THE IMPACT OF PROFESSIONAL DEVELOPMENT ON TEACHERS' IMPLEMENTATION OF FORMATIVE ASSESSMENT PRACTICES

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A dissertation submitted to the Curriculum and Instruction department,
College of Education
in partial fulfillment of the requirements for the degree of

Doctor of Education

in Professional Leadership with an Emphasis in Literacy

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August 2020

Acknowledgements

I would like to acknowledge everyone who played an integral part in my doctoral journey. First and foremost, I would like to thank Dr. Hutchison, my mentor, advisor, and committee chair. You are a constant source of knowledge and encouragement; your dedication to your students' success is evident, and I am forever grateful for your guidance. To my committee members Dr. Cameron, White, Dr. Miao Li, and Dr. LaShawn Hodge: thank you for your wisdom, guidance, and expertise, which paved the way for a piece of work of which I can be forever proud. To the residents of Thomazeau, Haiti: you are my inspiration for attaining my doctorate. Without you and the interactions I have had with each of you, I would have never started this journey or paid too close attention to the inequities in education worldwide. Mèsi anpil. To my brothers, Baylor and Britton Barbee, thank you for inspiring me to persevere, push my limits, and recognize my gifts. And to my parents, thank you for your constant love, support, and encouragement and reminding me of the fire and passion that burns within me to do something great.

Abstract

Background: In order to better prepare teachers for the journey ahead of them, effective models of professional development must be implemented. Formative assessment shifts the onus of learning onto students; this necessary mindset shift from a focus on teaching to a focus on learning has the potential to transform the dynamic of urban classrooms to create self-directed learners and more insightful instructional decisions. **Purpose**: This study will evaluate the impact of research-based features of effective professional development on teachers' knowledge, skills, and implementation of formative assessment practices. The proposed study will address the following research question: To what degree does a hybrid model of online- and site-based professional development affect teachers' implementation of formative assessment practices? **Methods**: This study employed a convergent mixed methods approach to collect and analyze quantitative and qualitative data. The convenience sample of participants was four elementary teachers, who teach grades kindergarten through fourth. Participants were selected based on their enrollment in the course Student Agency in Learning (SAIL) and their participation as first-year participants in the Formative Assessment Project. The researcher conducted classroom observations using the Formative Assessment Rubrics, Reflection and Observation Protocol (FARROP), and catalogued participants' professional development hours; participants completed reflections throughout the study and a pre-and posttest self-report of their implementation of formative assessment. The quantitative data allowed the researcher to analyze the improvements in formative assessment practices in teachers' classrooms from December 2019 to March 2020, while the qualitative data augmented the findings. Data was analyzed individually and holistically to track trends, and the

researcher constructed tables and graphs to show progression over the course of time in each dimension. Last, the researcher used a t-test to measure the significance of difference between the pre- and posttest self-reports. **Findings**: Based on exploratory analysis of teacher improvement and professional development opportunities, a diverse array of professional learning activities contributed to gains in FARROP and posttest results; however, the number of logged professional development hours did not correlate with growth. Each participant grew in their formative assessment practices from December 2019 to March 2020 in both their overall FARROP ratings, their self-selected focus dimensions, as well as their self-reports. Collaborative Culture of Learning, Success Criteria, Learning Goals, and Extended Thinking during Discourse showed the most growth overall, while Student Self-Assessment and Peer Feedback saw the smallest gains. **Conclusion**: The findings suggest that because of the intricate technicalities of the enactment of formative assessment dimensions, an array of opportunities that contain most or all elements of research-based elements of effective professional development is necessary to improve teachers' implementation and practice in formative assessment.

Keywords: professional development, professional learning, formative assessment; FARROP

Table of Contents

List of Tables

List of Figures

Figure Page

Chapter 1

Introduction

With the increasing rigor of what students are required to know and be able to do (Darling-Hammond, 2010; Postholm, 2012), the need for high-quality teachers grounded in pedagogical content knowledge is more pressing than ever. As classrooms in the United States grow increasingly diverse in terms of race, ethnicity, language, learning abilities, culture, and socioeconomic status, teachers need more than just disciplinary content knowledge; they need the pedagogy and methodology of practice to reach the diverse learners. Many teachers come into education ill-equipped and underprepared to handle the needs of urban classrooms, and as a result, the attrition rate in education continues to sore (Darling-Hammond, 2006). When teachers are not prepared to handle the demands of challenging classrooms with more rigorous standards, self-efficacy and agency dissipate and burnout increases. Despite the $18 billion that was spent on professional development in the United States for teachers in 2014 (Bill and Melinda Gates Foundation, 2014), many feel unprepared to navigate the challenges of the classroom.

One of the solutions policymakers, administration, and districts defer to to combat the problem is the implementation of various models of professional development. Professional development offerings with clearly defined objectives and evidence-based features have proven effective in improving teacher efficacy and instructional practices (Borko, 2004; Calvert, 2016; Darling-Hammond, Hyler & Gardner, 2017; Learning Forward EducationCounsel, 2017), which often results in increased student achievement. When reform methods of professional development like collaboration, coaching, and

active learning are implemented simultaneously into professional development models, the growth of both the teacher and student occurs (Desimone, 2009; Darling-Hammond et al., 2017). Furthermore, when professional learning is incorporated into sustainable practices like formative assessment, teachers' instruction improves as they teach students how to learn and monitor their learning. This change in practice ultimately results in a mind shift for teachers and students as each learns to share responsibility for both teaching and learning.

Statement of the Problem

Due to the incredible demands placed on educators, teaching has become a complex and challenging profession. Educating today's youth requires vast amounts of patience and empathy, content and pedagogical knowledge, cultural and emotional intelligence, political correctness and truth. The emergence of technology has brought the world closer together to where we only need a small device to see the other side of the world in real-time. Other technological means have brought the world to us, to our classrooms, and teaching has become more than disciplinary content; it is cultural relevance and intelligence, behavioral management, motivational speaking, and the art of persuasion with a hint of entertainment. To teach means to be bigger than ourselves, and teachers enter the profession with goals of making a difference and changing the world one child at a time.

Nevertheless, despite the ideals of education and the hopes and dreams of educators, students of color are often denied opportunities to grade-appropriate assignments based on low teacher expectations, and thus, are consequently denied opportunities to think critically, problem-solve, and become self-directed learners (TNTP,

2018; Mehta, 2018; Jaquith, 2019). As a result, students—especially of urban districts—are dependent upon their teachers to move forward in their learning (Hammond, 2015; WestEd, 2019), not because students lack the curiosity to learn or explore their learning, but because they have developed a teacher-induced reliance on teacher support and guidance that leaves students waiting to be told what to think. Similarly, teachers do not activate peers as resources for each other's learning by based on the assumption that peers do not know the concepts and skills themselves. Therefore, teachers are producing compliant students who can follow the rules but never learn to create them. The urban classrooms of the United States need independent thinkers, unbound by the chains of low expectation and mere compliance; we want free thinkers, critical thinkers, problem solvers.

The nation has tried to solve the achievement gap, the equity gap, the learning gap, the opportunity gap, and bridge every divide that exists in education. Phrases like "diversity," "inclusion," "differentiation," and "scaffolding" adorn the walls of every professional learning community (PLC) and reverberate from the auditorium walls in every faculty meeting. The past ten years have brought an increased emphasis on data analysis because the prevailing opinion has been that firsthand data evaluation will save the children…but it has not (Rodberg, 2019). The U.S. Department of Education's No Child Left Behind (NCLB) and Every Student Succeeds Acts (ESSA) are great in theory as they attempt to bridge the equity and achievement gaps, but sadly, they have not. As the gaps continue to increase, the rich get richer and the poor get poorer, and for our students of color, students at risk, and students of low socioeconomic status, we cannot take any more chances.

In order to better prepare teachers for the journey ahead of them, districts must implement effective models of professional development. Formative assessment disrupts the current teacher-focused classroom in education by shifting the onus of learning onto students; this necessary mindset shift has the potential to transform the dynamic of classrooms across the nation to create self-directed learners and more insightful instructional decisions (Formative Assessment for Students and Teachers [FAST] & State Collaborative on Assessment and Student Standards [SCASS], 2018). Although content is important (Desimone, 2009), the knowledge of how learners learn and how to adjust instruction in real-time are equally as vital to student growth. As Rodberg (2019) claims, "better instruction won't come from more detailed information, but from changing what people do" (par. 10).

Theoretical Framework for the Study

The theoretical framework for the study is constructivism, specifically socio-constructivism, situated in the context of andragogy and the adult learner. Constructivists like Piaget (1968) and Perry (1999) argue that learners actively construct their knowledge based on prior knowledge and experiences; the process occurs through both collaboration and self-regulation. Social constructivism or socio-constructivism, pioneered by Vygotsky (1978), argues that learning is contextualized and occurs when learners actively engage and collaborate. Additionally, he contends that learners require proximal development zones that assess where learners exist on a continuum and seek to situate learning beyond the current level of understanding. To access learning at its highest, learners will need scaffolding from an expert practitioner to give the support necessary to access the knowledge and mobilize the learning (Vygotsky, 1978).

Social constructivism. In the context of the study, social constructivism is critical to the transfer and mobilization of learning. For professional development to be effective, learners must be willing and active participants in building their learning—a hallmark of constructivism. The research-based core features of professional development, such as collaboration and active learning, situate the learner in social contexts to broaden and deepen their knowledge and understanding (Darling-Hammond et al., 2017) while observation, feedback, and reflection offer discovery, exploration, and problem-solving that build knowledge collectively and individually. Additionally, the use of models of instruction and coaching that function as cognitive apprenticeship are supported by Vygotsky's (1978) ideas of scaffolding and proximal development zones because an expert practitioner models and guides the teacher-learners to extend their learning and apply new pedagogical content knowledge. Similarly, the implementation of formative assessment practices requires a culture of collaboration for teachers as well as students. According to Sadler (1998), formative assessment poses three questions to situate learners in a feedback loop: Where am I going? Where am I now? How do I close the gap? These questions coincide with Vygotsky's zone of proximal development in helping learners—in this case, teachers—place themselves on a continuum of learning as they learn to bridge the gap between what they know and what they are expected to know. For learners to arrive at this level of understanding and self-awareness, teachers need to know and understand how to elicit evidence of learning to track their own growth as well as students' (WestEd, 2019). Teachers plan together, observe one another, and debrief to deepen their knowledge, understanding, and application of principles in a collaborative

learning environment (WestEd, 2019); through this means of professional development, the social context of learning is central to constructing knowledge.

Throughout this study, the reiteration of social interaction and context in building knowledge will be essential. Using zones of proximal development and scaffolding via coaching and mentorship will be components of the theory used to develop teachers. Additionally, active learning will play a central role in both the professional development and the implementation of formative assessment practices as teachers take an active role in developing their knowledge and skills, a hallmark of the constructivist theory (Piaget, 1968; Vygotsky, 1978), through reflective journals, online learning, and site-based communities of practice.

Purpose of the Study

The purpose of this study is to evaluate the impact of research-based features of effective professional development on teachers' knowledge, skills, and implementation of formative assessment practices. Professional development includes workshops, site-based communities of practice, online learning via videos, readings, and reflections, coaching, and the application of POD cycles as a means to develop the fundamental mindset shifts that are necessary for high levels of formative assessment expertise (Gerzon, 2019). In their seminal research on professional development, Darling-Hammond et al. (2017) indicate that effective professional development is "sustained, offering multiple opportunities for teachers to engage in learning around a single set of concepts or practices, has a greater chance of transforming teaching practices and student learning" (p. 15). Their research specifies that effective professional development models with 49 hours of professional development were associated with a boost in student

achievement (Darling-Hammond et al., 2017). Similarly, WestEd's (2019) research found that 84 hours of professional development over two years showed relevant changes in formative assessment practices and significant improvements in pedagogical content knowledge (Gerzon, 2019; Dunn, Makkonen, & Castillo, 2019). Therefore, this study will explore the relationship between research-based core features of professional development and the implementation of formative assessment practices.

Research Question

This study addresses the research question: To what degree does a hybrid model of online- and site-based professional development affect teachers' implementation of formative assessment practices?

Definition of Key Terms

Active learning. "Engages teachers directly in designing and trying out teaching strategies, providing them an opportunity to engage in the same style of learning they are designing for their students" (Darling-Hammond, 2017, p. v). This interactive form of learning incorporates meaningful discussion, planning, and application of practice (Garet, Porter, Desimone, Birman, & Yoon, 2001).

Andragogy. The art and science of helping adults learn (Knowles, 1968).

FARROP Rubric. Formative assessment rubric, resources, and observation protocol is an observation tool used to support the implementation of formative assessment dimensions; it is the only nationally validated formative assessment rubric.

Coaching. A type of teacher-support where experts employ types of professional learning strategies, such as "modeling strong instructional practices or supporting group discussion and collaborative analysis of student work" (Darling-Hammond et al., 2017, p.

12); it occurs during the day, helps with the implementation of curricula and has expert educators provide feedback (Garet et al., 2001).

Formative assessment. Formative assessment is "planned, ongoing process used by all students and teachers during learning and teaching to elicit and use evidence of student learning to improve student understanding of intended disciplinary learning outcomes and support students to become self-directed learners" (FAST & SCASS, 2018, p. 1).

POD cycle. A structure of professional learning where small communities of teachers plan together, observe one another and debrief in order to grow their practice.

Professional development. In this study, professional development refers to "structured professional learning that results in changes in teacher practices and improvements in student learning outcomes" (Darling-Hammond et al., 2017, p. v).

Student Agency in Learning (SAIL). An online course in formative assessment created by WestEd.

Self-assessment. A method of assessment where students evaluate their own learning progress.

Self-regulation. The ability to be an active agent in one's own learning through the intentional use of personal strategies to achieve academic goals (WestEd, 2019).

Workshop. A professional development workshop is a "structured approach to professional development that occurs outside the classroom" and involves leader(s) with specialized expertise (Garet et al., 2001).

Significance of the Study

With a two-year grant from the Michael and Susan Dell Foundation, sixty teachers from three districts in the Southwest began training in formative assessment practices through the How I Know pilot. The program started in the 2017-2018 school year to support districts as they implemented formative assessment practices for classroom instruction. My district began the program with four schools and twenty teachers and continued the program for Year 3 in the 2019-2020 school year by scaling to fifty teachers.

I entered the role as the formative assessment coordinator in August of 2019, and my reasons were two-fold: get back on to campuses more often to coach teachers, see kids learn, and continue living out my life's purpose to educate and empower the underserved and disenfranchised to relieve them from oppression. In 21st century America, test preparation and lack of access to equitable opportunities for authentic learning rank high on the oppression list for students of color with low socioeconomic status. Formative assessment shifts the dynamic of the classroom where students are agensic and own their learning; they are able to teach and learn from their peers; they are empowered with lifelong learning skills as they learn how to learn and communicate their knowledge. Thus, my involvement in the work centers around equity. Through this work, I hope to scale districtwide so that teachers know and understand best teaching practices to prepare students for more than just taking a test; teachers need to learn how to empower students so that they are college, career, and community ready.

As we move forward into scaling to additional campuses in the district, understanding whether more professional development offered in a variety of modalities

will increase practice and decrease pushback will be crucial to our work. This study aims to use the research-based features of effective professional development in blended learning environments to add to the body of research that addresses hybrid and online models of learning.

Chapter 2:

Literature Review

The content of this literature review on professional development and formative assessment provides the framing of the study and background of the research. The purpose of this study is to evaluate the impact of research-based features of professional development situated in the context of andragogy on the implementation of formative assessment practices. This chapter includes an overview of andragogy, professional development, and formative assessment as well as a review of the literature on professional development, formative assessment, and professional development on formative assessment.

The focus of this study narrowed the review of the literature to andragogy to frame adult learning, professional development, and formative assessment in the K-12 classroom. It specifies the need for and goals of professional development, the core features and conditions for effective online and hybrid professional development, as well as the barriers to effective implementation. Regarding formative assessment, the literature review will define and address the dimensions and goals of formative assessment, its features, the roles of teachers and students in the process. Last, this chapter reviews the literature regarding the impact of professional development on formative assessment practices as well as need the need for asset-based pedagogy to close the opportunity gap.

Andragogy: A Framework for Adult Learning

In order to give adults the professional development they need to experience success in the classroom, understanding how to educate adults best is essential. Dozens of researchers in the fields of science, psychology, philosophy, and social sciences attempt

to encompass the definition of learning, but simply put learning is acquiring knowledge of or skill in by study, instruction, or experience (*Dictionary.com,* n.d.); most of the definitions in academia also include the idea of change a learner must undergo in order for learning to happen and an emphasis on the learner "in whom the change occurs or is expected to occur" (Knowles, Holton, & Swanson, 2014, p. 17). However, it was not until the twentieth century that the understanding of adult learning established its importance in research (Merriam, Carrafella, & Baumgartner, 2007).

Several theories, models, and principles have arisen over the past fifty years surrounding the topic of adult learning; however, no model or theory that has been developed includes or explains all there is to know about adult learning (Knowles et al., 2014). In his seminal research, Knowles (1968)—the driver behind much of the research in the United States surrounding andragogy—defines andragogy as the "art and science of helping adults learn" (p. 43), which stands in contrast to pedagogy since pedagogy deals with children. Andragogy is a process-oriented, transactional model between the facilitator and the learner that allows for flexibility to fit individual learner differences (Knowles et al., 2014). Because not all adults learn the same way at the same rate, professional development models must encompass a variety of modes (digital and in-person) and styles (e.g., videos, peer observation, feedback, self-reflection, readings, sensemaking) to help adults mobilize content.

Andragogy remains hotly debated as a theoretical construct. Despite its well-intentioned assumptions, many argued against the validity of the claims, contending that the premises are not solely characteristic of adult learners and that the assumptions are based on what an adult learner should look like, not the reality of what one is (Hartree,

1984; Merriam, 2001; Drago-Severson, 2008). In fact, as more theories on social constructivism emerged and the cultural and context-dependent theories of learning grew, the theory of adults being autonomous, independent learners was called increasingly into question (Merriam et al., 2007). Brookfield (1986) even called andragogy culturally blind because it ignores factors of race, culture, and ethnicity (Knowles et al., 2014). However, Knowles et al. (2014) contend that andragogy can be embedded and used congruently with other theories, such as critical theory, to account for the element of social change, if that social change is the end goal. Thus, though many arguments have sprung forth against andragogy as a theoretical framework, andragogy remains the single most popular model for training and educating adults (Brookfield, 1986).

Beyond andragogy and Knowles' (1968) assumptions, researchers have identified several other factors of adult learning. Kennedy (2016) and Andersson and Palm (2017) found that the effect of professional development depends on teacher motivation, and deeper learning takes place when teachers volunteer to participate in learning (Knowles et al., 2014). The degree to which teachers practice the implementation of a learned skill or process also dictates the lasting learning adults experience. Andersson and Palm (2017) explain that teachers need substantial support and intervention to enact radical changes in practice, and contrary to Knowles's (1968) initial findings, adults need a social context in which to try on their learning in a social setting. This necessary socio-cultural foundational piece of constructivism will be a crucial element in the professional development of this study.

Professional Development

High-quality educators are at the heart of school improvement plans. As local and state policymakers struggle to keep up with the ever-changing landscape of education, schools and districts cannot and will not be better than the teachers within them (Guskey, 2002). Although debates contend the value of the teaching profession (Darling-Hammond, 2010), the necessity of educating America's youth to be critical thinkers in an increasingly competitive world remains largely uncontested. In order to prepare students for the world beyond K-12 education, teachers need to be equipped with the knowledge and skills necessary to navigate the terrain. The Teaching Commission (2004) contends that teaching is "our nation's most valuable profession" (as cited in Borko, 2004) and "helping our teachers to succeed and enabling our children to learn is an investment in human potential, one that is essential to guaranteeing America's future freedom and prosperity (as cited in Borko, 2004). In order to accomplish this vast undertaking, the nation spends billions of dollars each year in teacher professional development (Borko, 2004; Desimone, 2009), some estimates as high as $18 billion collectively a year (Bill and Melinda Gates Foundation, 2014).

However, despite the billions spent in monetary investment to improve teacher quality, professional development programs often fail to adequately prepare teachers for the reality of the classroom, especially in urban schools (Guskey, 2002; Darling-Hammond, 2006). Weak professional development programs that lack content-focus (Garet et al., 2001), coherence (Garet et al., 2001), or simply exist to check a box for state accountability or compliance (Calvert, 2016) create barriers to student academic achievement. Moreover, state leniency on teacher qualification and credentialing further

exacerbates the problem of creating and retaining high-quality teachers (Garet et al., 2001; Darling-Hammond, 2006; Darling-Hammond, 2010). Additional challenges to implementation, such as lack of time, lack of resources, and teacher buy-in create further challenges in the quest to prepare teachers for today's education system (Darling-Hammond, 2010; Darling-Hammond et al., 2017;).

Despite the challenges, research has shown a strong correlation between the core feature of effective professional development programs and teacher improvement (Darling-Hammond et al., 2017). Deliberate, well-defined programs with clearly specified roles for teachers, administrators, and facilitators with mutual adoption from each party lead to improvements in teacher agency (Guskey, 2002; Borko, 2004; Calvert, 2016). Darling-Hammond et al.'s (2017) extensive studies show that effective professional development programs need a combination of these seven features: content-focused, incorporation of active learning, support for collaboration, models of effective practice, coaching and expert support, feedback and reflection, and sustained duration. Additional researchers echo the findings with the addition of coherence as a final element (Garet et al., 2001; Guskey, 2003; Desimone, 2009).

Defining Professional Development and Goals. Researchers, policymakers, and educators define professional development in a number of ways: educators learning how to learn (Postholm, 2012), formal and informal processes that occur in a myriad of job-embedded contexts (Borko, 2004), and structured learning that results in the change of practices and student learning outcomes (Darling-Hammond et al., 2017); regardless of the informal or formal nature of the program, the heart of professional development is professional learning. At its peak, effective professional development alters a teacher's

practice for the better in order to improve student achievement (Guskey, 2002; Desimone, 2009; Guskey, 2003; Desimone, 2009; Calvert, 2016; Darling-Hammond et al., 2017;). Programs that are not focused on the knowledge and skills necessary to move teacher learning forward or designs that are used as a means to check a box for accountability, compliance, certification, or contractual agreements (Guskey, 2002; Calvert, 2016) will not give schools and districts the high-quality teachers needed for improvement of student learning outcomes (Desimone, 2009; Darling-Hammond et al., 2017).

Because teachers are necessary for school improvement, the success of any school or district initiative is contingent upon the effectiveness of teachers (Garet et al., 2001; Borko, 2004; Calvert, 2016); in fact, according to Learning Forward and EducationCounsel (2017), no in-school factor matters more in improving student achievement than quality teaching. In order for teachers to become high-quality in practice, they need a multitude of foundational knowledge and skills in order to be powerful agents in their increasingly diverse classrooms. First, teachers need deep knowledge of their content so that they understand its nuances and can effectively communicate the curriculum and subject matter to students (Garet et al., 2001; Borko, 2004; Darling-Hammond, 2006). Secondly, teachers need a knowledge of their students and how they learn in order to holistically and individually target the needs of learners (Garet et al., 2001; Borko, 2004; Darling-Hammond, 2006; ESSA, 2015); this includes a deep understanding of learner differences, language and cultural influences, individual temperaments, and learning styles (Borko, 2004; ESSA, 2015).

Yet despite the complex nature of the knowledge teachers must possess, the skills they need to enact their knowledge are arguably more challenging to master. Along with

their content knowledge and knowledge of learners, teachers need pedagogical content knowledge, which includes the skills they need to teach, how to adjust instruction, classroom management practices, and instructional strategies for a variety of purposes (Garet et al., 2001; Postholm, 2012; Darling-Hammond, 2006). Additionally, teachers need the professional and personal skills to function flexibly in a dynamic, ever-changing environment (Borko, 2004); they must be masters of communication, purveyor of problem-solving, and masters of teaching self-direction, metacognition, and critical thinking (Darling-Hammond et al., 2017). Thus, in order to be high quality and effective, teachers need a wide range of robust knowledge and skills that they continue to hone throughout their professional tenure; without continual growth and development, constant change of education and students will leave the once-effective teacher ineffective.

Core features of professional development. Research has shown that well-designed professional development programs can help teachers improve their instruction (Borko, 2004; Darling-Hammond et al., 2017; Learning Forward & EducationCounsel, 2017). In recent years, professional development reformation has come in the form of site-based mentoring and coaching in lieu of the traditional one- or two-day workshop model, which allows for little follow up or follow through (Garet et al., 2001; Darling-Hammond et al., 2017). The ESSA (2015) defines professional development as activities that are "are sustained (not stand-alone, 1-day, or short term workshops), intensive, collaborative, job-embedded, data-driven, and classroom-focused," many of the features research has identified as critical components of effective professional development programs, and although not every program included every core feature, most of the researched programs utilize many of the features simultaneously (Garet et al., 2001;

Guskey, 2003; Borko, 2004; Darling-Hammond, 2006; Desimone, 2009; Calvert, 2016; Darling-Hammond et al., 2017).

Content-focused. Desimone (2009) argues that content-focus is perhaps the most influential component of effect professional development models because it links subject matter to student learning. ESSA's (2015) focus on job-embedded and classroom-focused professional development lends itself to a focus on discipline-specific content, such as literacy, social studies, science, or mathematics, to ensure teachers have the knowledge necessary to effectively communicate their content to students in the context of a classroom (Garet et al., 2001; Borko, 2004; Darling-Hammond, 2006; Darling-Hammond et al., 2017). Thirty-one of the thirty-five studies Darling-Hammond et al. (2017) reviewed focused on content as a component of their professional development model; the researchers found that professional development that targets teachers' knowledge and allows them to practice new pedagogy with students and analyze and compare student work positively impacts student achievement because it is relevant and job-embedded. Preceding their work, in ESSA's (2015) established definitions of professional development, the bill cites the need for professional development to increase teachers' knowledge of the academic subjects they teach and improve teachers' abilities to analyze student work; therefore, the focus on content in any given professional development model is necessary in communicating the knowledge that teachers need to be successful (Garet et al., 2001; Desimone, 2009; Darling-Hammond et al., 2017; Institute for Learning [IFL], 2019).

Incorporates active learning. Active learning is a critical component for the internalization of new concepts, so professional development models need to focus on the

content teachers learn as well as how they learn it (Darling-Hammond et al., 2017). Active learning cannot be accomplished in one-day workshops; it is an ongoing process that takes place over time, "moving away from traditional learning models that are generic and lecture based toward models that engage teachers directly in the practices they are learning and preferably are connected to teachers classrooms and students" (Darling-Hammond et al., 2017, p. 7). Teachers learn in multiple ways: observing other teachers' classrooms and being observed, collaborative planning, giving and receiving targeted feedback, inquiry and reflection (Black & Wiliam, 1998; Garet et al., 2001; Guskey, 2002; Desimone, 2009; Postholm, 2012; Calvert, 2016; Darling-Hammond et al., 2017). The foundation that teachers bring to the table correlates with the absorption of material (Darling-Hammond et al., 2017), so activating a teacher's prior knowledge and experiences is critical step in order for learning to occur (Postholm, 2012); professional development models that value teachers' insights and experiences as springboards for learning often get more buy-in from participants because they are recognized as capable beings and become active agents in their own learning (Calvert, 2016). Activities that allow teachers to engage in the process of simulation (IFL, 2019), experience content, to observe others, and to be observed themselves create a job-embedded context, camaraderie, and ownership that extends learning (Black & Wiliam, 1998; Garet et al., 2001; Desimone, 2009) and ultimately, lead teachers to self-reflection and transformation (Desimone, 2009; Darling-Hammond et al., 2017). The process of teaching and learning in the context of classrooms is a necessary component to professional development models because it allows teachers to "try on" new content and pedagogical content knowledge to improve student outcomes. Lastly, giving and receiving feedback gives

teachers a critical eye for what to look for in classrooms so that they, too, can adjust their own instruction in real time (Garet et al., 2001; Guskey, 2002). When participants are actively engaged in their own learning, research shows it improves both teaching and learning (Black & Wiliam, 1998; Desimone, 2009; Calvert, 2016; Darling-Hammond et al., 2017).

Supports collaboration. Teachers learn through active participation, reflection, observations, and conversations, all of which are social, collaborative endeavors (Postholm, 2012). According to Darling-Hammond et al. (2017), collaboration can take many forms from "one-on-one or small-group interactions to schoolwide collaboration to exchanges with other professionals beyond the school" (p. 9). As part of Vygotsky's (1978) social constructivist theory, learners learn when they are socially engaged with one another, share a vision, or work to solve a problem. In a professional development model, an environment that supports and encourages collaboration contributes to teacher improvement (Borko, 2004; Darling-Hammond et al., 2017). One of the frameworks for collaboration often used in school settings are professional learning communities (PLCs), which when structured well and supported, foster a trusting collaborative environment where teams collectively develop strong commitments to learning, discussion, and problem-solving within the context of their classrooms (Guskey, 2003; Learning Forward & EducationCounsel, 2017; Darling-Hammond et al., 2017). This shared responsibility helps learners build knowledge together, prepares them for challenges, and leads to higher satisfaction on the job (Bill and Melinda Gates Foundation, 2014). However, the collaboration must be structured and purposeful with clear goals for all involved in order to be effective because unstructured collaborative efforts has been shown to inhibit

instructional practice and prevent changes if participants are begrudging the time lacks purpose, or goals are unclear (Guskey, 2003). Nevertheless, collective participation and collaboration remains a valuable component of sustained professional development models (Garet et al., 2001; Borko, 2004; Desimone, 2009; Darling-Hammond et al., 2017),

Uses models of effective practice. Teachers need models and modeling of effective instruction as exemplars for what instruction should look like (Darling-Hammond et al., 2017). In fact, research shows that teachers want applicable demonstrations and modeling to learn and grow (Bill and Melinda Gates Foundation, 2014). According to Darling-Hammond et al. (2017), models include video of teaching, demonstration lessons, peer observations, and curriculum models that include student work and sample assessments. These models help set the context for and connect learning to the day-to-day practice and have the ability to amplify transfer of observation to practice. This connection of theory to practice with the help of strong practitioners helps educators feel more prepared and capable than their isolated peers (Darling-Hammond, 2006).

Provides coaching and expert support. Amongst the various strategies of professional development reform, coaching and mentoring are at the top (Garet et al., 2001). Coaching matches an expert educator with other educators in one-on-one or group settings for a sustained duration of time to model instructional practices (Garet et al., 2001; Darling-Hammond et al., 2017), lead collaborative discussions (Darling-Hammond et al., 2017), share expertise, and be a lifeline for any questions that arise in the classroom. In keeping with Vygotsky's (1978) zone of proximal development and expert

scaffolding, part of coaching's success hinges on the ongoing relationship between expert and apprentice that ultimately focuses on students by aiding in lesson preparation, instructional coaching in the classroom, and reflective practices (Bill and Melinda Gates Foundation, 2014). Although the benefits of coaching are many, coaching is often relegated to new and struggling teachers, robbing the majority of the chance to grow their practice (Bill and Melinda Gates Foundation, 2014). Nevertheless, the impact of coaching and expert support cannot be overstated.

Offers feedback and reflection. Individualized feedback and self-reflection are critical components of andragogy and help teachers process their instruction in order to adjust it to better student outcomes. Feedback and reflection can overlap with active learning, but their presence as a standalone feature of effective professional development models is warranted. Darling-Hammond et al. (2017) explain, "Professional development models associated with gains in student learning frequently built in time for teachers to think about, receive input on, and make changes to their practice" (p. 14). Whether feedback comes from peers, coaches, or administrators, the frequency, timeliness, and actionability of feedback are critical in changing instructional practice (Guskey, 2002). However, as teachers have reported, feedback from administration often comes in isolated chunks with no follow-up or coaching (Bill and Melinda Gates Foundation, 2014), which can create confusion and division.

Is of sustained duration. Because research indicates that a change of practice in pedagogy and instructional practices requires sufficient amounts of time, (Garet et al., 2001; Guskey, 2002; Desimone, 2009; Darling-Hammond et al., 2017), the sustained duration of professional development activities is one of the critical elements to ESSA's

(2015) definition of professional development. Sustained duration includes both the span of time and number of contact hours (Garet et al., 2001; Desimone, 2009) in which the teacher is engaged with professional learning and in-depth study. Teachers need multiple opportunities and exposure to a concept to change their practice (Garet et al., 2001; Darling-Hammond et al., 2017) because "longer activities are more likely to provide an opportunity for an in-depth discussion of content, student conceptions and misconceptions, and pedagogical strategies" (Garet et al., 2001, p. 922-923) so that more in-depth learning and reflection can occur (IFL, 2019). Perhaps this is why models that include sustained coaching, mentoring, collaboration, and application to practice have proven effective (Garet et al., 2001; Darling-Hammond et al., 2017;). No official consensus has been reached on the number of hours required to alter a teacher's practice, nor has a threshold been found at the number of hours where change tapers off; however, Darling-Hammond et al. (2017) found that an average of 49 hours of development per year resulted in increased student achievement of 21 percentile points.

Is coherent. Desimone (2009) defines coherence as the "extent to which teacher learning is consistent with teachers' knowledge and beliefs" (p. 184) while others define coherence as alignment to school and district goals and state standards (ESSA, 2015; Learning Forward & EducationCounsel, 2017; Darling-Hammond et al., 2017; Learning Forward, n.d.). And although coherence does not appear as a stand-alone feature in Darling-Hammond et al.'s (2017) research, ESSA's (2015) inclusion of coherence makes it a formidable feature for professional development models. When professional development strikes a harmony in teachers' minds with their beliefs and in conjunction with supporting self and district goals, teachers will find more value in the delivery since

the learning is more apt to contribute to their growth and success (Guskey, 2002; Calvert, 2016,). However, when professional development is taught in isolation or is disconnected from school and district initiatives, its inadequacy renders it useless (Borko, 2004). Therefore, the coherence and the implementation across all educators in the system are necessary for successful systems-adoption (IFL, 2019).

Online Learning. Online learning through videos, modules, readings, and group interaction on the Internet is becoming an increasingly popular professional development design. As America becomes increasingly busy and technologically savvy, innovative approaches to increase the effectiveness of current professional development systems are needed , especially in a COVID-19 and post-COVID-19 society. Questions surrounding how to give equitable access to high-quality professional development in a manner that allows all to participate and enhance equity have arisen, but many turn to online platforms as innovative solutions to their problems (Fishman, Konstantopoulos, Kubitskey, Vath, Park, Johnson, & Edelson, 2013). Online modality allows developers to reach a broader audience in a timeframe that accommodates teachers' busy schedules (Moon, Passmore, Reiser, & Michaels, 2014). With the scalability online learning provides and the increased availability to participants (Fishman et al., 2013), online learning creates solutions to the problems of time and reach, which often plague large urban districts.

Research has shown that well-designed professional development programs can help teachers improve their instruction (Borko, 2004; Darling-Hammond et al., 2017; Learning Forward & EducationCounsel, 2017). In their study of online professional development versus the impact of traditional face-to-face presentations, Fishman et al.

(2013) found that "teacher learning experiences delivered partially or completely over the Internet can potentially provide high-quality teacher learning experiences" (p. 427) and found no difference in teacher practice, beliefs, and student learning outcomes in comparing the two modalities. However, Moon et al. (2014) argues that the modality should not be treated as the main effect when comparing online and face-to-face professional development but that the challenge is developing research-based designs that are effective for online learning. These include opportunities for active sensemaking and problem-solving (Garet et al., 2001) and ongoing opportunities to analyze and practice the implementation of content (Moon et al., 2014). Additionally, the online professional development needs to be connected to teachers' practice and focus on change in practice (Fishman et al., 2013), which is in line with the research from Darling-Hammond et al. (2017) and Desimone (2009) that cite the importance of content-based learning.

Despite the debates surrounding the effectiveness of online professional learning, online learning offers teachers a more convenient method of learning compared to traditional face-to-face workshops. As research continues to develop in the areas of comparison, looking at what other components are necessary to support online learning in achieving optimal impact will be paramount (Moon et al., 204).). Therefore, the effectiveness of online professional development most likely will hinge on these research-based core features: content-based; incorporates active learning; supports collaboration; uses effective models of practice; provides coaching and expert support; offers feedback and reflection; is coherent; and is of sustained duration (Darling-Hammond et al., 2017).

Hybrid Models of Professional Development. Along with face-to-face and online versions of professional development, educational research and consulting firms like WestEd have begun offering hybrid models of learning to combine face-to-face with online platforms. This model allows users to watch video modules, practice noticing and sensemaking, and read research-based texts in the comfort of their homes from a digital platform while practicing implementation in the safety of their classrooms and congregating in communities of practice face to face to discuss learning. Courses like Student Agency in Learning (SAIL) also add an element of online coaching where users can upload videos to an expert coach who will give feedback and next steps; expert coaches also provide feedback on users' insight journal reflections. The collaborative inquiry supports users in sharing questions, aspirations, ideas, and experiences to improve instruction. Perhaps the future of professional development will present more opportunities for online learning while continuing to leverage the expertise in school districts of knowledgeable professionals to deliver coaching and mentoring to better teacher practice.

Barriers to Implementation. Despite the average of 68 hours per year each teacher spends attending professional development, the learning is often viewed as a waste of time (Bill and Melinda Gates Foundation, 2014) and rarely improves practice (Calvert, 2016). Programs that do not address teacher needs, contribute to teacher growth, or incorporate the features of effective professional development will likely be unsuccessful (Guskey, 2002). Weak programs that do not prepare teachers, especially those in urban settings, often lead to teacher attrition (Borko, 2004). When professional development is not designed with the teacher and student needs in mind and does not

contribute to teacher growth or success, the program will be ineffective (Guskey, 2002). ESSA's (2015) exclusion of workshops (because they are not of sustained duration) as an efficient means of effective professional development activities is contrasted by the fact that teachers spend most of their professional development in traditional workshop-style learning (Bill and Melinda Gates Foundation, 2014). The irony is problematic due to the often low transfer of sit-and-get, lecture-based workshops.

In 2014, the Bill and Melinda Gates Foundation researched current professional development and 1300 stakeholders to find areas for growth and opportunity. What they found was that many current models are fragmented and disconnected with what teachers want and need (Bill and Melinda Gates Foundation, 2014). What they discovered that what teachers want largely mirrors the core features of effective professional development plans (Darling-Hammond et al., 2017). They found teachers want choice in their sessions, ongoing collaboration, relevant professional learning connected to the day-to-day, mentoring and coaching, actionable feedback, and professional development that is interactive, of sustained duration, and treats professionals like professionals (Bill and Melinda Gates Foundation, 2014). It is, therefore, no coincidence that effective models of professional development contain the very components teachers want. According to ESSA (2015), professional development activities should be "developed with the extensive participation of teachers, principals, and other school leaders"; however, the top-down approach to decision-making about professional development often leaves little opportunity for teacher voice or choice, which renders the programs ineffective at growing teachers and impacting student achievement (Guskey, 2002; Borko, 2004; Calvert, 2016).

Another reason professional development fails to deliver on its goals has nothing to do with the program itself, but its participants. Professional development "is only as effective as a teacher's will to employ the knowledge and skills gained" (Darling-Hammond et al., 2017, p. 20). Learning something new to change instructional practice requires time and intentional effort to implement the knowledge and skills acquired (Guskey, 2002). According to Borko (2004), learning is a slow and uncertain process, so when a complete overhaul or drastic change in attitudes and beliefs is needed to alter pedagogical practices, the idea of change often results in anxiety (Guskey, 2002; WestEd, 2019) that is enough to inhibit or stall the implementation. Because learning is gradual and non-linear, teachers will often experience cycles of progress followed by backsliding, a point at which some give up the application; as a result, some teachers change more than others (Borko, 2004). For some, no amount of data is enough to convince them they need to change; the neocortex, the logic part of the brain, is overcome by the limbic system, the feeling part of the brain, that produces inaction in teachers (Guskey, 2002; Sinek, 2009). As a result, they do not implement new learning in the classroom.

Summary. Professional development can be an effective strategy that results in enhanced instructional outcomes and student achievement. Despite the billions of dollars spent on teacher development in the United States each year, inefficient systems and models still permeate the industry rendering professional development ineffective. Considering what motivates teachers to attend professional development and the process by which change occurs in practice (Guskey, 2002), and designing a program that simultaneously integrates multiple research-based features can improve schools and districts.

Formative Assessment

As expectations become more and more rigorous for student learning, so also have the standards for standardized assessment. Wiliam (2013) argues, "If our students learned what we taught, we'd never need to assess. We could simply catalog all the learning experiences we had organized for them, certain in the knowledge that this is what they had learned" (p. 15). However, the reality of education, especially in urban schools, is assessment: quizzes, common assessments, interim assessments, and standardized assessments, yet despite the nation's push for raising the bar and closing the achievement gap in math and reading amongst Black, Hispanic, and White students through policy's like NCLB and ESSA, the gaps are more prevalent than ever (Musu-Gillette, L., De Brey, C., McFarland, J., Hussar, W., Sonnenberg, W., & Wilkinson-Flicker, S., 2017). With the increased rigor, urban schools with students of color and students who are economically disadvantaged are often relegated to test preparation instead of authentic means of learning, and teachers are given scripted curriculum as a means to increase test scores (Darling-Hammond, 2010; Mehta, 2018; TNTP, 2018). Nevertheless, the gaps persist.

As a result, educators have called for a more balanced approach on how to shape ongoing instruction (Trumball & Lash, 2013). Formative assessment is a method that focuses teachers' efforts on adjusting instruction in real-time based upon student evidence, with the ultimate goal of coaching students to self-assess as they regulate their own learning (Wylie & Lyon, 2016). Although the definitions of formative assessment vary in length and description, all definitions share these features: ongoing process, students and teachers sharing responsibility for teaching and learning to form student

learning (Black & Wiliam, 1998; Trumball & Lash, 2013; Wylie & Lyon, 2016; Andrade & Heritage, 2018; FAST & SCASS, 2018).

Elements and Dimensions of Formative Assessment. Formative assessment has been found to be one of the most powerful ways of improving student achievement (Wiliam, 2013). FAST and SCASS (2018) have identified five attributes of formative assessment—learning progressions; learning goals and criteria for success; descriptive feedback; self- and peer-assessment; and collaboration (Wylie & Lyon, 2016)—which are used to answer the three questions where are we headed; where are we now; and how do we close the gap? (Sadler, 1998). FAST SCASS expanded on the attributes and developed ten dimensions of formative assessment that "represent a set of inherited formative assessment practices" (Wylie & Lyon, 2016, p. 17) for robust implementation: learning goals; criteria for success; tasks and activities that elicit evidence of student learning; questioning strategies that elicit evidence of student learning; extending thinking during discourse; descriptive teacher feedback, peer feedback; self-assessment; collaborative culture of learning; and using evidence to inform instruction (Wylie & Lyon, 2016). The FARROP rubric describes the levels of implementation of particular aspects of teacher practice: Beginning, Developing, Progressing, Extending. Teachers evaluate themselves and their colleagues on the implementation of each dimension, and the focus is ultimately on increasing student learning outcomes (Guskey, 2003). Table 1 explains each dimension.

Table 1

FARROP Dimensions Explained

FARROP Dimension	Explanation
Learning Goals	Learning Goals should be clearly identified and communicated to students and should help students make connections among lessons within a larger sequence.
Criteria for Success	Criteria for Success should be clearly identified and communicated to students.
Questioning Strategies to Elicit Evidence of Learning	The focus of this dimension is on one way that a teacher can collect evidence of student progress through classroom questioning.
Tasks and Activities to Elicit Evidence of Learning	The focus of this dimension is on those things with which students engage during the lesson that potentially produce evidence of student learning (excluding classroom discussions).
Using Evidence to Inform Ongoing Teaching and Learning	Formative assessment is a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes.
Extended Thinking During Discourse	Students should be provided with ongoing feedback that helps them develop ideas and understanding of the content.
Descriptive Teacher Feedback	Students should be provided with evidence-based feedback that is linked to the intended instructional outcomes and criteria for success.
Student Peer Feedback	Peer feedback is important for providing students an opportunity to think about the work of their peers.
Collaborative Culture of Learning	A classroom culture in which teachers and students are partners in learning should be established.
Student Self-Assessment	Self-assessment is important because it provides students with an opportunity to think metacognitively about their learning.

Note. Reprinted from Wylie and Lyon (2016, p. 20)

Despite the clearly defined dimensions of formative assessment, implementation is relatively ambiguous in practice (Trumball & Lash, 2013; Andrade & Heritage, 2018; Wylie & Lyon, 2016). Trumball and Lash (2013) write, "Any instructional activity that allows teachers to uncover the way students think about what is being taught and that can be used to promote improvements in students' learning can serve a formative purpose" (p. 3). Consequently, no set formula, steps, or procedures can be created for ease of use or fly-by-evaluations due to the non-linear, dynamic nature of the practice. Furthermore, the elements and dimensions cannot be taught in isolation; they must be integrated into daily practice (FAST & SCASS, 2018) so that formative assessment is not a box to check but is the culture of teaching and learning. As a result of the ambiguous nature of formative assessment, the professional development is needed for teachers so that they understand the culture of formative assessment; having an in-depth knowledge of formative assessments helps teachers in several ways: they can identify the practices in peer observation and give clear, actionable feedback; know and understand how to implement them in their own lessons; and how to adjust instruction for student learning (WestEd, 2019).

The Role of Teachers. The goal of implementing formative assessment is to improve teaching practices to positively impact student learning (Wylie & Lyon, 2016; FAST & SCASS, 2018). WestEd (2019) argues that the increasing emphasis on summative evaluations for student learning set up students to be dependent on teachers for learning. Thus, a mindset that shifts away from teaching students what to think to teaching students how to think is necessary for the successful implementation of formative assessment practices. The formative assessment implementation must incur a

change in classroom culture because it alters the relationship dynamic of teaching and learning between the teacher and the student (Swaffield, 2011), and the focus shfits from teaching to learning. Sadler (1998) defines the role of the teacher as a mediator between the learner and the knowledge and skills they are learning. Teachers, then, must focus on learning and the learnerand how to make learning more efficient instead of answers that are right or wrong (Sadler, 1998; FAST & SCASS, 2018; WestEd, 2019). This celebration of mistakes as opportunities for growth often reduces the emphasis on grading for the teacher (Frey, Fisher, & Hattie, 2018; WestEd, 2019). They must be "intentional [in their] elicitation of evidence" (FAST & SCASS, 2018, p. 4) in order to understand what students know (FAST & SCASS, 2018), anticipate potential struggles (Swaffield, 2011), and adjust their instruction in real-time (Wiliam, 2013; Andrade & Heritage, 2018; WestEd, 2019). To place the onus of learning on the student, teachers must work to actively reduce their ownership of disciplinary content to transfer the ownership to the students (Sadler, 1998) while still balancing a shared responsibility of teaching and learning with the student (Trumball & Lash, 2013).

The Role of Students. If the role of teachers is to mediate the learner with the knowledge and skills, then the role of students is to become active participants in their own learning (Swaffield, 2011; Trumball & Lash, 2013; WestEd, 2019). The student must collaborate with the teacher in their learning (Trumball & Lash, 2013) so they can learn the content, knowledge, and skills as established by state standards (Learning Forward & EducationCounsel, 2017), but they also need to learn how to learn by regularly practicing metacognition as means of self-assessment (FAST & SCASS, 2018; WestEd, 2019;). Learning how to learn helps students become increasingly aware of their

level of understanding of a given concept (Frey et al., 2018), follow their learning progressions (Wylie & Lyon, 2016), and reflect and adapt their means of learning in order to find effective tools for learning to make their learning more efficient (Frey et al., 2018; WestEd, 2019). Another skill students need as part of the formative assessment model is learning how to give feedback and interpret feedback in order to internalize further a concept or skill (Sadler, 1998) and help with self-regulation (FAST & SCASS, 2018).

Summary. Formative assessment is a robust, recursive process that is dichotomous in form and function: the dimensions and elements help teachers categorize practices, but the ambiguity in practice makes the dimensions a little more challenging to apply. Wiliam (2013) states, "Everything works somewhere, ad nothing works everywhere…classrooms are far too complex for any prescription to be possible" (p. 19); therefore, although teachers can find freedom in creating their own interpretive framework for employing the formative assessment methods in the socio-cultural context of their classrooms, the ambiguity and flexibility can be troublesome for those who prefer clearly prescribed methods and checklists. The ten established dimensions of formative assessments are used as clear pathways, but for the purpose of this study, the dimensions themselves are less important than the implementation. Because the study highlights the connection between professional development and the implementation of formative assessment practices, the observation tools and rubrics will be key.

Professional Development and the Implementation Formative Assessment

Teacher professional development and formative assessment practices have roots in the social constructivism theory for both teachers and students: active learning is

incorporated; collaboration is critical; mistakes are celebrated; coaching and scaffolding are viable components. In all examples, learners take ownership of their learning and development within their respective contexts. However, because formative assessment is a complex undertaking, teachers need support in their implementation (FAST & SCASS, 2018); they must have the time and opportunities to observe, reflect, and try on new practice in order to make a lasting change (Trumball & Lash, 2013; Wiliam, 2013).

Much of the research surrounding effective professional development models is confirmed in the teacher learning that is needed to advance instructional practice. One of the ways to support teachers with the implementation of formative assessment is POD cycles where teachers plan together, observe one another, and debrief or reflect on the integration of practice. These cycles provide professional learning community support as well as support from an expert practitioner over a more extended period of time (WestEd, 2019). Additional research shows that in order for teachers to be effective with the implementation, they need models of practice to view and time and space to reflect on those exemplars (Darling-Hammond et al., 2017; FAST & SCASS, 2018). Lastly, content-based formative assessment training is needed to help teachers connect the content to practice (FAST & SCASS, 2018; Gerzon, 2019); understanding what formative assessment is and what is not helps give teachers a tangible model. Different teachers will find a variety of dimensions more effective than others depending on their style, their students, and the context in which they teach (Wiliam, 2013), so adaption of the dimensions may be necessary. When teachers do not understand formative assessment and are on their own to figure out the processes without the support of a content expert or coach, confusion ensues, and the implementation is dropped (Gerzon, 2019). The

research, therefore, on formative assessment implementation reflects and confirms the research-based components of effective professional development models. Thus, in order for the implementation to be successful, clearly defined elements of professional development with structured meeting times and expert coaching are critical to moving learning forward.

Not only are social factors important in professional development models for formative assessment, but so is time. Change takes time, especially in learning (Knowles et al., 2014). Teachers often opt to implement the "easier" dimensions of formative assessment while still maintaining control of the learning. Producing autonomous learning where students self- and peer- assess is more difficult than creating learning targets and success criteria because of the culture of learning that must be developed. If teachers are not producing students who are autonomous learners, students and teachers fail to meet the end goal. Without proper support, teachers struggle to implement the more challenging dimensions; either they do not see the value in student autonomy, or they are unsure how to build it (Pedder & James, 2012). This level of change requires a transformation in the teachers' ways of thinking, change which occurs rather slowly (Trumball & Lash, 2013). However, research shows that teachers can effectively implement formative assessment practices so long as they are supported in the process (Pedder & James, 2012), but the number of contact hours over the course of the year is important in seeing change. Ongoing professional development to support the process is needed; Darling-Hammond et al. (2017) suggest 49 hours of professional development within a school year significantly alters practice; however, research on formative assessment has found more hours are needed to support the formative assessment

integration (Trumball & Lash, 2013), although consensus on the specific duration has not been reached. Nonetheless, the importance of time and frequency in helping teachers try on these new practices cannot be stressed enough.

My District's History of Formative Assessment

In Years 1 and 2 of How I Know pilot in my district, teachers were given the opportunity to engage in on-site professional development provided by facilitators from WestEd. However, much of the professional development on formative assessment was optional for fear of overworking teachers. According to WestEd's observations, teachers who engaged in formative assessment content made good progress, and those who did not engage with formative assessment content showed far less growth. Gerzon (2019) argues:

> Teachers who spent time in the online course and engaged fully with the additional content … were more successful in adopting both the technical skills of formative assessment and in developing the initial mindset shift that is a hallmark of formative assessment expertise (p. 2).

As indicated by Darling-Hammond et al. (2017), changes in instructional practice require sustained opportunities for learning; thus, to fully implement formative assessment practices, more professional development has been offered in the 2019-2020 school year to help teachers with implementation. The professional development design provided multiple opportunities for learning with on-site optional workshops led by experts for four days across the instructional year as well as three formal POD (plan, observe, debrief) cycles, communities of practice, informal classroom visits, digital learning

courses, and site-based coaching to address new content, application, and reflection (Gerzon, 2019).

Another observation from WestEd was that insufficient content-based professional learning contributed to negative consequences and pushback. During the pilot, the district had been adamant about not asking teachers to take on too much to keep them from feeling overwhelmed and to prevent teacher-pushback. However, without an increase in professional development, teachers spend extra time and effort trying to figure out formative assessment on their own, and their existing knowledge does not move their learning or implementation forward. Consequently, teachers were confused by the feedback they received because they lacked a deep understanding of the process. The POD cycles were less effective and hindered by the lack of understanding, especially when teachers failed to try out new formative assessment content in their lessons. Teachers failed to implement and progress through the dimensions adequately and were unclear on how to give one another feedback, and without strong content to ground their learning, they pushed back (Gerzon, 2019). Therefore, more professional development from trained experts in the 2019-2020 school year gave teachers a common baseline knowledge to help teachers set clear learning goals and to develop site-based learning structures.

Opportunity Gap and Asset-based Pedagogies

Formative assessment is an asset-based pedagogy; it starts with what students know in order to bridge the gap between what they know and what teachers want them to know, e.g., the Texas Essential Knowledge and Skills (TEKS). However, on its own, formative assessment cannot undo the historical and contemporary structures in a

classroom, campus, or district that—perhaps unintentionally—perpetuate racism, prejudice, bias, and inequity. Thus, in order for formative assessment to help address issues of the achievement gap to promote equity for all students, teachers and leaders need to understand culturally relevant pedagogy (CRP) and culturally sustaining pedagogy (CSP) in order to better meet the needs of our students and "address the complexities of social inequalities" (Ladson-Billings, 2014, p. 77).

The need for asset-based pedagogy. The achievement gap refers to the "disparity in academic performance between groups of students. The achievement gap shows up in grades, standardized-test scores, course selection, dropout rates, and college-completion rates, among success measures" (Ansell, 2011, par. 1) and primarily deals with the achievement of African American and LatinX students in comparison to their White counterparts. When students are not given equitable opportunities for success and systemic biases create inequality and unfairness in education, the achievement gap will readily remain a reality in our schools. Research has shown that students spend most of their time in school without access to grade-appropriate assignments, strong instruction, and teachers who hold high expectations, and "students of color, those from low-income families, English language learners, and those with mild to moderate disabilities have even less access to these resources than their peers" (TNTP, 2018, p. 4). This inequitable access to instruction is damaging to historically marginalized and disadvantaged children because much of their instruction is spent on low-level tasks, multiple-choice items, test preparation (Jaquith, 2019), and less challenging and repetitive curriculum (Hammond, 2015). This deficiency thinking paradigm—which occurs when educators blame culturally and linguistically diverse students' educational failures on the students and the

families, failing to take into account the systems that normalized the inequities (Hammond, 2015; Muhammad, 2015)—is at the root of the achievement gap. Teachers blame students for lacking intellectual ability, and consequently, try to fix students by "dumbing down material" so that disenfranchised students are no longer exposed to the same complexity and rigor as their affluent peers (Hammond, 2015). The consequences are two-fold: teachers become "mere functionaries of a system that has no intent on preparing students...for meaningful work" (Ladson-Billings, 2014, p. 77), and the students are pushed further into the margins in an education system that promised to educate them but never provides the opportunities to move beyond low-level tasks and compliance.

Not only does the deficiency mindset affect teachers, but it negatively affects students as well. This lack of exposure to challenging tasks and complex curriculum in combination with the methods by which teachers educate marginalized students reduces students to becoming dependent on their teachers for learning (Hammond, 2015). Instead of becoming self-directed learners, students become reliant on the teacher to do their thinking, or even worse, students develop a sense of learned helplessness. This helplessness often occurs after students repeatedly fail in school and subsequently believe they are incapable of improving their own academic achievement (Muhammad, 2015). To complicate matters even more, when educators co-opt students' identities with terms like at-risk, disadvantaged, low, and underachieving (Ladson-Billings, 2014; Hammond, 2015), in self-fulfilling prophecy, students adopt their assigned identities, pushed to the margins, laggard and unmotivated, and ultimately defeated. Unhealthy perceptions of students and capabilities create systems that cannot sustain equitable academic

achievement (Muhammad, 2015). Thus, the power that a teacher holds to empower their students can just as easily be used to oppress, which results in students' "academic deaths" (Ladson-Billings, 2014, p. 77) further perpetuating the achievement gaps.

Culturally relevant and sustaining pedagogies. The achievement gap does not exist because of some inherent flaw in culturally and linguistically diverse students or low-income families; the gap exists because society has not enacted their commitment to equality (Muhammad, 2015). Students need to become independent learners, self-directed, and critical thinkers (Hammond, 2015), and educators can empower students to be so. Research shows that teachers with high expectations have the greatest effect on student learning and achievement (Darling-Hammond, 2000; TNTP, 2018); therefore, understanding students' multiplicities of identities, the contexts in which they live, and the cultures in which they are enveloped is critical to understanding how they learn and how to best teach them. Thus, in the realm of asset-based pedagogy, educators must start with what students know; they must connect new information with students' existing foundation of knowledge in order for the new content to be learned (Hammond, 2015). By building on students' knowledge, culture, and interests as the basis of education to bridge their understanding to the complexities of systems of which they are a part, educators honor students' academic and cultural identities and expand their cultural competence and socio-political consciousness (Ladson-Billings, 1995). On this idea of CSP and CRP, Ladson-Billings (2014) argues, "This notion of pedagogy shifts, changes, adapts, recycles, and recreates instructional spaces to ensure that consistently marginalized students are repositioned into a place of normativity—that is, that they become subjects in the instructional process, not mere objects" (p.76). Students must be

invited into the circle of scholarship and academia to become actors, doers, and executors.

Asset-based pedagogies, like CRP and CSP, give teachers and students the opportunity to change. Teachers shift their role to facilitator of learning in an equal partnership with students as the onus of learning shifts back onto students. For students, CRP and CSP open their eyes to their own academic capabilities, the socio-political realm in which they live, and their cognition of cultural competence (Ladson-Billings, 2014). Education can bring about conformity, or it can "become 'the practice of freedom', the means by which men and women deal critically and creatively with reality and discover how to participate in the transformation of their world" (Shaull, 2005, p. 34). In order for students to become active participants in transformation, educators need to become knowledgeable about culture and socio-political structures that contribute to inequity (Hammond, 2015) so that they can help students navigate the terrain.

Some educators of urban students emphatically claim that students must be taught test preparation in lieu of higher order thinking if they have any chance at passing the state standardized exam, which determines grade-level progression and graduation; they argue the cultural elements should not matter, that all students can be taught the same. Ladson-Billings (2014) argues, "Teachers undertaking culturally informed pedagogies take on the dual responsibility of external performance assessments as well as community- and student-driven learning. The real beauty of a culturally sustaining pedagogy is the ability to meet both demands without diminishing either" (pp. 83-84). So instead of education taking an either/or approach, educators must find the both/and so that students can be college, career, and community ready, productive and willing

citizens even as children in the communities in which they live. Therefore, it is the job of educators to guide students to accept and affirm their cultural identities (Ladson-Billings, 1995) while simultaneously seeking to perpetuate and foster cultural fluidity and pluralism (Paris & Alim, 2014). When these changes occur and students are viewed in terms of their capabilities and not what they lack, the educational paradigm will change.

Summary. The pedagogical underpinnings of formative assessment connect deeply to that of CRP and CSP, recognizing the need for the student to be the central crux of education, rather than the teacher; however, teachers need professional development to shape their competency in CRP and/or CSP to equalize educational systems that have historically been bias and inequitable. Learning belongs to the learner; it is the student who actually does the learning. By providing frequent opportunities for productive struggle, educators create the time and space to enhance students' abilities to engage in more complex thinking and learning (Hammond, 2015). Therefore, when learning is built on the foundation of students' pre-existing knowledge and takes their dynamic multiplicities of cultures and identities into consideration, students will rise to meet more rigorous demands. By enacting high expectations and by engaging students in more challenging content and higher-order thinking (TNTP, 2018), educators can eradicate the deficiency mindset and create equitable opportunities for all students, especially the culturally and linguistically diverse students, to become culturally competent and socio-politically conscious as they further develop their agency and academic identities.

Conclusion

Regardless of the hopes and dreams with which teachers enter into the profession, the reality of bureaucracy, scripted curriculum, and standardized assessment-focused

instruction is stifling. When teachers consider what success looks like in the urban classroom, coming to class, completing assignments, getting "right" answers are often the criteria. However, education exists for a greater purpose than compliance; it exists to serve students and give equitable access to what society has to offer (Darling-Hammond, 2006). In order to take advantage of all society has to offer, independence, self-regulation, curiosity, self-direction all have to be present. A teacher's job is to guide students, to facilitate, to grow students, and expand their thinking beyond mere content. Thus, shifts in thinking about students' abilities to regulate their own learning and what it means to teach are necessary shifts that must occur in order to produce free-thinking, self-directed learners, unencumbered by the weight of compliance. With the integration of formative assessment practices, students and teachers can establish a new classroom culture of teaching and learning. Students become collaborative partners in their learning with the teachers as they become active agents in their learning while teachers' mindsets shift as they redefine what it means to teach (Trumball & Lash, 2013; FAST & SCASS, 2018; WestEd, 2019).

Chapter 3:

Methodology

Research Design

A convergent mixed methods design, where qualitative and quantitative data are collected in parallel, analyzed separately, and then merged (Creswell, 2014) was used for this study. This mixed methods approach was used to develop a complete understanding of the research problem by converging quantitative and qualitative data and comparing the two (Creswell, 2014). In this study, classroom observations, pre-posttest self-reports, and logged professional development hours were used to test professional development's impact on teachers' implementation of formative assessment practices. The researcher's field notes and teachers' reflections explored teachers beliefs and attitudes regarding formative assessment implementation. The qualitative data was thus used to explore and augment the quantitative findings.

The goal of quantitative research is to test theories by examining the relationships between variables (Creswell, 2014) and "to explain, predict, and/or control educational phenomena" (Mills & Gay, 2016, p. 5) through quantifiable measurements. After creating hypotheses and testing theories, researchers can create generalizations about people and the world in which they operate (Creswell, 2014). These generalizations "about the world are not considered meaningful unless they can be verified through direct observation" (Mills, 2018, p. 6). Thus, direct observation is critical to data collection in quantitative research design.

In quantitative research studies, observations of a control group and a treatment group are used to determine the impact the intervention has on the treatment group

(Creswell, 2014). However, in this research study, the feasibility constraints prevented the researcher from incorporating a non-treatment, control group because those implementing formative assessment need professional development in order to understand the paradigm shifts that must occur. Additionally, the small sample size of participants reduced the ability to have a control and treatment group. As such, to explore the degree of impact that professional development has on the growth of teachers implementing formative assessment practices, quantitative data was insufficient in and of itself to understand the change in formative assessment practices. As such, the open-ended nature of the qualitative data was needed to enrich and deepen the researcher's understanding of the quantitative findings. Therefore, since the researcher needed to explain quantitative with qualitative data to develop a deeper understanding of the research question (Creswell, 2014), a convergent mixed methods approach was the most appropriate method.

This study was designed to examine the relationship between research-based features of effective professional development (Darling-Hammond et al., 2017) and change in teachers' knowledge, skills, and implementation of formative assessment practice. Mixed methods research was chosen to answer a research question that measures impact through quantitative data, while the qualitative data was used to enhance the findings. The convergent research design allowed the researcher to triangulate data and summarize observations based on rubrics and teacher reflections in order to see the progression a teacher underwent over time with continued professional development to explore the effect of professional development on practice.

Methodological Framework

The study utilized a pragmatic approach; this decision was driven by the research question that explores the effect of professional development on formative assessment practices. Creswell (2014) states, "Pragmatism is not committed to any one system of philosophy and reality…inquirers draw liberally from both quantitative and qualitative assumptions when they engage in research" (p. 11). In quantitative studies, researchers develop their knowledge from careful observation and measurement in the data-gathering phase in order to study the behaviors of individuals and causes that lead to a variety of outcomes (Creswell, 2014). However, pragmatist researchers look to the what and how to research based on the intended outcomes (Creswell, 2014). Therefore, in this study although quantitative allowed the researcher to track growth objectively and was a much-needed component in answering the research question, qualitative data needed to be mixed in order to better understand teachers' perceptions of formative assessment and their beliefs about growth and implementation. As such, to explore the impact of an intervention on implementation outcomes through both objective and subjective measures, pragmatism was the most appropriate worldview for mixed methods study.

This study tested the theory that professional development would positively impact the implementation of formative assessment. Rather than subscribing to one me approach for gathering and analyzing data (Creswell, 2014), this study included multiple approaches. Through pre-determined, closed-ended questions, participants self-reported their implementations of formative assessment attitudes and practices before and after the experimental intervention while open-ended responses to reflection questions allowed teachers to elaborate on their own understandings and beliefs. Furthermore, the

researcher observed classroom instruction monthly and rated teachers' implementation of formative assessment using the Formative Assessment Rubrics, Reflection and Observation Protocols (FARROP). Through design, implementation, and analyses that focus on inputs, outputs, and the processes of learning fostered by the professional development, the pragmatism encompassed the nature of this study as it seeks to analyze evidence in exploration of variables to support or refute a theory.

Sample and Participant Selection

For this study, the convenience sample of participants was four elementary teachers. Each of the three women and one man teach a combination of reading language arts and social studies and/or math and science to kindergarten, first grade, second, third, and/or fourth grade general education or bilingual students at an elementary school in a large urban district in the Southwest United States. Because of the practical constraints of this study and the limited number of individuals who meet the pre-determined criteria, a convenience sample was used. Participants were selected based on their enrollment in the online course Student Agency in Learning (SAIL) and their participation as first-year participants in the Assessment for Learning Project. Although ten teachers participated in the SAIL course, only four of the teachers are both teachers of record and first-year participants in formative assessment; thus, a purposive convenience sample was used.

Procedures for Data Collection

Multiple forms of data collection strategies were employed, including observations, response-scale questionnaires, course attendance, reflections, and field notes to enhance the trustworthiness of the study through the process of triangulation (Creswell, 2014). The researcher observed each teacher's classroom practice during the

2019-2020 school year from December 2019 to March 2020 as they participated in SAIL and ongoing, site-based professional development. Table 2 explains each professional development option that was presented to each teacher.

Table 2

Formative Assessment Professional Development Activities Explained

Activity	Explanation
POD Cycles	A collaborative cycle of learning where teachers plan, observe, debrief. Teachers spend two hours learning from experts and planning a formative assessment lesson they will teach. The following day, a group of 4-6 teachers observe one another's lessons and give feedback on a teacher's self-selected area of focus. Teams debrief with an expert.
SAIL	An online course designed by WestEd consisting of 6 modules broken up into four sub-modules. Participants read, watch videos, reflect, implement, and receive feedback from an expert.
Workshop	A collaborative, interactive 6-hour sessions led by an expert in formative assessment.
Communities of Practice	Collaborative meetings where teachers bring evidence from their classroom and collaborative reflect on formative assessment implementation.

Data was collected through classroom observations and rubrics about their formative assessment classroom practices using the FARROP (see Appendix A) with the intent to determine the progression of each of the ten formative assessment dimensions: learning goals; success criteria; tasks and activities that elicit evidence of student learning; questioning strategies that elicit evidence of student learning; extending thinking during discourse; descriptive feedback; peer feedback; self-assessment;

collaborative culture of learning; and using evidence to inform instruction (Wylie & Lyon, 2016).

In order to determine teachers' perceptions of their implementation for formative assessment practices, teachers took a pretest and posttest Likert questionnaire self-assessment (see Appendix B) and reflected with written responses throughout the study (see Appendix C). Data were sought about their formative assessment classroom practices with the intent to identify teachers' perceptions of their lessons in regard to their selected focus areas, their perceived strengths individually and as a group, and their next steps individually. Along with observational data rubrics, these self-reports and reflections were used to gauge participants' growth in their practice from December 2019 to March 2020. Additionally, archival data from the SAIL course, such as time spent in the modules and attendance at on-site training, was used to analyze the impact of professional development on implementation. The researcher analyzed the data individually and collectively to track trends in change in practice.

Measures and Instrumentation

Unlike typical quantitative researcher who remain detached from the research context, the researcher in this study had a role in coaching teachers as part of the professional development model to use the intervention as an "opportunity to examine core theoretical issues and explore learning (Barab & Squire, 2004, p.10). Because the goal of the study was to see the change in practice that results from professional development, quantitative measures were employed in order to measure the change. Through the use of observation, logged professional development hours, and self-reports, the quantitative data allowed the researcher to analyze the progression of implementation

of formative assessment in teachers' classrooms. The analysis of classroom observations data, teacher reflections, and pre-posttest results helped the researcher explore the relationship between professional development and changes in practice. The rationale was that if teachers were increasingly aware of and implement the various dimensions of formative assessment with greater proficiency after receiving professional development, the study would support the hypothesis that targeted professional development, entrenched in research-based practices influences teachers' instructional practices.

Using a response-scale questionnaire for teacher self-assessment, data was gathered about teachers' beliefs in their own implementation practices. Teachers' self-reporting measured their understandings and levels of implementation surrounding formative assessment, including implementation of learning goals, success criteria, descriptive teacher feedback, and modeling. Teachers will also respond to statements—using a Likert scale of Never Sometimes, Often, and Always—regarding classroom culture, student identity, and student agency, which are core guiding principles of the SAIL course. These questions were administered prior to the initial professional development module in October and again when the teachers had completed modules in SAIL. These questionnaires were then analyzed for growth in self-reported frequency of implementation in "often" and "always" from beginning-of-course to end-of-course. It should be noted that the spread of COVID-19 forced school closures and stopped data collection; thus, not all participants completed the SAIL course at the time of the last observation.

To measure teachers' classroom practices in relation to the professional development, the researcher conducted monthly classroom observations using the

FARROP rubrics, the only nationally validated formative assessment rubrics. According to Wylie and Lyon (2016), “the rubrics describe the level of implementation of a particular aspect of practice, not the level of expertise of a teacher” (p. 18); thus, good teaching is not the marker of observations, but the observational focus is on implementation of practice. These observations allowed implementation to be tracked from December 2019 through March 2020 to see if trends existed in growth as teachers became more well-versed in formative assessment through sustained professional development. Each observation served as evidence of teacher enactment, concerning a range of dimensions learned in professional development that are central to formative assessment: learning goals and success criteria; eliciting evidence of learning through questioning strategies, tasks and activities, and extended discourse; descriptive feedback; self-assessment; and a collaborative culture of learning; these dimensions represent a set of integrated formative assessment practices (Wylie & Lyon, 2016).

Each observation rated the implementation of the dimensions using the following scale: 1 - Beginning, 2 - Developing, 3 - Progressing, and 4 - Extending. The scales for each category were developed as a part of the FARROP, and “the rubrics for the dimension of formative assessment make explicit the characteristics of stronger and weaker formative assessment implementation along a number of relevant dimensions” (Wylie & Lyon, 2016, p. 13). The study examined and tracked trends in growth based upon the implementation of the professional learning into classroom practice and the teachers’ formative assessment ratings over the period of three and a half months.

Data Screening and Analysis Procedures

The main purpose of the data analysis was to identify the dimensions and characteristics of the changes in teachers' formative assessment classroom practice. In the first step of the analysis, the researcher quantified the pre-posttest and the FARROP data for individual participants to determine a mean score in each category as well as a initial and final score in each dimension and full rubric. The researcher defined the dimensions of formative assessment practice according to the FARROP (Wylie & Lyon, 2016). Each dimension contains two to four sub-descriptors, which were rated on a four-point scale of Beginning to Extending; this rubric involves converting behavioral responses into a numeric system (Mills, 2018). Observation data were analyzed through the use of descriptive statistics and measures of central tendency by tallying ratings in each dimension to see if progress had taken place, using mean, standard deviation, minimum and maximum. A move from Beginning (1 point) or Developing (2 points) to Progressing (3 points) or Extending (4 points) will indicate shifts have taken place as teachers implement ideas and techniques from the professional development. The observation data was summarized individually and collectively using the FARROP. The researcher constructed tables and graphs to show the progression of each dimension through the duration of the study for each participant as well as the cohort. Each participant also selected areas of focus shown in Table 3 on which they wanted the most feedback.

Table 3

Participants' Self-Selected Areas of Focus

Teacher	Focus 1	Focus 2	Focus 3
A	Learning Goals	Success Criteria	Tasks and Activities
B	Learning Goals	Success Criteria	Tasks and Activities
C	Learning Goals	Success Criteria	Questioning Strategies
D	Learning Goals	Success Criteria	Collaborative Culture of Learning

Additionally, the pre-test and post-test self-reports were analyzed for growth on a Likert scale, e.g., an upward trend from Sometimes (2 points) to Often (3 points). By assigning point values and calculating the average response, the researcher was able to describe what teachers believed about their own implementation of formative assessment practices (Mills, 2018) from the beginning of the course to the final observation. This use of descriptive statistics helped the researcher quantify and make sense of questionnaire data while the teacher reflections on each observation provided insight that enhanced and supported the findings through qualitative means.

The reflection times were semi-structured and took place at the end of each POD cycle as well as at the end of the study. In the reflections, teachers were asked to reflect on their personal learning goal and how that formative assessment practice was implemented in their lesson, what they wanted to learn more about, and what next steps they would like to take to move their formative assessment practice forward. Additionally, participants were asked to reflect on their cohort's strengths and areas of

opportunity. The qualitative responses were coded within and across reflections and analyzed for emerging themes individually and collectively This qualitative data was triangulated with the quantitative data to support the conclusions drawn. The analysis of observations data, pre-posttest results, and reflections helped the researcher explore the relationship between professional development and changes in practice. The t-test helped the researcher determine the significance of pre-posttest difference.

Ethical Considerations

The main ethical consideration for which the researcher actively strived against was bias in observation data. The researcher made attempts to mitigate bias in FARROP ratings during observations by calibrating ratings with campus administration to ensure that the teachers are being rated based on formative assessment implementation. Additionally, the researcher conducted monthly calibrations through WestEd's Formative Assessment Inter-rater Reliability course by watching videos of classrooms, rating teachers, and comparing the ratings to WestEd's expert ratings to ensure reliability and validity of the researcher's ratings in classrooms for the study. Lastly, to help reduce bias, the researcher created a t-test to compare pre- and posttest self-reports, and an educator reviewed the analysis to check for bias and consistency.

Chapter 4:

Findings

In this chapter, the findings of the study are presented. The purpose of the research was to determine if research-based components of professional development impacted teachers' growth in formative assessment practices, including their knowledge, skills, and implementation. The study participants included 4 teachers—who teach grades Kindergarten through fourth—from an elementary campus in a large urban district. Participants had no experience with formative assessment prior to their participation in the District pilot. This study used the quantitative data from pre-test and post-test teacher self-assessment, observations using the FARROP rubric, and logged professional development hours to evaluate the impact of professional development on improvement in formative assessment practice and qualitative data, i.e., teacher reflections and field notes, to enhance the understanding of the findings . The following question guided the study: To what degree does a hybrid model of online- and site-based professional development affect teachers' implementation of formative assessment practices?

As part of a school initiative, teachers engaged in a variety of professional development as a means to build and deepen their formative assessment practices. To address the research question, the researcher conducted classroom observations using the FARROP, which was developed by the Formative Assessment for Students and Teachers (FAST) and State Collaborative on Assessment and Student Standards (SCASS) of the Council of Chief State School Officers (CCSSO) to assess key dimensions of formative assessment practice (Wylie & Lyon, 2016). Additional professional learning opportunities included Communities of Practice, workshops from WestEd, and POD

cycles where a consultant from WestEd provided participants with direct, customized feedback to support their development in formative assessment implementation.

A few cautions must be mentioned regarding the data. Because the convenience sample contained only teachers participating in their first year of formative assessment, the data only covers a small sample of teachers. Additionally, since teachers engage in undocumented, diverse combinations of professional learning (such as Professional Learning Communities, schoolwide professional learning, informal conversations) in addition to the documented hours for the study, it is difficult to know exactly how many hours each teacher engaged in professional development. However, the various data collected provide multiple perspectives and insights regarding the development of participating teachers' formative assessment practice.

Participants' Activities and Hours

Participants engaged in the online coursework in SAIL, which contained a combination of video modules, readings, and reflective journals. Additionally, participants were offered opportunities to attend formative assessment workshops from experts in the field as well as POD cycles, where teachers participated in a two-hour planning session with experts followed by a full day of observations and feedback. Table 4 reports the documented hours and activities of each teacher in the 2019-2020 school year, ending in March 2020. Table 5 captures the evidence-based elements of each professional development opportunity (Darling-Hammond et al. 2017) and the percentage of time teachers spent in each.

Table 4

Participant Documented Professional Development Hours by Activity

Participant	Online Course	COP	Workshop	POD Cycles
A	7	1.5	8	24
B	8	1.5	7	24
C	2	-	10	24
D	4	1.5	16	16
Total Hours	21	4.5	42	88

Table 5

PD Activities and Research-based Components of Effective PD

Research-based elements of effective PD	Online course	Site-based COP	Workshop	POD Cycles
Percentage of Time	13.5%	2.9%	27%	56.6%
Content-focused	Yes	Yes	Yes	Yes
Active learning	No	Yes	Yes	Yes
Collaboration	No	Yes	Yes	Yes
Models of Practice	Yes	No	Yes	Yes
Coaching and Expert Support	Yes	Yes	Yes	Yes
Feedback and Reflection	Yes	Yes	Yes	Yes
Sustained Duration	Yes	No	No*	Yes

*Although workshops were offered for a sustained duration (5 total) throughout the school year, each teacher attended 0-2 sessions.

According to Table 4, participants engaged in a variety of activities with varying frequency. All participants engaged in more site-based PD than they did online with the majority of hours spent in a workshops and POD cycles. Overall, participants collectively averaged more hours (88) engaged in the POD cycle more than any other professional development activity; similarly, in their self-reported posttest results, teachers indicated that the POD cycles had the greatest influence on their formative assessment practice.

Professional Development Activities and Growth

Based on exploratory analysis of teacher improvement and professional development opportunities, a diverse array of professional learning activities contributed to gains in rubric ratings. This finding is aligned to WestEd's internal study of the first two years of the How I Know project (which had similar methodology to this study), citing that teachers from three districts who engaged in diverse mixes of professional learning saw greater gains in their rubric ratings over time than those who participated in fewer types of activities (Dunn et al., 2019).

Self-selected areas of focus and FARROP growth on individual practice. The participants were evaluated using the FARROP, which has 35 criteria ranked on a four-point scale (1 - Beginning, 2 - Developing, 3 - Progressing, 4 - Extending). As measured by the rubric, the participants in the research showed overall improvements in formative assessment practices over time with increased exposure to formative assessment models of practice in professional development. The average end score (2.59) was higher than the mean initial/first observation (1.34). As indicated by Table 6, all teachers in the study saw positive score gains in their areas of focus as well as their overall FARROP scores.

Table 6

Participant-selected Areas of Focus from the FARROP

Teacher	Focus 1	Rating	Focus 2	Rating	Focus 3	Rating
A	Learning Goals		Success Criteria		Task/Activity	
	Initial	1.0	Initial	1.5	Initial	2.6
	Final	4.0	Final	4.0	Final	4.0
	Difference	+3.0	Difference	+2.5	Difference	+1.4
B	Learning Goals		Success Criteria		Task/Activity	
	Initial	1.0	Initial	1.0	Initial	1.0
	Final	2.5	Final	2.5	Final	2.3
	Difference	+1.5	Difference	+1.5	Difference	+1.3
C	Learning Goals		Success Criteria		Questioning	
	Initial	1.0	Initial	1.0	Initial	1.25
	Final	2.75	Final	3.0	Final	3.25
	Difference	+1.75	Difference	+2.0	Difference	+2.00
D	Learning Goals		Success Criteria		Collaboration	
	Initial	1.0	Initial	1.0	Initial	1.0
	Final	2.0	Final	2.5	Final	3.0
	Difference	+1.0	Difference	+1.5	Difference	+2.0

Teachers self-reported that professional development impacted their growth in formative assessment, but there was no correlation tied to the number of hours attended and growth in formative assessment rubrics. Because each teacher was new to formative assessment, all of them self-selected Learning Goals and Success Criteria, which are the foundational elements. Teacher A demonstrated the greatest gains in the self-selected focus areas, achieving the highest rating, 4.0 - Extending, on all areas. As indicated by Table 3, Teacher A attended the same number of hours (40.5) as Teacher B; however, Teacher B did not see the same level of gains as Teacher A. Furthermore, Teacher C, who participated in the fewest hours, saw greater gains in Learning Goals and Success Criteria than did Teachers B and D, who participated in more hours.

Individual participant improvements. As shown in Figure 1, each participant's overall FARROP rating increased from the first to the final observation. Teachers A, B, and D made steady growth from Observation 1 to Observation 4; Teacher C's rating dipped in the third observation but rebounded in the final observation. As Table _ indicates, not only did teachers show growth in their observational ratings, but each teacher also self-reported growth in their pre-posttest, using a four-point response-scale score (Never – 1, Sometimes – 2, Often – 3, Always – 4). Their initial and final self-reports on their implementation of formative assessment practice in the pre and post-tests were higher than their FARROP initial observations scores.

Figure 1

Individual Teacher's Overall FARROP Scores over the Course of the Observation Period

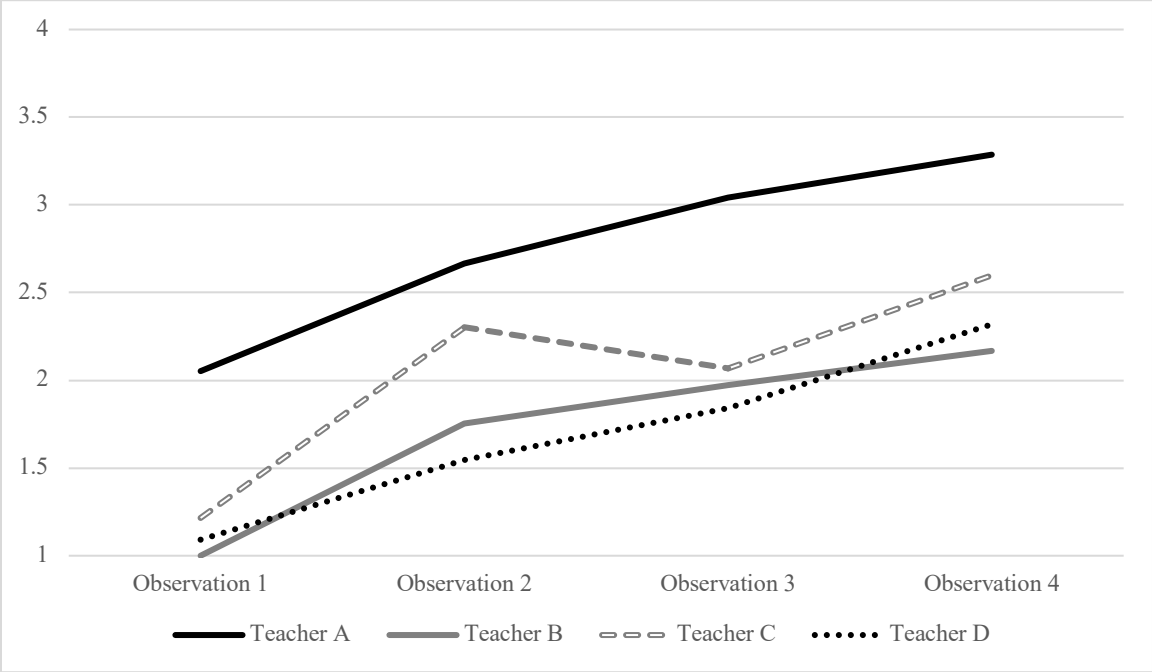


Table 7

Individual Teacher's Overall FARROP Scores over the Course of the Observation Period

Participant	Observation 1	Observation 2	Observation 3	Observation 4
A	2.05	2.67	3.04	3.29
B	1.0	1.75	1.97	2.16
C	1.21	2.3	2.07	2.60
D	1.09	1.55	1.84	2.32

Table 8

Participant Pre-Posttest Results

Participant	Pre-Test Score	Post-test Score	Difference
A	2.9	3.7	0.8
B	3.25	3.95	0.7
C	3.1	3.3	0.2
D	2.6	2.7	0.1
Mean	2.96	3.41	.45

Table 9

Pre-Posttest Paired Samples Statistics

		Mean	N	SD	SEM
Pair 1	Pre	2.96	4	.28	.14
	Post	3.41	4	.55	.27

Note. N = total number of participants; SD = standard deviation; SEM = standard error of the mean

Table 10

Significance of Pre-Posttest Results

Paired Samples Test									
		Paired Differences					T	df	Significance (2-tailed)
		Mean	SD	SEM	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre - Post	-.45	.35	.18	-1.01	.11	-2.56	3	.083

Note. SD = standard deviation; SEM = standard error of the mean; t = value of the t-test statistic; df = degrees of freedom

As shown in Table 9, the mean self-reported posttest score of 3.41 showed small gains from the mean pretest score of 2.96. Despite the small sample size, the pre-posttest T-test shows marginally significant gains ($p<.05$) of .08 as shown in Table 10.

Collective Participant Data from FARROP Ratings

For the purposes of the following analyses, the FARROP dimensions were averaged together to produce overall mean FARROP observation scores. All participants improved their performance on most FARROP dimensions over time, which resulted in

collective growth from the mean initial score. Table 11 displays the distributions of the participants' overall average observation scores during each observation period. The mean of the last observation was significantly higher from Observation 1 (1.34 - Beginning) to Observation 4 (2.59 - Developing-Progressing) at the end of the observation cycle.

Table 11

Mean Full-rubric FARROP Observation Scores Across the Research Period

Period	N	Mean (SD)	Min	Max
Observation 1	4	1.34 (.48)	1	2.05
Observation 2	4	2.07 (.51)	1.55	2.67
Observation 3	4	2.23 (.55)	1.84	3.04
Observation 4	4	2.59 (.50)	2.17	3.29

According to Table 12, The areas with the most statistically significant gains were Collaborative Culture of Learning (+1.90), Success Criteria (+1.81), Learning Goals (+1.75), Extended Thinking During Discourse (+1.75). Student Peer Feedback and Student Self-Assessment saw the least amount of gain, as only two participants grew from their first to last observation. These two dimensions of the FARROP were also scored the lowest across districts that were evaluated by Dunn et al. (2019).

Table 12

Mean Initial and Final Observation Scores by FARROP Dimension

Dimension/Period	Mean	SD
Learning Goals		
Initial	1	(0)
Final	2.75	(.87)
Pre/post difference	+1.75	
Tasks and Activities		
Initial	1.42	(.84)
Final	3.00	(.82)
Pre/post difference	+1.58	
Using Evidence		
Initial	1.42	(.63)
Final	2.75	(.96)
Pre/post difference	+1.33	
Collaborative Culture		
Initial	1.35	(.7)
Final	3.25	(.53)
Pre/post difference	+1.90	
Success Criteria		
Initial	1.13	(.25)
Final	2.94	(.72)
Pre/post difference	+1.81	
Questioning Strategies		
Initial	1.69	(1.05)
Final	3.13	(.60)
Pre/post difference	+1.44	
Extended Thinking		
Initial	1	(0)
Final	2.75	(.5)
Pre/post difference	+1.75	
Descriptive Teacher		
Feedback	1.94	(.88)
Initial	2.82	(.75)
Final	+0.88	
Pre/post difference		

Student Peer Feedback		
Initial	1	(0)
Final	1.5	(.58)
Pre/post difference	+0.5	

Researcher and Teacher Reflections on Practice

Teachers reflections on their own practice largely echoed the findings of the quantitative data. In the initial observations, teachers without clear Learning Goals and Success Criteria who operated from a stance of teacher-dominated instruction enabled dependent learners who had a lot of questions and took a while to get going on their own. Similarly, teachers who had wordy Learning Goals and Success Criteria and did not reference them beyond the beginning of the lesson caused student confusion and subsequently, more teacher-dependent learners.

However, by the final observation and after much professional development, teachers began to internalize the alignment between the dimensions of the FARROP and focused on clarity for learning. They used student-facing language in their Learning Goals and Success Criteria and presented opportunities for students to internalize them; as a result, the participants showed more success in developing student agency, which is the ultimate goal of formative assessment. Based on observations, students who had clarity in learning, i.e., clear Learning Goals and Success Criteria, were able to start tasks immediately. The shift from a focus on doing to a focus on learning gave students more equitable opportunities for all students to collaborate with their peers in high-level academic conversations.

Likewise, the teachers who had "correct" learning goals (i.e., focused on the conceptual learning for the day) and success criteria (i.e., showing kids how they will

know if they have learned the concept) as noted by the FARROP had much clearer direction for learning. Students were more self-directed and autonomous because of the teachers' intentionality. All teachers had a strong collaborative culture of learning amongst teacher and students, and the culture grew stronger with each observation.

Collective Teacher Reflections. Peer Feedback and Student Self-assessment were cited by all participating teachers as recommendations for the group's next steps in learning as well as individual next steps. The researcher saw two instances where Peer Feedback and/or Student Self-assessment were used in classrooms during the sixteen observations, and both occurred in Observation 4. This area of opportunity was also reflected in the quantitative findings with these two dimensions ranking the lowest in the FARROP dimensions.

On the other end of the spectrum, strong Collaborative Cultures of Learning was named by all participants as collective strength in their observations of one another in every reflection, while aligned Learning Goals and Success Criteria were named as strengths in 7 out of 8 reflections from Observations 3 and 4. Therefore, this qualitative data supported the findings of the quantitative data that showed the highest growth and scores in these three dimensions of the FARROP.

Teacher A. Teacher A had much consistency in each reflection. After Observation 3, Teacher A "noticed students used the exemplar and sentence stems to guide their conversations [and] addressed the learning goal and success criteria." After Observation 4, Teacher A (who received the highest rating in the FARROP on Learning Goals and Success Criteria) noticed her "students had time to process and internalize the learning goal and success criteria prior to the work stations. My students were able to use

the success criteria to help each other." These reflections are in line with the highest rating of the FARROP in the aforementioned dimensions.

On the other hand, Teacher A cited the same areas of opportunities throughout the study, claiming the need to incorporate Student self-assessment and Peer Feedback. Before the observations, Teacher A claimed, "I would like to model feedback language and how to reference the success criteria during feedback," and after the final observation, Teacher A claimed, "My next steps include using modeling and sentence stems to support peer feedback… and create a document for self-assessment that [the] students can easily recreate."

Teacher B. Teacher B also focused on Learning Goals and Success Criteria as well as the alignment between the two. After the initial observation, Teacher B noticed the need for better alignment between the Learning Goal, Success Criteria, and Task and Activities to Elicit Evidence of Student Learning. After the final observation, Teacher B, wrote, "In relation to my personal learning goal, [my] activities did align with the LG… my next step is …to be metacognitively conscious of the alignment with student activities." This participant also claimed that students became better able to articulate what they were learning and, consequently, began to assess their own learning as a result of clear Learning Goals and Success Criteria. These comments show the progression of alignment amongst Teacher B's self-selected areas of focus.

Teacher C. Teacher C noted in reflections that there was a strong alignment between the Learning Goals, Success Criteria, and Tasks and Activities. Because of teacher clarity, "the students were able to articulate what they were learning and were able to use the [academic] vocabulary," which shows a level of student agency. As a next

step, Teacher C wanted students to take more ownership of their learning so that they were more independent learners. This participant showed the most overall growth, attended the least number of hours of professional learning, but sought the most coaching and asked the most questions of the researcher about how to move the formative assessment practice forward.

Teacher D. Teacher D recognized that "students are eager to share their opinions and perspectives when they have a clear understanding of their learning goals" and that engagement increased when student had clarity in learning. In the final observation reflection, Teacher D proclaimed the desire to "solidify my understanding of how to adapt success criteria" to differentiate for students. The participant mentioned the increasing desire self-assess and reflect on "habits in my teaching process that I can refine in order to take it to the next level." Teacher D constantly reflected on the need to model risk-taking and help students overcome the fear of failure throughout the study as a means to increase autonomy and student reception of Peer Feedback.

POD Cycles played an integral role in the change of Teacher D's practice. After observing other teachers' classrooms, Teacher D, "really began to grasp the importance of student centered learning and autonomy" and reflected in the posttest about the significant growth that had occurred in the classroom formative assessment practice. Although this participant self-reported the least amount of growth in the quantitative pre-posttest, Teacher D became increasingly attune to the nuances of formative assessment as the teacher compared the implementation of the dimensions across classrooms.

Researcher reflections. My observations as researcher are reflected in the quantitative data of the FARROP ratings. However, to augment the findings, I wanted to

note the changes in student behavior as result of increased implementation of formative assessment practice in the classroom. When teachers first started out and had learning objectives that started with "Student will be able to…" followed by the TEKS, students did not understand what they were learning or how they knew they had learned it. When I asked students, "What are you learning today?" many of them could tell me what they were doing but had no clear understanding of what they were learning. In the middle of the study, students could at least point to the Learning Goal and Success Criteria, which showed a degree of independence because they knew what the dimensions were and where to find them. By the end of the study, most students in Teacher A's classroom and many in the other participants' classrooms could articulate the Learning Goal and Success Criteria and could show me what they were doing to assess their learning. This shift from dependence to agency is the hallmark of formative assessment.

Similar to what teachers echoed in their reflections, when students know what they are learning, they are more engaged in the task at hand because they feel a part of something, especially as the classroom culture increases and shifts to student-driven learning. However, without teachers spending time watching models of practice from their more expert peers in the school, these changes would not have taken place. POD Cycles played a crucial role in the shifts that teachers in the study underwent because they witnessed the autonomy and agency in other classrooms. In the debriefs, the participants sought more information from their more-expert peers on how they got students to function so independently. These debriefs helped reinforce the need for formative assessment and the alignment between dimensions as a framework to develop agensic learners who can answer Sadler's (1998) three questions: Where am I going?

Where am I now? How do I close the gap? Therefore, as a result of noticing and sensemaking, observations, and participation in collaboration with other teachers, participants in this study grew in their formative assessment practices.

Summary

Teacher reflections, which cited strong Collaborative Cultures of Learning, Learning Goals, and Success Criteria, aligned to the FARROP observations ratings with these three dimensions ranking among the highest with the most growth. Additionally, n response to the posttest question, "To support student agency, I create a transparent learning environment where students are clear about where the learning is headed, and how they can reach academic goals" teachers moved from a collective 2.25 (Sometimes) to a 3.25 (Often). This growth reflects the reflections and FARROP ratings for teacher clarity. Teachers claimed that students' engagement increased as a result of teacher clarity in Learning Goals and Success Criteria and that these two dimensions created students who are more self-directed, ready to tackle learning tasks with peers instead of being dependent upon the teacher.

Conversely, each teacher cited the need for improvement on Peer Feedback and Student Self-Assessment, which were the two lowest rated FARROP dimensions in this study. However, the teachers' reflections stand in stark contrast to their posttest answers. When teachers were asked to respond to the question, "To support student agency, I teacher students how to give and receive feedback," 3 teachers selected Often, and 1 teacher selected Always. Therefore, the implementation of feedback in classroom practice and the teachers' open-ended responses claiming Peer Feedback needed to improve in all classroom did not correlate with the posttest answers. Nonetheless,

teachers' post-observation reflections mirrored the observational FARROP data in both the highest and lowest ratings.

Overall, results in this study indicated that professional development in various modalities affected teachers' implementation of formative assessment practices. Professional development opportunities—SAIL, communities of practice, workshops, and POD cycles—each contained 6-8 of the 8 elements of effective professional development cited by Darling-Hammond et al. (2017). Although the t-test of pre-posttest results did not indicate a statistically significant difference in teachers' self-reports, the gains in FARROP ratings showed significant improvement from the initial observation to the final observation in both teacher self-selected focus areas and full-FARROP ratings; similarly, teachers echoed the same findings in their reflections in which all noted the continuous growth from one observation to the next. The researcher found no correlation between the number of hours of professional development and improvement of practice. Chapter 5 will provide a discussion of the research findings within the study and will address limitations and implication for future research, practice, and education.

Chapter 5:

Discussion

As diversity in race, ethnicity, ability, socioeconomic status, and behavior continues to grow, it is imperative that teachers have pedagogical content knowledge to reach all learners and provide all learners with equitable opportunities to succeed academically. Yet teachers enter the profession without having a robust set of skills to tackle the classroom challenges that lie ahead. Thus, it is important that campuses and districts provide effective models of professional development so that teachers have the means and the know-how to implement quality instruction for every student. The campus that was researched in this study is 90% economically disadvantaged with a 26% mobility rate; as a result, it was important to campus personnel that they find the best pedagogy and subsequently, professional development, to enact with teachers so that each student became an agensic, self-directed, and independent learner.

The purpose of this study was to evaluate the effect of research-based features of effective professional development on teachers' knowledge, skills, and implementation of formative assessment practices. Growth and implementation were measured by pre-posttest response-scale reports, classroom observations using the FARROP, and logged professional development hours. The research focused on participants' involvement in the SAIL hybrid course, which involved online coursework (videos, readings, reflections), POD cycles, workshops, and communities of practice, each of which contained at least 6 out of 8 research-based features of effective professional development as cited by Darling-Hammond et al. (2017).

This study employed a mixed methods convergent design. Using quantitative data from pre-posttests, classroom observations, and logged professional development hours, as well qualitative data from field notes and teacher reflections, the research was able to determine teachers' improvements in formative assessment practices from December 2019 to March 2020. Once the data was explored, the researcher focused on determining key influences on pedagogical practice and explored the relationship between hybrid modes of professional development and increased implementation of formative assessment. This chapter will discuss and interpret the findings through connections to past research and relevant studies. Furthermore, the limitations will be addressed as well as implications for further research. Last, this chapter will discuss the study's implication for classroom practice as well as the implication for education and training.

Discussion of Findings

The results presented in the previous chapter show that professional learning opportunities matter. The study revealed that every participant grew in their implementation of formative assessment from their first observation to their final observation as they participated in a variety of professional learning activities. Although the number of hours spent in various professional development activities did not correlate directly with improvement, it should be noted that a correlation does exist with participants growth and professional development. In previous studies (Dunn et al., 2019), participants who did not receive professional development in formative assessment did not see growth, and those who were provided with fewer modes of and opportunities for learning did not see statistically significant improvement in practice. Additionally, because of the technical aspects of formative assessment dimensions—e.g.,

the proper way to write learning goals and success criteria—professional development of some sort is needed to move participants' learning forward. Thus, because of the technicalities of formative assessment, it is unlikely that maturation affected implementation, especially considering 3 out of the 4 participants had 8 to 25 years' experience teaching and the observable changes happened over a short 3-month time frame. Participant A started with a higher initial score than the other three participants; however, this teacher had spent two hours in the online course prior to the first observation, whereas, the other participants had no content-specific training prior to their first observations. Therefore, strong evidence exists in the quantitative data and in the teacher reflections that professional development positively impacted teacher's classroom practice. This data supports Darling-Hammond et al.'s (2017) that a model of effective professional development that is "sustained, offering multiple opportunities for teachers to engage in learning around a single set of concepts or practices, has a greater chance of transforming teaching practices and student learning" (p. 15).

Limitations of the Study

It is important to address the limitations of the present study. The researcher acknowledges that the small convenience sample size of this study limits its generalizability in determining the effectiveness of online and site-based professional development. Additionally, because the District stopped all research and data collection in mid-March due to COVID-19, time constraints could limit the effectiveness and full development of teachers' practice due to the short duration of the study. Furthermore, "a persistent challenge for research on learning from PD is the *direct* measurement of impact on practice" (Fishman et al., 2013, p. 427), and consequently, an increase in

implementation of formative assessment practices may or may not be directly related to the components of professional development but could be impacted by other factors such as increased motivation as a result of evaluations by campus administration.

Furthermore, because of the research design and campus and district calendars, it was not feasible to rate teachers weekly, if not daily, to assess the frequency of implementation. The goal of formative assessment from the teacher lens is to incorporate the process and feedback loop as an everyday practice; however, in this study, the researcher always made participants aware of the particular date and time observations would occur. Thus, teachers could have been more well-intentioned on the days of observation than they would have been on a surprise observation. Nonetheless, many of the dimensions of formative assessment cannot be feigned insofar as students would have to have familiarity with the structure and goings-on in order for a teacher to be rated above a 2. However, if observations were unannounced and teachers were not made aware beforehand, observations would still most likely trend upward, but there would have been more downward deviations in ratings. If teachers are not intentional about incorporating Learning Goals and Success Criteria daily, FARROP ratings would drop until teachers began implementing formative assessment in the everyday. However, in this study, each observation was planned and thus constant, yet participants' ratings changed and trended upward with each observation. Therefore, the planned observation did not appear to influence the outcome

Implications for Future Research

This was but one study of four teachers in one elementary school in one diverse urban district who participated in a variety of professional trainings. Additional research

will need to be conducted in order to determine what aspects of online and site-based professional development are generalizable across different schools, grade-levels, contexts, modalities, and providers (Capraro et al., 2016). In a replication of the study, researchers should include a larger sample size of teachers in a longer timeframe with a 6-month follow-up in observations and focus groups to determine if formative assessment becomes habit in the everyday even after the intervention stops.

The ultimate goal of formative assessment is to create independent learners who know what they are learning, can monitor their progress in a learning continuum, and can self-select strategies to close the gap so that ultimately student achievement is increased (Sadler, 1998; Frey et al., 2018). According to measure the impact of formative assessment on student achievement, studies should be conducted with increased frequency of observations and unscheduled observations so that the frequency of implementation is assessed and evaluated in the everyday to ultimately evaluate the correlation between increased proficiency with formative assessment and student achievement. Student pre-posttests about their learning should also be given to include student perceptions about the dimensions of the FARROP and the opportunities students perceive that they engage in peer feedback, self-assessment, collaboration.

Lastly, research relating to how formative assessment works in a distance learning or remote learning environment will need to be addressed. Although this study was forced to end as emergency remote learning was enacted due to COVID-19, it is of utmost importance to foster student agency and equity even in an online setting; therefore, the principles that ground formative assessment will need to be revisited in the

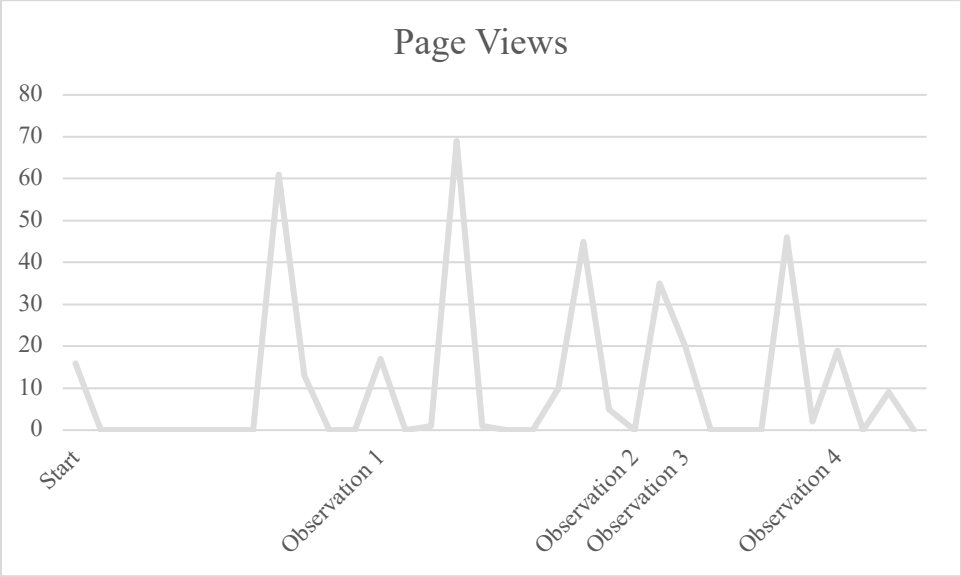
context of an online environment so that the most marginalized and vulnerable students can still have access to quality teaching that sustains and empowers them.

Implications for Practice

Participant A ended with highest ratings in each FARROP dimension, a 3.29 out 4.0 as a cumulative score in the full-FARROP compared to 2.36, which was the average final observation rating of Participants B, C, and D. Participant A experienced steady gains, attended the most balanced professional development between PODs, online, and site-based with a steady frequency over time. Figure 2 shows the frequency of engagement in the online SAIL course.

Figure 2

Participant A's Frequency of Online Modules Over Time



Although this teacher attended the most professional development hours, this participant did not see the most growth. This is in part because Participant A scored a 4.0 on 6 of the 10 dimensions on the final observation and could not exceed that number, whereas other participants never received a 4.0 on any dimension. Thus, perhaps the frequency and

sustained duration of Participant A's engagement with diverse forms of professional development that encompassed all of Darling-Hammond et al.'s elements of effective professional development contributed to the improvement in practice at the highest ratings. On the other hand, Participant C attended the least amount of professional development and showed the most growth in the cumulative full-FARROP rating. Participant C's initial observation was .85 points lower than Participant A's so Participant C had more room for growth.

In a previous study that explored the relationship between professional development and formative assessment (Dunn et al., 2019), teachers in the project opted to participate in formative assessment on a voluntary basis. In this study, the campus principal selected teachers to participate in formative assessment. However, the SAIL and workshop attendance were encouraged but not mandatory, and thus each participant engaged in formative assessment learning at varying rates. In future studies, researchers should take into consideration the role motivation and structure play into participants' completion and implementation of online modules.

The greatest collective gains (+1.90) occurred in the dimension of Collaborative Culture of Learning, which highlights the teacher-to-student and student-to-student partnership in learning (Wylie & Lyon, 2016). Learning Goals and Success Criteria also saw some of the greatest gains. Because teacher clarity is the foundation on which all other dimensions stand (Almarode & Vandas, 2019), collective gains in teacher clarity where students know what they are learning, why they are learning it, and how they know they will be successful enable students to articulate their learning and invite them to participate in the feedback loop: Where am I going, where am I now, and how do I close

the gap? (Sadler, 1998). Therefore, it is not surprising that when students have clarity for learning, they begin to share responsibility for teaching and learning, are increasingly involved in spontaneous classroom participation, and take on a growth mindset. Therefore, it is pertinent that teachers take the time to establish clear learning goals and student-facing success criteria to not only deepen their own pedagogical content knowledge, but also so that students can become agents of their learning.

Pre-posttests showed marginally significant gains due to the small sample size. However, participants ranked themselves significantly higher than their initial FARROP observations. This could be attributed to several factors: a misunderstanding of the dimensions, lack of awareness, and/or fear of being judged by the researcher. Because of the technicalities of the formative assessment, it is likely that the Dunning-Kruger Effect took place, where teachers' unawareness of their own lack of knowledge related to formative assessment led to an inflated self-assessment in the beginning (Kruger & Dunning, 1999). In a replication of the study, researchers should have each participant rate themselves in each dimension using the FARROP after the first observation is completed as well as at the end in the final observation to see if the teacher perception directly mirrors that of the researcher instead of relying on a response-scale test that has polarizing connotative language (Never, Always).

Implications for Education and Training

Teachers need access to variety of modes of training. In this study, some teachers preferred the structure of planned Saturday workshops while others favored the flexibility of online coursework. However, in a COVID-19 and post-COVID-19 society where online accessibility is critical to communication and collaboration, having an array of

unstructured online opportunities, like SAIL, that can be completed at the participants' convenience as well as structured workshop opportunities that allow for collaboration will provide teachers with the best of both worlds: structure and flexibility. Campuses should create a calendar of due dates for each module so that the campus teachers have buy-in and choice of deadlines based on their own school schedules to build camaraderie and enhanced communities of practice. Additionally, effective models of practice via video, video study groups, and/or classroom visits are also needed as a core component to move teachers' learning forward through a socioconstructivist lens. Teachers claimed that the benefit of the POD cycles was seeing other teachers' classrooms, being observed in a non-evaluative, non-threatening way, and receiving feedback on a self-selected dimension of the FARROP ultimately was the greatest learning each teacher received. However, getting full-day substitute teachers 6 teachers a day could prove difficult for large campuses. Creativity and ingenuity that allows teachers to observe one another should be enacted.

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Appendix A

Sample of the FARROP for Classroom Observations

Criteria for Success
(from Wylie & Lyon, 2016: p. 42)

1 - Beginning	2 – Developing	3 - Progressing	4 - Extending
☐ The criteria for success are not appropriate for the learning goals (e.g., they only refer to task requirements rather than helping students understand what quality work would look like in relation to the learning goals) or are not appropriate for students. OR The criteria for success are expressed in language that is not accessible to students. OR The teacher makes only a reference to criteria, such as "I can" statements, but without any explanation or presentation (e.g., "When you are done with the problem, you will use the rubric to score it"), and students do not seem to be familiar with the rubric and/or are not able to use it meaningfully.	☐ The criteria for success are somewhat appropriate for the learning goals and for students. They include extraneous task information and/or do not refer to key elements of the learning goal. They are generally expressed in language that is accessible to the students.	☐ The criteria for success are appropriate for the learning goals and for students, and they are expressed in language that is accessible to the students.	☐ The criteria for success are appropriate for the learning goals and for students. They clearly articulate what quality work looks like and are expressed in language that is accessible to the students.
	☐ The teacher presents or reviews the criteria with students but does not provide a way for students to internalize the criteria or to use the criteria effectively, resulting in few students engaging with the criteria in meaningful ways.	☐ The teacher engages the students with the criteria by providing a way for students to internalize the criteria and/or use the criteria effectively, but only some students seem to understand or engage with the process in meaningful ways.	☐ The teacher deeply engages the students with the criteria by providing a way for students to internalize the criteria and/or use the criteria effectively, allowing the majority of students to engage with the criteria in meaningful ways that support learning throughout the lesson.

Appendix B

1.15 - Self-Assessment on Formative Assessment Practices

This self-assessment is provided as a tool for reflection and goal setting at the beginning of SAIL. You will have a chance to assess yourself again at the end of the course. As always, please take this opportunity to be honest and vulnerable about your classroom and practice.

Likert Scale (1-4 scale) (never, sometimes, often, always)

When I practice formative assessment, I…

1. have a vision for how students' learning progresses within my content area and grade span.
2. use lesson-sized Learning Goals and Success Criteria to drive daily learning.
3. elicit and analyze evidence to gain an understanding of student thinking.
4. provide feedback to students that gives insight into their progress and helps them take steps for improvement.
5. use modeling, rehearsal and feedback practices to teach students how to support and direct their own learning.

When I address student identity I...

1. learn about students' backgrounds and values and use that information to support how students learn.
2. communicate the student's ability to succeed in school.
3. recognize and respond to unintentional biases, such as lowered expectations or productivity.
4. structure lessons so that all students have the opportunity to take on various roles (e.g., expert, helper, collaborator, or leader).
5. assess and work to close any gaps between students' current school-based identities and the identities needed to excel in class.

To develop a collaborative classroom culture, I...

1. establish and model classroom norms including careful listening, trusting relationships, positive interactions, and peer collaboration.
2. model how to use mistakes, failures, and struggle as opportunities for growth.
3. provide ongoing feedback to students regarding their use of classroom norms.
4. demonstrate for students how effort and practice can increase confidence in learning.
5. structure lessons so that learning is experienced as a social and shared responsibility.

To support student agency, I...

1. create a transparent learning environment where students are clear about where the learning is headed, and how they can reach academic goals.
2. provide frequent opportunities for students to set goals, reflect and monitor their own progress.
3. cultivate students' growth mindsets.
4. provide opportunities for student self-direction in learning related to pace, assignments, and learning processes.
5. teach students how to give and receive feedback.

Consider your responses to the self-assessment above. What did you learn about your practice? In what areas are you most excited to grow your practice?

Appendix C

POD Debrief Individual Reflections

Directions:
Please complete the "Here's What" and the "So What" columns as we enter the debrief. Your reflections in these columns will guide the debrief reflections. Once we're done with the debrief, please complete the "Now What" section, to capture next steps from the POD observation and reflection.

Teacher	**Here's What** What did you notice in your lesson, particularly in relation to your personal learning goal?	**So What** What do you want to learn more about during the debrief? What are you curious to learn from your peers?	**Now What** What are your next steps in learning?
Teacher A			
Teacher B			
Teacher C			
Teacher D			

POD Debrief Group Reflection

Directions:
Please complete both columns below. This information will be used to consider how to focus next steps in team learning, including our PLC/Community of Practice and our next POD cycle.

Teacher	Looking across all observations, what are collective strengths in formative assessment practice?	Looking across all observations, what are your recommendations for the group's next steps in learning?
Teacher A		
Teacher B		
Teacher C		
Teacher D		

IRB Approval

UNIVERSITY of HOUSTON

DIVISION OF RESEARCH
Institutional Review Boards

APPROVAL OF SUBMISSION

November 22, 2019

Kierstan Barbee

kmbarbee@uh.edu

Dear Kierstan Barbee:

On November 18, 2019, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	The Impact of Professional Development on Teachers' Formative Assessment Implementation
Investigator:	Kierstan Barbee
IRB ID:	STUDY00001937
Funding/ Proposed Funding:	Name: Unfunded
Award ID:	
Award Title:	
IND, IDE, or HDE:	None
Documents Reviewed:	• HRP-502a Barbee (4).pdf, Category: Consent Form; • FARROP .pdf, Category: Study tools (ex: surveys, interview/focus group questions, data collection forms, etc.); • Barbee-HRP-503 (2).pdf, Category: IRB Protocol; • IRB Recruitment.pdf, Category: Recruitment Materials; • Teacher Self-Assessment.pdf, Category: Study tools (ex: surveys, interview/focus group questions, data collection forms, etc.);
Review Category:	Expedited
Committee Name:	Not Applicable
IRB Coordinator:	Danielle Griffin

The IRB approved the study on November 18, 2019 ; recruitment and procedures detailed within the approved protocol may now be initiated.

UNIVERSITY of HOUSTON

DIVISION OF RESEARCH
Institutional Review Boards

As this study was approved under an exempt or expedited process, recently revised regulatory requirements do not require the submission of annual continuing review documentation. However, it is critical that the following submissions are made to the IRB to ensure continued compliance:

- Modifications to the protocol prior to initiating any changes (for example, the addition of study personnel, updated recruitment materials, change in study design, requests for additional subjects)
- Reportable New Information/Unanticipated Problems Involving Risks to Subjects or Others
- Study Closure

Unless a waiver has been granted by the IRB, use the stamped consent form approved by the IRB to document consent. The approved version may be downloaded from the documents tab.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system.

Sincerely,

Research Integrity and Oversight (RIO) Office
University of Houston, Division of Research
713 743 9204
cphs@central.uh.edu
http://www.uh.edu/research/compliance/irb-cphs/

District RRB Approval

[redacted]

[redacted]

December 11, 2019

Ms. Kierstan Barbee
University of Houston
[redacted]

RE: The Impact of Professional Development on Teachers' Formative Assessment Implementation

Dear Ms. Barbee:

The Research Review Board (RRB) of the [redacted] has reviewed and approved your proposal to conduct the above-referenced project. Based on the information provided, the committee concludes that the project serves a worthwhile purpose and will benefit the district. Approved project activities include:

- Participant recruitment
- Pre-/Post-testing
- Teacher observations

It is our understanding that you have read and agreed to the terms described in the *Guidelines for Conducting Research in the* [redacted]. Please note that all school and district information, wherever applicable, should remain confidential within the limits of the law. In addition, any data collected from [redacted] may be used solely for the purposes of the approved study.

Approval by the RRB does not guarantee that any [redacted] department, school, or employee will comply with data requests for the study. If the study involves collection of primary data at a school or schools, the permission of the building principal(s) must be obtained separately from this approval.

Please provide the RRB with a copy of any data file constructed using [redacted] student or personnel information, and a copy of your final report, within 30 days following the completion of the study. **In all future communications, please use the study's reference number** [redacted].

On behalf of the committee, I wish you the best of luck with your study.

Sincerely,

[redacted]

[redacted]
Chair, Research Review Board
Office of Applied Research
Department of Evaluation and Assessment
[redacted]ict