaches and 106 teachers.

3.1.2 Participants

Of the 106 teachers that enrolled, 76 started the intervention. The definition for starting the intervention was operationalized as completing the first math comfort survey and watching the first episode of Circle Time Magazine. Of the 76 teachers that began the intervention, 72 completed all components of the study. The attrition rate was about 5% (n= 4) and the two reasons for not completing the study was a lack of time (n=2) and no response (n=2). The final

sample for analysis included 70 teaches because upon closer look of all the survey data, two teachers did not answer all of the questions, so we removed them from the analysis. Of the final sample of 70 teachers, most identified as female (94%), White (51%), English speaking (68.6%) and had been teaching for 20 years or more (36%) see Table 3.1 for participant demographics details.

Table 3.1

Participant demographics

	n	%
Gender		
Female	66	94
Male	1	1
Null	3	4
Race		
White	36	51
Hispanic or Latino	23	33
Null	4	6
Asian	2	3
African American or Black	1	1
American Indian or Alaskan Native	1	1
European	1	1
Hispanic or Latino/White	1	1
Somali	1	1
Primary Language		
English	48	69
Spanish	12	17
English / Spanish	5	7
English / Punjabi	1	1
Farsi	1	1
Hindi	1	1
Polish	1	1
Somali	1	1
Years Teaching		
1 - 3 years	9	13
3 – 5 years	6	9
5 – 10 years	8	11

	n	%
15 - 20 years	10	14
20 years or more	25	36
Null	3	4

Note. N = 70. Demographic information collected in Survey Monkey.

3.1.3 Setting

The study was conducted across the state of Washington in the educators and coaches typical work setting (either center-based, Head Start, ECEAP or family home care environment). The natural setting used in this study had several affordances. The first, was that the educator and coaches could remain in their physical locations to eliminate travel which also addressed the goal of having a placed-based and real-world application. Secondly, the broad range of geographic location of participants generally mirrored the locations of where providers served young children across the state. Lastly, the study was interested in looking at the how much the participants liked and accepted a virtual development process.

3.2 STEAM trunk components

3.2.1 Circle Time Magazine

The first component of the STEAM Trunk Math study is of Circle Time Magazine (CTM) created by Gail Joseph (2016). CTM is a talk-show style web-series designed for early learning providers. The goal of the show is to replicate the content and knowledge typically disseminated in higher-learning courses on early learning and training. The difference between CTM and a course or training is the delivery method and style which was designed to be presented in a fun and engaging format. This is not to say that higher-learning courses are not fun and engaging, but Joseph (2016) leveraged the liveliness that was characteristic of daytime talk shows usually not associated with a course. The recorded nature of the show provided flexibility

for the learner to watch the episodes when it was most convenient for them. To provide another layer of flexibility, Joseph et al. (2016) designed the show to contain multiple segments so that teachers could easily re-watch portions that were useful in their teaching practice. The structure of the show included the following segments:

Table 3.2

Circle Time Magazine segments

Segment	Description
Behavior Management Minute	This segment provided tips on how to use the content of the episode (e.g., mathematizing/counting) for classroom management. For example, using the technique of including songs and finger play about numbers as children transition to the playground.
Circle Time Magic	This segment provided suggestions on how to incorporate the math focus (e.g., measurement) into large group or circle time.
Don't Just Read It STEAM It	This segment highlighted birth through five appropriate books viewers could purchase or borrow that focused on the episodes mathematical area. For example, "The Napping House" book was recommended as a book in the pattern episode because of its embedded concept about patterns.
Try It Out	This segment demostrated ways educators could use the materials in the STEAM Trunk in their learning environment with different age groups. For example, the large graphing mat could be used to chart children's favorite fruit.
Featured Guest	This segment highlighted information about the respective math topic by an expert in the early learning environment
It's All About You	This segment focused on resiliency and wellness strategies for educators to help them take care of their own physical and mental health.

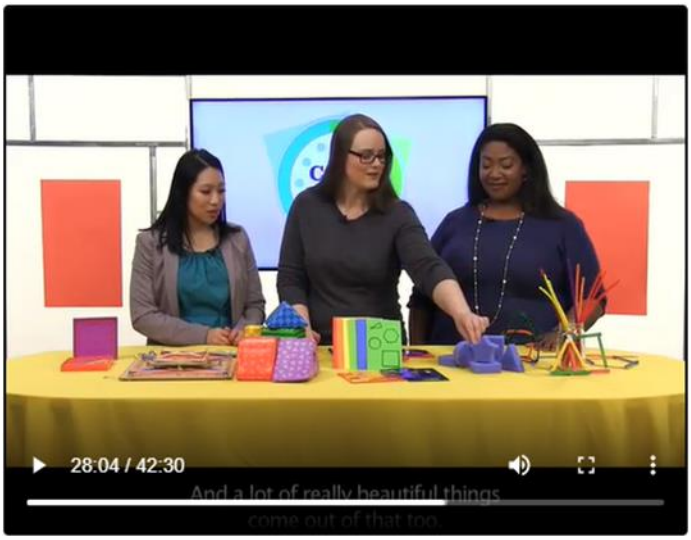
Note. STEAM trunk component from Joseph et al. (2016)

Figure 3.1

3.1 *Screen capture of the CTM Featured Guest segment*

Figure 3.2

Screen capture of the CTM Try it Out segment



The multiple segments also highlighted the nuanced elements of an early learning providers day (e.g., group circle times, transitions, choice time etc.) For example, the segment called Circle Time Magic provided tips on how to use circle time (a common portion of an early

learning program) as an opportunity to embed teaching strategies. Like a television series, CTM was created with different seasons. Each season focuses on different topics and within each season reside a range of episodes that dig deeper into the larger topic. The first season of the show focused on mathematics and was the season utilized for the current study. This season comprised of four episodes: counting and mathematizing, measurement, geometry, and patterns. The content, knowledge and skills discussed during each episode corresponded with the "knowing" and "seeing" portions of the ITF. Analogous to a training or higher learning course for early learning educators, Joseph (2016) designed Circle Time Magazine to be a platform learned about and could view what high-quality practices look like by watching other teachers demonstrate specific practices. For example, episode 3 of season 1 focused on geometry and spatial sense and how educators could engage in spatial sense with young children. In an in-person or online higher learning course/trainings, the instructor might first explain to students why spatial reasoning is important to young learners. For example, the student teachers might learn that tasks like the mental rotation of shapes and figures help children with orientation and navigation skills and later mental mathematics and area measurement tasks (Bruce & Hawes, 2015). The instructor then shows a clip of a teacher asking a child to explain their thinking of how they turned a unfix structure that looked like a "U" to match the one that looks like a "C". The CTM show replicates this knowledge delivery (knowing) and demonstration viewing process (seeing) in a format that can be accessed by anyone with internet access at times that are convenient for them. Additionally, CTM series has no fee associated with it thereby addressing some financial restraints that some educators in the early learning workforce may face.

3.2.2 STEAM Trunks

The second component of the virtual PD process are the STEAM Trunks themselves. These trunks are curated boxes of mathematically related materials appropriate for children birth through five years of age. For example, stuffed shapes that infants and toddlers can manipulate, and preschools can build with (see figure 3.3). These boxes serve as material and motivation for providers to complete the next step of the intervention which is to record themselves engaging in mathematical interactions with the children in their care. Similar to due dates and grades in a higher-educator course, these boxes provide motivation to complete the video "assignments". In addition, these boxes of materials allow providers to practice the strategies and skills they learned from the CTM show with the same materials that were featured on the show. This is an important step because for educators to effectively implement new knowledge they need to "actively engage in learning experiences that lead to the acquisition of professional knowledge, skills, and dispositions and the application of this knowledge in practice" (Buysse et al., 2009, p. 238). These trunks were delivered to providers after they watched the corresponding episode of Circle Time Magazine and allowed providers to actively and immediately engage in the teaching practices. The timing of the delivery of the STEAM trunks allowed providers to practice the skills they learned as quickly as possible, which aligned with the "doing" component of the ITF. (Hamre et al., 2012a; Joseph & Brennan, 2013). In addition to practicing with hands on materials, providers were asked to film themselves as they engage in adult-child interactions using the skills from the corresponding CTM episode (Do) while trying out new skills and/or materials. The incorporation of videos supports the student teacher's practice and later reflection of their own growth and learning (Joseph & Brennan, 2013).

In addition to the STEAM Trunks containing materials the teachers could use, they were valuable in other ways. They were an incentive and a motivator for the teacher to complete their video recording. This is comparable to grades a student would receive after turning in assignments. To receive another trunk (like a grade), the individual would need to complete an "assignment". The second benefit of the STEAM Trunk was the cost of each STEAM trunk when paired with the other elements of the intervention (gaining knowledge and engaging in reflection with their coach) was more cost effective compared to a coaching visit. The average cost of a trunk was about $60.00 USD. This amount was less than some cited costs for intensive instructional coaching visits which could be between $3.260-$5,220 per teacher per year (Knight, 2012; O'Keefe, 2017).

Figure 3.3

3.3 *Geometry STEAM Trunk*

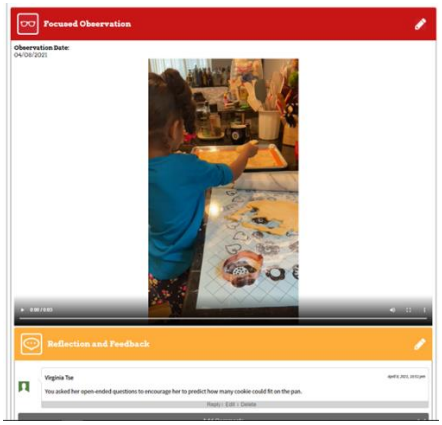
3.2.3 Coaching Companion

The third component of the STEAM Trunk math study was the Coaching Companion, a video-annotation application that follows the components of Practice-Based Coaching (Joseph, 2012; Snyder et al., 2015). PBC is a form of coaching that focuses on collaborative partnerships

to develop goals, action steps to meet the goal and focused observations that encourage reflection and feedback (Administration for Children and Families [ACF], Office of Head Start [OHS], & National Center on Quality and Teaching and Learning [NCQTL], 2012). The Coaching Companion provides a platform for the components of PBC to be entered. In addition, this digital space allows the coach and coachee to have dialog about teaching practices when they cannot be together in person. The Coaching Companion also allows users to upload videos and engage in the reflection and feedback component of PBC asynchronously and from a distance. This is especially important for teachers and coaches who are geographically distant from each other or constrained to virtual coaching because of time or restricted in person contact. This application helps curate a collection of videos to track growth and can function as a portfolio of a teacher's skills. In the STEAM trunk math study, the Coaching Companion tool helped support the "do" and "reflect" components of the ITF. Teacher participants recorded themselves trying out the teaching-strategies and uploaded the video clips to the Coaching Companion. The coach was notified that a coachee had uploaded a video and could review the video and provide feedback directly on the platform (see figure 3.4).

Figure 3.4

3.4 *Reflection and feedback page in the Coaching Companion*



Reflecting on one's practice is a critical piece of growth and improvement and when done independently, with peers or coaches can help teachers see their own teaching in a contemplative manner by allowing teachers to see themselves in action (Pianta et al., 2008; Joseph & Brennan, 2013; Sandall et al. 2019). An important component for the Coaching Companion and the reflection phase of the ITF are the coaches. Coaches are often the source of support for working early learning educators and are an integral part of the reflection process because of the established relationships they have with teachers. These relationships are the foundation on which meaningful reflection on a teacher's practice can be offered in a supportive way. The insight coaches offer can be an effective way to facilitate the transfer of new skills into everyday practice (Joyce & Showers, 2002). The components of the STEAM Trunk math study (Circle Time Magazine episodes, STEAM Trunks and the Coaching Companion) form a virtual approach to operationalize the ITF through supportive and collaborative relationships that thread everything together.

3.3 STEAM study sequence

The components of the STEAM Trunk math study (CTM, STEAM Trunks and Coaching Companion) follow an education approach from the EarluEdU Alliance (Sandall, Joseph & Porter, 2019). This alliance addresses teacher preparation by disseminating relevant and practical course content to its members in an asynchronous way. Through the alliances approach to develop, and distribute researched informed material, faculty members and other instructor can focus their attention on coaching learners to improve their practice. One study of an EarlyEdU course on early mathematics knowledge and skills, found students increased their use of mathematics language and their use of responsive math language and engaged in deeper

reflection. Pre and post analysis found significant increase in instructional support. In addition, this study found change in teacher's awareness and comfort of teaching math (Boyd, 2017).

The sequence of the STEAM intervention seeks to investigate if the EarlEdU approach could be replicated in the wild or in the real world. Joseph (2016) believed that the resources produced for EarlyEdU could be adapted for early learning providers that are not taking the courses. This idea would give providers that are working, access to the same high-quality information in a more accessible manner. One can think of the STEAM Trunk math scope and sequence as a mini version of a ten-week EarlyEdU course. The next sub-sections will describe the series of components the participants went through.

3.3.1 Teacher math comfort survey

Once consented, teachers were asked to complete a math comfort survey via Qualtrics software to answer questions regarding the teacher's comfort with teaching mathematics to the children in their care. This was the first step to get a baseline sense of a teacher's disposition (specifically math comfort) about mathematics before watching the first episode of Circle Time Magazine (Joseph et al., 2016) and engage in subsequent study elements. This survey had 24 questions, 20 of which were on a 6-point Likert scale (1932), with a score of one representing that they strongly disagreed with the statement and a score of six representing that they strongly agreed with the statement. Examples of questions that were asked on this survey included: "I feel comfortable planning and doing classroom activities related to math operations (e.g., addition, subtraction)" and "Exploring hands on with materials is how children learn best" (see table 8 for full list of questions). Eight out of the 20 questions were negative phrased and were reverse coded during quantitative data analysis (Suarez-Alvarez, 2018). For example, "math related activities are too difficult for young children". This survey was also given at the end of the study

to capture the comfort level after the teachers have participated in four cycles of the theoretical framework.

3.3.2 Baseline video

Once teacher participants completed the survey, they were emailed directions on how to record and upload a 20-minute baseline video of themselves interacting with the children in their care. Teacher participants were informed that they could record any activity they wanted to, with a recommendation for limiting recoding during outside time (that is, time spent outside the classroom) to limit ambient noise. The rationale for collecting this baseline video was to capture a reference point for the nature of mathematical teacher-child interactions before teachers engaged in the study elements. This baseline video was the last action item teacher participants needed to complete before the Circle Time Magazine episode links were sent to them. During this time when teacher participants were recording their videos, coach participants provided support (either by offering to do the filming if needed, helping teacher providers upload the video or providing general support to the teacher participants).

3.3.3 Circle Time Magazine episodes

After teacher participants submitted their baseline videos at the end of January of 2018, all participants (teachers and coaches) were provided a link for Season 1, Episode 1 of Circle Time Magazine on counting and mathematizing. See table 3.2 for individual Circle Time Magazine segments and descriptions. Teacher and coach participants were asked to watch the show at a time and place that was convenient for them their schedule. The length of the show was approximately 45 minutes long and providers that completed an optional knowledge check at the end of the show were awarded continuing professional development credit hours. The participants in the study were given approximately a week to watch the show before their

STEAM Trunk arrived in the mail. Table 3.3 shows the topic sequence and the associated intervention activities.

Table 3.3

STEAM Trunk topics and activities

Topic	Activity
Counting	• Watch counting episode of Circle Time Magazine • Use materials from trunk (Inflatable dice, mini white board & nontoxic markers, *5 Little Monkeys Jumping on the Bed* book, monkey mitt, 2-inch pom poms, clear container for a counting collection, 5 counting song cards, counting magazine) • Record and upload demonstration video • Coach provides feedback in the Coaching Companion.
Measurement	• Watch measurement episode of Circle Time Magazine • Use materials from trunk (big measuring tape, ribbon, measuring cups, thermometer, rain gauge, graphing mat, *Guess How Much I Love You* book, measurement magazine) • Record and upload demonstration video • Coach provides feedback in the Coaching Companion.
Geometry	• Watch geometry episode of Circle Time Magazine • Use materials from trunk (geoboards, craft loops, stuffed shapes, shape sponges, shape templates, foam paper, *The Secret Birthday Message* book, STEAM Trunk shape instructions, geometry magazine) • Record and upload demonstration video • Coach provides feedback in the Coaching Companion.
Patterns	• Watch patterns episode of Circle Time Magazine • Use materials from trunk (Scarves, music cd- focused on patterns, *The Napping House book*, egg shakers, graphing tray, patterns magazine) • Record and upload demonstration video • Coach provides feedback in the Coaching Companion.

3.3.4 STEAM Trunks

Approximately one week after all participants were provided with the episode link, each participant was sent a STEAM Trunk- a curated box of mathematical material that was featured in the shows "Try it Out" segment. The provision STEAM Trunk materials allowed recipients to try out some of the strategies they saw in the show. Teacher participants were asked to consult with their coach (if they'd like) to choose a skill and/or material the teacher participant would like to focus on. After deciding, teacher participants were asked to use the materials in their learning environment with the children in their care. For example, perhaps transition times are a period where the coach and teacher would like to incorporate more mathematics and she/he just watched the first episode of CTM on mathematizing. So, the teacher decided to use the song cards that were in the STEAM Trunk to engage children in songs like the five little ducks. This approach allowed the teacher to engage the children in talking about and using numbers while at the same time providing the children with a learning opportunity within a transition.

Figure 3.5

Image of student and teacher using STEAM Trunk materials

3.3.5 *Video recording*

Around the time teacher participants were asked to try out the materials in the trunk, they were also asked to record and upload a video of the interaction between themselves and the children in their care. This idea of using video to capture teaching interactions is like the purpose

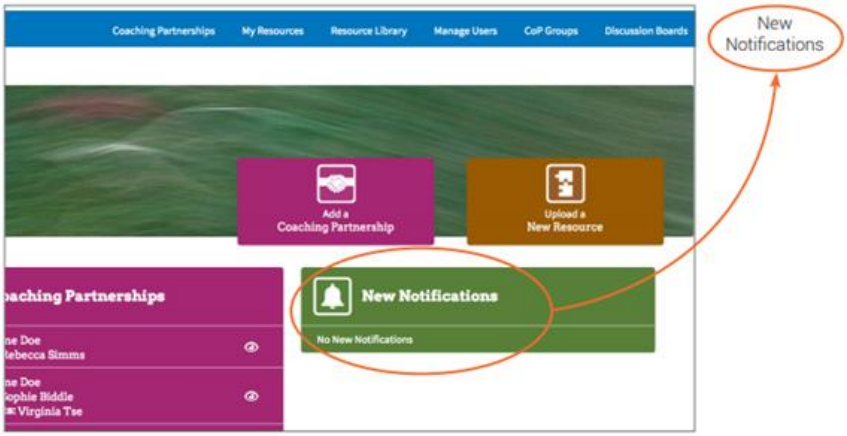
of video in Pianta et al. (2008) and EarlyEdU approach for pre-service teachers (Sandall et al., 2019). These methods suggested that teachers who watch their own and/or their peers' videos gained valuable skills in providing feedback that was grounded on objective teaching behaviors. The teacher participants were asked to upload 3-5 minutes after receiving each trunk as an "assignment" and as an opportunity for the teachers to practice the strategies from the CTM show. The next section will describe the directions participants were given of what to do with the recorded videos.

3.3.6 Coaching Companion

The video that teacher participants recorded were to be uploaded to the Coaching Companion (Joseph and Sandall, 2012; Sandall et al. 2020), a web-based video-annotation platform. This platform was originally conceived of by Joseph and Sandall (2012) through a grant funded by the Office of Head Start for Head Start and Early Head start teachers to engage in meaningful cycles of observation, reflection, feedback and ultimately improvement in child outcomes. For the current study, the Washington State version of the Coaching Companion was used (see figure 3.6).

Figure 3.6

Washington State Coaching Companion homepage



Different versions of the Coaching Companion exist so that each state or organization using the platform can customize the platform to fit their specific needs. Regardless of the version used, the foundation of the Coaching Companion follows the PBC cycle that includes shared goal and action planning, focused observation and reflection and feedback. The teachers in the current study were asked to create shared goal(s) and action plans after watching each episode of Circle Time Magazine. An example of a goal might have been "to embed more math talk during mealtimes". An example of an action step related to this goal could have been "I will talk about geometry and spatial sense three times during each breakfast time this week". The justification behind this step of creating goals and action plan steps after watching the CTM episode was the hypothesis that teacher participants would have discovered something in the show that they would want to try out in their own learning environment. After they have created a goal and action plan steps for how to achieve this goal, teachers were asked to record a video of the focused practice and upload the video to the Coaching Companion. For example, for the goal and action step listed above, a focused video observation would be a 3–5-minute snippet of one breakfast time where the teacher was talking about the shapes of food and the positions of the dishes and or peers at the table. The teacher might have been talking about how the shape of the waffle is a square and asked the children what shape the waffle was if she turns it 90 degrees and who was sitting next to and in front of them at the table. The aim of this video recording and uploading process was for teachers to practice a skill and review the practice together with their coach virtually. The video review process lends itself naturally to the reflection and feedback component in the ITF and how their practice worked. This could lead to further cycles of PBC and cycles of the ITF for improvement. Videos could be uploaded via smartphones, tablets, or computer if there was access to the internet.

A foundational part of the Coaching Companion is the PBC cycle of creating shared goals and action plans, capturing focused observations, and engaging in reflection and feedback based on the focused observations. Although the current study used the Coaching Companion platform and each element of the PBC cycle were encourage by participating dyads; it is important to note that each PBC element was not tracked to the extent that it would ensure fidelity to the PBC model. This is a limitation of the current study and would be a point of refinement in further iterations. Specially, the quality of the shared goal and action plans were not monitored nor assessed to ensure that they met the criteria of being SMART (specific, measurable, achievable, relevant and time bound). Additionally, the reflection and feedback cycles were also not monitored for quality or quantity (how many cycles of reflection and feedback cycles the dyad engaged in). There are several reasons for this, all of which could be improved upon in future iterations of the study. One reason the current study did not follow the PBC cycle to fidelity was because the main objective of using the Coaching Companion was to increase familiarization and utilization of the virtual platform and address dispositions around math. The increased use of the platform primarily concerned teacher participants successfully being able to upload videos to the virtual platform. Although the PBC cycle was not used to fidelity, each dyad was highly encouraged to engage in each element to some extend before either individual in the dyad received the link to the next episode and subsequent STEAM trunks.

3.3.7 Final video

At the end of the study, participants were asked to record one last 20-minute video. The objective of collecting this video was to gather post study observations of the participants teaching practice. This video footage was not analyzed for the current study, however future research could explore this final video.

3.3.8 Post study survey

The acceptability of the current study's virtual approach to PD was a focal interest. Thus, to gather more information about how participants felt about this virtual PD approach, post study questions were asked to obtain both quantitative and qualitative responses. For example, "Did you find the Circle Time Magazine episodes useful in your teaching practice?". Participants had the options of selecting yes or no. A follow up question was "why or why not?" and participants were provided with an open-ended field to type in their responses. See table 3.4 for post study

Table 3.4

STEAM Trunk post study survey

Question numer	Question
Q1	Did you find the Circle Time Magazine episodes useful in your teaching practice?
Q2	Why or why not?
Q3	Did you find the STEAM trunk materials useful in your teaching practice?
Q4	Why or why not?
Q5	Did you find the magazine that came with the trunk useful in your teaching practice?
Q6	Why or why not?
Q7	Did you find the coaching you received in the study useful in your teaching practice?
Q8	Why or why not?
Q9	Did you find the Coaching Companion website easy to use?
Q10	Why or why not?
Q11	Virtual professional development and coaching through watching the show, getting/using the materials, recording and uploading my videos and engaging in reflection and feedback cycles with my coach is an effective method of professional development and coaching.
Q12	Why or why not?
Q13	Did you use the Facebook group, "Let's get Mathematized"?
Q14	If you did use the Facebook group, "Let's get Mathematized", what did you find useful?
Q15	Would you be interested in using the Facebook group, "Let's get Mathematized" after the study is over? If you would like to join click here: Let's get Mathematized!
Q16	Reflecting on the cycles you've been through of watching the show, trying out materials, filming yourself, and receiving feedback from you coach, reflect on how this has impacted your teaching practice. Please explain in 5-10 sentences.

Chapter 4. Data Analysis

4.1 Quantitative analysis

One of the goals of the study was to investigate if participants experienced any changes in terms of their math teaching comfort as measure by the math comfort survey. The pre and post math comfort survey contained 20 Likert (1932) scale questions that could tap into the underlying concept of math comfort (see table 4.1 for full list of questions). These 20 questions were presented to the participants before they engaged in the study and after the study was complete. A question in its singularity could not capture the latent variable of math comfort, so the researcher decided to pare down the questions into more management components. To find out if any of the 20 variables "hung together" to represent a construct related to math comfort, a principal components analysis (PCA) was conducted to determine if there were smaller latent components of the total number of questions that could explain the interrelationship among the 20 variables. Two main components resulted from the PCA which needed to be operationalized. The first component was defined as *individual math comfort* and the second component was labeled as "negative views about math and young children". Once the two components were identified, an exploratory factor analysis (EFA) was conducted to help the researcher understand the strength of each question on the respective component/factor.

All responses including survey responses were collected via Survey Monkey (http://surveymonkey.com) and Qualtrics software between November 2017 through June 2018. Two different software packages were used because the institution that approved the IRB exemption ask that all university students and staff switch to Qualtrics to align with security requirements. Once all data was collected in both Survey Monkey and Qualtrics, the raw data was exported into an excel spreadsheet. In addition, the data was also entered into a Microsoft

Access database. All data was cleaned in excel and any identified missing data or cases were excluded from the analysis. The clean data with 70 participants was then imported into SPSS version 26 to prepare for analysis.

Before running an exploratory factor analysis (EFA) a principal components analysis (PCA) was conducted to reduce the data prior to running an EFA. This was completed to provide the combinations of variables (components) that account for most of the variance in the original items (variables). A zero-order correlation matrix was obtained in SPSS to summarize and show the correlation coefficients between all 20 variables for all 70 participants that completed all components of the study. It was expected that there would be some correlation between variables (question number) because the latent variable of interest (math comfort) was being assessed by the set of questions. However, it was important that no two variables measured the exact same thing. If variables are too highly correlated, it means you have the potential for a redundant variable or multicollinearity (Tabachnick & Fidell, 2017). The correlation table shows that there were no relationships that were more extreme than ±.90. The highest correlation was between comf6 (I feel comfortable planning and doing classroom activities related to patterns) and comf4 (I feel comfortable planning and doing classroom activities related to measurement and data) at 0.78. In other words, there were no variables that were correlated more extreme ±0.90 (Tabachnick & Fidell, 2017). After running the correlation matrix, the next step was to check for communalities. All communalities were > 0.40. ranging from a low of 0.520 to a high 0.863 (averaging 0.685), which is acceptable and indicates that each variable has at least 50% of its variance accounted for by the set of components with eigenvalues >1.

Table 4.1

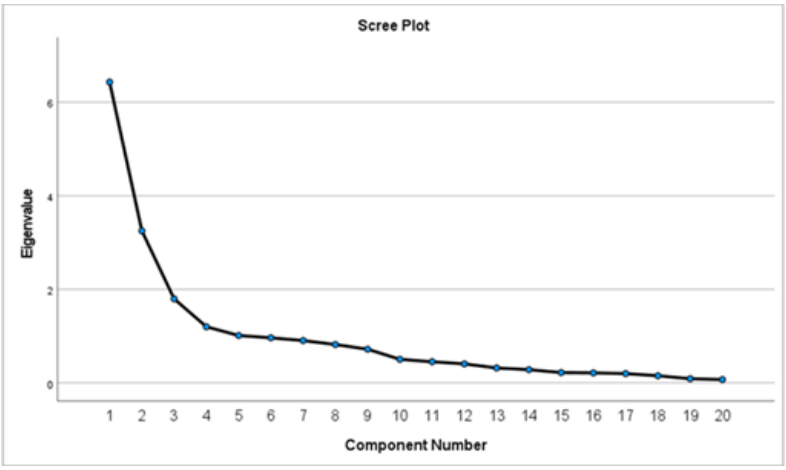
Math comfort survey questions

Question number	Question
Q1	Did you find the Circle Time Magazine episodes useful in your teaching practice?
Q2	Why or why not?
Q3	Did you find the STEAM trunk materials useful in your teaching practice?
Q4	Why or why not?
Q5	Did you find the magazine that came with the trunk useful in your teaching practice?
Q6	Why or why not?
Q7	Did you find the coaching you received in the study useful in your teaching practice?
Q8	Why or why not?
Q9	Did you find the Coaching Companion website easy to use?
Q10	Why or why not?
Q11	Virtual professional development and coaching through watching the show, getting/using the materials, recording, and uploading my videos and engaging in reflection and feedback cycles with my coach is an effective method of professional development and coaching.
Q12	Why or why not?
Q13	Did you use the Facebook group, "Let's get Mathematized"?
Q14	If you did use the Facebook group, "Let's get Mathematized", what did you find useful?
Q15	Would you be interested in using the Facebook group, "Let's get Mathematized" after the study is over? If you would like to join click here: Let's get Mathematized!
Q16	Reflecting on the cycles you've been through of watching the show, trying out materials, filming yourself, and receiving feedback from you coach, reflect on how this has impacted your teaching practice. Please explain in 5-10 sentences.

Examination of the scree plot also suggests that the number of linear combinations to retain for interpretation could be four or five based on the linear combinations at the elbows and up (see figure 4.1). This indicates that either four or five factors may be retained.

Figure 4.1

Scree plot of survey items linear combinations



However, the components matrix showed that only three factors were significant when examining the loadings, which are partial correlations between the variables and the components. With N = 70, a critical value of rα=.01, 2-tailed = ±0.722 was used to determine which loadings are significantly different from zero. Four of the loadings on component one was significant, only one loading on component two was significant, one loading on component three was significant, and no loadings on components four and five were significant. According to Stevens' (2002) criteria, four or more loadings need to be more extreme that ±0.60 regardless of sample size. The first component is reliable because it has 11 loadings that are more extreme than ±0.60 (Comf1, Comf2, Comf3, Neg4, Comf4, Enjoy1, Neg6, Neg7, Belief6, Comf5, Comf6). The second component is also significant because it has at least four loadings that are more extreme than ±0.60 (Belief3, Neg1, Neg3, Neg4). The third component has two loadings that were more extreme than ±0.60 (Belief1 and Belief2) but were not significant because there were only two components that met the requirement and no loadings more extreme that ±0.80). The fourth component had one component more extreme than ±0.60 and no loadings more extreme that

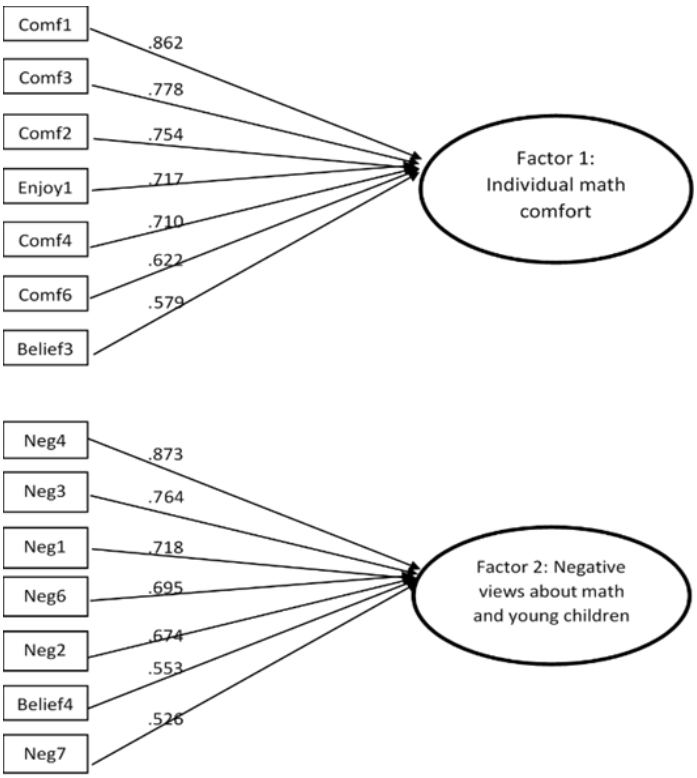
±0.80. The fifth component was not significant because there were no loadings more extreme than ±0.60 and no loadings more extreme than ±0.80. There was some cross-loading across one of the components (Neg4). The principal components analysis of the variable correlations indicated that two final factors could be retained for analysis in EFA. There was no indication of problematic variables in the communalities since all were > 0.40 and averaged 0.685. Inspection of eigenvalues showed that these first two components account for 48% of the variance in the original set of variables. Although this is not as optimal as hoped, it does indicate some of the variance is accounted for by the first two components. Whereas the scree plot showed that a fourth and fifth factor could be examined, the pattern of loadings indicated that only the first two components were reliable. These results, when taken together, indicate that a 2-factor EFA should be specified.

To gain interpretability, an orthogonal rotation was implemented to maximize the relationship between the factors and the variables that are within them while maintaining the original relationship of the variables to each other (Sanders, 2018). The results in the rotated factor matrix suggests most of the item-factor loadings fit into two factors (see figure 4.2). The first factor was interpreted as representing individual math comfort, second factor as negative views about math and young children. In short, six variables did not load onto the two significant factors and not considered in the regression. Paired sample *t*-tests were implemented to test pre-post mean change for the two factors considered for the EFA. Subsequently composite scores were calculated for each of the two factors totaling four factors to account for pre and post calculations. It is important to note that prior to calculating the composite scores, items that were phrased negatively (e.g., “math related activities are too difficult for young children”) were reversed coded. A total of 16 items were reversed coded, eight items from the pre survey and

eight from the post. Once all composite scores were calculated, two corresponding change scores were calculated to acquire the difference between pre and post scores for each factor.

Figure 4.2

Item-factor loadings



In addition to testing the mean change between pre and post survey, the relationship between pre survey level and change were also of interest. Two paired sample t-tests were conducted to find the mean difference between the two factors. Results for the pre-factor 1 survey (*M* = 4.86, *SD* = 0.70*)* and post-factor 1 (*M* = 5.34, *SD* = 0.67*)* indicate that participants individual math comfort increased by 0.48, $t(69) = -4.54$, $p < 0.001$ with a critical value of $t = \pm 2.00$ 2-tailed. Results for pre-factor 2 (*M* = 2.38, *SD* = 0.86*)* and post-factor 2(*M* = 2.48, *SD* = 0.73*)* indicate there was no difference between pre and post, $t(69) = -0.88$, $p = 0.38$ with a critical value of $t = \pm 2.00$ 2-tailed.

To analyze the relationship between pre survey and change two simple linear regressions models were conducted in SPSS version 26. The first model was for the factor called individual math comfort, the second model was for the factor labeled negative views about math and young children and the third was for positive beliefs about children and math. Normality, linearity, and homoscedasticity of residuals were examined for the models to ensure that linear regression model assumptions were tenable. The residual for the first model was fairly normally distributed with slight left skew. The second model was normally distributed with slight right skew. The residuals plots did not show any S-shaped or U-shaped pattern for either of the models which indicates that linearity is tenable. The residuals seem to show reasonably even dispersion of the scatter plot for the models with a focus of points in the center. The assumption of independence is tenable and is not violated because the treatment (STEAM Trunk study) was implemented individually. Two separate simple linear regression models were executed for each change score. The model used for each regression was as follows.

$$Y = b_0 + b_1 * X$$

$$\text{NewPost\_Fact1} = b_0 + b_1 * \text{ZNewPre\_Fact1}$$

$$\text{NewPost\_Fact2} = b_0 + b_1 * \text{ZNewPre\_Fact2}$$

In the model above, Y is equal to the constant mean (b_0) of each factor, plus the unique effects of the post factor for each.

4.2 Qualitative analysis

A combination of qualitative methods was used to analyze the open-ended questions on the post study survey. These methods included strategies prevalent in various first cycle coding methods such as open-coding methods, simultaneous coding, and evaluation coding. In addition, a combination of second cycle methods including axial and pattern coding were also utilized to

identify themes from the first cycle of coding (Glaser & Strauss, 2009; Greene et al., 1989; Saldaña, 2021). The intention of the post study survey was to gather open-ended feedback from the participants about their experience with the individual and collective elements of the study. The aim was to identify any patterns or commonalities within responses to understand what aspects of the intervention participants found to be effective. The survey contained a total of 16 questions. Eight out of the 16 questions required a dichotomous response (yes/no or agree/disagree). The other eight questions asked for elaboration to the previous question. An example of both types of question on this post study survey was "virtual professional development and coaching through watching the show, getting/using the materials, recording, and uploading my videos and engaging in reflection and feedback cycles with my coach is an effective method of professional development and coaching." Participants were first given the option to select agree or disagree to this question. A follow-up question was "why or why not" (see table 3.4). There were specific questions dedicated to each component of the study (CTM show, magazine, STEAM trunks and the Coaching Companion). Two open-ended questions towards the end of the survey asked the participants their opinion on the effectiveness of the combination of PD components. Question 12 asked if the whole process was effective and question 16 asked how their experience in the study impacted their teaching practice. These two questions were the focus of the qualitative analysis because they were believed to most accurately captured the experience of the participants. In other words, it was difficult to separate the intervention component of watching the CTM show with uploading demonstration videos because the elements were packaged together as an experience. The responses from participants about the individual elements are important but cannot provide a holistic picture of experience. Since the goal of this study was to understand the acceptance and viability of the intervention

from the participants point of view. The analysis and interpretation of open-ended survey responses can glean valuable information about how the program was or was not acceptable and what challenges were experienced.

The second, and third research questions were: 2) Is the STEAM Trunk a socially valid intervention? a) Will participants enjoy and feel like it was worth their time? b) Will they feel satisfied with this intervention and 3) How will teachers describe the influence of the STEAM trunk intervention on their teaching practice? These questions were the focus of the qualitative analysis. These questions are appropriate for a qualitative approach to code and categorize common themes or patterns because there is a level of interpretation that is required to make sense of open-ended responses. Categorization and conceptual interpretation can help attribute meaning to the responses from participants (Saldaña, 2021). The process can be likened to the exploratory analysis used to quantitatively interpret the survey data because of the grouping aspect. However, the qualitative approach of attempting to attribute meaning to the categories can provide richer data about participant experiences to inform program improvement efforts. In addition, the nuances of words can provide specific information that can be lost or overlooked in quantitative analyses.

Responses were analyzed from a total of n= 70 participants that completed the post study survey. All qualitative data from the post study survey were exported into an Excel spreadsheet. The data was double checked to make sure the responses in Excel matched the original answers in Qualtrics software (2018). Before the responses could be exported into a computer-assisted qualitative data analysis software (CAQDAS) response in Spanish were translated. Of the 70 teacher participants that completed all data points, 11 of the participants answered the post study survey in Spanish (see appendix B for full survey). The researcher was not fluent in the written

Spanish language and therefore required the open-ended responses in Spanish to be translated. Two literacy fluent Spanish speaking early childhood research coordinators translated the open-ended responses. This process began with the first coordinator reading a teacher participants open-ended response and then translating the response directly into Spanish. At times, when a direct translation was not possible due to a direct translation not making sense in English, the first coordinator paraphrased the response. Once the first coordinator completed translating all 11 participants responses, the second research coordinator read the same 11 original responses and reviewed the first coordinators translations. If the second coordinator agreed that the translation was accurate, no changes were made, and the second coordinator moved on to the next response. However, if the second coordinator did not agree or had a different interpretation of the teacher participants original open-ended response, the second coordinator entered their interpretation in parenthesis after the first coordinators translation in English. For example, one teacher participant's open-ended response to Q2 on the post study survey was as follows:

> Q2 Did you find the Circle Time Magazine episodes useful in your teaching practice? Why or why not?
>
> Participant response: *"Me gusto que explicaron el concepto de cada kit y la importancia de explorar cada concepto"*
>
> The first coordinator translated this response as*: "I liked that the concept of every kit and the importance of exploring each concept was explained."*
>
> The second coordinator in parenthesis entered: *"I like that it explained each concept of every kit and the importance of exploring each concept - more verbatim."*

There was a total of six responses (out of 88, 11x8= 88) that the second coordinator entered an alternate translation in parenthesis. This included the responses in which the second coordinator added an additional word. For example, one teacher participant's open-ended response to Q6 on the post study survey was:

Q6: Did you find the magazine that came with the trunk useful in your teaching practice? Why or why noy?

Participant response*: "Si, muestra cada edad y que materiales usar para cada actividad*

The first coordinator translated this response as*: "Yes, it includes all age groups and the materials to use for each activity"*

The second coordinator added the word "which" in parenthesis in the following format. *"Yes, it includes all age groups and the (which) materials to use for each activity".*

After the second coordinator completed reviewing all the open-ended responses in Spanish, the researcher asked the first coordinator if he/she agreed with the second coordinators interpretation. The first coordinator agreed that the changes/additions from the second coordinator were accurate. After all responses in Spanish were coded and agreed upon by both Spanish speaking coordinators, all the data was once again checked for consistency and imported into the CAQDAS.

All data from the 16 questions were entered into Dedoose version 8.0.35 software (2018). Eight of the 16 questions were open-ended and all eight were included in the qualitative analysis except for one which was about joining an optional social media group. The 70 participants responded to all open-ended questions except for the social media question which was not applicable to the participants that did not engage in the social media component. In addition, some participants selected a dichotomous answer (yes/no or agree/disagree) for question 10 about the Coaching Companion and did not elaborate on the response with an open-ended answer. This resulted in roughly 490 open-ended responses being coded. The first cycle of coding used a descriptive and simultaneous process for line-by-line coding "to provide an [initial] inventory of their topics" (Greene et al., 1989; Saldaña, 2021, p. 129). In addition, simultaneous coding was used because a single open-ended response could have multiple meanings, some that were apparent and some that were less obvious (Saldaña, 2021). For

example, the following response “the episodes were very helpful because not only did it explain math verbiage, but it also gave recommendations of great books along with how to use the items in the steam trunk” was given two codes, “provided information/ideas” and “using materials”. This example was assigned the code “provided information/ideas” because the participant referenced “giving recommendations”. It was also assigned the code “using materials” because the participant referenced the materials (see appendix A for full code book). This process was repeated for all open-ended responses that were received. This coding process can be described in multiple ways. For example, the term “open-coding” is used by Corbin & Strauss (1990) and “first cycle coding” by Saldaña (2021). Despite the difference in terminology, this initial round of coding is used to compare similar responses (Corbin and Strauss, 1990; Saldaña, 2021).

This first cycle of coding generated 52 codes (see appendix A for coding manual with full list of codes). Inter-rater reliability was completed in Dedoose after this first cycle of coding to ensure that the primary researcher was not completely off target. About 25% percent of the 490 responses were randomly selected to be double coded by an early learning professional. A pooled Kappa score of 0.81 was achieved which is interpreted as having a substantial amount of agreement (De Vries et al., 2008; Landis & Koch, 1977). Pattern coding was used for the second round of coding to organize the descriptive codes into categories that were more abstract. This phase generated themes or categories that were more abstract in nature and required some interpretation for sense making. Saldaña (2021) notes that a transition from first to second cycle is needed “to develop a sense of categorical, thematic, conceptual, and/or theoretical organization from your array of first cycle codes” (p.297). Eight categories were generated through multiple rounds of looking at the codes independently and together. For example, the category of “provided ideas and knowledge” was generated from grouping together any codes

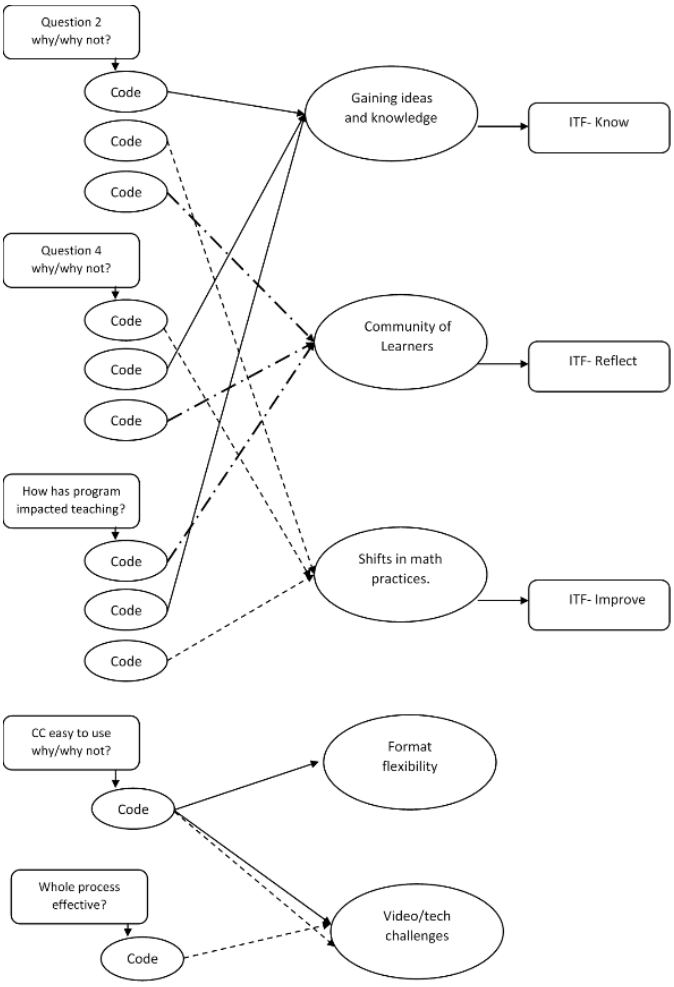
that referenced adding tangible or intangible ideas and knowledge from any of the study components. For example, the code “provided information and ideas” from the question of why the CTM episodes were useful and the code “gained knowledge, strategies and ideas” from the question about why the coaching was useful were combined. They were combined because both codes reference receiving new information or ideas that helped their work (see figure 4.3 for visual representation of coding process).

The last step was to condense the eight categories into a larger theme or concept (Saldaña, 2021). However, one category or theme would not authentically capture the difference components of the study that participants experienced. In other words, the CTM episodes and video recording your own practice are two different components in ITF framework (know and see versus do and reflect) so it would seem reasonable that the two components would generate different themes or concepts. One way to reduce the eight categories was to connect each category back to the ITF components. Since the components of the study (CTM episodes, CTM magazine, STEAM Trunks and Coaching Companion) were a mechanism to aid the delivery of the ITF in a virtual manner, it seemed sensible to connect the study components back to the framework. Subsequently, connecting study components can reveal information about portions of the study that worked well for the participants and others that did not. The eight categories could be reflected in four components of the ITF, but a few categories suggested other interpretation. For example, the categories of community of learners (including feedback and reflection), being more intentional about math and increased confidence can be linked to the reflection component of the ITF. In the next section, I will describe what each of the qualitative findings imply. Furthermore, I will connect the responses back to the concept of social validity and the judgement of acceptance. Specifically, the *goal* was to have teachers go through the

virtual professional development components. The *process* was about the acceptability of the program from participants perspective and the intended *outcome* was for participants to increase positive disposition towards math (Schwartz & Baer, 1991; Wolf, 1978).

Figure 4.3

Illustration of post study survey coding process



Chapter 5. Results

5.1 Quantitative results

The first research question, will math comfort and teacher attitudes about math change after participating in STEAM Trunk? A PCA followed by an EFA revealed two factors were to be considered. Means, standard deviations, and zero-order correlations among all variables are presented in table 5.1. Only one standardized pre factor was correlated with the outcome (NewPost_Fact2) with r = 0.33, p < 0.01. The predictor accounted for a small amount of variance in post factor 2, R^2 = 0.11, $F(1,68) = 8.31$, $p = 0.005$, R^2 adjusted = 0.10. The model estimate of the intercept showed that participants were predicted to average a score of 2.48 (*SE* = .083) on post factor 2, which was not significantly different from zero, $t(68) = 29.83$, $p = < 0.001$. Since the negatively phrased responses were reverse coded on the 1-6 Likert (1932) scale, a lower score represents more positive views. Lower negative beliefs about math and young children had a unique positive effect on their post survey rating ($b = 0.24$, $SE = 0.084$), $t(68) = 2.88$, $p = 0.005$, $sr^2 = 0.11$. Specifically, there is an estimated mean decrease of 0.241 points on postsurvey factor two, holding all other variables constant. In other words, participants on average had more positive beliefs about children's ability to learn math by 0.241 points. NewPre_Fact1 (pre survey for factor 1 on comfort) was not uniquely predictive of post math comfort, ($b = 0.12$, $SE = 0.081$), $t(68) = 1.47$, $p = 0.147$). In other words, an increase in teacher math comfort was not detected. However, there was a small yet significant reduction in negative views about math and young children.

Table 5.1

Correlation matrix for pre math comfort survey

Variable	*M*	*(SD)*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1 Comf1	5.00	(0.87)	--																			
2 Belief1	5.56	(0.69)	.19	--																		
3 Belief2	5.40	(0.67)	.23	.54 ***	--																	
4 Comf2	5.10	(0.82)	.71 ***	.36 **	.38 **	--																
5 Belief3	4.24	(1.39)	.36 **	-.01	.05	.35 **	--															
6 Comf3	4.77	(0.94)	.63 ***	.20	.20	.56 ***	.38 **	--														
7 Neg1	1.77	(1.24)	-.03	.03	.04	.04	.34 **	.04	--													
8 Belief4	3.80	(1.22)	.11	.05	.05	-.04	.28 *	.23	.41 ***	--												
9 Neg2	2.41	(1.39)	.29 *	-.03	-.09	-.23	.19	-.28 *	.32 **	.27 *	--											
10 Neg3	1.63	(0.89)	-.23 *	-.29 *	-.21	-.19	.16	-.03	.58 ***	.24 *	.37 **	--										
11 Neg4	1.86	(1.18)	-.38 **	-.18	-.07	-.33 **	.22	-.21	.60 ***	.30 *	.52 ***	.83 ***	--									
12 Belief5	4.34	(1.36)	-.12 *	-.05	-.04	-.08	.19	.02	.07	.01	-.11	.17	.21	--								
13 Comf4	4.90	(0.84)	.68 ***	.10 *	.15	.50 ***	.15	.58 ***	.03	-.03	-.31 **	-.13	-.26 *	.03	--							
14 Neg5	3.06	(1.51)	-.17	.20	-.14	-.16	-.06	-.13	.35 **	.05	.24 *	.28 *	.33 **	.07	-.25 *	--						
15 Enjoy1	0.00	(0.82)	.59 ***	.03	.16	.56 ***	.31 **	.57 ***	.09	.20	.18	-.04	-.18	.08	.72 ***	.35 **	--					
16 Neg6	5.00	(1.44)	-.45 ***	-.08	-.02	-.36 **	.10	-.18	.33 **	.11	.55 ***	.47 ***	.65 ***	.05	-.28 *	.32 **	-.27 *	--				
17 Neg7	2.70	(1.18)	-.41 ***	-.09	-.16	-.31 *	-.02	-.15	.27 *	.10	.32 **	.50 ***	.53 ***	.09	-.35 **	.29 *	-.32 **	.59 ***	--			
18 Belief6	5.16	(0.77)	.35 **	.35 **	.33 **	.50 ***	-.09	.41 ***	-.26 *	.00	-.39 **	-.42 ***	.53 ***	-.11	.47 ***	-.31 *	.46 ***	-.41 ***	-.45 ***	--		
19 Comf5	4.43	(1.19)	.55 ***	-.08	.11	.39 **	.09	.34 **	-.16	.08	-.29 *	-.19	-.31 **	.04	.60 ***	-.35 **	.60 ***	-.48 ***	-.49 ***	.42	--	
20 Comf6	5.01	(0.89)	.54 ***	.22	.26 *	.55 ***	.17	.49 ***	-.02	-.02	-.17	.19	-.25 *	.20	.78 ***	-.16	.72 ***	-.25 *	-.37 **	.52 ***	.53 ***	--

5.2 Qualitative results

The combination of first (open-coding, simultaneous coding, evaluating coding) and second coding methods (axial coding and pattern coding) provided information to answer the second and third research questions: 2) Is the STEAM Trunk a socially valid intervention? a) Will participants enjoy and feel like it was worth their time? b) Will they feel satisfied with this intervention and 3) How will teachers describe the influence of the STEAM trunk intervention on their teaching practice? (Glaser & Strauss, 2009; Greene et al., 1989; Saldaña, 2021).

Participant responses about the effective components of the study revealed a total of five themes: gaining knowledge and ideas, community of learners, shifts in math practices, flexible format, and video/tech challenges.

5.2.1 Qualitative Themes

The first theme, "gaining ideas and knowledge" was the most common code across all of study components both together and separately. For example, the words "ideas", "information", and "knowledge" came up in the answers about the show, trunks, magazine, coaching and the overall experience. This theme implies that participants were able to gain knowledge and skills through the intervention. Some responses from participants include "watching how other teachers incorporate math into their daily schedules helped me learn new ways to use them in my own classroom" and "It is always helpful having someone observe you and making you aware of new ideas". This theme aligns with the professional development framework in the sense that it addressed content knowledge, and skills. In regard to the intentional teaching framework, this category maps onto the "know" and "see" the best. The know and see component is about gaining knowledge of what high-quality teaching interactions look like and participant responses about gaining new information aligns well.

The second theme of "community of learners" encompasses the provision of feedback and opportunity for reflection with coaches, by others and self-reflection. This theme can be associated with "the what" component in the PD framework because reflection can help educators see what their strengths are as well as any areas of improvement. In addition, reflection can influence the dispositions of educators by showing them their strength. Reflection with the guidance of coaches, other teachers or individually maps on precisely with the reflect component of the ITF. Finally, reflection can elicit certain emotions in the educator. Examples of these types of responses include "I think that getting feedback from other people is helpful for all when we are trying to better our teaching skills" and "I found this to be very helpful due to sometimes self-doubting myself, so having another point of view and ideas was great". The process of watching the show and seeing other teachers engage children in math during meal times may help the educator feel more positive and potentially excited about implementing more math during meals.

The third theme of "shifts in math practices" included sentiments of being more confident, intention and aware of math opportunities. The responses that contributed to this theme could potentially fit in the center of the PD framework identified as the highly effective teaching. This theme could also map onto the reflect and or improve components of the ITF by providing educators information about how they are engaging children in math. Participant responses that contributed to this theme included, "I am more confident doing math activities with the kids. Prior I was intimidated on how to incorporate math in my everyday activities" and " I am more aware of math concepts and vocabulary and more deliberate in my usage of them!" the central element in the PD and ITF framework allude to this theme through the description of highly effective teaching and improvement, but there might be another framework that captures

the internal nature of confidence and intention. For example, the experiential, emotion or affective that is characteristic of a UX perspective.

The theme of "flexible format" included the virtual nature, and the ability to re-watch episodes. This theme maps onto the "how" component of the PD framework because it is referring to the way in which knowledge is delivered. In addition, this component can align to the entire process of the ITF, but specifically to the virtual components that drive the movement of the ITF. Example of participant responses that contributed to this theme include " I liked it because I could watch at my own convenience" and "This method is flexible, I can upload videos after class, my coach can view and respond at a time that fits her schedule".

Finally, the theme of "video/tech challenges" included responses alluding to difficulty uploading videos and unclear directions. This theme maps onto the "how" component of the PD framework and implies that clearer instructions on what participants are to do and how they are to do it are crucial in providing participants with a good experience. This theme also implies that negative experiences with PD can cause participants to feel frustration not only with the platform itself, but potentially also with the process. Thus, attention and care should be given when designing a virtual PD experience related to technology. Responses with codes that were in this theme included "unfortunately, [uploading videos] was a constant struggle for me" and " aside the video upload issues, it was a good experience". This is important information in helping to improve the design any PD and virtual PD in particular. Quotes such as these provide valuable feedback to improve user's experience.

In short, participants found the program to be effective because it provided new ideas and knowledge. In addition, the flexibility of the format, the provision of materials and ability to be in community with other through reflection and feedback were noted as the reason for its

effectiveness. Feedback on technological challenges and unclear instructions are components that should be addressed in future virtual PD designs to increase effectiveness.

5.2.2 Social Validity

The components of social validity to address participant acceptability were also evident in participant responses. The components of goals, process and outcome can be mapped onto the final five themes generated from the coding process.

5.2.2.1 Goal.

One goal of the STEAM Trunk math study was to increase math comfort and encourage teacher engagement of the components as a package. Most teachers, 67 out of 70 or 96% agreed that the STEAM trunk components were an effective way of delivering professional development (see table 5.2 for summary for dichotomous responses). The sentiments of why this was effective were varied, which was expected. Some participants noted that they were able to learn from other teachers. For example, one participant noted “Watching how other teachers incorporate math into their daily schedules helped me learn new ways to use them in my own classroom”. Other participants referenced the benefits of the components being virtual. For example, another participant wrote “I am very remote so I dont have opportunities for in-person classes. Virtual development is perfect! I enjoyed working with Circle Time team.” The flexibility of the format was also experienced in the context of having the content recorded. For example, a third participant said, “I could go at my own pace, and watch the shows multiple times to help me understand”. There were some participants that did express some challenges with the components. However, the participants noted that there were certain components of the study that were challenging and not the entire package. For example, “Yes, it was wonderful, but more technical support. Offering support in my home language.” Others noted challenges

concerned technology. For example, “YES, although I had a lot of problem downloading the videos....such a headache. But do love feedback.” Both positive and negative feedback were evident in the responses. Negative responses can be helpful despite the typical goal of desiring positive results. Negative or neutral responses are important in evaluating the acceptance of a program because the challenges participants have can “provide an *early* warning of program rejection in any of its forms” (Schwartz & Baer, 1991, p. 200). These responses about technology difficulties provide valuable information about how the design of and training for virtual PD elements can be improved.

Table 5.2

Post study survey participant responses

Question Number	Question	Count of Yes/Agree	%	Count of No/Disagree
1	Did you find the Circle Time Magazine episodes useful in your teaching practice?	64	91%	6
3	Did you find the STEAM trunk materials useful in your teaching practice?	69	99%	1
5	Did you find the magazine that came with the trunk useful in your teaching practice?	68	97%	2
7	Did you find the coaching you received in the study useful in your teaching practice?	68	97%	2
9	Did you find the Coaching Companion website easy to use?	40	57%	30
11	Virtual professional development and coaching through watching the show, getting/using the materials, recording and uploading my videos and engaging in reflection and feedback cycles with my coach is an effective method of professional development	67	96%	3

Note. N=70 (n=70 for each question)

5.2.2.2 Process.

When evaluating the process of the STEAM trunk math study, teachers were able to provide feedback on the components separately as well as together as a package since that is how they experienced it. Overall, there was much satisfaction with the components of the study both separately and when combined; 91% of participants reported that the CTM episodes were useful in their teaching practice. The most frequent code for this question was that the information

provided in the show was useful in their work. For example, a participant noted “They were so useful because they help you think about math differently, especially when they would explain that there is so much more to geometry than shapes, more to patterns than abab, more to counting than the rote one, two three ETC.” Some participants did note some challenges and most of them were centered around not watching them and one mentioned technology problems “It was difficult to watch the episodes because they would have a delay or skip. If there was an option to download then watch I could have better luck but the streaming did not work well.” These, not so positive responses provide us some information about elements that can be improved, but responses such as “I did not time to watch them, I work 12 hours day with the children” are extremely important but beyond the scope of this work.

Responses of the STEAM Trunk overwhelming reported positive sentiments about the trunks being useful. Ninety-nine percent of the participants appreciated the materials and reported that the trunks were exciting to receive. For example, one participant noted “It gave us new materials to use and broaden our imaginations and math concepts. Doing this study ignited a bright light of excitement and brought out more math language when using the materials sent in the trunk. The materials offered new and fun math skills and concepts”. Within this question, the codes that came up the most were that the materials *added to the environment* (e.g., “I was able to supplement my classroom with some new things) and *general positivity about materials* (e.g., “Loved the steam trunks”). The positive response makes me wonder if there may be some inherent traits within incentives (such as the STEAM Trunks) that are worth exploring deeper. This is especially interesting for a workforce that has been historically under-valued. This may be a topic worth exploring in the future.

The process component of the STEAM Trunk study that had the most variability between participants was about the video-annotation platform. Fifty-seven percent of participants noted that the platform was not easy to use. The patterns that arose within the theme of *video/tech challenges* was about the difficulty of uploading videos to the platform and lack of clear directions. For example, a participant noted “unfortunately, this was a constant struggle for me. Uploading videos was impossible. And one my coach uploaded them, I couldn't see them which made reflection and response to my coach impossible and very frustrating.” The sentiment that directions were unclear were reflected in comments such as “Creating and completing goals needs more specific instructions”. However, there were some responses that held positive notes. For example, “yes it improved greatly from the beginning. Once there was an update it was very easy to navigate.” When participants were asked to give feedback on the process, a common theme was the response was that the format of the study was useful. This encompassed remarks about the ability to re-watch, for example “I could go at my own pace and watch the shows multiple times to help me understand” and references to the barriers distance can cause. For example, “I am very remote so I dont have opportunities for in-person classes. Virtual development is perfect! I enjoyed working with Circle Time team.” The patterns and theme from participants about the video-annotation platform provide information about the need to ensure clear instructions and layout of the platform for future iterations.

5.2.2.3 Outcome.

The desired outcome of the STEAM Trunk study was to increase the knowledge, skills, and dispositions towards math to impact teaching practices, but there were other outcomes that arose. The intended outcome was highlighted in a theme that seemed prevalent. This theme encompassed responses that referenced a shift in math practices that were experienced.

Specifically, the words intentionality, awareness and confidence were coded the most within the theme of shifts in math practices (a total of 21 times across all questions). For example, “I think that what I will take away from this study is a refreshed perspective on what I am capable of teaching to my very young children. My kids are exploring and learning everyday and I can support that by being mindful of what I hope they will learn. By intentionally drawing their attention to math concepts as they play I can help them to build a deeper understanding of so many different relationships that they will encounter in the world.” An additional theme within shifts in math practice that arose was an increase in confidence. For example, “After participating in this class, I have improved on my knowledge of math education in early childhood. I now understand the different concepts I can highlight for my children (even babies!). I have a new repertoire of games and activities to use in every day play. I feel more confident in using math-based vocabulary and scaffolding techniques in my daily interactions with children. I'm more aware of math concepts and vocabulary and more deliberate in my usage of them! Math is more than just counting! It's all around us.”

A surprising theme that surfaced was the gratitude expressed for being in the study. Some of the responses included: “I would really like to say thank you for including me in this process, I not only had an amazing mentor I received various items for my classroom.”, “I feel very fortunate and grateful for the opportunity to be part of this study.” “We felt so blessed to have had our coach approach us with this great program.” “First off thank you for providing this type of training that gives us the opportunity to be educated and to be able to support children to learn in a way that is fun and new.” And “[I] never knew there were so much programs out that for us to better teacher and show our children and our classroom.”

These quotes are powerful because of the sentiments of appreciation for the program which was unexpected. We cannot tease apart specifically which component of the study was the more influential in their expressions of gratitude, but it peaks a question about the latent concept of gratitude and how this emotion might relate to PD in field of early childhood education and those in the workforce. Other intangible emotions such as joy and fun were also noted in participants responses. An additional perspective from a different field of study may be beneficial to explore these deeper reactions.

5.2.3 User Experience

Some participant responses mapped on to elements of the ITF and the components of social validity. However, there were also responses about gratitude, joy, fun, and aesthetics that also surfaced. These emotion and affect related responses *could* potentially fit into the reflection component of the ITF or the process component of social validity, but a user experience (UX) framework from the field of human center interaction (HCI) may provide a better explanation. The responses related to an affective dimension of PD appeared consistently enough amongst a variety of participants to reveal a theme. Themes of affective nature such as gratitude and shifts in math practice cannot be measured tangibly but are important in driving change that can be seen.

The internal change that happens within an educator's mind/being/soul can be implied by the different frameworks. For example, the reflect and improve component of the ITF requires some internal shift inside the educator, whether it is realizing they missed a teachable moment or should have stopped circle time ten minutes earlier. In the professional development framework of who, what and how, the affective dimensions can be viewed as occurring in the how component and the highly effective teaching in the center of the overlapping circles. Although

emotions such as gratitude and joy can be implied, I argue the need to intentionally design for them is needed. This is especially true in regard to virtual professional development because of the heavier reliance on technology. In in-person PD, the instructor, faculty member or trainer can read audience expression and adjust for a different perhaps more meaningful experience. However, in a virtual space human interaction is diminished or missing, but it does not mean affective dimensions are less important in a virtual space.

Coined by Don Norman and colleagues (1995), user experience (UX) is complex and there is no single definition for what it means, but many agree that UX is about the entire experience when engaging with technology (Hassenzahl and Tractinsky, 2006). UX considers how the user feels when using the product/program instead of just the goal or process of use. Hassenzahl and Tractinsky (2006) categories three intangible facets of UX that encapsulate the affective sentiments such gratitude, joy, aesthetics, and confidence. The three facets are: beyond the instrument, emotion and affect and the experiential (see figure 1.1).

STEAM participant's responses can map on to these three facets. For example, "beyond the instrument" refers to aesthetics and hedonic nature of a product or program. STEAM trunk participant responses such as: "Fun to read with the colorful photos and illustrations, I love it!!" (about the magazine), "bright and engaging" (magazine), and "colorful with an easily read font" provide evidence for the consideration of this facet. The second facet of "emotion and affect" was also prevalent in responses such as: "The steam trunks brought an excitement to our lives", "it was exciting to get the trunk each month", "they were fun to watch" (episodes) and "everything is math, it is fun nowadays!". The third and final facet of UX, "the experiential" relates to internal states before and after engaging with a product or process. Participant responses that map onto this facet also align with the responses about changes in teacher

practice. Responses such as: “I am now constantly thinking "Am I bringing math into this moment with this child? If not, how can I?”, “I am more confident doing math activities with the kids. Prior I was intimidated on how to incorporate math in my everyday activities” and “made me a better provider” can all be associated with this facet.

Chapter 6. Discussion

6.1 Extending the Conceptual Framework of PD in Early Learning

At the core of who early educators are, is their being, their experiences, and emotions. These affective dimensions may influence how professional development is received. The literature on PD in early learning may benefit from including an intentionally designed professional development framework. The reason is these dimensions are no less important than the knowledge and skills required to deliver effective teaching. The current PD framework referenced in this dissertation addresses the who, the what and the how, but is missing *the why*. I argue that the why of PD underlies the other elements and should be intentionally addressed when designing PD for early learning educators. One reason why educators engage in PD and why they find their experience acceptable or unacceptable can be related to the positive, negative, or meaningful feelings that are evoked in the process. This is particularly relevant for virtual PD because of the reliance of a digital platform or process that may not include live instructions.

One definition of user experience (UX) from the field of human computer interaction (HCI) looks beyond the "user friendliness" of process or piece of technology and into the internal motivator that are innate. The responses from the STEAM Trunk participants revealed that this intervention was potentially acceptable because it made them feel respected, positive, and encouraged. In other words, participants reported positive experiences with the study that will hopefully leave a "good taste" in their mouth about the potential of virtual PD. In addition the joy that was referenced on behalf of the educators and children when receiving the trunk provides some indication that this joy may contribute to their experience in the program.

Affective dimension such as joy, positive experiences, and feelings of respect should be incorporated into virtual PD, because these emotions and affect will likely lead to more engagement. More engagement can then lead to more knowledge, skills, and positive dispositions. Finally more knowledge and skills can lead to more effective teacher-child interactions and ultimately positive child outcomes.

A new PD framework that includes the facets of UX may be a helpful extension of the current frameworks that is worth considering. A layered approach to virtual PD begins with the underlying facets that are at the core of who we are as humans. The next level includes the theory of change or cycle of action, for example, the ITF. Finally the top layer includes the larger components of the who, what and how. In other words, the why lives under the two layers of the PD and ITF framework. Figure 6.1 illustrates this idea of a new proposed framework.

Figure 6.1

Conceptual framework of a UX PD approach in early learning

This framework can extend the literature on professional development and help guide the refinement of interventions such as the STEAM trunk math study and other virtual PD efforts.

The added layer of UX that tend to the emotion, affect, experience and underlies the existing framework can enhance our understanding on how to design and implement virtual professional development that encourages educators to keep engaging.

6.2 Limitations

It is important to recognize that no research study is without limitations and that there are always research constraints of the study itself or in the evaluation of the study. The limitations of the present STEAM Trunk study are varied and should be addressed in future iterations. The first limitation is the use of a convenient sample and lack of a control group which can lead to selection bias. Additionally, the research questions did not look at change in teacher practice or change in child knowledge about math. The study also consisted of multiple components (CTM, Trunks, Coaching Companion) so it is not possible to determine the effectiveness of each. In other words, we cannot make any claims that any one element caused change in teacher math comfort or classroom instruction. Another important limitation is the self-reporting nature of the surveys which compromises the integrity of the data. Finally the current study did not measure coaching fidelity or dosage. These limitations would be important to address in future research.

Despite the limitations mentioned above, there is value in considering the possibilities of a virtual approach to professional development. Additionally, the exploration of the social validity aspects of this intervention package from current center and home-based care providers is instrumental in the ongoing work of creating and sustaining professional development efforts in the early learning field.

6.3 Implications and Future directions

The results from this study suggest that considering UX in the design of virtual PD may be beneficial in the creation of effective PD. In addition, future research should consider

capturing specific data on the emotions and effect of educators while they engage in virtual PD. Understanding how internal motivation and satisfaction of experiences contribute to provider engagement can be a potentially improve the effectiveness of PD.

Other implication for future research include, expanding the duration and dosage in a micro learning approach. The current study was about six months long which may not have been long enough to realistically improve math comfort. However, it is important to keep in mind that the lack of time to engage in any PD may still be a barrier for some providers, so we need to think of ways to address this. For example, perhaps information can be presented in smaller chunks so that it is more digestible. Future research could also consider highlighting one specific strategy (for example spatial sense) across time and activities. Other implications include the potential adjustment of content for different age groups so that there is more concentration for skills related to specific developmental milestones. Finally, consideration for how these smaller micro learning opportunities can be credit bearing could mean an innovative approach to think about and honor professional development for our early learning workforce.

6.4 Conclusion

Virtual professional development can aid in the dissemination of evidence-based PD to the early learning workforce at large. The effectiveness of any PD program should be assessed to ensure that it is meeting the needs of its users and producing the intended goals and outcomes. In addition to effectiveness, the acceptability of the program also needs to be assessed by its users. However, effort in exploring the user experience in terms of their emotional experience is also important. At the core of human beings are emotions. These emotions can be tended to when in person or via video-chats. However, emotions such as fun, pride or determination could also be delivered virtually if designed with that thinking in mind. It is not to say that the designers of a

PD program have the capability to regulate human behavior. Instead, the design of virtual PD for the early learning workforce can provide a context in which the emotions of educators are cultivated. In the words of a STEAM Trunk participant whose experience shifted her view about math said, “math is EVERYWHERE and is not scary at all.”

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Appendix A

Qualitative code book

STEAM Trunk Math Study
Teacher participant Post Study Survey Qualitative Codes with Description
DRAFT – November 20, 2020

The process for coding the open-ended questions of the post study survey first entailed reading all the text responses for each question to gain an idea of what types of codes should be used. For example, question one on the survey asked teachers if they found the Circle Time Magazine episodes useful in their teaching practice. Respondents were given the options to choose yes or no. A subsequent question, question 2 followed up on question one by asking why the respondent thought it was or was not helpful. The first author read all open-ended responses to the follow-up questions (why or why not the component in the previous question was useful). This step was done to acquire a general understanding of the responses. The subsequent step entailed reading individual responses a second time and creating an initial code by summarizing or paraphrasing each survey response. The codes for the individual responses were not mutually exclusive. In other words, a participant's response could fit under multiple codes. The justification was that some responses consistent of multiple sentences that touched on several topics. As codes were created, if the next response to be coded fit the previous code, this response was added to the existing code. If the response did not fit an existing code a new code was added. This process was repeated six more times for the remaining open-ended questions about the separate intervention components.

Inter-rater reliability was completed after this initial round of coding. Thirty percent of the 70 participants were randomly selected to be double coded by an early learning professional. After the inter-rater reliability was completed for the first round of codes, the codes were condensed into meaningful categories (Corbin & Strauss, 1990; Saldaña, 2021).

Respondent who answered "yes" to post study survey question 1:
Question 1*: Did you find the Circle Time Magazine episodes useful in your teaching practice? (yes/no)*
Question2*: Why or why not?*

There were 64 out of 70 participants that said "yes" the episodes were useful to their teaching practice. The following fours codes were used for the follow-up question (question two) of why Circle Time Magazine episodes were useful to their practice.

1. *Format or delivery of episodes*- Respondent mention they liked the format (e.g. short) or delivery of the show (e.g. easy to understand or fun).

2. *Providing information or ideas*- Respondent mention concepts/phrases such as learning, understanding, explanations, providing ideas/suggestions and increased knowledge or information. This includes responses that state what they learned. For example, "I didn't know that you can teach math at such a young age" would be given this code because the respondent shares what they learned.

3. *Responses not specific or related to episodes*- Respondent mention other parts of the study (e.g. magazine) or responses that did not provide specific information on why the episode was useful.

4. *Using Materials* – Respondent mention the use of, or ways of how to use materials. The materials include those that were provided in the STEAM Trunks and/or materials they already had in their environment. For example, "it gave me ideas of how to use what I already had".

Respondent who answered "no" to post study survey question 1:
Question 1*: Did you find the Circle Time Magazine episodes useful in your teaching practice? (yes/no)*
Question2: *Why or why not?*

There were 6 out of 70 participants that said "no", meaning they did not think the episodes were useful to their teaching practice. The following fours codes were used for the follow-up question (question two) of why Circle Time Magazine episodes were not useful to their practice.

1. *Did not watch*- This code was used when a respondent wrote that they did not watch or access the video. This can include any reason or difficulty with playing the episodes.

2. *Episodes would delay or skip*- This code was used when respondent mentioned the episodes would delay or skip, thereby making if difficult to watch the episodes.

3. *No time*- This code was used when respondent mentioned lack of time to watch episodes.

4. *Used own resources*- This code was used when respondent mentions using own resources.

Respondent who answered "yes" to post study survey question 3:
Question 3: *Did you find the STEAM Trunk materials useful in your teaching practice? (yes/no)*
Question 4*: Why or why not?*

There were 69 participants out of 70 that responded "yes" the materials were useful to their teaching practice. The following six codes were assigned to the follow- up question 4 (Question 4) of why the STEAM trunk materials were useful to their practice.

1.) *Added to environment – general* – Respondents mention the materials **added** something to their environment, both tangible and non-tangible. Example of non-tangible additions could be ideas, excitement, and opportunities to engage in math without explicit mention of math. For example, "showed me different ideas" and "try out a new way to do something" are examples of non-tangible ways the materials added ideas to their practice. Examples of tangible additions are, "they were a wonderful supplement to my classroom" or "materials had a useful purpose" are examples of the materials adding a tangible component to their environment.

2.) *Added to environment– math specific*- Respondent specifically mention the word math when describing the additive nature of the STEAM Trunk materials. This includes both tangible and non-tangible additions like materials, ideas, excitement, and opportunities to engage in math. For example, "added more opportunities in the classroom for math talk" is a non-tangible addition (added opportunities) and "variety of math tools that enhanced what we already had in the classroom" is a tangible addition. The main distinction between this code and "added to environment-general" is the specific mention of math.

3.) *Different ages* – Respondent mention using materials with different or specific age groups. For example, "all age groups" or "infants".

4.) *Ease of use*- Respondents reference the simplicity or ease of use.

5.) *General or non-specific positivity about materials (by adults or children)* – respondents mention non-specific liking of the materials (e.g. good, yes, cool) or that they or the children liked the materials (e.g. "has items I can use" or "children were delighted").

6.) *Negative or challenges*- responses about the materials that were not positive or difficult to use.

Respondent who answered "no" to post study survey question 3:
Question 3: *Did you find the STEAM Trunk materials useful in your teaching practice? (yes/no)*
Question 4*: Why or why not?*

There was one respondent out of 70 that mentioned the STEAM trunk materials were not useful. This response was given the code of *Negative or challenges*. This allows their comment to be grouped with similar reasons.

1.) *Negative or challenges*- responses about the materials that were not positive or difficult to use.

Respondent who answered "yes" to post study survey question 5:
Question 5: *Did you find the magazine that came with the trunk useful in your teaching practice? (yes/no)*
Question 6: *Why or why not?*

There were 68 out of 70 respondents that said "yes" the magazine that came in the trunk was useful to their teaching practice. The following six codes were assigned to the follow- up question 5 (Question 6) of why the magazine that came in the trunk was useful to their practice.

1. *Different age groups* - Respondent references the magazines distinction of how to use materials or facilitate activities with different age groups.

2. *General positivity* - Respondent provides a non-specific answer to how the magazine was useful. For example, "it was fun", or "it was colorful."

3. *Ideas/suggestions/explanation* - Respondent mention the magazine provided ideas, information or explanation about how or what to do in their learning environments. This can include how to use materials, how to plan the use materials or how to incorporate materials or ideas in a lesson plan.

4. *Preference for episodes* - Respondents reference that the episode was more useful/information than the magazine.

5. *Reference/Remind/Reinforce* - Respondents mention the magazine helped reference/remind or reinforced what they learned/watched in the Circle Time Magazine show.

6. *Share with others* - Respondents mention the ability or desire to share the magazine with others.

Example of a response to Q6 that had multiple codes "*The magazine was very useful* (general positivity), *I love how resourceful it was and I could keep it handy to reference* (reference/remind/reinforce). *It was also very useful in how it was broken down by age group* (different age groups) *and I could share with my co-workers* (share with others)."

Respondent who answered "no" to post study survey question 5:
Question 5: *Did you find the magazine that came with the trunk useful in your teaching practice? (yes/no)*
Question 6: *Why or why not?*

There were 2 out of 70 respondents that said “no”, the magazine that came in the trunk was not useful to their teaching practice. The following code was assigned to the follow-up question 5 (Question 6) of why the magazine that came in the trunk was not useful to their practice.

1. *Preference for episodes* - Respondents reference that the episode was more useful/information than the magazine.

Respondent who answered “yes” to post study survey question 7:
Question 7: *Did you find the coaching you received in the study useful in your teaching practice? (yes/no)*
Question 8*: Why or why not?*

There were 68 out of 70 respondents that said “yes” the coaching they received in the study was useful to their teaching practice. The following six codes were assigned to follow-up question 7 (Question 8) of why the magazine that came in the trunk was useful to their practice.

1. Confidence- Respondent mention that coaching/coach help boost their confidence.

2. Feedback and reflection– Respondent mention receiving feedback or engaging in reflection with their coach.

3. Gained ideas/strategies/knowledge- Respondent mention coaching was useful because it offered ideas on how or what to do with materials to encourage more math. Can include ideas and strategies that are general and not tied to any specific material. For example, “helped me understand the content better”.

4. Helpful or resourceful- Respondent mention the coaching they received was helpful or coach was available to provide them with assistance or resources. General positive statements could fit under this category as well. For example, "it was great" would fit under this code.

5. NA- Response not related to coaching or response is unclear on what respondent is referencing. For example, “the videos helped”. It is unclear if this response is referencing coaching or the CM episodes.

6. Perspective/observation by others- Respondent mentions the role of others point of view or being observed by another person.

Respondent who answered “no” to post study survey question 7:
Question 7: *Did you find the coaching you received in the study useful in your teaching practice? (yes/no)*
Question 8*: Why or why not?*

There were 2 out of 70 respondents that said “no”, the coaching they received in the study was not useful to their teaching practice. The following code was assigned to follow-up question 7 (Question 8) of why the coaching was not useful to their practice.

1. No coaching or feedback- Respondent mentions that they did not receive coaching or feedback.

Respondent who answered “yes” to post study survey question 9:
Question 9: *Did you find the Coaching Companion website easy to use? (yes/no)*
Question 10*: Why or why not?*

There were 40 out of 70 respondents that indicated "yes" the Coaching Companion website was easy to use. The following seven codes were assigned to follow-up question 9 (Question 10) of why the Coaching Companion website was useful to their practice.

1. *Difficulty navigating site*- respondent mentions trouble finding where to upload videos, where to enter in goals/action steps, search for comments or otherwise moving around in the site.

2. *No problems*- respondent mention they did not have trouble or was able to navigate Coaching Companion site on own.

3. *Non-Coaching Companion related response*- response mentions other components of the study instead of the Coaching Companion.

4. *Trouble in beginning*- respondent mentions experience trouble or difficulty with Coaching Companion website in the beginning.

5. *Video upload*- respondent mentions difficulty with video process either uploading their own videos or the length of time required during upload.

Respondent who answered "no" to post study survey question 9:
Question 9: *Did you find the Coaching Companion website easy to use? (yes/no)*
Question 10*: Why or why not?*

There were 30 out of 70 respondents that said "no", the Coaching Companion website was not easy to use. The following six codes were assigned to follow-up question 9 (Question 10) of why the Coaching Companion website was not useful to their practice.

1. *Difficulty navigating site* – respondent mentions trouble finding where to upload videos, where to enter in goals/action steps, search for comments or otherwise moving around in the site.

2. *Tech problems/knowledge*- respondent mentions either their own lack of technological knowledge or that there were other challenges with the website unrelated to video upload.

3. *Unclear directions/training*- respondent mentions not being trained on how to use Coaching Companion. Includes responses that indicate not knowing where to upload videos or components of the study not being clear.

4. *Video upload*- respondent mentions difficulty with video process either uploading their own videos or the length of time required during upload.

Respondent who answered "agree" to post study survey question 11:
Question 11: *Virtual professional development and coaching through watching the show, getting/using the materials, recording, and uploading my videos and engaging in reflection and feedback cycles with my coach is an effective method of professional development and coaching? (Agree or Disagree?)*
Question 12*: Why or why not?*

There were 67 out of 70 respondents that said they agreed that virtual professional development and coaching through watching the show, getting/using the materials, recording, and uploading my videos and engaging in reflection and feedback cycles with their coach was an effective method of professional development and coaching? The following seven codes were assigned to follow-up question number 11

(Question 12). This follow-up question asked participants to provide an open-ended response as to why they agreed that what they experienced was an effective method of professional development.

Positive - Out of the 67 respondents that selected they "agree" that the combination of study components was an effective method of professional development. There were 61 responses that contained a positive quality.

Negative – Out of the 67 respondents that selected they "agree" that the combination of study components was an effective method of professional development. There were six responses that contained a mixed opinion. For example, "It was but it was frustrating to get from section to section".

1. *Feedback from others (coach, mentor, or peer)* – Respondent who mention that feedback from others (such as coach or another individual) in their response. The intention of this code is to capture the relational piece of feedback, reflection, and improvement. In other words, the importance of relational exchange with others such as a coach.

2. *Effective because of virtual component*– Response mentions features of the study related to the virtual component of the study. This could be the ability to watch episodes or use the Coaching Companion on their own time or that the virtual component was a contrast to in person professional development. The intention of this code captures responses that reference the flexibility of the virtual platform.

3. *Variety of delivery/presentation methods* – Respondent mentions the method of information delivery in their response.

4. *Gain knowledge, strategies, or ideas* – Respondent mentions learning or the acquisition of knowledge, teaching strategies or ideas in their response of why the study was an effective method of PD. This code captures the responses that reference the KNOW and SEE components of the intentional teaching framework.

5. *General/non-specific* – Respondent mentions an unclear response that does not specify why the process of going through the study was helpful or effective. For example, "it was a good experience". This response provides unclear information about why it was a good experience.

6. *Reflection/Seeing own teaching* – Respondent mentions being able to watch themselves and/or reflect on their teaching. This code captures the responses that reference the REFLECT and IMPROVE components of the intentional teaching framework. The response can be about reflecting both strengths and areas of improvement.

7. *Tech/Coaching Companion/video challenges*- Respondent mentions the tech component (any aspect related to the coaching companion- video uploading, site navigation or the technology piece being a challenge).

Respondent who answered "disagree" to post study survey question 11:
Question 11: *Virtual professional development and coaching through watching the show, getting/using the materials, recording, and uploading my videos and engaging in reflection and feedback cycles with my coach is an effective method of professional development and coaching? (Agree or Disagree?)*
Question 12*: Why or why not?*

There were three out of 70 respondents that said “disagree”, Virtual professional development and coaching through watching the show, getting/using the materials, recording, and uploading my videos and engaging in reflection and feedback cycles with my coach is an effective method of professional development and coaching? The following three codes were assigned to follow-up question number 11 (Question 12). This follow-up question asked participants to provide an open-ended response as to why they disagreed that what they experienced was not an effective method of professional development.

1. *Materials* (1) – respondent mention the materials.

2. *Not in home language* – Respondent mention that language was not taken into consideration.

3. *Tech/Coaching Companion/video challenges*- Respondent mentions the tech component (any aspect related to the coaching companion- video uploading, site navigation or the technology piece being a challenge).

Respondents open-ended responses to Q16:
Question 16: *PostStudyQ16 Reflecting on the cycles you've been through of watching the show, trying out materials, filming yourself, and receiving feedback from you coach, reflect on how this has impacted your teaching practice.*

1. *Intentional about doing math*- Respondent mentions being intentional or purposeful about incorporating math, eliciting math, encouraging and bringing more math into the environment.

2. *Awareness of existing or possible math instances or opportunities*- Respondent mentions being or becoming more aware of how they are already incorporating math or now being more aware of opportunities to incorporate math. In other words realizing/being aware that math can be everywhere and that it can be included in all the time.

3. *Increased confidence/comfort* – Respondent mentions that they have gained confidence, comfort, or otherwise different perspective on math. (e.g., is less challenging to incorporate than previously thought, more fun.)

4. *Feedback for improvement* – Respondent mentions feedback (either from coach or other mentor role personal) from the study help them grow. This is either by offering another opinion or lens about the respondents teaching. The feedback mentioned comes from their coach or another personal that observed the respondents teaching practice.

5. *Reflection on own teaching*- Respondent mentions watching self or reflecting on their own teaching or actions was helpful helped.

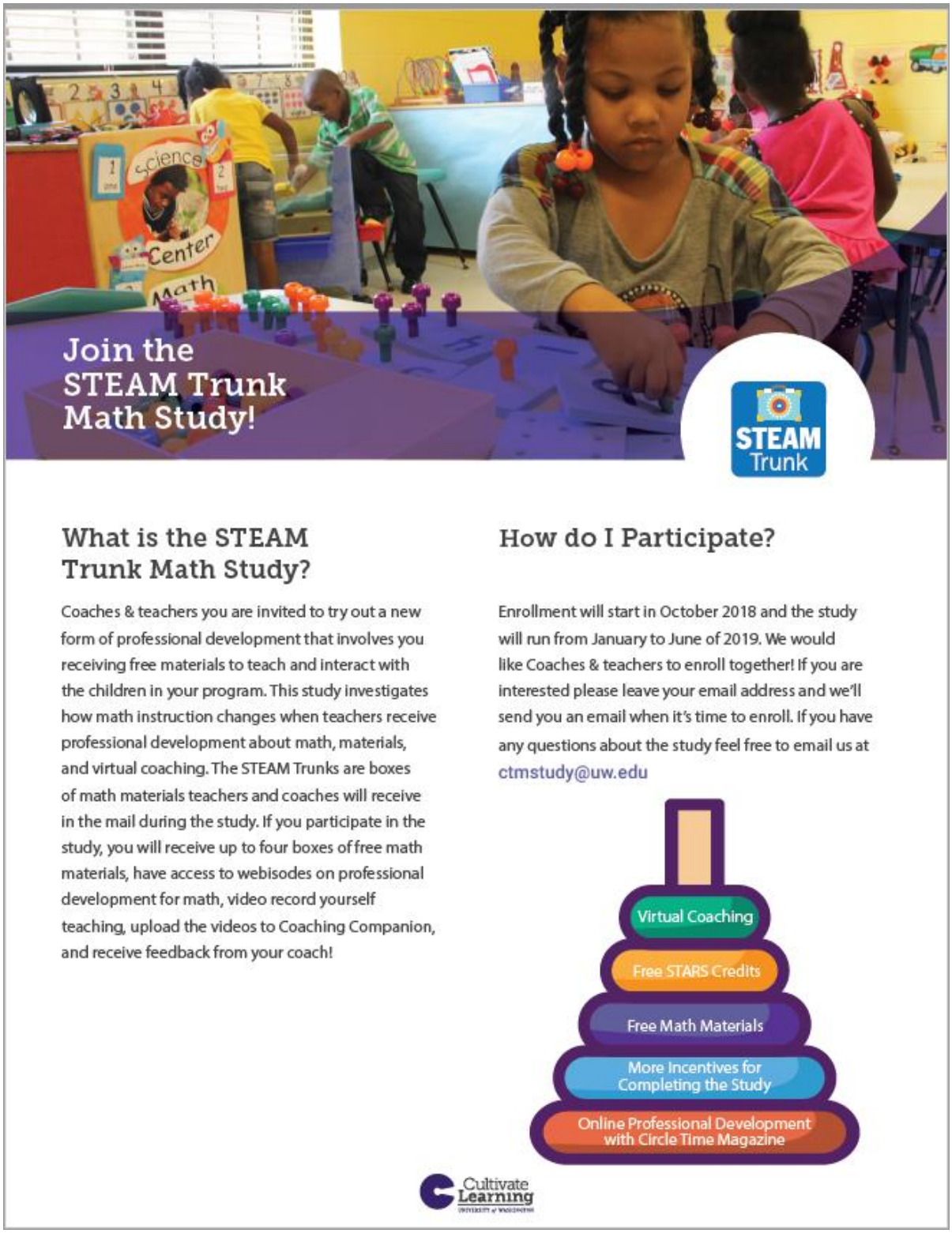
6. *Materials helped teaching practice*- Respondent mentions the materials provided were useful in helping them execute ideas and strategies from the show, magazine and or their coach. This also includes respondent mentioning themselves using existing materials they previously had for math. This code captures "materials" as an element that relates their teaching practice.

7. *Provided ideas, knowledge, skills, and strategies on how to teach math*-Respondent mentions gaining either tangible or intangible actions, ideas, knowledge and plans on how or why to incorporate math into their learning environment.

8. *Video upload was challenging*- Respondent mentions difficulty or challenges with the video/technology component of the study.

Appendix B

STEAM Trunk recruitment material



Math Study
Teacher Recruitment Letter

Dear Colleagues,

We are inviting you to participate in an exciting study! As part of our effort to understand more about math instruction in early childhood environments, we are giving interested educators free teaching materials to use with children in their programs. This study investigates how math instruction changes when teachers receive professional development about math, materials, and coaching. The STEAM Trunks are boxes of classroom materials you will receive in the mail during the study. If you participate in the study, you will receive up to four boxes of free math materials for use with the infants, toddlers, and preschoolers in your program. In addition, we will provide you with a $100 gift card at the end of the study **if you complete all parts of the study**.

In this study, you will be asked to:

1. View engaging webisodes on professional development for math.
2. Video record yourself teaching with those materials.
3. Upload the videos to Coaching Companion and receive feedback from your coach.
4. We are also asking you to complete surveys about your comfort level with math and your experience using the materials.

Together these activities will help us understand more about math instruction in early childhood learning environments!

Interested? Simply complete these two steps by November 16, 2018:

1. Complete the enrollment form: https://www.surveymonkey.com/r/R8BC862
2. Create an account on Coaching Companion if you do not have one: www.cqelcoach.org Sign up under STEAM Trunk.

For more information, contact us at ctmstudy@uw.edu

Best Regards,
STEAM Trunk Math Study Team

Estudio sobre Matemáticas Baúl de STEAM 2018-2019

Carta para Reclutar Maestros(a)

Queridos Colegas,

¡Los invitamos a participar en un emocionante estudio! Como parte de nuestro esfuerzo en comprender más sobre la instrucción de las matemáticas en entornos de la primera infancia o infancia temprana, le estamos ofreciendo a los educadores interesados materiales de enseñanza gratuitos para ser usados con los niños de sus programas. Este estudio investiga cómo la instrucción de las matemáticas cambia cuando los maestros(as) reciben desarrollo profesional sobre matemáticas, materiales, y asesorías. Los baúles de STEAM son cajas con materiales para el salón de clases que usted recibiría por correo durante el presente estudio. Si usted participa en el estudio, recibirá hasta cuatro cajas de materiales gratuitos para ser usados con los bebés, niños pequeños y en edad preescolar de su programa. Además, le obsequiaremos al final del estudio y si completa todas las partes del mismo, una tarjeta de regalo por un monto de $100 USD.

Durante el estudio, se le pedirá que:

1. Vea episodios en la Web sobre desarrollo profesional en el área de matemáticas.
2. A continuación le pedimos que se grabe usted mismo(a) en video haciendo uso de los materiales proporcionados en la caja.
3. Cargar o subir los videos a la página Web del Compañero Virtual de Asesoría para recibir apoyo y comentarios constructivos.
4. También le pedimos que complete encuestas sobre su nivel de comodidad con respecto a las matemáticas y su opinión en cuanto al uso de los materiales.

¡Todas estas actividades mencionadas nos ayudarían mucho para comprender más sobre la instrucción y enseñanza de las matemáticas en entornos de la primera infancia!

¿Le interesa? Simplemente complete los dos siguientes pasos antes del 16 de Noviembre del 2018:

1. Completar la forma de inscripción en el siguiente enlace: **https://www.surveymonkey.com/r/R8BC862**
2. Crear una cuenta de usuario en el Compañero Virtual de Asesoría: **www.cgelcoach.org** si es que no cuenta ya con una. Registrarse en la categoría del STEAM Trunk o Baúl de STEAM.

Para más información por favor contáctenos al siguiente correo electrónico **ctmstudy@uw.edu**

Saludos cordiales,

El equipo de la Revista Tiempo en Círculo

Math Study
Coaching Recruitment Letter

Dear Colleagues,

We are inviting you to participate in an exciting study! As part of our effort to understand more about math instruction coaching in early childhood environments, we are giving interested educators free teaching materials to use with children in their programs. This study investigates how math instruction changes when teachers receive professional development about math, materials, and coaching.

We are asking you to help recruit teachers into the study, provide coaching about math instruction, support teachers with Coaching Companion, and complete surveys. These activities will help us understand more about math instruction in early childhood learning environments. You will receive your own STEAM trunk each month. We will also provide you a $100 gift card for each teacher (up to four teachers) you coach **that completes the study**.

You will be asked to:

1. View engaging webisodes on professional development for math.
2. **Engage in the cycles of Practice-Based Coaching (you can learn more about PBC here:** http://cultivatelearning.uw.edu/coaching/
3. Watch videos of the teachers trying out some of the strategies on the Coaching Companion.
4. Provide feedback to teachers on the Coaching Companion about their math interactions.
5. We are also asking you to complete surveys about your experiences in the study.

Together these activities will help us understand more about math instruction in early childhood learning environments.

Interested? Simply complete these two steps by November 16, 2018:

1. Complete the enrollment form: **https://www.surveymonkey.com/r/R8BC862**
2. Send the above link to a teacher you want to include in the study.
3. Create an account on for yourself in the NEW Coaching Companion if you do not have one: **www.cqelcoach.org** Sign up under STEAM Trunk.

For more information, contact us at **ctmstudy@uw.edu**

Best Regards,
STEAM Trunk Math Study Team

Cultivate Learning
UNIVERSITY of WASHINGTON

STEAM Trunk

2018-2019 Math Study

Thank you for participating in our study! The study will help us understand more about math instruction in early childhood learning environments. This is a new type of professional development and your participation will help us know how it works. Over the course of the study you will receive free math materials, watch webisodes that provide information about math concepts, complete surveys, and film yourself using the materials. You will then upload the video to Coaching Companion and receive feedback from your coach.

This document contains deadlines for each step in the study. There are also details about each task and explanations of the activities.

Before the first trunk is sent	Coach	Teacher
By January 12, 2019	1. Complete the pre-math coach comfort survey: https://uweducation.co1.qualtrics.com/jfe/form/SV_5ak5lDT3MX4BpK5 2. Watch the Practice Base Coaching and STEAM Trunk webinar on Friday, December 14th at 3pm PST on how to use the new Coaching Companion. 3. Watch the Q & A session for teachers and coaches on the new platform on Monday January 14th at 2pm PST. 4. Encourage teacher to record and upload a 20-minute baseline video by January 31, 2019. If this is completed by January 16 we'll send you the counting trunk.	1. Complete the pre-math coach comfort survey: https://uweducation.co1.qualtrics.com/jfe/form/SV_9X1XqTXv9ctwlgl 2. Watch the STEAM Trunk webinar on how to use the new Coaching Companion on Monday, January 7th at 2pm PST (coaches are welcomed to join). 3. Watch the Q & A session for teachers and coaches on the new platform on Monday January 14th at 2pm PST. 4. Film a 20-minute video of yourself teaching and upload it to Coaching Companion. If this is completed by January 16 we'll send you the counting trunk.

Trunk 1: Mathematizing and Counting	Coach	Teacher
January 31, 2019	1. Confirm with your teacher(s) that their 20-minute video is uploaded to the Coaching Companion. 2. Watch the counting episode of Circle Time Magazine that is released on January 31.	1. Make sure your 20-minute baseline video has been uploaded to the Coaching Companion. 2. Watch the counting episode of Circle Time Magazine that is released on January 31.
February 6, 2019 Mathematizing/Counting trunk is shipped! Try the materials out in your learning environment!		
By February 22, 2019	3. Confirm with your teacher(s) that their 20-minute video is uploaded to the Coaching Companion. 4. Watch the counting episode of Circle Time Magazine that is released on January 31.	3. Upload your 3-5-minute video using the mathematizing/counting materials to the Coaching Companion due February 22, 2019. 4. Complete the mathematizing/ counting trunk survey to let us know how you liked the materials in this trunk.
March 1, 2019	5. Coach feedback due March 1, 2019.	5. Look for your coaches' comments on your mathematizing/counting video in the Coaching Companion.

Trunk 2: Measurement	Coach	Teacher
February 28, 2019	1. Watch the measurement episode of Circle Time Magazine that airs on February 28, 2019.	1. Watch the measurement episode of Circle Time Magazine that airs on February 28, 2019.
March 6, 2019 Measurement trunk is shipped! Try the materials out in your learning environment!		
Due March 22, 2019	2. Try out some of the materials from your measurement trunk. 3. Encourage your teacher(s) to video record and upload their 3-5-minute video to the Coaching Companion. 4. Provide a comment to your teacher(s) measurement video in the Coaching Companion between March 22-March 29, 2019.	2. Upload your 3-5-minute video using the measurement materials to the Coaching Companion due March 22, 2019. 3. Complete the measurement trunk survey to let us know how you liked the materials.
March 29, 2019	5. Coach feedback due March 29, 2019.	4. Look for your coaches' comments on your measurement video in the Coaching Companion.

Trunk 3: Geometry	Coach	Teacher
March 29, 2019	1. Watch the geometry episode of Circle Time Magazine that airs on March 29, 2019.	1. Watch the geometry episode of Circle Time Magazine that airs on March 29, 2019.
April 3, 2019 Geometry trunk is shipped! Try the materials out in your learning environment!		
Due April 19, 2019	2. Try out some of the materials from your geometry trunk. 3. Encourage your teacher(s) to video tape and upload their 3-5-minute video to the Coaching Companion by April 19, 2019. 4. Provide a comment to your teacher(s) geometry video in the Coaching Companion between April 19-April 26, 2019.	2. Upload your 3-5-minute video using the geometry materials to the Coaching Companion due April 19, 2019. 3. Complete the geometry trunk survey to let us know how you liked the materials (we will email this survey to you after you video is uploaded).
Due April 26, 2019	5. Coach feedback due April 26, 2019 to teachers.	4. Look for your coaches' comments on your mathematizing/counting video in the Coaching Companion.

Trunk 4: Patterns	Coach	Teacher
April 30, 2019	1. Watch the patterns episode of Circle Time Magazine that airs on April 30, 2019.	1. Watch the geometry episode of Circle Time Magazine that airs on April 30, 2019.
May 1, 2019 Pattern trunk is shipped! Try the materials out in your learning environment!		
Due May 17, 2019	2. Try out some of the materials from your patterns trunk. 3. Encourage your teacher(s) to video tape and upload their 3-5-minute video to the Coaching Companion by May 17, 2019. 4. Provide a comment to your teacher(s) pattern video in the Coaching Companion between May 17-May 24, 2019.	2. Upload your 3-5-minute video using the pattern materials to the Coaching Companion due May 17, 2019. 3. Complete the patterns trunk survey to let us know how you liked the materials (we will email this survey to you after you video is uploaded).
Due May 24, 2019	5. Coach feedback due May 24, 2019 to teachers.	4. Look for your coaches' comments on your mathematizing/counting video in the Coaching Companion.

Last Steps!	Coach	Teacher
Due June 14, 2019	1. Complete the math coaching comfort survey (post). 2. Encourage your teacher(s) to upload their final 20 minute video to the coaching companion.	1. Complete the math coaching comfort survey (post). 2. Film a 20 minute video of yourself teaching and upload it to Coaching Companion: www.coelcoach.org

Explanation of Activities

Math comfort surveys

Coaches and Teachers will complete

These are surveys you will take at the beginning and the end of the study to give us an idea of your comfort level coaching or teaching the different math concepts talked about in each webisode (counting, measurement, geometry and patterns). These will take about 10-15 minutes to complete.

STEAM Trunk Surveys

Coaches and Teachers will complete

These are surveys that you will answer after each trunk so you can tell us how it worked for you. How did you like the materials? How did you like the episode? And did you use the magazine? We're trying to find out how the materials in the trunk are useful to you or not. (About 5 minutes to complete)

Pre and post 20 videos

Teachers will complete

These are 20 minute videos of you teaching at any time or activity during the day that you will film at the beginning and end of the study. These videos should represent a typical teaching lesson for you in your learning environment.

Trunk videos

Teachers will record and upload. Coaches will watch their teachers video and provide feedback

Throughout the course of the study, you will record four 3-5 minute videos of you using the trunk materials (one video per each trunk you receive). Only one video is required to receive the next trunk but you can do more! You can choose any of the materials to film with. It can be one or more than one at a time.

Watching webisodes of Circle Time Magazine

Coaches and Teachers

Circle Time Magazine webisodes are professional development opportunities where you will learn about math concepts (counting, measurement, geometry and patterns). The materials in the trunks will be highlighted on the show. You can also receive STARS credits for watching the episodes by filling out the evaluation mentioned on the show.

STEAM Trunk

Cultivate Learning
UNIVERSITY of WASHINGTON

2018-2019

Baúl de STEAM
Estudio sobre matemáticas

¡Gracias por su interés en nuestro estudio! El estudio nos ayudará a entender más sobre la instrucción y el asesoramiento relacionados con las matemáticas en los entornos de aprendizaje de la primera infancia. Este es un nuevo tipo de desarrollo profesional y su participación nos ayudará a saber qué tal funciona. Durante el curso del estudio, los maestros recibirán materiales de matemáticas gratuitos, verán episodios en internet que proporcionan información acerca de conceptos matemáticos, completarán encuestas y grabarán videos de sí mismos usando los materiales. Los maestros también subirán los videos al Compañero Virtual de Asesoría y recibirán comentarios constructivos de su asesor. Los asesores utilizarán el Asesoramiento Basado en la Práctica para guiar a los maestros a través de cada ciclo y proporcionarán comentarios constructivos.

Este documento contiene las fechas límites para cada paso del estudio. También hay detalles acerca de cada tarea, así como explicaciones sobre las actividades.

Antes de enviar el primer baúl	Asesor(a)	Maestro(a)
	1. Completar la pre-encuesta para asesores sobre sentirse cómodo con las matemáticas: https://uweducation.co1.qualtrics.com/jfe/form/SV_5ak5lDT3MX4BpK5 2. 2. Participe en el webinario de internet el viernes 14 de diciembre a las 3 pm PST. El webinario se tratara de cómo usar el nuevo Compañero Virtual de Asesoría. 3. Participe en el webinario de internet para Asesores y Maestros el lunes 14 de enero a las 2 pm PST. En webinario hablaremos de preguntas sobre el nuevo Compañero Virtual de Asesoría. 4. Alentar al maestro a grabar y subir un video de 20 minutos como línea de base, a más tardar el 31 de enero del 2019. Favor de completar los pasos 1 y 2 a más tardar el 18 de enero.	1. Completar la pre-encuesta sobre sentirse cómodo con las matemáticas: https://uweducation.co1.qualtrics.com/jfe/form/SV_9X1XqTXy9ctwlql 2. Participe en el webinario de internet el lunes 7 de enero a las 2 pm PST. El webinario se tratara de cómo usar el nuevo Compañero Virtual de Asesoría. Los Asesores son pueden participar. 3. Participe en el webinario de internet para Asesores y Maestros el lunes 14 de enero a las 2 pm PST. En webinario hablaremos de preguntas sobre el nuevo Compañero Virtual de Asesoría. 4. Grabar un video de 20 minutos de Ud. mismo cuando está enseñando, y subirlo al Compañero Virtual de Asesoría: https://cqelcoach.org Si complete esto a más tardar el 31 de enero, le enviaremos el Baúl de **"Matematizar"/Contar**.

Baúl 1: "Matematizar" y Contar	Asesor(a)	Maestro(a)
31 de enero del 2019	1. Confirmar con su(s) maestro(s) que subieron su video de 20 minutos al Compañero Virtual de Asesoría. 2. Ver el episodio sobre **"Matematizar"/Contar** de la Revista Tiempo en Círculo, que se lanzará el 31 de enero (opcional, pero altamente recomendado).	1. Asegurar que su video de 20 minutos, como línea de base, se ha subido al Compañero Virtual de Asesoría. 2. Ver el episodio sobre **"Matematizar"/Contar** de la Revista Tiempo en Círculo, que se lanzará el 31 de enero.
6 de febrero del 2019 ¡El Baúl de "Matematizar"/Contar se ha enviado! ¡Pruebe los materiales en su entorno de aprendizaje!		
A más tarde el 22 de febrero del 2019	3. Probar algunos de los materiales de su Baúl de **"Matematizar"/Contar**. 4. Alentar a su(s) maestro(s) a grabar su video de 3-5 minutos y subirlo al Compañero Virtual de Asesoría. 5. Repasar todos los componentes del Asesoramiento Basado en la Práctica en el Compañero Virtual de Asesoría para cada maestro, para su video de **"Matematizar"/Contar** y proporcionar comentarios constructivos entre el 22 de febrero y el 1º de marzo del 2019.	3. Subir su video de 3-5-minutos usando los materiales de **"Matematizar"/Contar** al Compañero Virtual de Asesoría, fecha límite: el 22 de febrero del 2019. 4. Completar la encuesta sobre el Baúl de **"Matematizar"/Contar** para dejarnos saber qué le parecieron los materiales en este baúl (nosotros le enviaremos esta encuesta por correo electrónico después de que suba su video).
1º de marzo del 2019	6. Comentarios constructivos del asesor, fecha límite: 1º de marzo del 2019.	5. Buscar los comentarios de su asesor sobre su video de **"Matematizar"/Contar** en el Compañero Virtual de Asesoría.

Baúl 2: Mediciones	Asesor(a)	Maestro(a)
28 de febrero del 2019	1. Ver el episodio sobre **Mediciones** de la Revista Tiempo en Círculo que se transmite el 28 de febrero del 2019 (opcional, pero altamente recomendado).	1. Ver el episodio sobre **Mediciones** de la Revista Tiempo en Círculo que se transmite el 28 de febrero del 2019.
6 de marzo del 2019 ¡El Baúl de Mediciones se ha enviado! ¡Pruebe los materiales en su entorno de aprendizaje!		
Fecha límite: 22 de marzo del 2019	2. Probar algunos de los materiales de su Baúl de **Mediciones**. 3. Alentar a su(s) maestro(s) a grabar su video de 3-5 minutos y subirlo al Compañero Virtual de Asesoría. 4. Repasar todos los componentes del Asesoramiento Basado en la Práctica en el Compañero Virtual de Asesoría para cada maestro, para su video de **Mediciones** y proporcionar comentarios constructivos entre el 22 y el 29 de marzo del 2019.	2. Subir su video de 3-5-minutos usando los materiales de **Mediciones** al Compañero Virtual de Asesoría, fecha límite: el 22 de marzo del 2019. 3. Completar la encuesta sobre el Baúl de **Mediciones** para dejarnos saber qué le parecieron los materiales (nosotros le enviaremos esta encuesta por correo electrónico después de que suba su video).
29 de marzo del 2019	5. Fecha límite para los comentarios constructivos del asesor: 29 de marzo del 2019.	4. Buscar los comentarios de su asesor sobre su video de **Mediciones** en el Compañero Virtual de Asesoría.

Baúl 3: Geometría	Asesor(a)	Maestro(a)
29 de marzo del 2019	1. Ver el episodio sobre **Geometría** de la Revista Tiempo en Círculo que se transmite el 29 de marzo del 2019 (opcional, pero altamente recomendado).	1. Ver el episodio sobre **Geometría** de la Revista Tiempo en Círculo que se transmite el 29 de marzo del 2019.
3 de abril del 2019 ¡El Baúl de Geometría se ha enviado! ¡Pruebe los materiales en su entorno de aprendizaje!		
Fecha límite: 19 de abril del 2019	2. Probar algunos de los materiales de su Baúl de **Geometría**. 3. Alentar a su(s) maestro(s) a grabar su video de 3-5 minutos y subirlo al Compañero Virtual de Asesoría, a más tardar el 19 de abril del 2019. 4. Repasar todos los componentes del Asesoramiento Basado en la Práctica en el Compañero Virtual de Asesoría para cada maestro, para su video de **Geometría** y proporcionar comentarios constructivos entre el 19 y el 26 de abril del 2019.	2. Subir su video de 3-5-minutos usando los materiales de **Geometría** al Compañero Virtual de Asesoría, fecha límite: el 19 de abril del 2019. 3. Completar la encuesta sobre el Baúl de **Geometría** para dejarnos saber qué le parecieron los materiales (nosotros le enviaremos esta encuesta por correo electrónico después de que suba su video).
Fecha límite: 26 de abril del 2019	5. Fecha límite para los comentarios constructivos del asesor: 26 de abril del 2019.	4. Buscar los comentarios de su asesor sobre su video de **Geometría** en el Compañero Virtual de Asesoría.

Baúl 4: Patrones	Asesor(a)	Maestro(a)
30 de abril del 2019	1. Ver el episodio sobre **Patrones** de la Revista Tiempo en Círculo que se transmite el 30 de abril del 2019 (opcional, pero altamente recomendado).	1. Ver el episodio sobre **Patrones** de la Revista Tiempo en Círculo que se transmite el 30 de abril del 2019.
1º de mayo del 2019 ¡El Baúl de Patrones se ha enviado! ¡Pruebe los materiales en su entorno de aprendizaje!		
Fecha límite: 17 de mayo del 2019	2. Probar algunos de los materiales de su Baúl de **Patrones**. 3. Alentar a su(s) maestro(s) a grabar su video de 3-5 minutos y subirlo al Compañero Virtual de Asesoría, a más tardar el 17 de mayo del 2019. 4. Repasar todos los componentes del Asesoramiento Basado en la Práctica en el Compañero Virtual de Asesoría para cada maestro, para su video de **Patrones** y proporcionar comentarios constructivos entre el 17 y el 24 de mayo del 2019.	2. Subir su video de 3-5-minutos usando los materiales de **Patrones** al Compañero Virtual de Asesoría, fecha límite: el 17 de mayo del 2019. 3. Completar la encuesta sobre el Baúl de **Patrones** para dejarnos saber qué le parecieron los materiales (nosotros le enviaremos esta encuesta por correo electrónico después de que suba su video).
Fecha límite: 24 de mayo del 2019	5. Fecha límite para los comentarios constructivos del asesor a los maestros: 24 de mayo del 2019.	4. Buscar los comentarios de su asesor sobre su video de **Patrones** en el Compañero Virtual de Asesoría.

¡Pasos finales!	Asesor(a)	Maestro(a)
Fecha límite: 14 de junio del 2019	1. Completar la post-encuesta para asesores sobre sentirse cómodo con las matemáticas a más tardar el **14 de junio**. 2. Alentar a su(s) maestro(s) a subir su video final de 20 minutos al Compañero Virtual de Asesoría, a más tardar el **14 de junio**.	1. Completar la post-encuesta sobre sentirse cómodo con las matemáticas a más tardar el **14 de junio**. 2. Grabar un video de 20 minutos de Ud. mismo cuando está enseñando, y subirlo al Compañero Virtual de Asesoría: www. cgelcoach.org a más tardar el **14 junio**.

Explicación de las actividades

Encuestas sobre sentirse cómodo con las matemáticas

Serán completadas por los asesores y los maestros
Estas son encuestas que Ud. completará al principio y al final del estudio, con el fin de darnos una idea de su nivel de comodidad al dar asesoría o enseñar los diversos conceptos matemáticos que se abordan en cada episodio en internet ("Matematizar"/Contar, Mediciones, Geometría y Patrones). Cada una tomará entre 10-15 minutos para completar.

Encuestas sobre el Baúl STEAM

Serán completadas por los maestros
Estas son encuestas que Ud. completará después de recibir cada baúl, para que Ud. nos pueda decir cómo funcionó en su entorno de aprendizaje. ¿Qué le parecieron los materiales? ¿Qué le pareció el episodio? Y, ¿utilizó la revista? Estamos tratando de averiguar qué tan útiles son los materiales en el baúl para Ud. (Toma alrededor de 5 minutos para completar)

Videos pre- y post- de 20 minutos

Los maestros los grabarán y los subirán.
Estos son videos de 20 minutos de Ud. mismo cuando está enseñando durante los tiempos de elección libre, que Ud. grabará al principio y al final del estudio. Estos videos deben representar un día típico para Ud. en su entorno de aprendizaje.

Videos sobre el baúl

Los maestros los grabarán y los subirán. Los asesores verán los videos de sus maestros y proporcionarán comentarios constructivos.
Durante el curso del estudio, Ud. grabará cuatro videos de 3-5 minutos de Ud. mismo usando los materiales del baúl con los niños bajo su cuidado (un video por cada baúl que reciba). Se requiere solamente un video para recibir el siguiente baúl, ¡pero Ud. puede grabar más! Puede escoger cualquier material para hacer la grabación. Puede usar uno o más de uno de los materiales a la vez.

Asesoramiento Basado en la Práctica

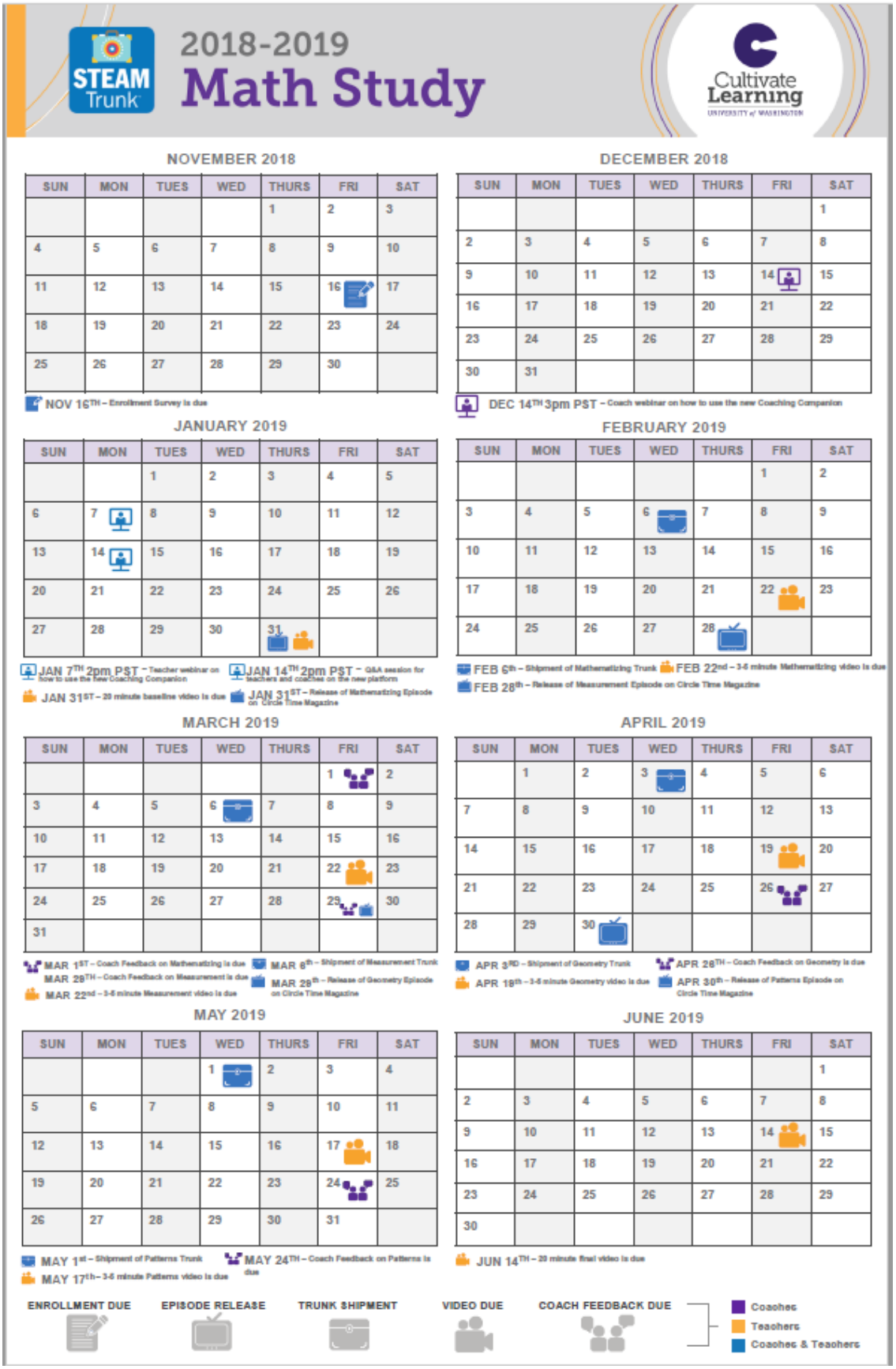
Los asesores completarán los siguientes pasos con los maestros:

El Asesoramiento Basado en la Práctica consiste en que el maestro y el asesor creen metas y planes de acción compartidos, desarrollen observaciones enfocadas y participen en reflexiones y comentarios constructivos sobre la observación enfocada. Estos ciclos se repetirán para cada episodio ("Matematizar"/Contar, Mediciones, Geometría y Patrones). Ud. puede aprender más acerca del Asesoramiento Basado en la Práctica aquí:
http://cultivatelearning.uw.edu/coaching/

Ver episodios en internet de la Revista Tiempo en Círculo

Asesores y maestros

Los episodios en internet de la Revista Tiempo en Círculo son oportunidades de desarrollo profesional donde Ud. aprenderá sobre conceptos matemáticos ("Matematizar"/Contar, Mediciones, Geometría y Patrones). Se realzarán los materiales de los baúles en el programa. También puede recibir créditos de STARS por ver los episodios cuando complete la evaluación que se menciona en el programa.


STEAM Trunk
2018-2019
Math Study
Cultivate Learning
UNIVERSITY of WASHINGTON
NOVEMBER 2018
SUN MON TUES WED THURS FRI SAT
1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30
NOV 16TH – Enrollment Survey is due
DECEMBER 2018
SUN MON TUES WED THURS FRI SAT
1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31
DEC 14TH 3pm PST – Coach webinar on how to use the new Coaching Companion
JANUARY 2019
SUN MON TUES WED THURS FRI SAT
1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31
JAN 7TH 2pm PST – Teacher webinar on how to use the new Coaching Companion
JAN 14TH 2pm PST – Q&A session for teachers and coaches on the new platform
JAN 31ST – 20 minute baseline video is due
JAN 31ST – Release of Mathematizing Episode on Circle Time Magazine
FEBRUARY 2019
SUN MON TUES WED THURS FRI SAT
1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28
FEB 6th – Shipment of Mathematizing Trunk
FEB 22nd – 3-5 minute Mathematizing video is due
FEB 28th – Release of Measurement Episode on Circle Time Magazine
MARCH 2019
SUN MON TUES WED THURS FRI SAT
1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
MAR 1ST – Coach Feedback on Mathematizing is due
MAR 6th – Shipment of Measurement Trunk
MAR 28TH – Coach Feedback on Measurement is due
MAR 22nd – 3-5 minute Measurement video is due
MAR 28th – Release of Geometry Episode on Circle Time Magazine
APRIL 2019
SUN MON TUES WED THURS FRI SAT
1 2 3 4 5 6
7 8 9 10 11 12 13
14 15 16 17 18 19 20
21 22 23 24 25 26 27
28 29 30
APR 3RD – Shipment of Geometry Trunk
APR 28TH – Coach Feedback on Geometry is due
APR 19th – 3-5 minute Geometry video is due
APR 30th – Release of Patterns Episode on Circle Time Magazine
MAY 2019
SUN MON TUES WED THURS FRI SAT
1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31
MAY 1st – Shipment of Patterns Trunk
MAY 24TH – Coach Feedback on Patterns is due
MAY 17th – 3-5 minute Patterns video is due
JUNE 2019
SUN MON TUES WED THURS FRI SAT
1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30
JUN 14TH – 20 minute final video is due
ENROLLMENT DUE
EPISODE RELEASE
TRUNK SHIPMENT
VIDEO DUE
COACH FEEDBACK DUE
Coaches
Teachers
Coaches & Teachers


STEAM Trunk
2018-2019
Estudio de Matemáticas
Cultivate Learning
UNIVERSITY of WASHINGTON
NOVIEMBRE 2018
DOM LUN MAR MIER JUE VIE SAB
1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30
NOV 16 – Vence Encuesta de Inscripción
DICIEMBRE 2018
DOM LUN MAR MIER JUE VIE SAB
1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31
DEC 14 3pm PST – Asesoría de webinario acerca de cómo usar el nuevo Coaching Companion
ENERO 2019
DOM LUN MAR MIER JUE VIE SAB
1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31
ENE 31 – Vence video de 20 minutos sobre línea de base
ENE 31 – Lanzamiento del Episodio sobre Matematizar en la Revista Tiempo en Círculo
ENE 7 2pm PST – Sesión de webinario para maestros(as) y asesores(as) acerca del uso del nuevo Coaching Companion
ENE 14 2pm PST – Sesión de preguntas para maestros(as) y asesores(as) acerca de la nueva plataforma
FEBRERO 2019
DOM LUN MAR MIER JUE VIE SAB
1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28
FEB 6 – Envío del baúl sobre Matematizar
FEB 22 – Vence video de 3-5 minutos sobre Matematizar
FEB 28 – Lanzamiento del Episodio sobre Mediciones en la Revista Tiempo en Círculo
MARZO 2019
DOM LUN MAR MIER JUE VIE SAB
1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
MAR 1 – Vence comentarios constructivos del asesor sobre Matematizar
MAR 8 – Envío del baúl sobre Mediciones
MAR 28 – Vence comentarios constructivos del asesor sobre Mediciones
MAR 28 – Lanzamiento del Episodio sobre Geometría en la Revista Tiempo en Círculo
MAR 22 – Vence video de 3-5 minutos sobre mediciones
ABRIL 2019
DOM LUN MAR MIER JUE VIE SAB
1 2 3 4 5 6
7 8 9 10 11 12 13
14 15 16 17 18 19 20
21 22 23 24 25 26 27
28 29 30
ABR 3 – Envío del baúl sobre Geometría
ABR 18 – Vence video de 3-5 minutos sobre Geometría
ABR 26 – Vence comentarios constructivos de asesor sobre Geometría
ABR 30 – Lanzamiento del Episodio sobre Patrones en la Revista Tiempo en Círculo
MAYO 2019
DOM LUN MAR MIER JUE VIE SAB
1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31
MAYO 1 – Envío del baúl sobre Patrones
MAYO 17 – Vence video de 3-5 minutos sobre patrones
MAYO 24 – Vence comentarios constructivos de asesores y patrones
JUNIO 2019
DOM LUN MAR MIER JUE VIE SAB
1
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30
JUNIO 14 – Vence video final de 20 minutos
VENCE INSCRIPCIÓN
LANZAMIENTO DE EPISODIO
ENVÍO DE BAÚL
VENCE VIDEO
VENCE COMENTARIOS CONSTRUCTIVOS DEL ASESOR
Asesores
Maestros(as)
Asesores & Maestros

Math Study

Letter to Directors

Dear Directors,

A teacher at your program has enrolled in an exciting study called the STEAM Trunk math study! This study investigates how math instruction changes when teachers receive professional development about math, materials, and virtual coaching. The teacher at your program will receive STEAM Trunks which are boxes filled with different materials the teacher can use in her/his classroom with infants, toddlers and preschoolers in your program.

The teacher will then be asked to view engaging webisodes on professional development for math, then video record themselves teaching with those materials, upload the videos to Coaching Companion, and receive feedback from their coach. They will also be asked to complete surveys about their comfort level with math and their experience using the materials. Together these activities will help us understand more about math instruction in early childhood learning environments.

For more information, contact us at **ctmstudy@uw.edu**

Best Regards,
STEAM Trunk Math Study Team

UNIVERSITY OF WASHINGTON
College of Education
Title of Study: STEAM Trunk Math Study
Parental Passive Consent

Gail Joseph, Associate Professor, (206) 685-7469, gjoseph@uw.edu
Virginia Tse, Research Assistant, (206) 221-4723, vstse@uw.edu
Contact email for the study, ctmstudy@uw.edu

Dear Parent/Guardian:

This year your child care provider is participating in a program called the STEAM Trunk Math Study. The STEAM Trunk math study is an investigation of how teachers provide math instruction. The teachers in the study will receive the STEAM Trunk (a box of math materials), film themselves using the materials, and share the video with their coach and the research team via a secure website called Coaching Companion. It is possible that your child could be in the videos the teacher uploads. The videos will only be viewed by coaches and members of the research team.

We want you to be informed about the study and are asking for your consent if your child is included in a video. Please know that we do not expect any risk to your child. They will be engaged in typical classroom activities with their teacher. However, if your child is unhappy, he or she will not have to continue. If you change your mind at any time, you may take your child out of the study. If you say no, there is no consequence and it will not affect your child's enrollment or status in the child care program.

If you have any questions about the study, please contact us at ctmstudy@uw.edu.

What do you need to do?

- If you are willing to allow your child to participate in this study, **you do not have to do anything**.
- If you DO NOT want your child to participate, **please fill out, sign the attached "Refusal to Allow Participation" form, and return the form to your child's teacher no later than January 18, 2019.**

If your child's teacher does not receive a signed form from you by this date, we will include your child in the study.

Thank you in advance for helping us in our efforts to learn how to improve math instruction for young children.

Sincerely,

Virginia Tse
Research Assistant

STEAM Trunk Math Study

Parent Informed Consent – Refusal to Allow Participation

Child's Name _____Child Care_____

My signature below indicates that I have read the information provided and have decided that I will not allow my child to participate in the study titled "**STEAM Trunk Math Study**".

_____

Parent/Guardian Signature Date

UNIVERSIDAD DE WASHINGTON
Facultad de Educación
Título del Estudio: Estudio de Matemáticas Baúl de STEAM
Consentimiento Pasivo de los Padres de Familia

Gail Joseph, Profesor Asociado, (206) 685-7469, gjoseph@uw.edu
Virginia Tse, Asistente de Investigación, (206) 221-4723, vstse@uw.edu
Correo electrónico de contacto para el estudio, ctmstudy@uw.edu

Querido Padre de Familia/Tutor:

Este año su proveedor de cuidados infantiles está participando en un programa llamado Estudio de Matemáticas Baúl de STEAM. El estudio de Matemáticas del Baúl de STEAM es una investigación sobre cómo los maestros proporcionan instrucción matemática. Los maestros participantes en el estudio recibirán el Baúl de STEAM (una caja de materiales), se filmaran a sí mismos usando los materiales, y compartirán el video con su asesor y con el grupo de investigación a través de una página *Web* segura llamada Compañero Virtual de Asesoría. Es posible que su hijo(a) forme parte de los videos que el maestro carga en el sitio *Web*. Los videos únicamente serán vistos por los asesores y los miembros del grupo de investigación.

Queremos que usted esté informado(a) sobre el estudio y le estamos pidiendo su consentimiento en caso de que su hijo(a) esté incluido en el video. Por favor tenga la seguridad que no esperamos ningún tipo de riesgo para su hijo(a). Sin embargo, si su hijo(a) no está contento, él o ella no tienen que continuar. Si usted cambia de opinión en cualquier momento, puede sacar a su hijo(a) del estudio. Si usted dice que no, no existe ningún tipo de consecuencia y no va a afectar la inscripción o el estatus de su hijo(a) en el programa de cuidado infantil.

Si usted tiene cualquier pregunta sobre el estudio, por favor contáctenos al siguiente correo electrónico; ctmstudy@uw.edu.

¿Qué tiene que hacer?

- Si usted permite a su hijo(a) participar en el estudio, **usted no debe de hacer nada.**
- Si usted SE NIEGA a que su hijo(a) participe, por favor llenar y firmar el formato adjunto de **"No Aceptación para Permitir la Participación", y devolver el formato al maestro(a) de su hijo(a) a más tardar el día 18 de Enero de 2019.**

Si el maestro(a) de su hijo(a) no recibe el formato firmado por usted para la fecha arriba mencionada, incluiremos a su hijo(a) en el estudio.

Muchas gracias anticipadas por colaborar con nosotros en nuestros esfuerzos en aprender cómo mejorar la instrucción matemática para niños pequeños.

Sinceramente,

Virginia Tse
Asistente de Investigación.

Estudio de Matemáticas Baúl de STEAM

Formato de Consentimiento para Padres de Familia – Negación para Permitir la Participación

Nombre del niño(a) _____

Centro de Cuidados Infantiles _____

Mi firma a continuación indica que he leído la información proporcionada y he decidido que no voy a permitir a mi hijo(a) participar en el estudio llamado "**Estudio de Matemáticas del Baúl de STEAM".**

_____

Firma del Padre de Familia/Tutor Fecha

UNIVERSITY OF WASHINGTON
COLLEGE OF EDUCATION
Title of Study: STEAM Trunk Math Study
Early Learning Professional Consent Form (Educator)

Investigators (UW, College of Education):
Gail Joseph, Associate Professor, (206) 685-7469, gjoseph@uw.edu
Virginia Tse, Research Assistant, (206) 221-4723, vstse@uw.edu
Contact email for the study, ctmstudy@uw.edu

INVESTIGATORS' STATEMENT

We are asking you to be in a research study. The purpose of this consent form is to provide the information necessary to help you decide whether to participate. Please read this form carefully. You may ask questions about the purpose of the research, what we will ask you to do, the possible risks and benefits, your rights as a participant in the project, and anything else about the research and contents of this form that is not clear. After we answer all of your questions, you can decide if you want to participate in the study. This process is called *informed consent*. We will give you a copy of this form for your records.

PURPOSE

The STEAM (Science Technology, Engineering, Art and Math) Trunk math study investigates how math instruction changes when teachers receive professional development about math, math materials, and online coaching. To help us understand more about math instruction in early childhood learning environments, we are asking you to complete surveys, questionnaires, film yourself teaching, and upload video recordings.

PROCEDURES

If you agree to participate, during the study, we will mail you up to four boxes (STEAM Trunks) of classroom materials.

Once you consent to participate in the study, you will upload to Coaching Companion a 20-minute pre-video recording of your teaching and interacting with children in your program. This video recording will help us understand what is happening in your childcare program *before* you start using the materials. We will also ask you to complete a survey about your comfort level with math.

Then, you will be notified that an episode of *Circle Time Magazine* is available to watch. Shortly after, you will receive your first STEAM Trunk. When your first STEAM Trunk arrives in the mail, you will find it includes the *Circle Time Magazine* resource guide that explains how to use the toys and visual support materials in your Trunk to teach and interact with children. You will then begin to use the materials with the children in your program.

To receive your next STEAM Trunk, video record yourself for three to five minutes using the STEAM Trunk materials from the first box. Upload the video recording to Coaching

Companion. Your coach will provide feedback (virtual coaching) on your video recording. You will have approximately 15 days to upload your video recording. If you upload your video recordings by the deadlines, you will receive all four trunks. If you miss a deadline, you will not receive the next trunk. Although you will miss receiving a trunk, you can still upload a video recording after the deadline and receive the next trunk, but you will not receive all four trunks.

Lastly, you will upload a 20-minute post-video recording of you teaching and interacting with children in your program. This video recording will help us understand what is happening in your childcare program *after* using the materials, watching the *Circle Time Magazine* episodes, and participating in virtual coaching.

Over the course of the study, you will upload six video recordings: the pre-video recording, four STEAM Trunk videos, and the post-video recording. Your coach will provide feedback (virtual coaching) on each of the four STEAM trunk video recordings. We will also ask you to complete surveys about your comfort level with math, and how you used the materials and the professional development opportunities.

If you are new to using video recording in your classroom, check out the Coaching Companion's terrific resources to guide you through the process, including a user's guide and frequently asked questions. Visit the Coaching Companion Quick Start videos here:
https://cqelcoach.org/quickstart

When you participate in the STEAM Trunk study we will:

1. Provide you with resources to teach math concepts to children in your care by sending you a STEAM Trunk and posting *Circle Time Magazine* webisodes to the Cultivate Learning website each month, for four months.
2. View the video recordings you upload to Coaching Companion. By watching and analyzing interactions in the video recordings, the Cultivate Learning team starts to learn about the impact of the STEAM Trunk materials on your interactions with children.
3. Review the surveys you return. By collecting and analyzing survey responses, we can start to understand the impact of the STEAM Trunk materials on interactions with children in your care.
4. Keep all information private. We will write a report about what we watch in the videos and what we learn from the survey answers. We will not identify you in the report. The report will be shared with the STEAM Trunk study team and the Department of Children Youth and Families (DCYF).
5. Provide your coach with coaching resources to give you support, ideas, and feedback on your use of the materials in the Coaching Companion.

The only instance we will share identifiable information is in cases of suspected child abuse. By law, we must report these cases.

You can choose not to participate, or stop participating, in the STEAM Trunk at any time. You will still have access to view the *Circle Time Magazine* episodes on the Cultivate Learning website (http://cultivatelearning.uw.edu/circle-time-magazine-2/) and use the Coaching Companion (www.cqelcoach.org).

RISK, STRESS, OR DISCOMFORT

Some people feel that participating in research is an invasion of privacy. We do our best to protect your privacy. The only people who will have access to your identifiable information are members of the research team who have signed an agreement to protect your privacy and keep your information confidential. Your name will be kept until data collection is complete and the data is organized at our office location. We will remove links to names from our records no later than December 31, 2019 All data will be kept indefinitely in a locked location accessible only to project research team members. Your name will not be used in any articles we publish or presentations.

Whether or not you choose to be in the study, it will not affect your childcare program. No personal questions will be asked. You are free to stop activities at any time.

BENEFITS

We hope the results of this study will help us understand how to improve math instruction for young children and early childhood educators. You will receive free materials and coaching support. In addition, we will provide you with a $100 gift card at the end of the study if you complete all components of the study.

OTHER INFORMATION

Participation in this study is voluntary. At any time during the study, you may choose to stop participating.

Confidentiality of data will be maintained at all times, except in cases where child abuse is suspected. By law, such instances must be reported by the investigator.

Sometimes, government or university staff review studies such as this one to make sure they are being done safely and legally. If a review of this study takes place, your records might be examined. The reviewers will protect your privacy. The study records will not be used to put you at legal risk of harm.

A consent form is attached. Please read it, mark accordingly to indicate receipt of a copy of the consent form and consent to participate in assessment and video recordings, sign it, scan, and return it to us via email. Please keep an electronic copy for your records.

Thank you for considering participation in this study. We think that our research will help create more opportunities for high quality early learning environments across the state. We will be happy to answer any questions you have. You can call Virginia Tse at 206-221-4723 or email vstse@uw.edu or ctmstudy@uw.edu

Sincerely,

Gail E. Joseph, Ph.D.

SUBJECT'S STATEMENT

The details of this study have been explained to me. I have had an opportunity to ask questions. I understand that the research team member listed above will answer future questions that I may have about the research study.

_____I have received a copy of this consent form.

_____I give consent to participate in assessments conducted by the researchers.

_____I give consent for video recordings of me to be shared with the University of Washington researchers.

I have read the above and give my consent to participate in this study.

_____ _____ _____

Printed name of participant Signature of participant Date

Your program name: _____

Your E-mail address: _____

Your phone number: _____

UNIVERSIDAD DE WASHINGTON
FACULTAD DE EDUCACIÓN [College of Education]
Título del estudio: Estudio sobre Matemáticas Baúl de STEAM
Formato de Autorización del Profesional de Aprendizaje Temprano (Educador)

Investigadoras (UW, College of Education):
Gail Joseph, Profesora Asociada, (206) 685-7469, gjoseph@uw.edu
Virginia Tse, Asistente de Investigación, (206) 221-4723, vstse@uw.edu
Dirección de correo electrónico para el estudio, contactar a: ctmstudy@uw.edu

DECLARACIÓN DE LAS INVESTIGADORAS

Le estamos solicitando que forme parte de un estudio de investigación. El propósito de este formato de autorización es proporcionar la información necesaria para ayudarle a decidir si quiere participar. Favor de leer este formato cuidadosamente. Puede usted hacer preguntas acerca del propósito de la investigación, sobre lo que nosotras le pediremos hacer, los posibles riesgos y beneficios, sus derechos como participante en el proyecto, así como cualquier otra cosa que no le quede clara sobre la investigación y el contenido de este formato. Después de contestar a todas sus preguntas, usted podrá decidir si quiere participar en el estudio. Este proceso se llama *autorización informada*. Le daremos una copia de este formato para sus archivos personales.

PROPÓSITO

El Estudio sobre Matemáticas Baúl de STEAM (Ciencia, Tecnología, Ingeniería, Arte y Matemáticas, STEAM por sus siglas en inglés) investiga cómo la instrucción sobre las matemáticas cambia cuando los maestros reciben apoyo a través de instrumentos de desarrollo profesional sobre las matemáticas, materiales matemáticos, así como asesoramiento en línea. Para ayudarnos a comprender más sobre de la instrucción sobre matemáticas en los entornos de aprendizaje de la primera infancia, le estamos pidiendo que complete encuestas, cuestionarios, así como videograbarse cuando está enseñando y cargar los archivos de las grabaciones en video al internet o *Web*.

PROCEDIMIENTOS

Si usted está de acuerdo en participar, durante el transcurso del estudio, le enviaremos por correo hasta cuatro cajas (Baúles STEAM) con materiales para el salón de clases.

Una vez que otorgue su autorización para participar en el estudio, subir o cargar al sitio del "Compañero Virtual de Asesoría" [*Coaching Companion*], una grabación en video de 20 minutos, *"pre"* , es decir que muestra el proceso de enseñanza e interacción con los niños en su programa. Esta grabación en video nos ayudará a comprender qué está sucediendo en su programa de cuidados de niños *antes* de que usted empiece a usar los materiales. También le pediremos que complete una encuesta acerca de su nivel de comodidad con las matemáticas.

Luego, se le notificará que está disponible un episodio de la *Revista Tiempo en Círculo* [Circle Time Magazine], para que usted lo vea. Un poco después, recibirá su primer Baúl STEAM. Cuando llegue su primer Baúl STEAM por correo, notará que incluye la guía de recursos de la *Revista Tiempo en Círculo* que explica cómo usar los juguetes y los materiales con apoyos visuales que vienen en su Baúl, para enseñar e interactuar con los niños. Entonces usted puede ya comenzar a usar los materiales con los niños en su programa.

Para recibir su próximo Baúl STEAM, haga una grabación en video de usted mismo(a) de tres a cinco minutos, mientras está usando los materiales de la primera caja del Baúl STEAM. Subir or cargar la grabación al sitio del Compañero Virtual de Asesoría. Su asesor le proporcionará comentarios constructivos (asesoramiento virtual) sobre su grabación en video. Tendrá aproximadamente 15 días para subir su grabación en video. Si sube sus grabaciones en video antes de las fechas límites, recibirá los cuatro baúles. Si no alcanza a hacerlo antes de alguna de las fechas límites, no recibirá el siguiente baúl. Aunque se pierda de recibir un baúl, usted todavía puede subir una grabación en video después de la fecha límite y así recibir el próximo baúl, pero no recibirá la totalidad de los cuatro baúles.

Por último, le pediremos que suba una grabación en video de 20 minutos, "*post*", es decir que le muestra a usted enseñando e interactuando con los niños en su programa. Esta grabación en video nos ayudará a comprender qué está sucediendo en su programa de cuidados de niños *después* de usar los materiales, haber visto los episodios de la *Revista Tiempo en Círculo* y haber participado en el asesoramiento virtual.

En el transcurso del estudio, le pedimos que suba a internet seis grabaciones en video: la grabación en video "*pre*", cuatro videos usando el Baúl STEAM, y la grabación en video "*post*". Su asesor proporcionará comentarios constructivos (asesoramiento virtual) sobre cada una de las cuatro grabaciones en video del Baúl STEAM. También le pediremos que complete una encuesta acerca de su nivel de comodidad con las matemáticas, y sobre cómo utilizó los materiales y las oportunidades para el desarrollo profesional.

Si la grabación en video en su salón de clases es algo nuevo para usted, le recomendamos que vea los fantásticos recursos del Compañero Virtual de Asesoría, incluyendo la guía del usuario y preguntas frecuentes, los cuales le guiarán a lo largo del proceso. Aquí los enlaces a los videos del Inicio Rápido del Compañero Virtual de Asesoría, aquí: https://cqelcoach.org/quickstart

Cuando usted decida participar en el estudio del Baúl STEAM, nosotras:

1. Le proporcionaremos con recursos para enseñar conceptos matemáticos a los niños bajo su cuidado, enviándole un Baúl STEAM y publicando episodios en la *Web* de la *Revista Tiempo en Círculo* en el sitio de internet de "Cultivate Learning", cada mes por cuatro meses.
2. Vamos a ver las grabaciones en video que usted suba al Compañero Virtual de Asesoría. Al observar y analizar las interacciones en las grabaciones en video, el equipo de "Cultivate Learning" empieza a aprender acerca del impacto de los materiales del Baúl STEAM en sus interacciones con los niños.

3. Revisaremos las encuestas que usted regrese. Al recopilar y analizar las respuestas a las encuestas, nosotras podemos empezar a comprender el impacto de los materiales del Baúl STEAM en las interacciones con los niños bajo su cuidado.
4. Mantendremos la confidencialidad de toda la información. Escribiremos un informe acerca de lo que observamos en los videos y lo que aprendemos de las respuestas de las encuestas. De ninguna forma vamos a identificarle a usted o su nombre en el informe. Se compartirá el informe con el equipo del Estudio del Baúl STEAM y con el Departamento de Niños, Jóvenes y Familias [del Gobierno del Estado de Washington: Department of Children, Youth and Families (DCYF, por sus siglas en inglés)].
5. Proporcionaremos a su asesor con recursos de asesoría para que le dé apoyo, ideas y comentarios constructivos, en el Compañero Virtual de Asesoría, sobre el uso que usted hace de los materiales.

La única instancia en que compartiremos información sobre identidades es en casos donde se sospeche el abuso de menores. Por ley estamos obligados a reportar estos casos.

Usted podrá elegir no participar, o dejar de participar, en el Estudio del Baúl STEAM en cualquier momento. Todavía tendrá acceso para ver los episodios de la *Revista Tiempo en Círculo* en el sitio de internet de "Cultivate Learning" (http://cultivatelearning.uw.edu/circle-time-magazine-2/), y podrá usar al Compañero Virtual de Asesoría (www.cqelcoach.org).

RIESGO, ESTRÉS, O INCOMODIDAD

Algunas personas sienten que participar en este tipo de investigación académica es una invasión de la privacidad. Hacemos todo lo posible para proteger su privacidad. Las únicas personas que tendrán acceso a la información sobre su identidad son los integrantes del equipo de investigación, quienes han firmado un acuerdo para proteger su privacidad y mantener la confidencialidad de su información. Se guardarán [los datos con] su nombre en el sitio donde se ubica nuestra oficina hasta que la recopilación y la organización de los datos se finalicen. Eliminaremos los enlaces con los nombres de nuestros archivos a más tardar el 31 de diciembre del 2019. Se guardarán los datos de manera indefinida en un sitio bajo llave, accesible solamente a los integrantes del equipo del proyecto de investigación. No se usará su nombre ni en artículos que publiquemos ni en presentaciones.

Si usted elije participar o no participar en el estudio, no se afectará su programa de cuidados de niños. No se le harán preguntas personales. Usted tiene completa libertad de dejar de participar en las actividades en cualquier momento.

BENEFICIOS

Esperamos que los resultados de este estudio nos ayuden a entender cómo mejorar la instrucción sobre matemáticas para niños pequeños y para los educadores de la primera infancia. Usted recibirá materiales gratuitos y apoyo a través del asesoramiento. Además, le proporcionaremos con una tarjeta de regalo con valor de $100 al final del estudio, si usted completa todos los componentes del estudio.

OTRA INFORMACIÓN

La participación en este estudio es voluntaria. En cualquier momento durante el estudio, usted puede tomar la decisión de dejar de participar.

Se mantendrá la confidencialidad de los datos en todo momento, excepto en casos donde se sospeche el abuso de menores. Por ley, tales casos tienen que ser reportados por el investigador.

Algunas veces, personal del gobierno o de la universidad revisan estudios como éste, con el fin de asegurar que se estén llevando a cabo en forma segura y legal. Si ocurre una revisión de este estudio, sus registros podrían ser examinados. Los que hagan la revisión protegerán su privacidad. No se utilizarán los registros del estudio para ponerlo a usted en riesgo de algún problema o daño de tipo legal.

Se anexa un formato de autorización. Favor de leerlo, marcarlo en el lugar correspondiente para indicar que recibió una copia del formato de autorización, y marcar su autorización para participar en la evaluación así como para lo relacionado con las grabaciones en video, firmarlo, escanearlo y devolvérnoslos vía correo electrónico. Favor de guardar una copia electrónica para sus archivos personales.

Muchas gracias por considerar participar en este estudio. Creemos que nuestra investigación ayudará a crear mayores oportunidades para tener entornos de aprendizaje temprano de alta calidad a lo largo del Estado. Estamos en la mejor disposición de contestar cualquier pregunta que pueda tener. Puede llamar a Virginia Tse at 206-221-4723 o contactarla por correo electrónico a vstse@uw.edu o ctmstudy@uw.edu

Sinceramente,

Dr. Gail E. Joseph

DECLARACIÓN SOBRE EL SUJETO DE ESTUDIO

Se me han explicado los detalles del presente estudio. He tenido la oportunidad de hacer preguntas. Entiendo que la integrante del equipo de investigación arriba mencionada, contestará futuras preguntas que yo pueda tener acerca del estudio de investigación.

_____He recibido una copia de este formato de autorización.

_____Doy mi autorización para participar en las evaluaciones realizadas por los investigadores.

_____Doy mi autorización para que se compartan grabaciones en video de mi persona, con los investigadores de la Universidad de Washington.

He leído lo anterior y doy mi autorización para participar en este estudio.

_____	_____	_____
Nombre del participante en letra de molde	Firma del participante	Fecha

Nombre de su programa: _____

Su dirección de correo electrónico: _____

Su número de teléfono: _____

UNIVERSITY OF WASHINGTON
COLLEGE OF EDUCATION
Title of Study: STEAM Trunk Math Study
Early Learning Professional Consent Form (Coach)

Investigators (UW, College of Education):
Gail Joseph, Associate Professor, (206) 685-7469, gjoseph@uw.edu
Virginia Tse, Research Assistant, (206) 221-4723, vstse@uw.edu
Contact email for the study, ctmstudy@uw.edu

INVESTIGATORS' STATEMENT

We are asking you to be in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether to participate. Please read the form carefully. You can ask questions about the purpose of the research, what we will ask you to do, the possible risks and benefits, your rights as a participant in the project, and anything else about the research and contents of this form that is not clear. When we answer all of your questions, you can decide if you want to participate in the study or not. This process is called 'informed consent.' We will give you a copy of this form for your records.

PURPOSE

The STEAM (Science Technology, Engineering, Art and Math) Trunk math study is an investigation into how math instruction changes when teachers receive professional development about math, math materials, and coaching. We are asking you to help recruit teachers into the study, provide coaching about math instruction, support teachers with Coaching Companion, and complete surveys. These activities will help us understand more about math instruction in early childhood learning environments.

PROCEDURES

If you agree to participate, during the study, we will ask you to recruit teachers into the study. Encourage teachers to upload videos. Use Coaching Companion to provide feedback to teachers about their videos before the release of the next episode of Circle Time Magazine. Watch corresponding Circle Time Magazine episodes. Complete surveys about your use of Coaching Companion.

The coaches are being asked to do the following:

1. Recruit at least one teacher (up to four) to participate in the study with them
2. Complete surveys about their coaching practices
3. Watch episodes of Circle Time Magazine which are professional development talk shows about math. Shortly after, coaches will receive a STEAM trunk. The STEAM Trunk is a box of math materials.
4. Watch the videos that teachers upload to the Coaching Companion and provide feedback about the videos to the teacher(s) on the Coaching Companion. Coaches will have

approximately a week to provide feedback to each teacher after the video has been uploaded.

Over the course of the study, teachers will upload six videos; the 20-minute pre-baseline video, four 3-5 minute STEAM Trunk videos, and the 20 minute post-baseline video. Coaches will provide feedback about the videos on the Coaching Companion website.

When you participate in the STEAM Trunk study, we will:

1. Provide you with resources to support coaching about math instruction.
2. View the videos teachers upload to Coaching Companion. By watching and analyzing interactions in the videos, the Cultivate Learning team starts to learn about the impact of the STEAM Trunk materials on interactions with children.
3. Review the surveys you return. By collecting and analyzing survey responses we can start to understand the impact of the use of Coaching Companion and coaching about math.
4. Keep all information private. We will write a report about what we watch in the videos and what we learn from the survey answers. We will not identify you in the report. The report will be shared with the STEAM Trunk research team and the Department of Children Youth and Families (DCYF).
5. Send you $100 gift cards for each teacher (up to four teachers) that completes all components of the study.

The only instance we will share identifiable information is in cases of suspected child abuse. By law, we must report these cases.

You can choose to not participate, or stop participating, in the STEAM Trunk at any time. You will still have access to view the *Circle Time Magazine* episodes on the CQEL website (http://cultivatelearning.uw.edu/circle-time-magazine-2/) and use the Coaching Companion (www.cqelcoach.org).

RISK, STRESS, OR DISCOMFORT

Some people feel that participating in research is an invasion of privacy. We do our best to protect your privacy. The only people who will have access to your identifiable information are members of the research team who have signed an agreement to protect your privacy and keep your information confidential. Your name will be kept until data collection is complete and the data is organized at our office location. We will remove links to names from our records no later than December 31, 2019. All data will be kept indefinitely in a locked location that only project research team members can access. Your name will not be used in any articles we publish or presentations.

Whether or not you choose to be in the study, it will not affect your employment. No personal questions will be asked. You are free to stop activities at any time.

BENEFITS

We hope the results of this study will help us understand how to improve math instruction for young children and early childhood educators. You will receive up to four boxes of math

materials during your participation in this study. You will also receive a $100 gift cards (up to a maximum of four gift cards) for each teacher that completes all components of the study.

OTHER INFORMATION

Participation in this study is voluntary. At any time during the study, you may choose to stop participating.

Confidentiality of data will be maintained at all times, except in cases where child abuse is suspected. By law, such instances must be reported by the investigator.

Sometimes, government or university staff review studies such as this one to make sure they are being done safely and legally. If a review of this study takes place, your records might be examined. The reviewers will protect your privacy. The study records will not be used to put you at legal risk of harm.

A consent form is attached. Please read it, sign it with your decision marked about participating, scan, and return it to us via email. Please keep an electronic copy for your records.

Thank you for considering participation in this study. We think that our research will help create more opportunities for high quality early learning environments across the state. We will be happy to answer any questions you have. You can call Virginia Tse at 206-221-4723 or email vstse@uw.edu or ctmstudy@uw.edu

Sincerely,
Gail E. Joseph, Ph.D.

SUBJECT'S STATEMENT

The details of this study have been explained to me. I have had an opportunity to ask questions. I understand that the research team member listed above will answer future questions that I may have about the research study.

_____I have received a copy of this consent form.

_____I give consent to participate in assessments conducted by the researchers.

_____I give consent for video of me to be shared with the University of Washington researchers.

I have read the above and give my consent to participate in this study.

_____	_____	_____
Printed name of participant	Signature of participant	Date

Your program name: _____

Your E-mail address: _____

Your phone number: _____

Pre and Post Math Comfort Survey STEAM Trunk Math Study

Please indicate the degree to which you agree or disagree with each statement below by marking the box for the appropriate letters: strongly disagree (SD), disagree (D), mildly disagree (MD), mildly agree (MA), agree (A), or strongly agree (SA).

1. I feel comfortable planning and demonstrating classroom activities related to counting (e.g., knowing number names and counting sequence)
2. Exploring hands on with materials is how children learn best.
3. Math-related activities help children learn other topics (such as reading) as well.
4. I feel comfortable doing math activities with the young children in my care.
5. Listening to counting and looking at numbers is how young children learn math best.
6. I feel comfortable planning and doing classroom activities related to math operations (e.g., addition, subtraction)
7. It is not appropriate to introduce math to children at an early age.
8. Exploring on their own is the best way for young children to learn math.
9. I do not have enough math knowledge to teach math to young children.
10. Young children cannot learn math until they are able to read.
11. Math related activities are too difficult for young children.
12. Children learn math best when teachers talk with them about math during math activities.
13. I feel comfortable planning and doing classroom activities related to measurement and data (e.g., describing and comparing things that are smaller or bigger, more or less, etc.)
14. I feel uncomfortable using math tools such as scales, rulers and calculators when teaching math lessons.
15. I enjoy doing math related activities with children.
16. I am afraid that children may ask me a question about math that I cannot answer.
17. Planning and doing hands on math activities with children is a difficult task.
18. Young children are curious about math.
19. I feel comfortable planning and doing classroom activities related to geometry (e.g., exploring and describing spatial relationships and shapes).
20. I feel comfortable planning and doing classroom activities related to patterns (e.g., creating a pattern of shapes triangle, square triangle, square, etc.).

21. Since the beginning of the study, about how many math activities do you do with children each week?

22. Do you use math materials during any of these daily activities? If so, check all that apply.

Arrival / departure

Transitions

Large group time

Small group time

Mealtime

Free choice

Outside

Other (please specify)

23. Are you providing more math learning opportunities and instruction because you participated in this study?

Yes

No

24. If you are providing more math learning opportunities and instruction, when and how is that happening?

25. If you are not providing more math learning opportunities and instruction, what are the barriers or challenges?

26. Describe a math activity that you have done with children that went well:

27. Describe a math activity that you have done with children that did not go well:

28. Please enter your name below. All responses will be kept confidential within the research team and will not be personally identifiable.