UNIVERSITY OF CALIFORNIA SANTA CRUZ

EXPLORING PRE-SERVICE TEACHERS' LEARNING OF FORMATIVE ASSESSMENT IN ELEMENTARY, MULTILINGUAL CLASSROOMS

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by

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Abstract

Exploring Pre-Service Teachers' Learning of Formative Assessment in Elementary, Multilingual Classrooms

Adria Patthoff

The ability to formatively assess for understanding in the midst of interacting with students is crucial for effective teaching, particularly so for Multilingual Learners (MLs) (Alvarez et al., 2014; Solano-Flores & Solterno-González, 2011). However, teacher educators and researchers lack an understanding of how student teachers learn (or fail to learn) this critical pedagogical process. This qualitative study examines how pre-service teachers (PSTs) learn about and enact in-the-moment formative assessment (FA) processes that promote student understanding in elementary classrooms with high populations of MLs. Framed by sociocultural theories of learning (Vygotsky, 1978), the PST is the focal learner of the study, learning to teach in the context of ongoing participation in the activities of a teacher education program with a variety of teacher educators. The central data are Video Stimulated Recall (VSR) interviews in which five multiple subject PSTs discuss how FA strategies are enacted - or not - in a video submitted for both a course assignment and as a component of their Teacher Performance Assessment portfolio. Supplemental data includes the total PST cohort's (n=17) lesson plans, videos, and reflection documents relating to the assignment. Additionally, four PSTs from the cohort completed two repeated surveys on their definitions of and perceived use of dialogic strategies (e.g., questioning) as FA during the fall and winter placements. I analyzed the VSR interview and artifact data via inductive coding methods to develop descriptions of changes in PSTs' understanding of FA and identify variations of learning patterns across the central five cases. The supplemental data from the

remainder of the cohort was used to triangulate the understandings described by PSTs participating in the VSRs. The findings indicate that PSTs can deepen their understanding of FA as an integrated process, provided strategic structures and TE guidance within the VSR interaction. The analysis adds to the literature by revealing patterns and distinguishing features of the trajectories of PSTs' thinking and enactment of FA questioning practices and processes (Gibbons, 2015; Hattie & Timperley, 2007; Ralph, 1999; Ruiz-Primo et al., 2014) with MLs (Alvarez et al., 2014; Bunch et al., 2015), ultimately providing elementary teacher educators with valuable information on the kinds of structures and scaffolds that might be useful in supporting PST's continued development and understanding of in-the-moment FA practices.

Dedication

To mom, who teaches me still.

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I am deeply grateful for the evolving social, historical, and cultural contexts that have inspired, motivated, and made it possible for me to spend the last four years indulging my curiosity. Through my growing relationships with students and scholars, I have continuously rejuvenated and reframed my dedication to enhancing and improving the experiences of PSTs, in pursuit of more meaningful learning experiences for children in early childhood and elementary classrooms.

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Chapter 1: Introduction

Formative assessment (FA) is a potentially sophisticated act of responsive teaching, or informed improvisation, capable of markedly improving student learning (Abedi, 2010; Duran, 2008; Hattie & Timperley, 2007; Llosa, 2011; Ruiz-Primo et al., 2014). Top internet searches for "formative assessment strategies" emphasize written documents (e.g., exit tickets) and quick group checks for understanding (e.g., thumbs up/thumbs down). However, these conceptualizations do not adequately capture the often improvisational and dialogic nature of FA. Dialogic FA strategies include those a teacher uses to adjust instruction in-the-moment to elicit, identify, and meet the needs of her students, responsive and unscripted, through strategic questioning and other high-leverage instructional moves, such as wait time and posing open ended questions. Timely questions and thoughtful pauses are integral to responding effectively to students as a lesson unfolds. In the micro-moments of teaching–a student's raised eyebrow, confused expressions, jumbled choral responses–a teacher revises her planned script in order to more precisely identify and meet the needs of her students, through an iterative cycle of noticing, questioning, and reflecting (e.g., Furtak et al, 2016). This aspect of teaching is undeniably challenging to learn (Ralph, 1999; Shepard et al., 2019; Singer-Gabella et al., 2016; van Es & Sherin, 2002). At minimum, this kind of responsive teaching necessitates pedagogical content knowledge (Shulman, 1987), pedagogical language knowledge (Bunch, 2013; Galguera, 2009), and knowledge of specific students, all the while being open to students' various ways of organizing and perceiving knowledge. Arguably, the most helpful tools teachers use to facilitate the forward movement of students' learning are deliberate, responsive questioning and informal FA feedback strategies. When used

effectively, students' elicited responses enable teachers to gauge students' ways of knowing and then guide the class to fuller understanding. Learning how to effectively respond to students in-the-moment requires teachers to do anticipatory planning and judicious guesswork, coupled with iterative and ongoing active noticing, throughout the teaching day, week, and year, for each student, and for the whole class.

Lack of Formative Assessment Principles Specifically for Multilingual Learners

An increase in the number of Multilingual Learners (MLs)[1] in elementary classrooms makes the relevance of researching FA infinitely more essential and complex. In the United States, 9.6% of students are classified as MLs; in California, that number more than doubles, to 20.2% (U.S Department of Education, 2020). The majority of these learners, throughout the country, are born in the U.S. and in elementary school: 85% are U.S. citizens (Whatley & Batalova, 2013) and in California, 70.2% of MLs are in grades K-6 (CDE, 2019). Teachers prepared today will continue to see significant numbers of MLs in their classrooms and will need to learn to effectively support diverse students, their families, and classmates.

There are currently no defined, accepted sets of FA principles specifically for MLs (Alvarez et al., 2014). Principles of summative assessment for MLs have been widely examined and discussed (e.g., Abedi, 2010, Martiniello, 2009). The means by which a teacher learns to assess student understanding in-the-moment, interpret those understandings, and ultimately translate those interpretations into instructional choices has yet to be fully described in elementary classrooms with high ML

[1] School districts and researchers use various terms to designate and describe students whose primary home language is not English and who are learning English, in schooling contexts. Rejecting the term "Limited English Proficient" as it frames children through a deficit lens, and "emergent/ing bilingual," as it narrows linguistic capabilities to just two, I prefer and use the term "Multilingual Learner," (Merritt et al., 1992), which embodies the concept of translanguaging (Vogel et al., 2019) and centers language as a tool of learning, a critical component of the sociocultural lens of learning and teaching, through which this study is framed.

populations. While effective FA is useful for all learners, the elevated multidimensionality of MLs' linguistic and cultural experiences necessitates teachers' explicit attention to awareness and eliciting students' use of language to support learning (Meskill, 2009; Solano-Flores & Soltero-Gonzáles, 2011, Téllez & Mosqueda, 2015).

Research is needed to explore and describe how teachers learn to compose follow up questions to probe and elicit students' explanations to more effectively respond to the ways students express and communicate understanding of concepts (Alvarez et al., 2014). Identifying patterns of how Pre-Service Teachers (PSTs) understand FA and enact FA strategies in-the-moment can help teacher educators (TEs)[2] design more explicit experiences and offer more effective feedback, potentially expediting PSTs' progress in this highly influential teaching practice.

Classroom contexts with high percentages of MLs demand a high level of pedagogical language knowledge, the knowledge of how language interacts with content in an academic setting (Bunch, 2013; Galguera, 2009). As PSTs learn the why and how of eliciting of students' knowledge to support students' knowledge construction, they must simultaneously develop a deep understanding of language as both potential obstacle and asset to moving students' learning forward. These circumstances elevate the relevance of ensuring that PSTs develop this particular combination of pedagogical language knowledge and FA teaching practices at early stages in their careers.

How do Pre-Service Teachers Learn to Teach?

[2] In this study, "teacher educators" (TEs) refers to the triad of influential experts regularly interacting with PSTs: cooperating teachers, university supervisors, and education course lecturers/professors.

Since Shulman and Elstein (1975) and Clark and Yinger's (1979) work in exploratory research on teacher decision making and teacher learning, the literature on this topic has grown considerably. Research within this lineage has developed and defended a set of effective, common, teachable practices. The last few decades of work have seen researchers move from trying to SOLVE education problems to working to DEFINE education problems. In shifting this focus, researchers recognized "that the essence of [teacher] learning is not merely doing, but thinking about what one is doing" (Shulman & Elstein, 1975, p. 37). This early work on teacher decision making and exploring qualities of teacher effectiveness was completed around the same time that Vygotsky's theories of sociocultural learning were published in English. Shulman and Elstein (1975) and Clark and Yinger (1978) describe their efforts to make sense of teaching and learning as explorations into interactions between what happens inside teachers' heads in relation to what happens in classrooms. In service of a sociocultural framing, understanding how teachers learn necessitates understanding the social and historical contexts of the present teaching environment in relation to teachers' thoughts as they occur in-the-moment and is the foundation for building a common vocabulary that unites educators (Clark & Yinger, 1979, p. 10).

Alongside a more robust description of the common components of teacher thinking resides a necessity for a framework and theory of how PSTs develop interactive decision making skills. Shulman and Elstein (1975) suggested that researchers use systematic, descriptive research to explore TEs' strategic feedback practices and identify teachers' "major repeatable decisions" (p. 35-36). Since Shulman and Elstein's work, "major repeatable decisions'' has been defined and

refined as “core teaching practices” by many (e.g., Grossman, et al., 2009; Lampert, 2010; McDonald, et al., 2013). As novices do not instantly become experts, there is still much work to be done in defining patterns of PSTs’ development of FA practices over time, within teacher education courses and field placements, as well as the first years of teaching. The sociocultural perspective of learning I employ in this study seeks to attend to the multi-layered and complex influences on PST learning. Simultaneously, I looked for evidence of patterns of PST learning, shifts in understanding and explanations of FA, using the shared context of a single teacher education program. Recognizing similarities in learning trajectories afforded the opportunity to look for variations in PSTs’ learning trajectories, as expressed through their experiences in classrooms as well as the dynamic and developing relationships with their various TEs. Together, these patterns and variations of shifting understanding provide a more robust description of PSTs learning trajectories.

The above arguments establish the necessity for research that defines and describes PSTs’ learning processes, particularly those not easily measured through a single lesson observation or a submitted lesson plan. Descriptions of how PSTs think about and develop definitions of FA and work to incorporate informal FA practices into their teaching over time are fundamental to developing responsive practices for TEs to respond to, support, and potentially expedite the deepening and automaticity of PSTs’ understanding and enactment of responsive FA practices. This dissertation study can help TEs better understand how PSTs understand and enact responsive questions that probe and elicit deeper student thinking and language for students in elementary classrooms with high populations of MLs, particularly in the early stages of a teacher’s professional learning. The study traces PSTs’ progressive development

across multiple artifacts of learning and shows evidence of how interactions with various mentors and instructors enhance understanding.

Chapter 4 describes how various TEs influence PST learning in this study, examining if and how TE modeling, feedback, and instruction are referred to by PSTs in VSR reflections and survey reports. The dissertation's findings have implications for the ongoing revision and development of teacher education program structures, specifically field experiences and mentoring practices. The discussion in Chapter 5 suggests further revisions and refinements of a probing construct map developed by Duckor and Holmberg (2019) and presents practical and theoretical implications for teacher education programs and teacher education researchers.

Research Questions

Given recent arguments to increase teachers' assessment literacy and practice (California Commission on Teacher Credentialing [CCTC], 2016; Gotch & French, 2014; Popham, 2004, 2009) as well as increased reliance on learning progressions to award candidates teaching credentials (i.e. California Teaching Performance Assessment [CalTPA], educative Teacher Performance Assessment[3]), this study explored the nuances of PSTs' learning trajectories in the FA practice of responsive dialogue techniques, specifically follow-up oral responses and questioning seeking to elicit students' responses (Ralph, 1999; Moyer & Milewicz, 2002), referred to in this paper as 'probing.' This study explores and describes how PSTs in one program learned to efficiently and effectively elicit and respond to students in the midst of teaching.

[3] The educative Teacher Performance Assessment (edTPA), used in many states' licensure protocols, is based on the California Teacher Performance Assessment (CalTPA). Both are portfolio-based assessments completed by student teachers to demonstrate their readiness to become instructors of record (Pearson, 2022).

Specifically, the analysis describes how PSTs in dense ML field placements (a) changed their understanding of FA; (b) attempted to draw on conceptual frameworks of FA and teaching practices in the midst of teaching and (c) consciously implemented responsive, improvisational FA practice. Using videos and PST documentations from required observations enacted in intermediate field placements, as well as follow-up VSR interviews (Bloom, 1954; Calderhead, 1981) for each recorded lesson, the study explored processes by which PSTs developed an understanding of FA. The data traces how PSTs began to learn to use follow-up responses and questions in concert with responsive dialogue techniques (wait time, planned questions) through cycles of iterative planning, enactment, and reflection. Cycles were conducted with various TE and teacher education program supports including university teaching supervisors, Cooperating Teachers (CTs) in the field, as well as course assignments which included lesson plans and self-reflections.

Recognizing the complex interactions of the many and diverse factors that influence teacher learning, the research design included multiple sets of data from 17 PSTs created across time, focusing on VSR interviews and assignment data from 5 case study PSTs, and using lesson plans, video enactments, and reflections of the remaining PSTs, as well as repeated questionnaires from 4 PSTs to answer this central question:

1. How do PSTs learn to utilize probing questions and prompts to uncover and elicit ML students' thinking in elementary classrooms?

To explore and define PSTs' learning of this FA practice, the study sought evidence of (a) how PSTs understood and defined FA (and, if applicable, how this changed over time), (b) any frameworks, models, or interactions that influenced the PSTs'

learning of FA, as well as (c) whether, when, and how PSTs enacted dialogic questioning in recorded lessons during intermediate field placements. The three sub questions listed below provided a structure to inductively analyze and build towards a more robust description of PST FA learning progressions, focusing on the specific concept and skill of using probing questions and prompts to uncover and elicit student thinking:

2. How do PSTs in one teacher preparation program think about, define, and describe formative assessment?
3. What resources do PSTs call on in-the-moment of thinking about and asking questions/offering prompts to follow up on student responses (the FA move of 'probing')?
4. To what extent do PSTs consciously plan for and use follow-up questioning and responsive prompting to respond to and recognize students' everyday language, and provide language models in classrooms where there is a dense population of Multilingual Learners?

Frameworks and Theories Informing the Study

In this section, I define concepts central to the dissertation study and theories that ground my design and analysis: sociocultural theories of learning (specifically, learning how to teach), formative assessment, and language learning. I center PSTs as learners of teaching. As I participated in the PSTs' learning experiences in the context of this study, including the VSR interview experience as well as a co-led assessment workshop, I describe my role and positionality in the next section.

Learning (To Teach)

I employ a sociocultural learning perspective, arguing that teaching and

learning are situated in social and historical constructs that develop fluidly and iteratively over time. Vygotsky (1978) argues that learning is characterized by a process of change (p. 73). This characterization is well aligned with my exploration of how PSTs shift and develop their understanding and enactment of FA over time. The sociocultural framework sees learning as both participation and a process of change, always situated within social-historical contexts. Crain (2005), referring to Vygotskian frameworks, describes the necessity of recognizing and considering relationships in the context of a student-teacher dyad: "The teacher cannot prescribe the manner in which the child learns…still, adult teaching is necessary. Without it, the child's mind wouldn't advance very far" (p. 239). The same can be inferred for a PST–TE relationship: the TE cannot dictate or predict the manner in which a student teacher takes up pedagogical practices; yet CTs' and other experienced TE models (including the researcher's, in this study) are influential and essential to moving PSTs' learning forward. Through interactive and dynamic relationships between individuals, changes in the individual's understanding—deepening, strengthening, altering—occur. Learning occurs for all participants during the active exchange of ideas. This sociocultural perspective of learning is inherent in the central methodology of this study - VSR interviews - in that I anticipated and looked for how the semi-structured protocol and my own relationship with participants influenced each PSTs' learning. …

Sociocultural theories of learning attend to the multifaceted contexts of instruction and emphasize the decreasing visibility of collaborative supports over time as a child develops deeper understanding. "The child's concepts have been formed in the process of instruction, in collaboration with an adult … he makes use of the fruits

of that collaboration, this time independently. The adult's help, invisibly present, enables the child to solve such problems" (Vygotsky, 1986, p. 191). The dissertation study sought to identify TE and teacher education program ("adult") collaborative supports that incited conceptual shifts in PSTs' ("child's") understanding of FA. Additionally, I aimed to identify patterns of how PSTs learn about and understand FA, as demonstrated over time through planning, enactment, and reflection. Taken together, the PSTs' conceptual changes, over time, can be considered working towards the "major repeatable decision" (Shulman & Elstein, 1975) of intentional FA. The described learning progressions in Chapter 4 illustrate how the PSTs, in this one program, learned FA as a process through practice in collaboration with various TEs and teacher education program activities.

Teacher educators and researchers, including myself, are responsible for constantly engaging in awareness of our own levels of participation as we engage in dialogue and revise our understandings and perceptions of PSTs' competence. As PSTs gain awareness of specific routines and begin to more effectively anticipate student responses, TEs must organize and enact practice sessions, mentoring sessions, and dialogue to build both confidence and flexibility in PSTs' ability to respond to students' anticipated and unanticipated responses. I extrapolate the relevance of social interaction in learning, the enacted relationship between teacher-student, to the dialogic relationship between TEs and PSTs.

Relationships are essential to learning, and rely on the interaction between external connections of 'others' to the internal identities of individuals, as identity relates to the various facets of each individual's lived world: self, classroom, family, school, learning community, etc. (Greeno et al., 1996; Vygotsky, 1978). Learning, in

this sociocultural view, is participating in social practices, motivated and achieved by interaction with others in active, engaged participation (Greeno, et al, 1996, p. 23). The existence of relationships and their influence on learning are fundamental to the conceptual framework that propel this research agenda, and therefore attention and analysis included a review of the content covered in university coursework, interviews with PSTs and PSTs' CTs, as well as consultations with field supervisors.

Knowledge of pedagogy happens over time (Cochran-Smith & Demers, 2010). In this study, the TEs who work with PSTs have experience and deep knowledge of teaching and learning, based on the presumed selection process of the high-quality teacher education program from which the PSTs in this study were selected. TEs in this program offered feedback and structured field experiences and assignments for the PSTs in the study. The PSTs were in their first year of learning about learning, teaching, and how to teach. Given this context, my dissertation focuses on the PSTs, learning teachers, novices in the profession. I explore how these PSTs understand and enact questioning as a method of FA in their first months of teacher preparation, within TE-constructed and TE-supervised contexts of preparing for and enacting assignments (lessons/reflections) for required coursework, credentialing requirements, and the students in the PSTs' field placements.

Formative Assessment

Definitions of effective teaching always include an ability to assess formatively, to respond to students in-the-moment (e.g., Hattie, 2009). FA is a sophisticated process of responsive teaching, capable of markedly improving student learning (Abedi, 2010; Duran, 2008; Hattie & Timperley, 2007; Llosa, 2011; Ruiz-Primo et al., 2014). The relevance and influence of effective follow-up questioning

strategies as a form of FA is well documented (Black & Wiliam, 1998; Hattie & Timperley, 2007; Hattie, 2009, 2012; Heritage & Heritage, 2013), especially in mathematics (e.g., Franke et al., 2009; Moyer & Milewicz, 2002) and science (e.g., Furtak et al., 2016; Levin et al., 2009; Ruiz-Primo & Furtak, 2006).

The field offers many definitions of FA that describe this type of assessment as occurring during instruction for the purpose of improving students' learning (e.g., Shepard, 2008; Shepard et al., 2005). Because this study's data centers a mandated TPA portfolio component, I chose to use a definition of FA that would align both with the constraints of the defined parameters of participants receiving a credential and with the purpose of the study, which focuses on in-the-moment enactment of FA. I utilized the revised definition of FA offered by the Formative Assessment for Students and Teachers (FAST) State Collaborative on Assessment and Student Standards (SCASS) (2018) to frame my analysis. The revised policy-oriented definition (first version, 2006) captures the interactive and sociocultural nature of FA centered by teacher education researchers and is directly positioned to inform the structures that support PST learning:

> Formative assessment is a 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. (p. 2)

In exploring PSTs' learning of FA as a practice, the study focuses on two aspects of this definition. First, that FA occurs "during learning and teaching." Second, that FA has a two-pronged objective "to elicit and use evidence." These two facets of the definition capture the in-the-moment teaching actions that simultaneously probe for and act on knowledge gained from constant checks for student understanding.

In this sense, FA is an iterative practice of actively eliciting information about

students' understanding and responding to that understanding with the goal of co-constructing knowledge between teacher and student. Construction of knowledge is facilitated by the teacher in varying degrees, but guided by students' present, presumed understandings. The developing product of this co-construction leads toward an ultimate goal of developing students' ability to self-direct their own learning. This definition of FA aligns with sociocultural views of learning, as it presumes a dialogic relationship between teachers' observations and elicitations and student responses. As lessons unfold, the use of strategic FA strategies leads to deeper development of concepts for students, and increasingly generalized pedagogical content and language knowledge for teachers (e.g., Furtak et al., 2018).

In this study, the central unit of inquiry is exploring how PSTs learn FA as a process. The data illustrate how PSTs' descriptions of FA shift over time. PSTs' planned and in-the moment prompts, questions, and probes are compared to their reflections on their enactments. PSTs incorporated or mentioned thinking about, but not enacting, FA during their VSR interviews and written reflections. Evidence is shared of whether and how PSTs use FA questioning and response strategies to check for and elicit students' understanding, within video recorded lessons and through PSTs' observations and reflections throughout VSR interviews. This dissertation analyzes defined moments of orally presented probing FA turns of talk as units of interaction in which PSTs seem to increase (ever so slightly), maintain (through affirmation or silence), or break down (confuse, disaffirm) students' understanding of the lesson's concept or topic through dialogue. By exploring the thoughts PSTs describe having during these instructional moments and their ability to notice opportunities seized and missed over the duration of the VSR interview, the analysis

and discussion show how the PSTs in this program learn FA as a concept and how these PSTs learn to enact informal, dialogic FA strategies.

How Teachers Learn to Foster Language Development

An explicit and strategic focus on language in elementary classrooms, regardless of content area, is socially just pedagogy (Moje, 2015) and is a critical component of effective formative assessment. Learning to foster language learning applies to teachers of all disciplines, age groups, and cultural contexts (Bunch, 2013; Hawkins, 2004). For teachers to help all students meet the common core standards, which intensify the language and literacy demands on students, Bunch argues that "preparing teachers to implement these shifts must become a 'mainstream' concern...teachers need to know something about language" (2013, p. 299). These frameworks dismiss the idea of "typical" learners and move away from simplified behaviorist approaches of inserting ideas into children's brains. Instead, they recommend teachers start with the whole child, foregrounding the experiences and language students bring to the classroom, weaving from there to introduce and connect students' understandings to the concepts and terminology of the given discipline.

The unique language resources and thinking habits students bring to the classroom are assets to learning. Arguably, in teacher education programs, PSTs should learn how to promote content-specific terminology, language structures, and ways of thinking as different, not better, ways to communicate disciplinary ideas and concepts (e.g., Bunch, 2013; Hawkins, 2004; Moje, 2015). As such, pedagogical language knowledge (Bunch, 2013; Galguera, 2009), in addition to pedagogical content knowledge (Shulman, 1987) are distinct and essential components of teacher

preparation programs.

Considering these arguments, TEs should support PSTs in their ability to gain knowledge of and the ability to teach the underlying structures of specific disciplines (pedagogical CONTENT knowledge). Simultaneously, teachers should provide opportunities for PSTs to learn to utilize the varying language experiences and resources their students bring into classrooms, to actively seek students' divergent and rich ways of thinking and communicating (pedagogical LANGUAGE knowledge). The literature suggests that effective teachers start instruction with students' ways of knowing, including their uses of language, to help students connect to content and learn to navigate the various subjects and disciplines (e.g., Fillmore & Snow, 2018; Moje, 2015; Valdés, et al., 2014). The elicitation and use of students' own words to describe and define concepts is a feature of effective responsive FA notoriously difficult for PSTs to develop (Ntombenhle & Cristian, 2018), as it necessitates flexibility in interpretation and deviation from normed and experienced practices of seeking specific textbook correct answers.

Moje (2015) asserts that teacher preparation should begin with language knowledge. However, the issue of the limited length of a teacher education program, typically around twelve months, must be considered. TEs must make difficult choices in what PSTs learn and experience in their all-too-brief preparation programs. Both Moje (2015) and Bunch (2013) articulate this concern: "This is time- and labor-intensive work that demands attention, commitment, and support over the long term" (Moje, 2015, p. 270); "The practical question of the time it takes to provide an adequate introduction to these topics …" (Bunch, 2013, p. 306). For PSTs, learning how language and content interact for students can only happen deeply over time, in

and through direct and explicit apprenticeship, observation, and experience.

This sociocultural consideration of how PSTs learn to foster language development embodies the interactive duality of seeming contradictions: fostering language learning is simultaneously situated and dynamic; scientific and every day; capricious yet often predictable. Instruction and learning for the PST can be both proleptic and reflective, planned and spontaneous. For PSTs, the objective is not to learn how to achieve a perfect balance between fostering language and teaching content, but to become aware of the tensions and interactions between these knowledges. In other words, when "teachable" moments present themselves during a structured activity, the PST learns to flexibly and effectively respond. The PST should learn to be prepared to improvise. Walqui and Bunch (2019) express this skill as a process: teachers "need to gain awareness of what they say as they engage in the doing of their discipline" (p. 68). Teachers must also be aware of students' own words, as they engage and participate in disciplinary dialogue. To foster language development, teachers constantly balance consciousness of students' precise responses and their own comprehensive understanding of pedagogic and disciplinary knowledge. How do PSTs learn how to do this, given inevitable tensions between what the architect (teacher) designs and how builders (students) interpret the blueprint?

Vygotsky (1986) describes a teacher who must be highly cognizant and knowledgeable of the general direction of both pedagogical content and development for a given group of children. In this perspective, a teacher's grasp of the blurred distinction between every day and scientific knowledge–and language– as well as the teacher's ability to discern how every day and academic understandings–and

language–interact and complement one another, is essential to teaching and to fostering students' use and understanding of language in relation to disciplinary concepts. Effective teaching cannot be accomplished without having some awareness of and conscious attention to the situated and dynamic cultural and linguistic histories of students individually and as a group.

According to Vygotsky (1986), "the only good kind of instruction is that which marches ahead of development and leads it; it must be aimed not so much at the ripe as at the ripening functions" (p. 188). Walqui and Bunch (2019) offer further insight for how instructors learn to march ahead of development, to lead it: "the role of educators is proleptic*,* meaning that teachers anticipate in advance the realization of students' potential and treat students accordingly" (p. 22). Both arguments are essential. How do teachers identify the "ripening functions?" Through knowing children as individuals, knowing how children learn, knowing the content deeply and anticipating students' understanding. How do teachers identify the reach of a child's zone of proximal development in any given moment? Through ongoing, attentive, dialogic FA, punctuated by scripted and unscripted eliciting prompts and questions, that constantly seek verification of anticipated responses and set the stage for responsive shifts in instruction. If "education, in this sense, is no longer about teaching (as transmission), but about promoting and supporting learning as it unfolds" (Bunch & Walqui, 2019, p. 25), how do teachers learn to be simultaneously proleptic and reflective, while teaching, not just during planning periods or when class is dismissed? Herein lies this dissertation's objective.

Role of the Researcher & Methodology

In conceptualizing this research agenda, it became clear that to capture the

thinking processes of PSTs, a certain level of rapport and familiarity with the recruited PST cohort needed to be established. Participating in conversations about personal performance, in any field and at any level of experience, can cause reasonable anxiety for PSTs. To alleviate PSTSs potential hesitations to express their thinking and to embrace the vulnerability of their novice status, I first interacted with the cohort of multiple subject PSTs in an informal setting, introducing myself as a former elementary teacher and someone who would ask for research volunteers later in the year. In the fall, I co-conducted a required workshop on assessment for the cohort, sharing research and best practices aligned with perspectives and strategies for formative and summative assessment, using artifacts from my prior teaching experiences to support the conversation. I visited the cohort several more times during required courses and seminars on campus and via Zoom. Through these interactions, I intended to establish myself as an experienced thinking partner, as opposed to a mentor or supervisor, to support the development of PSTs' understanding, awareness, and enactment of FA moves in field placements and required by credentialing and program assignments.

Simply asking participants for their understanding of FA, examining lesson plans and post-lesson reflections, and counting and classifying FA moves in video recorded lessons, while informative, does not offer a complete picture of what PSTs actually think and consider in-the-moment of enacting. I therefore chose VSR as the central point of data for this study. I also used VSR as a method, to strategically explore opportunities for validation that lay within triangulation of the data I collected: between semi-structured VSR interviews, lesson plans, and written reflections. Given the nature of VSR as a methodology, I also recognized that each

VSR interview had the potential to simultaneously become an intervention, a means by which the PSTs' understanding of FA would be altered, perhaps significantly, by the process of interreacting with me to recall, interpret, and verbalize thoughts recalled in-the-moment of their recorded events.

At the outset of this study, I therefore embraced the assumption that participants' thoughts would be fundamentally altered within the VSR interview through their interactions with me, as recommended by several studies that used interviews to explore participants' interactive thinking. Russ and colleagues (2012) argue that "openly acknowledging and examining student framing in our clinical interviews, and reporting them when we provide excerpts of interview data, is a crucial step to being more confident, circumspect, and precise in our analyses of student knowledge" (p. 597). While their study referenced focused on middle school students' framing, the recommendation was applicable to my VSR interviews with PSTs. The declared objective of the interview was to reflect upon an enacted lesson and an implied objective was that PSTs would learn from watching their own teaching and discussing it with an experienced educator, me.

VSR offers the opportunity to explore and describe both the thinking processes and patterns of teachers in-the-moment and the changes in thinking and patterns within interviews. The method aligns well with the sociocultural theories of learning (learning as a process of change through participation) described earlier in this chapter. As "stimulated recall can be used both to collect data on student teacher behaviors in the classroom, but also to capture the reflections-in-action of student teachers in the classroom" (Stough, 2001, p. 3), I incorporated this potential opportunity to explore PSTs' reflections-in-action into my research design. VSR

methods, when combined with a close examination of PSTs' lesson plans and reflection, provided valuable insight to how PSTs construct knowledge and utilize resources from coursework, conversations with supervisors and mentors, as well as structured reflections on field work experiences.

A peripheral argument of this dissertation is that VSR is a complex method with opportunities to collect data AND influence data collection. These dual purposes require targeted and specific attention in research design and analysis. It is a research method for studying thinking, but also a method for studying learning, as well as a means for participants to learn, a strategy for learning itself. VSR is a tool to improve teaching for participants but also a tool that, with aggregate data across individuals, can supply information to use in research that describes and explores teacher learning. In other words, VSR is a method that is useful to both "examine and manipulate interpersonal behavior" (Kagan et al., 1963, p. 237). It is both a tool for research and a tool for intervention, and in the context of this study, required that I build relationships with participants that centered on supportive, guided learning, as opposed to evaluation or judgment.

Organization of the Dissertation

Chapter 2 reviews further research associated with the concept of FA, centering language and defining FA as an intricate, cyclical, dynamic, interactive process of planning, eliciting, and responding to the complexity of a classroom environment. The chapter attends to terminology related to the practice and process of improvisational FA, framed as teachable moments that might be anticipated, but usually occur in-the-moment. The literature review leads to the argument that while teacher education researchers and practitioners have shown that PSTs' understanding

of FA can be developed in a teacher education program, the TE field does not yet fully understand if or how PSTs' understanding of the role of language in FA translates to PST responsive interactions with students in elementary, ML classrooms.

Chapter 3 describes the design of the study and attends to the various complexities of centering the introspective method of VSR. Descriptions of the PSTs' program and field contexts are provided. Chapter 4 shares the results of the triangulated data analysis and describes how FA as a dynamic process and a set of practices is defined, attended to, and developed by PSTs. The final chapter discusses how the analysis can and should be utilized to improve PSTs' ability to learn and implement this fundamental component of effective teaching and learning (Black & Wiliam, 1998) in elementary classrooms with MLs.

Chapter 2: Learning Formative Assessment as a Process

Formative assessment is an intricate, cyclical, dynamic, interactive process of planning, enacting, and responding to the complexity of a classroom environment. Some researchers call this teaching practice interactive decision making (Clark & Yinger, 1979; Housner & Griffey, 1985; Jackson, 1965), others term the process "withitness" (Kounin, 1970), "information processing" (Joyce, 1978), "theory-in-action" or "reflection-in-action" (Schön, 1983), "deliberate practice" (Ericsson et al., 1993), "dynamic assessment" (Lantolf & Poehner, 2004; Litz, 1991), and more recently, "adaptive expertise" (Hammerness et al, 2005) and "leveraging student thinking" (Singer-Gabella et al., 2016). All these terms center the relationship between student responses and teachers' actions, whether instinctual (Ellsworth, 1997; Téllez, 2016) or deliberate. This recursive decision-making process involves eliciting, noticing, interpreting, evaluating options, responding, and reflecting, and is how this dissertation defines the process of FA.

It is commonly presumed that effective teachers develop the ability to enact FA as a process over years of experience, slowly. However, the last two decades of research on interactive decision making and FA illustrate that the components of observation and decision-making skills central to practicing FA are not necessarily purely instinctual or peripherally developed but can be learned by novice and experienced teachers (e.g., noticing, van Es & Sherin, 2002; interpreting and responding, Kang & Anderson, 2015, Torrance & Pryor, 2001; leveraging/eliciting, Singer-Gabella et al., 2016; responding/reflecting, Furtak et al., 2015). This chapter describes research on the dialogic nature of FA and begins with a discussion of the centrality of language in this form of assessment. The sections review studies that

illustrate the learning, practice, and processes of improvisational FA, the teachable moments occurring during instruction that might be anticipated but usually occur in-the-moment. This literature shows how these related but often separately described skills develop in teachers, across the career spectrum and across academic specializations. The constellation of constructs that comprises the dynamic practice of FA is essential for all teachers to develop skills and competency in, especially those who interact with MLs, for whom developing communicative competency in the language of instruction while drawing on their diverse linguistic assets is especially critical (Abedi, 2010; Alvarez, et al., 2014; Téllez & Mosqueda, 2015).

If the work of teacher education is to develop novices into competent practitioners, then TEs must, at the very least, better understand the early development of this complex phenomenon as a set of practices, and, if possible, help PSTs learn it more quickly. The chapter argues that while teacher education researchers and practitioners know that PSTs' understanding of FA can be developed in a teacher education program (e.g., Kang, 2017), the field does not yet fully understand how PSTs' understanding translates to responsive interactions with students, nor how TEs might support PSTs' ability to implement understanding of FA into moment-to-moment classroom dialogue. This lack of understanding how PSTs learn dialogic forms of FA is compounded for MLs, whose interactions with content, classmates, and instructors are vividly mediated by proficiency of the language used for instruction (Solano-Flores & Soltero-Gonzáles, 2011). A systematic exploration of research related to teacher learning and FA has led to this dissertation. This work is a next step in improving PSTs' ability to enact FA in-the-moment, a fundamental component of effective teaching (as listed in core practices of teaching, e.g.,

Grossman, 2018; Council of Chief State School Officers, 2013) and learning (Black & Wiliam, 1998) in ML-dense classrooms (Alvarez et al., 2014; Valdés et al., 2014).

The chapter begins with descriptions of the central role of language in FA and discusses the teacher's (PST's) role in facilitating classroom dialogue. I then share literature on how formative, responsive classroom dialogue facilitates deeper student learning. The next section examines the role of teachers' interactive decision making in this dialogic process. I then review sociocultural perspectives of PST learning, followed by short descriptions of pedagogical frameworks that support PST learning. These views and structures of PST learning lead to descriptions of studies that have examined components of dialogic FA in teacher learning, namely, noticing, interpreting and responding, and reflecting. The findings, described in Chapter 5, illustrate how PSTs in one teacher education program learned FA practices promoted in the context of a university teacher education program. The PSTs progressively developed more sophisticated definitions of FA. They grew more aware of seized and missed opportunities that illustrated or could have illustrated responsive probing as FA, to uncover and elicit students' thinking elementary classrooms with high populations of MLs.

Centrality of Language in Formative Assessment

While researchers have addressed the challenges and opportunities of summative assessments and MLs (e.g., Abedi, 2010; Martiniello, 2009), there is a substantial gap in the literature when it comes to the direct exploration and evaluation of FA and the role of language, particularly in how teachers learn the distinct knowledge and strategies necessary to effectively practice FA with MLs (Alvarez et al, 2014; Téllez & Mosqueda, 2015). FA with MLs necessitates that PSTs have

knowledge of content and skills for a subject and knowledge of the specialized terminology and pragmatics that students need to communicate effectively within a discipline or subject in the language of instruction (Abedi, 2010; Alvarez et al, 2014; Bunch et al., 2009; Meskill, 2009). Bunch (2013), expanding on Galguera's (2011) description of pedagogical language knowledge, describes this as a critical addition to the conception of what constitutes essential teacher knowledge, a crucial companion to pedagogical content knowledge (Shulman, 1987). Pedagogical language knowledge is defined as "as knowledge of language directly related to disciplinary teaching and learning and situated in the particular (and multiple) contexts in which teaching and learning take place" (Bunch, 2013, p. 307). Bunch further argues that pedagogical language knowledge is useful in all subjects for teachers of all students, regardless of age, language, or culture, and is most effective when embedded into novice teacher theory courses and practicum experiences, not only in settings with MLs.

Despite the lack of research attending to the FA and language, sociocultural theories of FA and learning emphasize the role of discourse (Pryor & Crossouard, 2008) and language as a tool that mediates learning (Vygotsky, 1978, 1986). Pryor and Crossouard (2008) presented a theory that highlights the role of power and identity in the ways that distinguish and bind regulative and instructional discourse in school settings. They argue that FA is a discursive social practice, and the objective of FA depends on what kind of discourse is centered (p. 1). On one side, FA is convergent, more rigidly defined by aims to attend to specific rules and structures of regulative and instructional discourse. On the other, FA is divergent, accomplished through fluid processes collaboratively constructing and revising understanding.

Pryor and Crossouard suggest that both forms of FA are essential to learning. “The idea of convergent assessment could be seen as providing a base for the learner, so that through understanding of the rules, divergent assessment can create spaces for using them, or bending them in novel, exploratory ways” (p. 11). In their sociocultural theory of FA, the role of language is central and complex. The theory recognizes a dynamic relationship between rigid language rules and structures and fluid expression. It emphasizes the need for explicit attention to the role of power and identity in whether and how language is used as an asset or framed as a deficit, in how teachers elicit and support students’ use of language in school settings. Further, it acknowledges that learning occurs for both the learner and the teacher within and throughout all discursive FA transactions, in both convergent and divergent forms (see also Ash & Levitt, 2003).

Sociocultural theories of FA and language are at odds with wide-spread perspectives on what is often termed “academic language.” In this study, the PSTs are exposed to and expected to directly address an ability to support students’ use of “academic language” in their performance assessment portfolio and course assignments. Critics of academic language emphasize that the construct is deficit-oriented, centering the acquisition and production of academic language (seen as superior to other forms of language) as a primary goal of schooling (e.g., Bunch & Martin, 2020; MacSwan, 2020; Wang et al., 2021). Thompson & Watkins (2021) suggest that foregrounding academic language in schooling settings is dysfunctional. They argue, “in order to understand the (academic language), the reader must already understand, as a scientist would, the conceptual content of the text” (p. 467). Considering this view, conceptual understanding should be the primary goal of

schooling. Typical conceptualizations of academic language stand in contrast to more asset-oriented views of the relationship between language and learning, which center developing students' understanding of concepts using a variety of linguistic resources (e.g., Bunch, 2014; Bunch & Martin, 2020; MacSwan, 2020; Wang et al., 2021). Indeed, teachers who emphasize convergent forms of FA, the rules and regulations of disciplinary language and concepts or so-called "academic language" and forego or diminish divergent forms of FA fail to see or use students' linguistic resources as assets to learning. However, teachers who develop pedagogical language knowledge and discourse practices that foreground students' conceptual understandings, as expressed through students' own words, are better prepared to support deeper learning. Teachers with this knowledge and practice base are more fully equipped to consider and attend to the language resources students bring to the classroom to support student learning, to bridge regulative and instructional discourses through active elicitation of students' words and explicitly connecting students' words to disciplinary concepts (Bunch & Martin, 2020).

Bridging Discourses

Gibbons (2006) posits that teachers working to support MLs' learning of content and language engage in a process of bridging discourses. This bridging process is situated and continuous in day-to-day interactions (p. 5) and is a method by which MLs are given clear access to curricular content and thereby are able to learn. Gibbons presents teachers' actions as a form of mediation, drawing from sociocultural theories of learning: the teacher is an active participant in the construction of students' knowledge, neither fully in control nor a passive bystander (p. 174). This linguistic mediation process is also informed by the various modes of

communication students offer within and throughout a lesson, or the mode continuum, a construct from systemic functional linguistics (e.g., Halliday, 1993). Mediation becomes synonymous with bridging, interactional scaffolding, dialogic teaching, and FA; effects are contingent upon the quality of the teacher's interaction and response to the different language registers students use in classrooms. The process is "oriented towards showing students HOW to do (or think or say), rather than WHAT to do, think or say" (emphasis author's, Gibbons, 2006, p. 176); the teacher foregrounds students' understandings in-the-moment of instruction, meeting them where they are, and works to facilitate co-construction of knowledge and understanding via strategic moves while attending to the purpose of each interaction as it vacillates between language and content. To be clear, this kind of facilitation and attention to language benefits all learners, but is heightened for MLs (Schleppegrell, 2001, 2005; Walqui & Heritage 2012).

In addition to awareness of differences between language and content, effective teachers of MLs work to link a student's prior experiences and knowledge with the student's understanding in a particular moment of time with the next interaction (Meskill, 2009, p. 208). Each new interaction and new observation adds to the teachers' schema of a student's display of competency and confidence, providing additional fodder for interpretation and data to substantiate teachers' interpretations and subsequent teaching moves. To be effective, micro interactions between a teacher and student rely on the teacher's iterative and conscious attention to a continual and dynamic process of assessing the student's dialogic contributions.

For MLs, teachers must be aware that assessing a ML in one language, whether it is their dominant language or not, will never fully be an accurate

measurement of a student's language or content knowledge (Téllez & Mosqueda, 2015). Teaching MLs presents unique challenges for teachers, particularly that of identifying what a child knows to provide effective instruction: how can a teacher support a student when what the student knows and is able to do is in a different language than the language of instruction? Téllez and Mosqueda (2015) argue that researchers must turn their attention to examining the complexity of FA with MLs. Teachers working with ML populations must be able to competently distinguish between assessing for language and assessing for understanding of content. However, very few studies of FA have focused on MLs, despite findings that have illustrated that engaging students in dialogue via questions that encourage thinking and talking about thinking is effective means to support MLs' learning (Duckor & Holmberg, 2019/2020; Linquanti, 2014; Ruiz-Primo et al., 2014).

Formative Assessment Principles for MLs: Elicitation and Explicit Feedback

To reiterate a point made in Chapter 1, there are currently no defined, accepted sets of FA principles specifically for MLs (Alvarez et al., 2014). "Simply put, teachers need to know how to both amplify communication and minimize language load and be able to make a decision to engage in one strategy over the other, as the instruction or assessment situation demands" (Alvarez et al., 2014, p. 19-20). This is, as stated, put simply. Principles of summative assessment for MLs have been widely examined and discussed (e.g., Abedi, 2010, Martiniello, 2009). However, how teachers elicit student responses, assess informally in-the-moment, proceed to interpret student(s)' words and understanding, and then translate those interpretations into instructional choices has yet to be fully explored in elementary classrooms with MLs.

Mehan (1979) addresses the importance of recognizing a teacher's internal conflict of creating a lesson plan WHILE providing space for spontaneous discourse and subsequent responsive changes to the plan, especially given classrooms where students speak multiple languages: students should not be asked to blindly or complicity conform to the language or norms of the classroom. He notes that while there are similarities between every day and school discourses, they are not the same. He asserts that assuming there a one-to-one correspondence, that children should conform to classroom discourse, has severe consequences, particularly for diverse learners; yet: "the opposite possibility is equally viable: change the classroom to accommodate the child, including a plurality to speech styles and ways of acting" (p. 197). To make this accommodation, a teacher must first be able to elicit and recognize the students' own words and ways of knowing as a starting point to develop their conceptualization and application of content knowledge and language.

Most studies of FA with MLs center wait time and recasting as primary strategies to accommodate ML students. For example, Smith and King (2017) found that with extended wait time in college ESL classrooms, the discourse patterns moved from teacher-driven Initiation-Response-Feedback or Evaluation (IRE/F) frames (Mehan, 1979) to more student-responsive, discursive structures. Still more work focuses on recasting students' contributions to highlight grammar. This line of research is often situated in behaviorist views of learning, identifying overt relationships between output (students' own words) and response (teachers' recast) and subsequent student outputs (students' future uses of the correct form). Teachers' recasts function to acknowledge students' attempts to communicate, to affirm general content of students' responses and simultaneously offer feedback, "target" models of

the correct form of the response. A typical example in early childhood classrooms is to correct for pronunciation and use of pronouns:

> Student: Her has pasghetti for lunch.
> Teacher: Yes, she has spaghetti for lunch.

Here, the teacher offers feedback, but it is implied, not explicit. Recasting can be a useful, though implicit, form of FA. Recasting is most often not made explicit (Pomerantz & Fehr, 2011). Whether the teacher repeats a phrase verbatim, to hold a kind of a mirror to the student, so the student can hear and recognize the error for himself, or repeats but makes operative the "correct" form, the interaction is not necessarily intentionally instructive or perceived as instructive by the student. Recasting interactions occur fluidly and naturally in most conversations, and participants (both teachers and students) are not usually fully aware of the patterns: "Interactants have ways of fixing, modifying or correcting what they and their co-participants are saying and doing as they interact" (Pomerantz & Fehr, 2011, p. 171).

Contrary to this natural inclination, explicit feedback is more helpful for students' learning, particularly for elementary-aged children. Explicit feedback in effort to support or promote learning is an essential component of learning complex concepts in a sociocultural view: "concepts are not absorbed ready-made, and instruction and learning play a leading role in their acquisition" (Vygotsky, 1986, p. 161-162). Vygotsky argues that direct instruction, in combination with collaborative experience, is necessary to deepen a child's understanding and move away from initially shallow, rote ways of understanding.

In a comparative study on the difference between corrective implicit and scaffolded feedback and implicit recasts and ML elementary students' grammatical accuracy, Saeb and colleagues (2016) found that both forms of feedback improved

students' accuracy, from pretest to post-test. However, there was a significant difference between the amount of improvement between the two groups. The students who were offered explicit, scaffolded feedback showed greater improvement on learners' grammatical accuracy. Likewise, Esmaeili & Behnam (2014) found that the most common type of corrective feedback offered to MLs aged 16-29 was recasting; however, recasting alone was the least effective in improving students' grammar. Whether a teacher is correcting for linguistic or epistemic reasons, the more explicit the feedback, the more likely a student will understand the underlying structures and be able to transfer this knowledge to other communications and subjects.

Considering the literature reviewed above, TEs should help PSTs be aware of IRE/F habituated reparative sequences and move PSTs towards understanding the connection between language and content, so that the PST and their students can cooperatively work towards mutual understanding. This enables PSTs to construct clearer and more robust pathways for students to understand disciplinary content and to communicate thoughts via a common language. Teacher education research does not yet have a clear understanding of how this skill is learned, developed, and honed through teacher preparation courses and fieldwork, particularly in interaction with MLs (Abedi, 2010; Duran, 2008; Llosa, 2011; Ruiz-Primo et al., 2014). The next section reviews literature on the IRE/F and other dialogue structures, emphasizing the teacher's (PST's) role in promoting and supporting students' learning through these talk sequences.

The Teacher's (PST's) Role in Classroom Dialogue Structures

Mehan's (1979) year-long study of a first-grade classroom analyzed how discourse structures promoted students' learning. He distinguished between a

mechanistic model (predicable, rote, linear) and an interpretive or mutually constitutive model: "the teacher does not automatically match strategies and behavior in the classroom; she interprets students' behavior against a constantly changing background of practical circumstances" (p. 124). In the mechanistic model, the teacher seeks specific answers or responses. In the interpretive model, however, the teacher works to elicit and uncover students' understanding. She uses questions, prompts, and activities to facilitate students' construction of knowledge. Research has yet to thoroughly uncover how PSTs learn to fluidly enact this mutually constitutive model, in which small moments of decision making inform the trajectory of a given lesson. This model is exceedingly complex: a cyclical, mostly internal, process of eliciting, noticing, interpreting, responding, and reflecting to students' understandings all within a few breaths. Mehan's study points to evidence of a more situated reality within enactment of FA practices: one that adamantly recognizes students as active participants in constructing the world (p. 124), where teachers iteratively negotiate long-term and short-term learning goals with understandings that surface from students' participations–students' own words and knowledge–within a lesson.

Building from Mehan's (1979) work, Greeno (2015) considers learning as attending to the constraints and affordances of FA talk sequences within classroom interactions. This sociocultural perspective argues that through repeated experiences with discourse patterns like Initiation-Response-Evaluation (IRE) and Initiation-Response-Feedback (IRF), participants (students, teachers, and PSTs) learn to anticipate and then provide appropriate responses to complete patterns of discourse. There is evidence of clear, though often unspoken, rules and implications of talk sequences. Learning to initiate and participate in dialogic interactions is defined by

increasing awareness of these rituals and their reproduction of the sequences in discourse, for both PST and student. Talk sequences are jointly constructed. Greeno reviews the standard four sequences that typify talk patterns of the dialogue participants in classrooms: IRE, IRF, and Initiation-Response-Restate-Feedback or Evaluate (IRRF and IRRE). In IRE and IRF sequences, students are typically presumed receptive, and the teacher is presumed "evaluator of knowledge" (p. 258). The trajectory of these enacted sequences rests on the teacher's move in the third position. Greeno touches on this aspect of the teacher's role, and notes that a teacher's explicit awareness of sequence types is necessary to enact them on demand. He does not describe how PSTs learn to enact these sequences.

Franke and colleagues' (2009) study explored variations of third moves a teacher can make during mathematics instruction in elementary classrooms with large numbers of MLs. They looked at questions posed to follow up on students' initial responses including questions to clarify or to uncover misunderstandings or errors, requests to elaborate, and those highlighting specific mathematical ideas (p. 383). The only teacher questioning practice to frequently help students correct and complete explanations was asking a probing sequence of specific questions. The authors noted that scant research examines how teachers learn to "make the transition from asking the initial question to pursuing student thinking" (p. 380), despite studies that illustrate clear distinctions between novice and experienced teachers' questioning practices.

Given a push towards sociocultural models of teaching and assessment (e.g., Shepard et al., 2018), the question becomes how to ensure that PSTs are prepared to attend to and enact the more robust and mutually constitutive model of classroom

dialogue that aims to first elicit students' understanding and then develop understanding of specific academic concepts. This stands in contrast to the more mechanistic, behaviorist-oriented rote model that first centers academic concepts and then looks for affirmation that students understand. The latter model is one that many PSTs are familiar with from their own apprenticeship of observation (Lortie, 1975) over their years of schooling. There is an undeniable relationship between PSTs' covert beliefs and concepts of teaching and PSTs' overt behaviors, actions, and decisions within the classroom setting (Borko et al., 1987, p. 78). As Lortie (1975) and as many others have acknowledged, teaching is unique in the professions in that novice teachers have abundant experience of the other side of the profession, having been in classrooms in a student role for most of their lives. These experiences, and observations of teachers from this point of view, undoubtedly affect the ingrained patterns and intuitions of PSTs.

Most PSTs' experiences as students were likely in classrooms where IRE/F discourse patterns and expectations of rote responses prevailed. Yet, if a central goal of teaching is to increase students' ability to learn and effectively transfer knowledge, then effective teaching hinges on a teacher's interactive decisions made during dialogue. In particular, the teacher needs the ability to identify and seize opportunities to follow a student's response with a probing question intended to lead the student to deeper understanding. Preparing teachers to exercise in-the-moment judgements and adjustments is crucial for meeting this goal (Hammerness et al., 2005). As Mehan (1979) suggests, "these improvisational strategies, when coupled with the basic turn-allocation procedures, constitute the machinery that structures the organization of lessons" (p. 108). However, articulating competent probing questions that elicit

additional information from students and encourage students to use their own words in the moment-to-moment act of teaching requires a sophisticated balance of planning questions before enactment and improvising. In planning, teachers must anticipate possible student responses and select questions that will likely (hopefully) elicit students' knowledge construction and provide encouragement for students to use their own words. While teaching, teachers must then revise or form new questions and prompts, fluidly and effectively accommodating and responding to elicited and spontaneous student responses.

Wells (1996) also positions teachers as primary drivers of discourse in their classrooms, but notes that most dialogue patterns are delivered unconsciously: "at a level below conscious attention, participants select from their repertoire of routinized behaviors the ones that, in the light of the prevailing conditions, they judge appropriate for the activity or task in hand and deploy them relatively automatically towards the achievement of that end" (p. 76). This assertion provides for a context of understanding how teachers seemingly follow predictive IRE and IRF scripts. As Tsagari et al. (2018) argue, "teachers 'informally' assess their learners in the classroom constantly. This is generally done without any specific criteria in mind and without a focus on particular learners – more or less intuitively" (p. 154). Disruption of these scripts, reversing the operationalization stage back to the level of conscious action, ignites potential for conscious and deep learning within dialogic interactions between student and teacher.

Seemingly spontaneous interactions, turns of conversation, are at the heart of what it means to teach. The power of discourse sequences rest on the teacher's reply to students' elicited responses after she initiates a cycle of dialogue. Identifying and

seizing opportunities to elicit, acknowledge, and deepen students' understandings through dialogue is central to effective FA processes. This dissertation argues that teachers who can identify patterns of talk, who strategically initiate and attend to how particular questions and responses facilitate co-construction of knowledge, effectively promote deeper learning consistently and fluidly throughout the school day. Again: this pedagogical practice is useful for all learners, but particularly for MLs. Given differences in linguistic resources, it benefits MLs when teachers attend to amplify instructional communication in this way (Walqui, 2003; Walqui & van Lier, 2010).

The relationship between language and FA is clear: a teachers' ability to elicit and utilize students' linguistic resources in relation to both how concepts are communicated and how they are understood is critical for enacting effective pedagogical practices that facilitate students' deep learning of content. This relationship is relevant for all learners, but particularly salient for MLs, who navigate multiple languages to learn the language of ideas as well as the ideas themselves (Bunch & Martin, 2021).

Dialogic Interactions Facilitate Deeper Learning

A teacher's task is to simultaneously recognize individual students' present expression of knowledge and provide bridges to new knowledge, moment by moment, day after day. Jackson (1968) describes this kind of attention as rare and daunting: "Teachers, like parents, seldom ponder the significance of the thousands of fleeting events that combine to form the routine of the classroom" (p.3). Jackson emphasizes that micro interactions between teacher and student are informed by a myriad of sociocultural factors and are compounded over time. Individual formative feedback exchanges, "fleeting events," epitomize moments in which learning moves

forward, for both teacher and student. Collectively, "fleeting events" vividly exemplify and are inherent in the act of effective teaching and learning. Teachers facilitate students' understanding through dialogic interactions. If unexamined and compounded, these same interactions can inhibit awareness of teachers' and students' learning and development. Awareness of language and strategic FA teaching moves including practices like wait time and probing questions are necessary for a teacher to assess and scaffold students' understanding, to move learning forward.

FA is inherent to effective teaching (e.g., Hattie, 2009). Informal FA strategies like follow up questioning are influential components of the FA process (Black & Wiliam, 1998; Hattie, 2009, 2012; Hattie & Timperley, 2007; Heritage & Heritage, 2013). This has been studied extensively in mathematics (e.g., Franke et al., 2009; Moyer & Milewicz, 2002) and science classrooms (e.g., Ateh, 2015; Furtak et al., 2018; Thompson et al., 2016) and combinations of math and science (e.g., Robertson et al., 2016; Walkoe & Levin, 2018), mostly in secondary environments. As described in Chapter 1 and repeated here, this dissertation utilizes the revised definition of FA offered by the Formative Assessment for Students and Teachers (FAST) State Collaborative on Assessment and Student Standards (SCASS) (2018):

> Formative assessment is a 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. (p. 2)

This study highlights the phrases "planned, ongoing process" and "elicit and use evidence," amendments to the 2006 definition offered by the same group. FA encompasses many different practices and teaching activities. In this study, I emphasize the role of language in FA practices. As such, the term FA refers to the dialogic practice of actively eliciting information about students' understanding and

then responding to that understanding and includes class discussions, turn-and-talk interactions, and informal small group conversations. Examples of elicitations range from rote to open ended. Teachers elicit through choral responses (e.g., a teacher might say, "What color is the carpet?" gesture to the whole class, who chorally respond, "blue") and verbal repetitions (e.g., a teacher provides a disciplinary term, "isopod," and asks the students to repeat it). On the other end of this range, a teachers encourage students to use their own words ("How did you see the groups of seven crackers?") and work towards helping students make explicit connections to the lesson's academic vocabulary and language structures. Across this range of practices, the FA process is guided by an objective to construct knowledge between teacher and student, facilitated by the teacher in varying degrees and continually informed by students' present, presumed understandings, leading to an ultimate schooling goal of self-directed learning.

Teachers, as arbiters of learning and knowledge, can use responsive questions to deepen students' understanding. Effective teacher questions can simultaneously promote and assess student learning (Cazden, 2001, p. 92). This dissertation centers the use of probing questions and responsive dialogue moves (e.g., wait time and prompts) that work to elicit and extend students' expressed thinking in their own words, yielding deeper learning in individual, small group, and whole class discussions. These competent questions (Moyer & Milewicz, 2002) and provocations can be customized to individual students, combining the teacher's knowledge of individual students' understanding, the curriculum, and of all learners more generally. Competent questions and prompts provoke the elicitation of students' thinking (Moyer & Milewicz, 2002, p. 308), working to uncover students' understanding in

their own words, as opposed to a correct answers or surface-level response (yes/no, fill in the blank). By asking competent questions, teachers provide models from which students might learn to ask such questions of themselves and others, to begin to drive their own learning, to become self-motivated and consciously working towards rewards of deeper learning (e.g., Almeida, 2012; Council of Chief State School Officers, 2018).

Researchers and educational philosophers have long alluded to the idea of FA, as defined above, as a critical component of effective teaching and learning (e.g., Dewey, 1928; Jackson, 1968). Identifying "core" practices and "high-leverage" practices are prevalent in recent literature (Ball & Forzani, 2009; Grossman, 2018; McDonald et al., 2013; TeachingWorks, 2018) but often contested (e.g., Forzani, 2014) as to their emphasis on pinning down the complex practice of teaching to a set of items to be checked. Regardless of the argument, researchers seem to agree that eliciting and responding to students' thinking via strategic, competent questioning is central to teaching and learning and driven by both theory and action (e.g., Thompson et al., 2016; Weiland et al., 2014). Singer-Gabella et al. (2016) refer to these processes of FA, which they term "leveraging student thinking," as "a constellation of practices," a set of individually distinguishable but mutually constitutive actions that comprise ambitious teaching (Lampert et al., 2011).

A growing body of research suggests that teachers' responses after eliciting students' ideas (Ball, 1993) can help students develop content knowledge and proficiency in mathematics and science practices in the classroom (Hammer, et al., 2012; Pierson, 2008; Robertson, et al., 2016). Ambitious teaching practices that focus on discourse can move student learning forward (e.g., Furtak et al., 2015). Effective

teachers draw on pedagogical content knowledge (Shulman, 1987) and developmental knowledge to anticipate students' reactions and develop lesson plans that accommodate these anticipations; but they also actively read and respond to students' learning as a lesson moves forward, in-the-moment.

Ambitious practitioners purposely (and formatively) assess what students know and how students understand academic concepts. They weave together planned questions, tasks, and spontaneous elicitations with knowledge of pedagogical content trajectories. While teaching, they making decisions about what to ask, how long to wait, and what materials might be useful to support students' engagement with short- and long-term learning goals (Bransford et al., 2005). The questions a teacher asks can either facilitate co-construction of learning or promote rote, shallow ways of thinking: low-order questions that lead to a particular answer give students little opportunity to think for themselves and tend to result in surface-level comprehension (Moyer & Milewicz, 2002). However, high-level questions and prompts, those that elicit thinking and invite students to construct meaning with the questioner, have the potential to guide students towards deeper comprehension and understanding (van Zee & Minstrel, 1997).

Questioning is, by far, the most frequently used instructional tool (Wassermann, 1991). Multi-leveled, iterative, dynamic attention to the crafting of questions in response to students, in-the-moment, is characteristic of teachers characterized as 'expert' (e.g., Feiman-Nemser, 2001; Mehan, 1979; Yinger, 1987; etc.). Expert teachers make consistent use of extended turn-taking structures (Cazden, 2001; Greeno, 2015; Mehan, 1979) through initiating dialogue with competent prompts and probing questions that encourage students to use their own words to

express their understanding. These interactions last more than four turns and volley back and forth between responses and feedback, improving student understanding (Borko & Livingston, 1989; Coffey et al., 2011; Franke, et al. 2009; Nassaji & Wells, 2000).

IRE/F questioning patterns often dominate in ML environments (Daniel, 2014), for teachers of all levels of experience. More effective teachers in ML-dense classrooms use questioning strategies to clarify, recast, revoice with translation or grammar correction, or paraphrase ML responses (e.g., Gibbons, 2003; Saeb et al., 2016; Walqui & Heritage, 2018). Novice teachers, however, more frequently exhibit questioning strategies that make use of simpler IRE/F (Mehan, 1979) formats, asking questions that seek a specific response (known answer), require a yes/no, or provide a hint (instruct, rather than assess), rather than competent sequences of follow-up questions that elicit understanding of students' thoughts for the teacher and understanding of content for the student (Borko & Livingston, 1989; Levin, et. al., 2009; Moyer & Milewicz, 2002; Ralph, 1999).

In addition to competent questioning, well-timed feedback is consistently shown to be one of the strongest influences on student learning (Hattie, 2009; Hattie & Zierer, 2018), especially for MLs (Walqui & Heritage, 2018). Several studies have found that as teachers become more experienced, they improvise more (Berliner & Tikunoff, 1976; Borko & Livingston, 1989; Moore, 1993; Yinger, 1987), one effect of this being that they are able to respond and provide feedback to students more quickly. However, though powerful, the variability of feedback's effect on student learning is also strong. Feedback might be immensely helpful or harmful, depending on context (e.g., Shepard et al., 2018). Ruiz-Primo and Li (2013) are among a

growing set of researchers concerned with why and how the influence of feedback swings so dramatically, recommending observational and case studies to examine how formative feedback interactions differ, for example in ML-dense classrooms or in specific subject areas. Román and colleagues (2019) completed such a case study involving two elementary science teachers in ML-dense classrooms. They found that when teachers' explanations included attention to both form and content as well as more frequent opportunities for students to participate in the feedback interactions, the quality of ML students' responses seemed more sophisticated (p. 11).

Consistently facilitating the dialogic processes inherent to FA is a challenge for many teachers, regardless of years' experience (Hall & Burke, 2003; Ralph, 1999; Torrance & Pryor, 2001; Webb & Jones, 2009), but particularly so for PSTs (Buck et al., 2010; Weiland et al., 2014). Buck et al. (2010) found that elementary PSTs demonstrated an inability to probe for students' prior knowledge in science. However, Weiland et al. (2014) found that though PSTs often missed opportunities to probe elementary students' math and science thinking in one-on-one formative assessment interviews, when primed by a researcher, PSTs showed modest improvement in their ability to ask competent questions over the course of ten interviews. Kang & Anderson (2015) found that, given supportive conditions, some PST participants teaching science were able to interpret and respond to students' thinking more effectively. Such findings suggest that it is possible for PSTs to develop competent and responsive questioning skills, if given the opportunity to improve their interactive decision-making fluency and to directly connect their decision making to FA as a process. These studies shine light on the possibilities of learning FA utilizing programmatic structural opportunities inside of teacher education programs,

emphasizing practice and reflection on FA dialogue patterns in simulated and field experiences.

Effective FA requires dual engagement between teacher and student, such that the resulting dialogic interaction offers data and information for both teacher and learner to adjust their responses (AERA/APA/NCME, 2014; Linquanti, 2014; Wiliam & Thompson, 2008). While the literature offers substantial evidence to support the use of dialogic FA, particularly in ML-dense classrooms, there is a lack of evidence to guide TEs' feedback to PSTs and teacher education program curricular structures, so that there are clear steps to help PSTs more quickly transition from asking planned, stock questions to pursuing and eliciting students' thinking through follow-up, probing questions (Franke et al., 2009; Moyer & Milewicz, 2002). Though some research and generalized assumptions suggest that PSTs are not capable of engaging in advanced practices (Bennett, 2011; Kagen, 1992; Shavelson, 2008), much of the work in the past two decades indicates the opposite: PSTs are capable of developing the skills and practices to necessary to foreground and develop student thinking (e.g., Levin et al., 2009; Weiland et al., 2014), particularly the ability to cope with and lean into uncertainty.

The skill of using responsive questioning and feedback/prompting strategies to elicit knowledge and understanding of students' conceptualization is an essential component of an effective teaching practice (Black & Wiliam, 1998; Hattie & Timperley, 2007; Hattie, 2009, 2012) in all classrooms, regardless of the linguistic or cultural background of students. For MLs, the relevance and importance of knowledge-constructing teaching strategies are heightened, given the dual challenge of learning content and learning the content language (Abedi, 2010; Bunch et al.,

2009). Teachers prepared today will continue to see significant numbers of MLs in their classrooms and will need to effectively engage with increasingly diverse students and families, with greater variation of home and schooling experiences. Teacher educator programs are in a position to support the growing number of MLs more effectively in classrooms through developing PSTs' FA practices. TEs can utilize Bunch's (2013) concept of pedagogical language knowledge (see also Galguera, 2009). For, example, coursework and mentoring conversations should offer PSTs more explicit attention on how to leverage formative feedback in dialogic interactions to bridge students' own words and understanding with academic language, in the here-and-now of everyday "teachable" moments. Conceptualizing pedagogical language knowledge as a necessary companion to pedagogical content knowledge within teacher education programs is essential in understanding how scholars theorize the relationship between every day and academic language and ultimately how teachers (and PSTs) facilitate students' development of academic language and concepts through dialogic FA moves that elicit, recognize, and utilize students' own words and understandings.

Interactive Decision Making and Formative Assessment

As teaching is considered an improvised performance (Borko & Livingston, 1989, Sawyer 2004), Floden & Buchmann (1993), make the argument that teachers must be prepared for uncertainty. Teachers make many decisions in the course of their daily practice. Achieving moments of "withitness" (Kounin, 1970), of being able to consistently and effectively respond to and anticipate the ways students develop understanding of concepts, to seamlessly adjust the classroom environment or pose a question to elicit students' participation and promote learning, is a significant

milestone in the career of the effective teacher.

Jackson's (1968) description of interactive decision making emphasizes this sense of productive, anxious movement from anticipation to action, and leaves room for wondering whether interactive teaching and decision making is fully "uncertain," when unpacked. Interactive decision making is built on a complex set of factors, including what happens before a lesson (pre-active teaching, planning, etc.) as well as knowledge of individual students built up over a school year and of curricular content over the years. As teachers become more experienced, patterns of responses and lived trajectories add to teachers' developing schema. Even when the unexpected happens, the experienced teacher effortlessly (at least to the outside observer), maintains momentum throughout the lesson.

The practice of teaching is typically divided into three parts: planning, teaching, and reflecting. Jackson (1968) was an early user of the term "interactive" to refer to the part of teaching that is performative, conducted in-the-moment with students who actively respond and participate. This component of teaching is the most unpredictable and least controllable by the teacher as it relies on dialogic interactions between students and the teacher. Jackson deploys a sense of wide-eyed wonder and anxiety about interactive teaching:

> There is something special, in a cognitive sense, about interactive teaching, about what goes on when a teacher is standing before his students. At such times the spontaneity and immediacy and irrationality of the teacher's behavior seem to be its most salient characteristics. At such times there appears to be a high degree of uncertainty, unpredictability, and even confusion about the events in the classroom. (p. 152)

Since Jackson's description of this highly influential, improvisational, and incalculable part of teaching, many scholars have worked to uncover and describe teachers' thinking patterns in the midst of moment-to-moment decisions (e.g., Clark

& Yinger, 1979; Housner & Griffey, 1985; Joyce, 1978). Researchers seem to agree that interactive teaching, while never fully certain nor full predictable, when set in relation to pre-active practices (e.g., planning, general experience) and post-active experiences (e.g., reflection), generalizable structures and patterns appear in the ways teachers make and enact in-the-moment decisions. For example, in the dialogue patterns described above (Greeno, 2015; Mehan, 1979).

Considering 'decision making' in this view, teachers constantly make choices and adjustments to their words, materials, and reactions. "In fact any teaching act is the result of a decision—sometimes conscious but more often not—that the teacher makes after the complex cognitive processing of available information" (Shavelson, 1973, p. 144). Shavelson attends to the concern highlighted above by Wells (1996): decisions to enact specific discourse patterns are often unconscious, somewhat visceral. Experienced teachers, due to schema built up over years of enacting lessons and interacting with students, fluidly, though not always deliberately, make effective in-the-moment decisions: even when surprised by a student's confusion or a missing stapler, they are able to adjust effectively. These teachers, through strategic questions and comments that build on student's specific responses, sustain movement toward a lesson's learning goals, even as unfolding actions constrain and alter the planned path of learning.

In this sense, students' responses–students' own words–drive the lesson. Teachers work to respond to what students communicate and how students communicate understanding of concepts to the activities and content the teacher planned and is presenting. Lesson plan objectives and years-end learning goals are malleable blueprints, when put into dynamic interaction with students. "Once a

teacher's attention is on her students' learning, she is free to respond to it rather than being chained to a lesson plan that may or may not fit the learning" (Rodgers, 2002, p. 233-4). By consciously and actively integrating new information presented by students' reactions and responses, the effective teacher is able to seamlessly utilize this information to make productive decisions regarding the lesson's trajectory.

In general, theories of interactive decision making can be considered as theories of FA. FA involves a "systematic process to continuously gather evidence and provide feedback about learning while instruction is underway" (Heritage et al., 2009). Further, a goal of the FA process is to make students' thinking visible to themselves and to the teacher, enabling students to evaluate their understanding and teachers to evaluate and execute instructional moves to achieve learning goals (Ruiz-Primo et al., 2010). This interactive decision-making process is consistently described, in various related terms, as a central component of effective instruction (e.g., Black & Wiliam, 1998; Feiman-Nemser, 2003; Lampert, 2010; Sadler, 1998). Research over the last twenty years has done much to isolate, describe, and explore the teaching of individual components of this constellation of practices that comprise interactive decision making, namely: noticing, interpreting, responding, and reflecting. Much of this work is done with in-service teachers (e.g., Franke et al., 2009; van Es & Sherin, 2002) and some with PSTs (e.g., Thompson et al., 2016; Walkoe & Levin, 2018), providing a foundational knowledge for how teacher learning develops over time in each component.

The final section of this chapter reviews specific research that indicates PSTs can develop strategies to cope with and lean into the uncertainty of interactive teaching. Further, they can begin to learn to not only read and make sense of

classroom actions but also to effectively, if not consistently, elicit and respond to student interactions as they unfold, with the goal of co-creating knowledge with students in one on one, small group, and whole group configurations. Using the overarching concept of interactive decision making, TEs might first isolate and then help PSTs combine components of this sophisticated, complex process, weaving together the role of language with the constructs of eliciting, noticing, interpreting, evaluating next steps, responding, and reflecting. As discussed in this section, there are significant overlaps in the relevance of dialogic strategies and conscious, interactive teaching in classrooms. These constructs and their relationship to FA are critical to preparing PSTs to support all learners, but especially MLs in elementary classrooms. MLs benefit from increased opportunities to use language as well as explicit attention to features of language necessary to understand and communicate in specific disciplines (e.g. Alvarez et al., 2014; Furtak et al., 2015; Gibbons, 2014; Ruiz-Primo, 2011). Before sharing studies that illustrate how isolated FA components can be learned, the next two sections focus on specific literature that describes PST learning processes and structures that enhance PST learning.

Novice Teacher (PST) Learning

As discussed in Chapter 1, learning is a complex process in which inter- and intra-actions are embedded within social, cultural, and historical contexts, constantly informing and shaping the ways in which students learn (Vygotsky, 1978), whether those are students in an elementary school classroom or a teacher preparation program. Learning to effectively enact interactive decision-making as a teacher in a school environment necessitates conscious and strategic decisions with astute awareness of these contexts: attending to the routines and patterns that develop within

a specific cohort of students within a specific community within a particular time. Learning is not always intentional, on the part of the teacher or the student.

Ellsworth (1997) argues that PSTs are both learners and teachers, and the novice's unconscious beliefs and attitudes are reachable and malleable through conscious application of a 'third ear.' The triad of influences on learning to be a teacher, according to Ellsworth, center within the PST himself: the student teacher as learner, the student teacher as a novice teacher, and the student teacher's memory of being a student (Lortie, 1975). Ellsworth's constructive view of learning sees the PST as continually navigating familiar situations from an unfamiliar position. This perspective is helpful in considering differences between an elementary school student and a PST as a learner. Early in a teacher education program, a PST begins to recognize patterns of learning trajectories and interactions between a teacher and their students, from the vantage point of a teacher. She experiences school anew, widens her purview. Through critical contemplation and iterative consideration of each teaching moment and its contextual factors, the student teacher is enlightened by a broadened awareness of the limitations of previously held (conscious or unconscious) expectations of learning and teaching from the teacher's point of view, negating the effects of ignorance brought forth from entrenched memories of school as a student. Indeed, self-reflection assignments and post-lesson reflections with supervisors are the norm in most teacher education programs.

Ellsworth brings attention to the necessity of a teacher's ability to bring themselves into a kind of out-of-body experience, calling forth explicit awareness of both of their own thoughts and actions and the thoughts and actions of those they hope to teach. She, like Téllez (2016), who refers to this action as 'theory of mind' (p.

39), likens this skill of cultivating a third ear to that of an instinct inherent to effective teaching practices. TEs are positioned to encourage and foster a PST's innate ability to think vicariously, to recognize, elicit, and appreciate the perspectives of others, to help the PST learn how to teach effectively.

While PSTs arguably should learn to actively attend to this internal teaching instinct, PSTs must also learn the language of teaching, which includes a repertoire of FA moves like eliciting questions and prompts, noticing, interpreting, and responsive reactions that drive students' learning forward. This dissertation argues from a sociocultural view of learning: PSTs learn the language of teaching through the dialogic nature of the active practice of mentored teaching and through observation of and interaction with more competent others–TEs (e.g., Graham, 2005; Kaden & Patterson, 2014; Walkoe & Levin, 2018). Yinger's (1987) examination of longitudinal case studies recognized compelling patterns in language used by novice and experienced teachers. Embedded in the everyday interactions between teachers and students, Yinger found a distinct language of practice, based on grammars and structures unconsciously and repetitively utilized by teachers, patterns of language used in the particular circumstances of teaching. Learning the language of practice requires interaction between novices and experienced practitioners, and is essential for quality teaching (Yinger, 1987, p. 313).

Shulman (1987) argued that in addition to language, there are identifiable patterns of skills that make up effective teaching practices, requiring deep comprehension and active reasoning, transformation, and reflection. This knowledge base, referred to as pedagogical content knowledge, includes but extends beyond language patterns, centering conceptual development and lies at the intersection of

content and pedagogy. A nascent pedagogical knowledge base makes it challenging for novices to effectively and efficiently notice and capitalize on opportunities to co-construct knowledge with students via questioning and strategic dialogue (Reynolds, 1992; van Es & Sherin, 2002).

Grossman and McDonald's (2008) argument for "an expanded view of teaching that focuses on teaching as a practice that encompasses cognition, craft, and affect" (p. 185) is a useful construct for conceptualizing a process for how a PST develops a strong pedagogical content knowledge base and learns how to teach. This practice, as imagined by Grossman and McDonald, inherently requires ongoing reflection on what is planned for a lesson, what actually happens, and what might be expected to happen in the next lesson. Van Es and colleagues (2017) refer to these as mini cycles of studying practice, noting that these structures are useful to think about how teachers get better at getting better. Bransford et al. (2000) recommend that teachers (here TEs are subsumed into the label) use a four-pronged systems approach to align and enhance learning environments: value students' (and PSTs') knowledge, provide curriculum that provides opportunities to make connections, and use assessments to make learning visible, all within a learning community that follows norms that encourage understanding and working through mistakes.

Relationships with TEs are essential to PSTs' development of effective teaching practices. These relationships rely on the interaction between external connections of 'others' (TEs, students in the field placement) to the internal identities of PSTs as individuals, as 'identity' relates to the various facets of each individual's lived world: self, classroom, family, school, learning community, etc. (Greeno, et al., 1996; Vygotsky, 1978). Ralph's (1999) study of oral-questioning skills of novice

teachers indicated that supervisors' strategic approaches to scaffolded feedback and modeled practices led to growth of novice teachers' questioning skills; yet his work did not clearly identify how different supervisors evaluated and defined novices' skills and levels of oral questioning nor how each novice's conceptual understanding developed with supervisor guidance.

The existence of developing and shifting PST/TE relationships (including PST/CT; PST/Supervisor; and PST/professor) and their influence on learning are fundamental to the conceptual framework that propel this investigation. Teaching and learning to teach are situated in social and historical constructs that develop fluidly and iteratively over time, within and between communities of practice. Learning to teach is improved when communities of practitioners at various skill levels come together to learn with and from one another, practice iterative reflection together, and draw on one another as resources for inquiry and challenge, affirmation and critique (Cochran-Smith & Demers, 2010, p. 36). Neither the university supervisor, nor the CT, nor the PST herself is fully responsible for the work of learning to be a teacher.

Floden and Buchman (1993) suggest that teachers-as-learners take on an inquiry stance by embracing uncertainty, acknowledging and fostering the presence of unpredictability, while simultaneously encouraging the familiarity of structures and routines. Learning to teach, and the practice of teaching itself, requires planning and responding, as well as constant and ongoing conscious attention to maintaining this balance (Floden & Buchman, 1993, p. 379). The authors argue that TEs must prepare PSTs to take a deliberate inquiry stance when it comes to uncertainty, to enable novices to consciously practice adapting to changing structures within the classroom ecosystem. While patterns and routines are useful, a fluid and flexible orientation to

patterns and routines is essential to foster a flexible stance towards uncertainty, enabling learning and practicing teachers to more effectively utilize the momentum of uncertainty to respond to students in-the-moment, to actively construct knowledge with, rather than for, each unique student and class. This necessitates the construction of eliciting statements or probing questions in-the-moment of teaching, responding to both student reactions and the words used by students to express their thinking. Learning how to capitalize on micro moments in this way requires a combination of explicit modeling from experienced teachers, enacted practice by PSTs, and consistent, strategic, collaborative reflections on these models and enactments (Feiman-Nemser, 2001).

Effective FA, that which entails effective questioning skills, cannot be fully learned from a textbook or through observation of an expert teacher. Moyer and Milewicz (2002), referring specifically to mathematics classrooms, note that this process "requires shifting the practices and beliefs of the individuals engaged in those interactions … although seemingly a basic activity that requires little expertise, effective questioning in mathematics actually requires well-developed oral-questioning skills" (p. 295-6). Their study worked to identify categories of questions that novices ask in one on one interviews with children at the beginning of a teacher education program, in order to provide a common language by which TEs can help novices identify and then shift the kinds of questions they ask, moving from questions in the IRE/F format to questions that elicit student's co-construction of knowledge.

The trajectory from novice to experienced formative assessor is, like teaching, much more complex than binary labels imply. Novices become more effective teachers by developing pedagogical content knowledge (Shulman, 1987) and

developing skills of orchestrating (planning and enacting) learning activities that help students learn the subject (Bransford et al., 2000) and reflecting upon these enactments. Knowledge of pedagogy happens over time, with trial and error, via discourse with colleagues and ongoing reflection (Cochran-Smith & Demers, 2010). Learning to formatively assess in-the-moment, to identify and respond to student thinking as it is happening, requires PSTs to possess more than content knowledge and pedagogical knowledge. Learning to teach in this way requires direct modeling and instruction from TEs. A TE, "although a subject-matter expert, still must be able to see the subject as novices do" (Bruer, 2000, p. 282). While Bruer here refers to teachers and elementary or secondary students, I apply the paradigm to TE-PST interactions. TEs perform the role of subject-matter experts, working to provide feedback and structure field experiences that are neither too challenging nor too simple. In other words, TEs identify the parameters of and work within each PST's zone of proximal development.

Pedagogical Structures for PSTs

Teacher education programs typically consist of course work, simulations (approximations, modeling, role-play), and field work. Learning to teach is most effective in situations where there is a strategic combination of each of these elements (e.g., Bransford et al., 2000; Bransford et al., 2005). The PSTs chosen to participate in this dissertation study were from a teacher education program that gradually releases responsibility to PSTs with increased field practice and decreased coursework over a year-long program. Many studies (mostly with small sample sizes, in particular programs) illustrate how these specific structures support and enhance PST learning. Additional effective structures include reflection journals, pre- and post-lesson

conferences with CTs and supervisors, video models, and micro-teaching. As this dissertation's methodology centers videos of students' own teaching, captured live and through video recordings for the purposes of a state-mandated Teaching Performance Assessment (TPA, see footnote on page 6), below are descriptions of the use of videos in TPA assessments and PST learning. A less explored structure, teacher learning progressions, is also discussed, as it shows promise in supporting PST's learning and development of FA.

VSR interviews are often described as pedagogical interventions, as semi-structured and structured mentoring or coaching sessions. The use of VSR as a learning activity assumes that when novices can recognize and identify how particular questions and dialogic moves facilitate discussion, "they might be able to transfer this understanding to their in-the-moment decision making in the context of their own instruction. Such videos ultimately serve to broaden teachers' vista of the possible" (Bien et al., 2018, p. 144). This dissertation's choice of methodology/intervention capitalizes on the possibilities of VSR as a framework for PST learning and as a research methodology and method of data collection.

In addition to required course and field work, the PSTs in this study must also complete and pass an assessment of their teaching performance in order to become credentialed in their state (California statute Ch. 517, Stats 2006). The CalTPA, used by the multiple subject candidates in this study, consists of two cycles conducted over one year. Within the context of their field teaching placement, candidates provide evidence of enacting four components of an instructional cycle, including planning, teaching and assessing, reflecting, and applying (California Educator Credentialing Assessments, 2019). These assessments are not designed or evaluated by the teacher

education program. Teacher education programs, including the one in this study, use the state's requirement as reference to design field and class assignments so that PSTs can meet the requirements of the program and document their teaching practice to submit as part of their portfolio for the CalTPA.

Many teaching performance assessments like the CalTPA have the potential to be utilized as formative assessment tools in teacher education programs to support PSTs' development and improve teacher preparation programs (e.g., Bunch et al., 2009). Bunch et al. (2009) argue that teacher performance assessments should be considered as dually purposed, more than just a tool for evaluation. TEs should look beyond scores and towards identifying and providing contexts for these tools to be a resource and structure for PST self-reflection activities, particularly in learning to teach MLs.

For TEs, learning progression models that clearly specify distinct levels of practice are useful to develop and provide scaffolded and targeted feedback to novices who exhibit skills beyond a complete neophyte yet less than an adaptive expert (e.g., Bunch et al., 2009, 2015; Darling-Hammond & Oakes, 2019). These models emphasize the intricate and complex nature of the pathways PSTs follow as they learn how to teach. Teacher learning progression models are part of a larger discussion on how TEs might more effectively provide feedback and experiences to enhance and improve PST learning (Duckor & Holmberg, 2019, p. 863). As an established, essential skill of teaching, a more robust, comprehensive framework of FA teaching learning progressions is needed in teacher education programs. From these models, TEs might more effectively provide formative feedback to enhance the FA practices of teachers early in their careers. Duckor and Holmberg (2019) offer

such learning progressions for three FA actions: pausing, probing, and posing. This dissertation study uses the learning progression for probing. Duckor and Holmberg (2019) are careful to position their constructs as dynamic and interactive, changing as they are developed by PSTs, continually informed by sociocultural factors. The constructs are not meant to be interpreted as static or isolated in a cognitive dimension.

Duckor and Homberg's (2019) construct maps seek to "better understand one of the most powerful evidence-based teaching and learning practices — how teachers make FA moves in their classrooms — in part, by measuring them better" (p. 864). The authors define five levels of enactment/understanding for three separate FA moves, or actions, from prestructural to differentiated (adaptive). The defined moves of pausing (wait time), posing (asking a question), and probing (questions that elicit knowledge connected to but beyond a posed question) are well reviewed in the literature as effective teaching strategies. As described, these constructs emphasize the gerund use of each verb: the active, ongoing, and dynamic nature of each move within an individual's conception and enactment of each FA practice.

However, agreement on degrees or levels of increasingly sophisticated enactment and understanding continue to be a challenge for TEs and researchers. The second and third levels of Duckor and Holmberg's (2019) construct maps, 'emergent' and 'intentional,' are starting points for understanding how PSTs might conceptualize and enact FA in their earliest months of a field placement. The full construct map is located in Appendix A; here I briefly describe the definitions of each of these two nascent levels as they relate to the strategy of eliciting and uncovering student thinking via questions, or 'probing.'

Emergent formative assessors focus on general probes, like "why" or "tell me more," often enacting the strategy in one particular part of a lesson (often, the 'hook,' or beginning), and in small-group or one-on-one configurations. Probing interactions are directed towards capturing students' ability to meet the teacher's learning goal, and often end after one or two turns of IRE/F or IRQE/F. Intentional Formative Assessors, one level above, are described as "individuals whose responses to tasks/items reveal they intentionally probe 'correct answers' and … demonstrate probing to uncover misconceptions and to check for understanding of academic language" (Duckor & Holmberg, 2019, p. 850). Intentional Formative Assessors employ strategies to keep the momentum of a lesson but might not consistently seize opportunities to extend talk sequences.

While these definitions and Duckor and Holmberg's (2019) probing construct map are useful for framing an understanding of how the probing move is developed, the tools were created primarily using data from middle school English Language Arts classrooms and did not directly attend to the needs of MLs. Further, the levels do not adequately address the distinction and relationship between a teacher's planned and enacted moves, nor a teacher's ability to recognize probing when it is occurring, when it occurred, or missed opportunities for probing.

Teacher Learning: Components of the FA Process

While most university teacher education programs structurally attend to FA via required coursework and stated objectives of the program, typically through readings and possibly through noticing activities (e.g., Sun & van Es, 2015; Walkoe & Levin, 2018), research does not clearly address whether or how PSTs conceptualize or enact FA as full processes (including eliciting, noticing, interpreting, responding,

and reflecting) in their earliest stages of teacher development. In this section, research is described that shows that PSTs can more effectively develop these skills, at least in isolation, given direct attention, modeling, and feedback from TEs. Hiebert et al. (2007) argue that "the core of teaching—interacting with students about the content—is not learned well through automatizing routines or even through acquiring expert strategies during a teacher preparation program. Rather, it is learned through continual and systematic analysis of teaching" (p. 49). PSTs can be taught to learn from teaching (p. 50) while under the mentorship and supervision in a teacher education program. As the studies described show, PSTs do not have to sink in order to swim when it comes to learning how to lean into students' unanticipated responses, to effectively use competent questioning to engage in a full cycle of formative assessment, from noticing to reflecting.

Noticing

Walkoe & Levin (2018) note that most research on the components of FA has been on the development of teachers' capacity to notice student thinking. They recommend expanding this framework, to include all the good work on noticing, but to also investigate how more experienced (and effective) teachers respond to student thinking. Research should consider if and how teachers elicit students' thinking, "in the sense of probing students' ideas in moment-to-moment interactions with the intent of uncovering students' thinking" (Walkoe & Levin, 2018, p. 128). For example, Weiland et al.'s (2014) case study of two teachers described how PSTs were able to develop "competent" questioning over 10-week periods through iterations of written FA interview reflection forms and recorded interactions with elementary math and science students in one-on-one configurations.

In a study of mathematics' teachers learning to notice student thinking through participation in video clubs, van Es and Sherin (2008) argued that learning to notice requires three things. Teachers must be able to identify what is relevant in-the-moment of a lesson; they should be able to successfully interpret and reason the meaning of what is noticed; and teachers should be able to express a working connection to larger learning principles and theory. Jacobs et al. (2010) found that novices were not able to easily create substantive responses based on students' expressed thinking, despite being able to notice (that is, attend to and interpret) student thinking. Without a sound understanding of how learning theory connected to what novices noticed in student work, novices' in-the-moment responses to students were not able to substantiate their stated observations with relevant evidence.

Interpreting and Responding

In a study of early elementary teachers in their first or second year of teaching, Singer-Gabella and colleagues (2016) found that despite being able to notice and interpret student thinking, the teachers struggled to respond to students' thinking in a way that reflected their stated beliefs about co-constructed learning. The teachers expressed a helpless awareness of this dissonance, not trusting themselves to move beyond their lesson plans and adjust their teaching to students in-the-moment. Walkoe and Levin (2008) suggested that novice teachers, specifically PSTs, could be primed to interpret meaning through explicit modeling of noticing and interpreting prior to simulated practice. The primed PSTs asked more effective follow questions than those without this explicit priming by researchers, reflecting their ability to both notice and interpret student thinking, in order to respond to it more effectively.

In their study of PSTs conducting one on one FA interviews with elementary

students, Moyer and Milewicz (2002) found that many, though not all, of their participating PSTs were able to use follow up questions, either the ones listed in a provided protocol or those they were encouraged to create on their own in response to the student in-the-moment. The one-on-one configuration is noteworthy: novice teachers are arguably able to more effectively take up practices in smaller configurations (e.g., Duckor & Holmberg, 2019; Weiland et al, 2014).

Reflecting

Sherin et al. (2011), in a study using portable cameras attached to a teacher, found that in-the-moment of teaching, teachers were able to identify interesting moments of instruction by pressing a button that captured the thirty seconds before and after they identified a moment as significant. Each moment captured signaled that the teacher had reflected and determined the prior seconds of teaching as noteworthy. The authors argued that the experienced teachers were acutely aware of each phase of the decision-making process: noticing, interpreting, responding, and reflecting, as indicated by the clips they selected in-the-moment and their recall of those moments in subsequent interviews. The in-service teachers, primed by their use of the video technology, described these iterative cycles of FA (an average of 18 per class period for each of eight focal participants) as mini cycles of testing and responding to their hypotheses about how the lesson was progressing in light of their planned expectations. Teachers chose to capture moments that were either surprising (deviating from the plan) or exemplary (aligning with the plan).

Centering core ambitious teaching practices has also been shown to support PSTs' development of critically reflective practices that then inform future planning and enactment cycles. Kang and Zinger (2019) traced the development of three PSTs

from the beginning of their preparation into their second year of teaching. They found that the implementation of four core practices ambitious science teaching (including planning, eliciting students' responses, supporting shifts in students' thinking, and probing for students' use of evidence) contributed to the PSTs' ability to attend to equitable practices. However, they cautioned that approximations of the core practices alone were not sufficient to help PSTs learn how to create inclusive learning environments. "The way in which core practices are presented to and experienced by novice teachers mediates whether and how they develop the capacity for equitable teaching" (p. 848). While the study focused on developing PSTs for equitable teaching, the components of the core practices implemented (which include eliciting and probing aspects of dialogic FA) illustrate how using and reflecting on the set of practices, over time, influences PST learning. However, this study did not attend to additional structures that likely informed the PSTs' learning, including their relationships with TEs, program assignments, and other contextual factors.

Many researchers have drawn substantive connections among some of the components of FA (eliciting, noticing, interpreting, responding, reflecting), with noticing as a constant prerequisite for all subsequent constructs, driven by discourse, encouraging evidence-based interactive decisions in responses to students (Jacobs et al., 2010; van Es, 2011). Yet, there remains a lack of data to support a robust understanding of the ways in which teachers, especially PSTs, learn the interactive process as a whole. There is much to learn about how PSTs learn to respond to students with competent questioning to what the PST notices and interprets in the midst of teaching. This dissertation study set out to explore how PSTs learn FA as a constellation of skills, as a set of practices that encompass a fluid and complex

process. As very little is known about how PSTs learn to ask competent questions in relation to MLs, this study aimed to capture PSTs' development in relation to this growing and diverse student population.

In reviewing the literature on the connection between FA and dialogic patterns and interactive teaching, I have argued that further exploration of how PSTs learn and develop the practice of FA, particularly in elementary, ML-dense classrooms, is a worthwhile endeavor. TEs must work to better understand the early development of this phenomenon. I contend that it is possible to more quickly and more effectively help PSTs to fluidly enact in-the-moment FA processes, through clear feedback given by TEs, aligned with well-defined developmental trajectories. Teacher education researchers and TEs know that PSTs at the beginning of their teacher education programs tend to ask stock questions and that experienced teachers can "read" students and create questions and prompts in-the-moment to help students engage in the process of co-constructing knowledge. However, our understanding of the early development of this complex and sophisticated skill is limited.

Recent work has contributed much to the field's understanding of how an initial component of the FA process, noticing, is learned and developed. We also know much about how and why experienced teachers make decisions, adjust instruction, and ask questions in-the-moment to enhance student learning. The field needs to understand how to teach PSTs to more quickly and effectively become proficient in this set of skills. TEs need guidance on how to teach PSTs to become proficient at enacting in-the-moment FA strategies before they enter a classroom as the teacher of record.

Knowledge and understanding of learning and developing the components

that reside in the earliest (eliciting) and final (responding) stages of the FA process, those subsequent to noticing and interpreting, as well as how PSTs learn to enact the FA process as a set of practices to elicit and uncover student thinking and in relation to language demands, is a significant gap in the literature. Alvarez et. al (2014) offer a useful analogy of the function of FA in relation to ML learners, relating FA to a mirror: "reflecting to the student important information about his or her learning even as, at the same time, it reflects to the teacher important information about his or her instruction" (p. 4). FA is a powerful tool for learning, for both the student and the teacher. The field needs more research like this dissertation that explores PST processes of learning to strategically enact FA strategies with elementary MLs, moving beyond revoicing or paraphrasing (Bunch et al. 2009) and helping PSTs recognize that ML students may understand content but lack the language to express this understanding (Abedi, 2010).

Chapter 3: Research Design

This study explores how PSTs learn to utilize probing questions to uncover and elicit ML's students' thinking in elementary classrooms. The qualitative approach to the design and analysis is appropriate as the central purpose is to describe a continuum of how PSTs incrementally learn and develop these practices. Comparative case study in this context is a useful method, offering the opportunity to examine "evidence of uniqueness and commonality" (Stake, 1995, pp. 3-4) as well as individual reflections on experiences (Cohen et al., 2007). This chapter contains an overview of the study design; a review of the research questions; a description of the context, participants, data, and data collection procedures; attention to my positionality; and the assumptions and limitations of the design.

Setting and Context

All 17 participants were multiple subject PSTs attending a one year, quarter-based Master's/Credentialing program at a large university on the coast of California. At the time of the study, the PSTs had completed 10 observation hours in an initial placement and accumulated approximately 16 hours/week of classroom time for each of 14 weeks in a beginning student teaching placement. The PSTs also completed initial coursework in a summer bridge program as well as coursework in the Fall Quarter. The program required PSTs to attend an ungraded assessment workshop (co-conducted by a university faculty member and myself) in the first quarter of the program. The VSR interviews and lesson plan, enactment video, and reflection assignment were completed towards the end of the second of three field placements. TEs in the program encouraged PSTs to use video-recorded lessons for multiple purposes, including required observations for university supervisors, course

assignments, and as part of their submission for Cycle 2 of the state's TPA.

With the assistance of the teacher education program director, I identified eight PSTs student teaching in winter quarter field placements with greater than 40% MLs in the classroom. Of these eight, five PSTs accepted my recruitment invitation and agreed to participate in VSR-interviews. Demographic, placement, and lesson contextual information of the five PSTs participating in the VSR is described in the next section of this chapter.

Because this study frames learning as a process that happens over time, within a community of practice and through dialogic interaction, the university's Education Department professors, university supervisors, CTs, cohort peers, and field placement student populations are also considered as part of the research context. Each of these actors influence PSTs' conceptualizations and processes in-the-moments of teaching. For this study, they influence the PSTs' understanding of FA as well as if and how PSTs assess students' understanding in the form of a probing question or prompt in-the-moment of teaching.

In the study, there are three groups of participants, two nested inside the larger group. The larger group consists of 17 PSTs enrolled in a Master's/Credentialing program in a large university on the coast of California. This group is referred to as the Entire Cohort. The second group, recruited from the Entire Cohort, are the five PSTs placed in classrooms with more than 40% MLs who participated in Video Stimulated Recall interviews, referred to as the VSR-PSTs. VSR-PSTs reflected on and discussed their video recorded lessons in relation to FA. These five VSR-PSTs cases are the main source of data and descriptions of individual VSR-PSTs are provided in this chapter. The third group of participants is four PSTs who completed

two questionnaires about their understanding and use of FA, once at the end of their beginning field placement and once at the end of their intermediate field placement. One of the VSR-PSTs is also included in the questionnaire group. Table 1 illustrates the participant groups and their relationships.

Table 1

Participant Groups

Multiple Subject PSTs (Entire Cohort) n=17				
	VSR Participants n=5	**Non-VSR PSTs n=12**		
	Sam	Daniel	Lynn	Katie
	Swathi	Betsy	Adelyn	
	Amanda	Rose	Tara	
	Vicky	Macy	Nadine	
Questionnaire Respondents n=4	Kathy	Marty	Chad	Stephanie

Exploration of the individual components of the PSTs' planning, enactment, and reflection assignment central to the study (described below) is critical to identifying patterns of PSTs' learning trajectories. The comparative analysis utilizes the 17 PSTs' lesson plans in relation to the thoughts, actions, and responses of the PSTs in-the-moment of teaching (via the 5 students' verbal reflections in VSR interviews as well as all 17 written reflections completed as part of the course assignment). The structure of the study attended to various influences on the PSTs' learning of FA (including course content, interactions with TEs, as well as the VSR interviews), enabling me to unravel bits of the covert processes by which over time, PSTs constructed and expanded descriptions of the complex processes of learning to

elicit and respond to students' understanding of content, in-the-moment of teaching.

Research Design and Research Questions

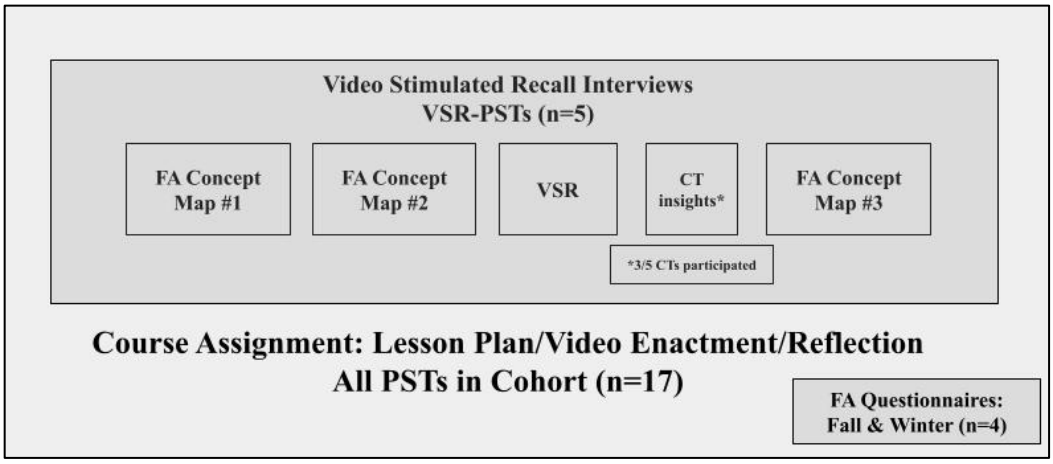
Given the sociocultural perspective of learning to teach outlined in Chapter 1 describing learning as a process of change, the study was designed to comparatively analyze multiple sources of data created over time from multiple participants to develop descriptions of how PSTs learn to think about, define, enact, and reflect on the use of FA. While the data from the VSR-PSTs is the focus of the analysis, the triangulated data collected from all groups provided the necessary material needed to uncover substantive patterns of shifts in PST thinking and understanding of FA concepts and practices across time. Each PST in the Entire Cohort created a lesson plan, recorded enactment of the lesson, and submitted a reflection on the enacted lesson over a period of several weeks. The VSR interviews provided VSR-PSTs the additional learning and reflection opportunity to share their thoughts about FA through prompted responses and the creation and revision of FA concept maps.

The lesson data evolved from a required course assignment to plan, enact, and reflect on a lesson designed to meet a portion of the requirements for the state-mandated TPA Cycle 2, "Assessment-Driven Instruction." The VSR interview process enacted with the five VSR-PSTs was described to participants as an extension of the "reflection" component of the assignment. The Entire Cohort's lesson plans, enactment videos, and written reflections were examined as artifacts created over time, to further corroborate or contradict learning patterns found in coding the VSR transcripts. Four PSTs twice completed questionnaires asking for definitions of FA and self-reflections on use of FA, once at the end of the first field placement and again at the end of the second field placement. This last set of data provided a means

to explicitly compare definitions of FA over time. A figure of the data sources is illustrated in Figure 1, below. Each data source and its contribution to answering the research questions is described in further detail in the next section of this chapter.

Figure 1

Data Sources



Taken together, the VSR-PST case studies, cohorts' materials for the course assignment, and responses to the FA Questionnaires serve as the data for analysis to create a baseline description of: 1) how PSTs think about and define FA and FA's relationship to questioning; 2) what resources PSTs use in-the-moment to consider and enact follow up questions; and 3) how PSTs consciously plan for and use follow up questions to respond to and recognize students' own words in relation to the language demands (e.g. content-specific vocabulary) of a given lesson. The analysis used the three sub-questions listed below to construct rich descriptions of the Entire Cohort's conceptualizations and enactments of probing forms of FA. The primary data used to respond to each question is listed in parentheses.

1. How do PSTs in one teacher preparation program think about, define, and describe formative assessment? (VSR interviews, FA Questionnaires)
2. What resources do PSTs call on in-the-moment of thinking about and asking

questions to follow up on student responses (the FA move of 'probing')? (VSR Interviews, Entire Cohort Reflection Assignment)

3. To what extent do PSTs consciously plan for and use follow-up questioning to respond to and recognize students' everyday language, and provide language models in elementary classrooms where there is a high population of Multilingual Learners? (VSR Interviews, Entire Cohort Lesson Plan and Video Enactment Assignments)

The central question of the study builds from the sub questions above, synthesizing evidence from all the data sources: How do PSTs learn to utilize probing questions to uncover and elicit ML students' thinking in elementary classrooms? This question required participation from PSTs placed in classrooms with high ML populations in the VSR interviews.

Data Sources & Positionality

In the fall, before any data were collected, I co-conducted an Assessment Workshop with a university faculty member for the multiple subject PST cohort, required as part of their teacher education program. The faculty member is also my advisor and the chair of my dissertation committee. Additionally, I introduced myself as a researcher and former elementary educator during three required classes in the first half of the program. These interactions were meant to build rapport, so that when I recruited and interviewed PSTs placed in high ML-classrooms, the Entire Cohort would see me as a familiar and non-evaluative professional resource. A major assumption I bring to this research process and analysis is my prior, subjectively successful, reflexive FA experiences as an elementary school teacher and teacher mentor. I continue to confront and work with my deeply rooted beliefs and

experiences and try to be aware of their subtle and strong influences on my methods and blind spots.

Because my research questions are interpretive, exploring a myriad of processes and strategies by which PSTs plan, conceptualize, and reflectively articulate understanding of FA moves with MLs, my research and analysis methods were designed to be flexible and to strategically set up moments for me to iterate and revise. I consistently and strategically looked for evidence to contradict my observations (Corbin & Strauss, 2008). The variety of qualitative data across participants (videos, student-created lesson plans and reflections, VSR interviews, and questionnaires) provided the opportunity for triangulation to validate observations and findings. The VSR protocol placed priority on PSTs-selected clips of teaching episodes that evidenced possible probing interactions, providing additional evidence as to what the PST perceived as enacting FA. Additionally, analyzing the Entire Cohort's lesson plans, lesson reflections, and the VSR-PSTs' interview transcripts provided added layers of contextualization to the moments I identified as 'probing' in each VSR-PST video. Using the varied sets of data and mixed methodologies helped to both combat any overconfidence and opinionated mentalities I encountered within myself and enhance the validity and reliability of the work. Descriptions of the VSR interview method, the course assignment, and the FA Questionnaire are provided below.

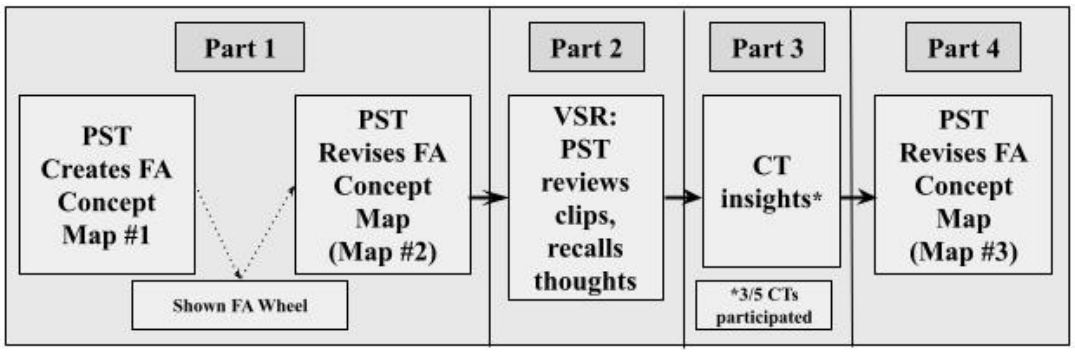
Video Stimulated Recall Interviews

Video Stimulated Recall semi-structured interviews with the five VSR-PSTs were conducted over an online meeting platform so that the videos of the PSTs' teaching could be easily shared. PSTs shared their videos with me prior to the

meetings. I watched each lesson before the interview, noting times of potential probe and probe-like interactions. The four-part, semi-structured think aloud interviews were not part of the teacher education program's formal evaluation nor of the course assignment and were conducted specifically for this study. The protocol is in Appendix B and Figure 2 depicts the sequence of the VSR interview. Interviews lasted between 45 and 60 minutes and were conducted 48 hours to 2 weeks after the VSR-PST enacted their lesson. One VSR-PST participated in four interviews and discussed three separate lessons. The fourth interview included her CT. Transcripts from this VSR-PST's second and third interviews were not included in the analysis.

Figure 2

VSR Interview Sequence



In the first section of the interview, each PST created an initial concept map of FA. I then briefly reviewed a visual graphic of various FA strategies (FA Moves Wheel, Duckor & Holmberg, 2019, p. 842; reproduced and annotated version used during the interview, Appendix C). This graphic was a part of the assessment workshop presentation slides conducted in the fall. I then invited interviewees to revise and add to their concept maps.

During the second part of the interview, I briefly introduced one to four clips identified during the first phase of data collection. The VSR-PSTs were directed to

pause the video at any time during the viewing to explain what the VSR-PST was thinking or to specify a moment of where the VSR-PST felt they had elicited or missed an opportunity to elicit students' understanding as a FA practice. After viewing each clip, I asked VSR-PSTs if and how they noticed any probing practices, even if the VSR-PST did not ask me to pause.

During part three (if applicable, and on a separate date for one VSR-PST), the VSR-PST's CT joined the conversation. The VSR-PST explained the purpose and content of the conversation thus far and the researcher asked the CT "What does FA mean to you?" The PST was asked if they wanted to share a clip with their CT. Two VSR-PSTs opted for this, and one did not. The researcher facilitated a dialogue between the CT and VSR-PST about FA strategies in general and with MLs in particular. To conclude the interviews, after the CT left the conversation, the researcher invited the VSR-PST to revise and add to their concept map for a third and final time. The concept maps created by the VSR-PSTs, with revision keys, are in Appendix D.

VSR is in the family of stimulated recall research, which derives from introspective methods. Stimulated recall research methods employ the use of a stimulus to facilitate a subject's reporting of a past event. Stimulated recall encompasses a variety of related but distinct methodologies, as both stimulus and report can vary, depending on the research. Bloom's (1954) description of stimulated recall is cited often by both critics and proponents of the method. He states,

> The basic idea underlying the method of stimulated recall is that a subject may be enabled to relive an original situation with great vividness and accuracy if he is presented with a large number of the cues or stimuli which occurred during the original situation. (p. 24-25)

The stimulus can take various forms including images, documents, and audio and

video recordings. Subjects' reports can also be captured in various forms, including written, drawn, or verbal.

This study utilizes VSR, in which video is the stimulus and interviews are used to report participants' thinking via verbal recall. Kagan et al. (1963) assert that interviews stimulated by video enable the participant to feel "removed enough from the image of himself on the television screen so that he is able to think of the 'person' on the screen as being well known to him, yet not quite he" (p. 239). They argue this method enables subjects to provide detailed reports of conscious thoughts and their meanings (p. 239). The authors note that extricating conscious participants' thoughts for analysis is a delicate process that necessitates a shift from behaviorist to a cognitive or sociocultural perspective on the part of the research analyst.

The VSR method can be used to explore and test theories of the cognitive processes and thoughts that occur while a subject (a teacher, a PST, a learner) is constructing knowledge and making decisions based on this new knowledge as well as prior knowledge, in-the-moment. In the context of this dissertation, the research questions and design work toward descriptions of changes in how PSTs describe FA as a process and centers the thoughts that the VSR-PSTs described having while they were teaching. Understanding this covert process necessitates methodology that goes beyond overt observation and protocol questions that invite self-evaluative reflection as opposed to recollection of specific thoughts.

Polio et al. (2006) found that as a methodology, "stimulated recalls were able to reveal patterns that could not be discerned through an inspection of the primary data alone" (p. 251). The primary quantitative data in their study examined the recasting feedback practices of novice and experienced teachers in one-on-one

tutoring sessions with nonnative speakers. They found no significant evidence of difference in the quantity of each group's production of recasting feedback. However, the qualitative data collected from the VSR interviews after the tutoring session revealed that experienced teachers described their thinking in terms of the nonnative speakers' learning, whereas novice teachers described their thinking in terms of the laboratory task and of the nonnative speakers' comfort with the language. The recall data obtained through their VSR interviews, in tandem with quantitative counts of recasting feedback, provided evidence that VSR data was essential to identifying a relationship between teachers' level of experience and the quality of interaction with students (p. 258). Despite inconclusive results from quantitative counts of recasting feedback, the VSR interviews allowed the authors to explore beyond overt actions to the covert thoughts that led to these dialogic decisions. The challenge for Polio and colleagues, given the VSR data, was to determine which statements were recalled and which were reflections (p. 260).

This central challenge of distinguishing between recalled thoughts and reflections on thoughts, is an opportunity in the context of this dissertation study. I embraced the idea that verbal recall reports are always limited, always tinged with reflection. Further, the VSR conversations in this study are situated in the relationship between the VSR-PSTs and me (as researcher and nonevaluative professional), as well as the VSR-PSTs and the three CTs who participated. While I made every effort to describe the interview as non-evaluative, the VSR-PSTs themselves, in their responses to recall their thoughts during the interactions, moved towards reflection on the quality of their enactment and what they could learn from their experiences.

The use of video in teacher education coursework and observations is

becoming more common, and often mandatory in the assessment and certification or credentialing of PSTs (e.g., California Commission on Teacher Credentialing, 2021). Videos are often used in program coursework, offering PSTs regular opportunities to reflect on and observe their own and others' teaching experiences with TEs and other PSTs (e.g., Gazdag et al., 2019; Masats & Dooly, 2011; Santagata & Guarino, 2011; van Es et al., 2017). Paskins et al. (2017) argue that given the inherent qualities of a VSR study, changes in participants' perceptions "should not be considered a threat to validity but as a stimulus for reflexive analysis" (p. 10). Embracing the dynamic nature of thought, as a participant grows and learns, is central to this view: when this is a central part of the research design, the VSR interview is both an experimental intervention and research method.

Given the multiple sources of data across participants and my role as an non-evaluative professional resource, I strategically explored PST learning opportunities embedded within the context of semi-structured VSR interviews. I presumed that VSR-PSTs' verbal reports could be altered by my presence and the process of recalling, interpreting, and verbalizing the thoughts recalled in-the-moment of the recorded event. By acknowledging and examining this framing in my research design, I am arguably more valid and reliable in my analysis of the PSTs' statements (Russ et al., 2012, p. 597).

In this study, VSR offers an opportunity to explore and describe not just the thinking processes and patterns of teachers in-the-moment, but also the changes in these processes and patterns over time. "Stimulated recall can be used both to collect data on student teacher behaviors in the classroom, but also to capture the reflections-in-action of student teachers in the classroom" (Stough, 2001, p. 3). VSR methods,

when implemented with various strategies for triangulation embedded into the design such as the submissions of the Entire Cohort and the subset of FA Questionnaires, provide valuable insight to how PSTs construct knowledge and utilize resources from coursework, supervision and mentoring conversations, as well as reflections on fieldwork experiences. It is a research method for studying thinking, a method for studying learning, as well as a means for the VSR-PSTs in this study to learn about FA. These various takes on the method, as both a research tool and an invention model embedded into the design of the study, provide specific implications for future research. VSR is a tool to improve teaching for participants but also a tool that, with aggregate data across individuals, can supply information to use in research that describes and explores teacher learning.

Course Assignment Submissions: Lesson Plan, Video Enactment, and Reflection

During the winter field placement, the Entire Cohort was enrolled in "Teaching English Language Development." This is a required course with an assignment to plan, enact (video-record), and reflect on a lesson that included at least one objective from the History-Social Science Framework and at least one English Language Development (ELD) standard. In their submitted lesson plans and reflections, PSTs were required to attend to two Teaching Performance Expectations (TPEs). TPEs are state-imposed and are not program-driven and are the basis of the state-mandated TPA. The teacher education program in this study created and uses a TPE Developmental Continuum (2019) that supervisors and instructors use "to guide the development of beginning teaching aligned with the (State's) Teacher Performance Expectations" (p. 1). In the assignment used as data for this study, students were asked to attend to TPE 3.5, "Adapts subject matter curriculum

organization, and planning to support the acquisition and use of academic language within learning activities to promote subject matter knowledge of all students," and TPE 1.6, "Supports students' 1st and/or 2nd language acquisition by using research-based instructional approaches including ELD2, SDAIE, scaffolding across content areas, and Structured English Immersion."

The use of the term "academic language" in TPE 3.5 requires attention, as I critiqued this term in Chapter 2. The PSTs in this study were frequently exposed to this problematic term. For example, in the state-provided descriptions of TPEs (as above), "academic language" appears 25 times (CTC, 2016). In the state-provided Performance Assessment Guide for Instructional Cycle 2, Assessment-Driven Instruction (CTC, 2018), the term appears 46 times. This guide states, "Even though students may be highly intelligent and capable, for example, they may still struggle in a school setting if they have not yet mastered certain terms and concepts, or learned how to express themselves and their ideas in expected ways" (p. 47). As described in Chapter 2, this is a deficit framing of students and does not foreground students' varied and rich linguistic resources. The PSTs were not provided significant opportunities to critically examine the deficit orientations imbued in the history and use of this framing. It is worthwhile to note that while the program's developmental continuum of the TPE also uses the term (19 times), it is not necessarily representative of the TEs' views. However, as the term is integrated into the requirements of the TPA portfolio, lesson templates, and used by various TEs, including CTs, the term is retained for the remainder of Chapter 3 and Chapter 4. In Chapter 5, I discuss suggestions for critiquing the terminology as it relates to dialogic forms of FA.

The course instructor, the committee chair for this dissertation, weekly incorporated activities, lectures, and guidance as to how the content of the course and the lesson plan, enactment, and reflection assignment related to many of the components for Cycle 2 of the state's TPA. One of the five core principles underlying the course stated that students should understand that "multifaceted assessment practices sensitive to ELLs' linguistic and academic strengths are key to effective placement, instruction, and student success" (University, 2020). The instructor framed the assignment as fitting some, but not all, Cycle 2 requirements. Notably, the Cycle 2 Performance Assessment Guide does not use the word "formative." However, "informal assessment" is listed as "essential terminology" and is in the guide's glossary, described as "purposeful questions to check for understanding during the lesson" (CalTPA Performance Assessment Guide - Multiple Subject, 2018, p. 1).

FA Questionnaires

At the end of beginning and intermediate placements, four PSTs completed identical FA questionnaires (for a total of two questionnaires). The brief questionnaire included questions on the PST's understanding and use of FA, loosely based on a survey used by Ralph (1999, p. 295) which examined the questioning skills of novice teachers. A sample question from this study's questionnaire is "What is your understanding of formative assessment at this point in the program?" The full questionnaire used in this study can be found in Appendix E. PSTs were instructed to consider the repeated questionnaires as self-assessments and not evaluative. I explained that there could be concepts they were not familiar with or did not enact when they first took the survey, while completing their beginning placements, but that

over time, as they entered and completed their intermediate field placement, the concepts may (or may not) become more familiar.

VSR-PST Participants

The five VSR-PST cases for this study are multiple-subject PSTs placed in elementary schools located on or near the coast of California. For three VSR-PSTs (Amanda, Sam, and Kathy), their CTs participated in about 10 minutes of the interview, toward the end of the meeting. Vicky's CT, though willing, was unable to participate given a re-scheduling issue. Swathi's CT was not able to participate due to a busy schedule. Below, Table 2 provides further demographic information about the VSR-PSTs, their recorded lesson topic, and their field placement.

Table 2

VSR-PSTs Demographic, Lesson, Placement, and VSR Information

Teacher (pseudonym)	**Gender**	**Race/ Ethnicity**	**Grade**	**Lesson Topic**	**CT**	**% MLs in Class**	**VSR conducted**
Amanda	F	Asian	5	Reading Maps	Carly	50%	2 weeks after enactment
Vicky	F	Latina	1	Traffic Signals	n/a	80%	2 weeks after enactment
Sam	M	White	2/3	Word Roots	Rhonda	41.6%	2 weeks after enactment
Kathy	F	White	2/3	Bio-graphies	Rebecca*	43.8%	2 days after enactment
Swathi	F	Asian	3	Gratitude	n/a	61.9%	1 week after enactment

*Kathy completed four VSR interviews. Rebecca joined us on the fourth.

Procedures, Data Sources, and Data Analysis

An inductive approach (LeCompte, 2000) was used to identify processes by which the PSTs conceptualized, enacted, and self-assessed their practices of questioning as a form of FA. The content of the VSR interview transcripts, specifically VSR-PST selected turns of talk and VSR-PST responses describing what they were thinking in-the-moment of specific video clips, were the primary data for analysis. I developed initial qualitative codes from the VSR-PST created assignment materials including the lesson plans, videos, reflections, as well as VSR transcripts and each iteration of FA concept maps. From this, I moved towards identifying more specific units of data (e.g., identifying moments of FA, of using probing moves) for each case, across VSR-PST cases, and finally the Entire Cohort. I identified moments that illuminated the relationship between the PSTs' understanding and enactment of FA moves across the data and VSR-PST cases. I cycled back through the data, looking for patterns of learning and changes in thinking. This triangulation verified or disrupted conclusions about the patterns of how PSTs learned to utilize probing questions to uncover and elicit ML students' thinking.

The software MAXQDA was used in this study to create and track codes across the data sets. All transcripts and student created documents were uploaded to the system. The order of coding each set of data and establishment of themes is described in detail below. After reading through each VSR-PST transcript and course assignment, the first round of coding began. After coding the third VSR-PST transcript, I began to tentatively group together similar themes, checking for similarities and seeking contradictions as I completed the first round of coding for all five VSR-PSTs. Using procedures of constant comparative analysis strategies across

the VSR-PST cases (Corbin & Strauss, 2008; Emerson, et al., 2011; LeCompte, 2000), I read through the Entire Cohort's written components of the assignment (lesson plans and reflections), again making shifts, regrouping, and isolating codes as they more frequently appeared, contradicted my observations, or stood out as anomalies worthy of further inquiry. The questionnaires were then coded using the same scheme. Once the written data from the Entire Cohort and the questionnaire sets had been coded once, the set of 39 codes was examined for common cross-occurrences and placed into eight overarching categories.

Two major themes appeared regarding the VSR-PSTs and Entire Cohort's use of FA to use purposeful questions to check for understanding: 1) whose version of understanding was foregrounded (PST-worded lesson objectives or the students' own words/thoughts); and 2) what the PST elicited and/or confirmed as evidence of students achieving the learning objectives (verbatim responses, general understanding, or active incorporation of the students' own words into the learning objectives). These themes will be further described in Chapter 4. The subsections below provide further details of the coding process in relation to the set of data analyzed and order of incorporation into the analysis.

Analysis of VSR-PST Transcripts & Artifacts

The first data sources for coding and analysis were the VSR interviews and FA concept maps created and revised twice by each VSR-PST during the course of the VSR interview. Before each VSR interview, I reviewed each VSR-PST's course assignment (lesson plan, video-recorded lesson, and reflection). In the reflection assignment, the Entire Cohort was required to describe the relative success of attending to these TPEs and to indicate specific timestamps in the video. Four of the

five PSTs identified specific clips in their written reflections, as instances of fulfilling the above TPEs.

While watching each VSR-PST recorded lesson, I also noted timestamps of probe and probe-like turns of talk and concluded each independent viewing with a memo of general observations about the kinds of talk in the lesson. I then reviewed any segments the VSR-PST identified in their written reflection. During the VSR interviews, I first asked participants if there were any clips they wanted to watch and reminded them of any segments they had indicated in their written reflection. After these clips were watched and the VSR-PST noted what they were thinking during the moment and if and how probing occurred, we then watched 2-4 additional clips that I had identified as probe or probe-like moves. After each VSR interview, I memoed my observations and thoughts.

After all interviews were completed, I transcribed and inductively coded the VSR interview transcripts and the VSR-PST's course assignment. In the course assignment lesson plan, I focused on the sections titled "Essential Questions," "Assessment," "Knowledge of Students," "Language Demands" as well as any questions listed in "Activities, Strategies, and Materials," the agenda for the lesson. The questions listed in the lesson plan were counted and coded for content (posing question, probing question). Any listed adaptations and scaffolds for MLs were coded for relevance and quality, as well as predictions of students' needs in-the-moment of teaching. The VSR-PST's written reflections on their efforts to meet TPE 1.6 and 3.5 (CCTC, 2016) were also coded.

Using a final focused coding scheme based on the complete data set, I identified patterns, possible deviations, and themes in the PSTs' learning about and

use of FA. These patterns and themes were then compared to the narrative enactment descriptions of FA in Duckor & Holmberg's (2019) Probing Construct Map, (Appendix A), and Probing Scoring Guide (Appendix F). These frameworks were a convenient and effective way to compare and contrast the VSR-PSTs' reflective statements about FA in their lessons, as the data examined aligned with and did not significantly deviate from the construct map and scoring guide descriptions. However, as I will describe in Chapter 5, potential additions of more robust descriptions of the PSTs' learning and practice were identified. Sample codes and examples taken from the VSR-PST transcripts are provided in Table 3, below.

Table 3
Coding Examples

Codes	Examples from VSR-PST Transcripts
Repeat back	• I was trying to repeat back, to make sure that I heard correctly and that the whole class heard. • I know I have them repeat back a lot of words.
Noticing	• I saw that they seemed like they were getting it, mostly thumbs up. • I was walking around and I noticed that they did need some help.
Checking that students understand	• It was more to see who understood what stop, slow down, and go means, for my ELs. • What I'm doing a lot is like getting their answer and then like building off of it and, like kind of giving it to them in that way um. Yeah, yeah she gave her answer, and I said, oh yeah, oh kind of like this? And then, does that sound good?
Develop deeper/new understanding	• One of my takeaways about language-free entries is that its, its very, um. Accessible and flexible. And you can pull a lot out, a lot of thoughts out from the students, and then you can work with those, to develop more academic language. • It's also an opportunity for me to push the students to the next level.

Analysis of Entire Cohort's Artifacts

Analysis of data from Entire Cohort (the three components of the assignment from the course: lesson plan, video enactment, and reflection) began after the first cycle of coding described above. Lesson plans and reflections were coded and incorporated into the emerging themes and patterns identified in the VSR-PST data. The 12 video enactments from non-VSR-PSTs were then reviewed, similar to the VSR-PST data, to identify moments of probing questions and in-the-moment adaptations as well as to compare these moments to any timestamps listed in the

Entire Cohort's written reflections. This portion of the analysis offered additional evidence for the research questions "To what extent do PSTs consciously plan for and use follow up questions to respond to and recognize students' everyday language and provide language models?" and "What resources do PSTs call on in-the-moment of thinking about and asking questions to follow up on student responses?" The "Assessment" section of the lesson plan also offered some evidence of examples of how PSTs defined this concept in light of their planned lesson, as they responded to the prompt: "What will students do to show their understanding?" I coded if and how they described how they planned to monitor, provide feedback, and assess comprehension and learning in their enacted lesson.

Analysis of the FA Questionnaires

The FA Questionnaires were coded and reviewed to look for corroboration or conflicting evidence in what (if any) changes occurred in PSTs' definitions of FA over time as well as what resources the PSTs claimed as influences on their knowledge and practice of FA. This portion of the analysis offered evidence for the research questions "How do PSTs think about, describe, and define FA?" and, to a smaller extent, "What resources do PSTs call on in-the-moment of thinking about and asking questions to follow up on student responses?"

Ethical Considerations and Strategies

I received IRB approval under Exempt Category 2, for the Entire Cohort's assignment submissions, VSR interviews, and surveys. In accordance with these exemptions, I received signed consent forms. All identifying information from the participating PSTs and CTs were removed, and all names in the dissertation are pseudonyms. The data, analysis, and findings represent only a moment in time and

are a reflection of PSTs' understanding in context of the learning environment of the University's teacher education program goals and coursework. Further, I report all findings as not necessarily representative of the PSTs' current understanding of FA, but more specifically, of the PSTs' understanding in a particular place in time, recognizing the learning process of a PST as a process of change. The findings likely do not represent the PSTs' most current thinking, and certainly not their potential and future understanding. However, the analysis of the multiple data points across the cases over time provide evidence to create robust descriptions of how these PSTs learned the complex pedagogical practice of FA in elementary environments with a high proportion of MLs.

Limitations of the Design

The limitations of this project included the very real presence of evaluation in all artifacts, including self-evaluation in the surveys, grades on artifacts submitted for lessons, and evaluative rubrics and follow up conversations completed by the PST's supervisor and CT as part of a formal, required observations. I did not directly address PSTs' awareness that central data, the lesson plan, video, and reflection collected from the course assignment, was graded and a component of their progress towards a credential. I was not able to fully account for the classroom contexts and built-up experiences in which the PSTs conducted their teaching episode, nor was I able to attend to the constraints of those contexts (e.g., the content of the lesson may be mandated by the district and not selected by the PST). Further, my own positionality as a non-evaluative professional engaging in conversation about the VSR-PSTs' own videos very likely influenced the content and comfort of the VSR-PSTs during the interviews. Additionally, the cases are from only one teacher

education program: strength is in the description and analysis of the data sources. In the next chapter, I offer evidence of how this particular group of PSTs illustrated their learning of FA as a concept and practice through systematic explanation of responses to each research question. The findings are situated in the context of the University's teacher education program philosophy, the constraints of receiving a "good" evaluation, the common awkwardness of viewing and discussing one's own video enactment with a professional (e.g., Calderhead, 1981; Masats & Dooly, 2011), the field placement setting (philosophy of the school and CT, if possible), as well as the demographics of the students in the PSTs' student teaching placement.

Chapter 4: Description of Findings

From initial lesson plans to final revisions of FA construct maps, all VSR-PSTs showed evidence of deepening understanding of probing questions as a tool to uncover and elicit students' thinking in elementary classrooms. Looking across the artifacts, most (15/17) of the Entire Cohort showed evidence of significant movement towards deeper understanding of FA as a complex process. TEs expect evidence of PSTs learning in teacher education programs. The evidence of this study shows that PSTs deepened their understanding of this complex concept over a relatively short time frame. In the time between the creation of the lesson plans and writing their reflections, PSTs discussed opportunities seized (and missed) to uncover and obtain evidence of their students' understanding in-the-moment of their enacted lessons. The VSR-PSTs showed significant forward movement in their descriptions and understandings of FA over the course of 45-minute conversations and in the revisions made to their concept maps. Two major themes appeared regarding the VSR-PSTs and Entire Cohort's understanding and use of FA to elicit and uncover students' thinking in the midst of teaching: 1) what PSTs sought as evidence of student learning and 2) whose version of understanding (PSTs' or students') PSTs seemed to foreground in facilitating classroom dialogue.

Chapter 4 explores these themes in relation to individual PST's learning progressions and patterns of the Entire Cohort's trajectories and is organized by the study's research questions. The first section discusses the general expansion of the Entire Cohorts' descriptions and definitions of FA. The second section describes the resources PSTs called on in-the-moment of thinking about and asking questions to follow up on student responses, as offered during VSR interviews as well as written

in the reflection component of the Entire Cohort's submitted assignment. The third section addresses the PSTs' enactment and noticing of opportunities for FA and the extent to which PSTs consciously planned for and used follow-up questioning to respond to and recognize students' language resources and provided language models in classrooms with high numbers of MLs. The chapter concludes with a description of individual trajectories by which the VSR-PSTs in this study learned to utilize probing questions to uncover and elicit ML students' thinking in elementary classrooms.

Thinking About, Defining, and Describing Formative Assessment

Across all 17 PSTs in the Entire Cohort, PSTs' definitions and descriptions of FA evolved and deepened from the creation of lesson plans to written and VSR reflections, and in the case of the PSTs who completed questionnaires, from responses in the fall to responses submitted three months later. Nearly all (15/17) of the PSTs' initial descriptions and lesson plans offered some description of FA as a strategy to identify and capture evidence of students' understanding of content and specific terminology during a lesson. Initial definitions were frequently illustrated by tangible strategies like thumbs up/down/sideways and student-created work samples, including worksheets, graphic organizers, and notebook entries. The PSTs often used the phrase "checks for understanding" in their first definitions and examples, without detail as to what "checks for understanding" looks or sounds like in the classroom. Several of the Entire Cohort (4/17) also mentioned planned use of exit tickets as an informal assessment strategy, though this type of FA occurs at the end of a lesson and not in the midst of instruction.

Initially, the Entire Cohort's understanding of FA was oriented towards moving students towards a specific wording or interpretation of the PSTs' learning

objectives. For example, Kathy's first concept map included the phrase "making sure that students are where they need to be." She explained that FA was the opposite of summative assessment, so that a teacher would know if students would fail to understand the content as they enacted the lesson. A lesson plan from the Entire Cohort noted that they would "ask the students to repeat what I had just demonstrated, ask them what area we live in and point it out on the map." This PST's lesson plan showed that the PST planned to look for specific responses, specific labels that students copied from the enlarged teacher model at the front of the room.

While all PSTs' conceptualizations included variations of this base-level understanding, not all PSTs were completely oriented toward the above convergent form of FA. Approximately half of the Entire Cohort (8/17) also alluded to actively responsive uses of FA. In one Fall questionnaire, a PST wrote that they understood FA to be "a part of the process of learning and used to inform instruction." The use of the word "process" and phrase "inform instruction" indicates an active orientation to FA. In her first concept map, Amanda noted that FA is "responding to feedback from students" and "adapting to students." Swathi, another VSR-PST, first explained that to her, FA "is like me making mental notes. Okay, so when I send them away, I've got to hold them back for when I say work." The gerund verb forms "responding," "adapting," and "making" from Amanda and Swathi suggest that FA, for them, is a dynamic and active process, something happening during a lesson. However, despite some hints of deeper understanding and active application of FA in some PSTs, all 17 initial definitions from the Entire Cohort more generally described FA as surface-level, passive checks for understanding with intentions of pulling students toward a specific understanding of the teacher's learning objective.

The last understandings described by PSTs showed movement towards descriptions of FA that emphasized increasingly active and diverse possibilities of what FA could and did look like in-the-moments of their teaching. There were two shifts in the content of these descriptions. The first, in what PSTs sought as evidence. The PSTs descriptions shifted from binary yes/no checks as to whether students understood or achieved a learning objective to more expanded views of what served as evidence of understanding, including responses to probing questions and monitored small group discussions. The second shift was in whose understanding PSTs prioritized, from working towards a specific wording or understanding of a concept, to eliciting and uncovering students' thinking and phrasings, in relation to the lesson objective. While the PSTs' descriptions were not equal in depth in the latter type of descriptions, the Entire Cohort's understanding of FA generally deepened, with comparative evidence appearing from the lesson plans to written reflections and the first to second questionnaires.

There was a range in how much PSTs seemed to change between their initial and final descriptions. Some students offered evidence of small shifts (4/17) and others' descriptions were significantly more sophisticated (13/17). For example, a smaller shift is visible in the written reflection of one PST, wrote, "I would have liked to have had better UDL methods in place to help synthesize the lesson goals and assist students in understanding." This PST sees the use of Universal Design for Learning (UDL) (Meyer et al., 2014) as a tool to support students' understanding across the whole class in applying their lesson objective to "how other leaders have advocated for democracy." An example of a more significant shift can be seen when comparing one of the Questionnaire PST's short answer responses. In response to

"What is your understanding of formative assessment at this point in the program?" in the fall questionnaire, Chad wrote, "not a lot." In the winter response, he wrote, "It is used to see if there are places where students are strong in or a place where a teacher may need to reteach." After three months, this PST moved from not knowing much about FA to recognizing FA as a tool to identify students' strengths and an opportunity for the PST to gauge how to support and develop students' understanding.

For VSR-PSTs, more expansive shifts in understanding like Chad's were evident over the course of the 45 to 60-minute VSR interviews, and particularly in the revisions of the FA concept maps (see Appendix C). VSR-PST Amanda revised her final FA concept map to include the idea that a teacher is "kind of always doing formative assessment, if you're really paying attention." She added that FA is when

> You're seeing like, what they're doing, what they're not doing, you're interpreting that. You're interpreting that, you're interpreting why they're doing something or not doing something. And that's how you decide to respond. That's how you decide whether or not you even want to intervene in that moment. Cause maybe they, they need to kind of come to their own mistakes, for example.

Here, Amanda explains FA as an iterative, active process. While she does not specify eliciting, she did comment that FA is something teachers always do, and definitively includes the remaining components of noticing, interpreting, responding, and reflecting in her revised concept map. The final moments of Swathi's VSR interview also reflected increased attention to the nature of FA as a dynamic. While Swathi began with a fuller understanding than most PSTs, noting that FA is a "bridge between student understanding and teacher teaching," Swathi revised her understanding as she looked at her FA concept map for a third time at the end of the 45-minute VSR interview. She asked to add that FA is a process to help students

understand the essential question of the lesson, but with an important clarification. She explained that FA is about getting to "what they (the students) are thinking, I think, not what you (the teacher) think they should think." Swathi describes an objective to understand how students are thinking as an end goal, not simply whether or not students show comprehension of the teacher's understanding of how a concept should be thought about in the academic setting. The addition, as clarified, shows a more complex understanding of what teachers can use FA for in a lesson. Whether or not a student understands a concept is an essential goal for teaching. How students understand a concept is equally essential, but not visible when only using "checks for understanding" with a thumbs up/down.

Checking for this level of understanding requires attentive, dialogic work on the part of the teacher, and a significant amount of student and content knowledge. As Amanda put it: "You can see how it's really intertwined with teacher-student relationships … formative assessment is what happens when the plan is in the real world and it's not, the step by step that you plan." From Entire Cohort, 15 of the 17 PSTs showed more expansive descriptions and increased awareness of FA's purpose. These PSTs described future goals of actively eliciting, and not only noticing, student understanding in relation to learning objectives. One PST from the Entire Cohort reflected that they "felt as though I gave them (students) too much," in their lesson, wishing they had provided more opportunity to hear students' responses. Another wrote that they worked to record student's thinking but realized that they used their (PST's) "own words or thinking to push students' thoughts into a clearer idea," as opposed to students' own words. The data shows that most of the PSTs (15/17), from lesson creation to reflection, more explicitly and deeply recognized students' own

thoughts and own words as a component of FA and instruction generally. PSTs started expressing that students' own words provided or could provide evidence of how students understood concepts in relation to the PST's learning objective. They moved away from perceptions of FA as a one and done strategy, a simple identification of whether or not students can provide a correct response or fill in a sentence frame, and towards deeper learning as a central lesson objective.

Noticing whether or not students are achieving or have achieved a learning objective is an essential component of responsive FA and was fully reflected in the Entire Cohort's definitions in both initial and final conceptions. Most of the Entire Cohort (13/17) showed evidence of moving toward an expansion of what evidence of learning an objective could look like. Verbatim choral responses and repeated phrases are useful and help teachers quickly gauge if students are moving towards the learning target but are meant to be "quick" checks. In the later versions of descriptions and strategies, PSTs began to describe how they would like to find ways to provide opportunities for students to put concepts into their own words. PSTs expressed that the students' own words could help them more fully understand students' thinking. One written reflection from the Entire Cohort explained how the PST was really proud of themself for giving more space for students to talk, "rather than having me teach the entire lesson myself…In my own teaching journey, I am working on saying less and leaning into the students to say more." From the Entire Cohort, 13 PSTs showed this kind of movement toward deeper understandings of FA, refining and sharpening what they meant by "checks for understanding." The PSTs in the studied program, who initially described FA as close-ended, quick checks for understanding accompanied by planning strategies like choral or nonverbal responses

(thumbs up/down, fist to five) moved toward descriptions of FA strategies as a responsive process, looking for and eliciting a deeper level of student understanding, at varying degrees. While not all PSTs showed clear movement or deepening of understanding, across the Entire Cohort, there was no evidence of regression. That is, no PSTs showed shifts towards less dialogic descriptions or described strategies that could not be identified as a recognized form of FA. The following subsections will provide more specific descriptions of the PSTs' varying learning patterns.

A Third Ear: Resources for Conceptualizing and Enacting Formative Assessment

The prior section described how PSTs' thoughts, definitions, and descriptions of FA generally deepened and expanded over time. In this section, VSR interview data shows the resources PSTs called on in-the-moment of thinking about and asking questions to follow up on student responses. PSTs referred to how learning in and from actual teaching experiences in field placements, observations of their CTs, conversations with and observations of supervisors, course readings and activities, and the VSR interview itself supported a progressively enhanced conceptualization of FA. These resources provided the VSR-PSTs structures for learning about and describing FA practices and were the PST-identified means of developing and deepening their understanding of FA as a construct. Data from the Entire Cohort's reflection documents as well as the FA questionnaires support the data described from the VSRs.

VSR-PSTs mentioned a variety of resources in their reflections of their enactment videos and in relation to their descriptions of their general use and perception of FA. Most of the VSR-PSTs (4/5) referred to observations of and

conversations with their CT as influential to their conception. All four sets of questionnaires reported that observation of their CT "extremely" influenced their knowledge or practice of formative assessment. Additionally, 3 of the 17 PSTs from the Entire Cohort directly referenced their CTs in their written reflection as influences on their enacted teaching.

In the VSR interviews, 3 of the 5 VSR-PSTs CTs participated for ten to fifteen minutes, after the VSR-PST and I reviewed the selected clips and before the VSR-PST revised their FA concept map for the final time. I asked CTs to share their understanding of FA and facilitated a general discussion of FA strategies. This conversation provided a window into how the PST-CT relationship affected the VSR-PST's understanding of FA. Prior to the CT's arrival in the interview, the CTs of 2 of the 5 VSR-PSTs (Amanda and Sam) had already brought up their CT's influence as they described thoughts they had while teaching. All three VSR-PSTs whose CT's participated (Amanda, Sam, and Kathy) referred to specific CT comments made during the VSR interview in their final revisions of their FA concept maps, after their CT had left the conversation.

For example, while her CT was in the interview, Amanda shared that Ms. Carly was like a "friendly voice in her ear," helping her be more aware of and attuned to students in-the-moment. When Amanda took over teaching, Ms. Carly would be "pointing out, you know, things that I haven't trained myself to see yet. About what they're doing or what they're not doing." Amanda recognized the complexity of the classroom environment and how Ms. Carly helped her figure out what kinds of things to look for in anticipation of and in response to potential stalls in moving student understanding forward. After Ms. Carly left, Amanda added to her construct map a

third time. She immediately called on something Ms. Carly said, saying "I mean I really like what Carly said. It's something that's always happening. It's not just like something you take a moment to do." In addition to their time in the classroom together, Ms. Carly's participation in the VSR interview influenced Amanda's conceptualization of FA, providing a model to help Amanda put into her own words what she admired about her CT's teaching and how she saw Ms. Carly as a model of effective FA enactment.

Similarly, Sam and Vicky noted how observations of their CT in action provided models for the possibilities and opportunities for FA in-the-moment. Sam said his CT was "really good at connecting to the students when it seems like there's a gap there, or when they're not fully following." Vicky noted that her CT attended to students' understanding in relation to learning goals and small group configurations. She explained that her CT does a "really good job at moving them around constantly, to make sure they're at where they need to be." These accolades by Sam and Vicky illustrate what these two VSR-PSTs aspired to enact in their lessons. Additionally, their CTs provided instructional models of a skill the VSR-PSTs hoped to continue to develop, the ability to navigate known learning goals and unknown student understanding of these learning goals effectively and fluidly in the midst of teaching, minute by minute and day by day.

Kathy and Sam both mentioned how their university-assigned supervisor's models and guidance influenced their understanding and enactment of FA. I asked if Kathy saw probing in a short clip where she asked for students to show thumbs up/down/side to ask students if they "felt good about these new words." Kathy responded, "Yes, I get that from (Supervisor). That's like (Supervisor) always does

thumbs up thumbs to the side and yeah and the fist to five. So those are just in, my, you know, in my repertoire." Kathy calls on a tangible FA strategy she has been on the student end of in her supervisor's seminars and classes, thumbs to indicate self-assessment of comprehension, and described how she uses this same quick, observable strategy in her own teaching.

Evolving from the tangible, overt strategy Kathy mentions, what her supervisor DOES, Sam references what the supervisor SAYS about FA in relation to his final revision of his concept map. In his last revision, Sam brings up the relevance of elicitation in the FA process. Sam explained that "whenever formative assessment gets brought up, I always think back to just what (Supervisor) says, um, he says it's just like constant checks for understanding." Sam and Kathy's descriptions reflect how supervisors supported their understanding and enactment of FA in different ways. Kathy's description ties her learning direct modeling for PSTs in seminar classes. Sam's description moves beyond overt strategies and centers the content of the lectures and conversations he participated in with his supervisors.

When asked for more detail about what he meant by "constant checks for understanding," Sam tied together his own thoughts and observations from watching his lesson in the VSR interview, the supervisor's words, and comments from his CT, Rhonda, who had just left the conversation. He explained that he understood his supervisor's definition, "constant checks for understanding," as not one particular strategy. When asked to elaborate, he said, "It can look like so many different things. It really just depends on the lesson. But…it can be, it was like (Rhonda) was saying, you know it could be informal, it could be self, it could be any type of assessment." For Amanda, Vicky, Kathy, and Sam, their descriptions of and conceptualizations of

FA were significantly enhanced by the conceptual models and frameworks provided through relationships and activities with CTs and supervisors. Of the 3 VSR-PSTs who had CTs participating in the interviews, 2 called on CTs' models prior to their CT's arrival, and all 3 promptly responded to the CT's own words after the CT left the conversation (for Sam, Amanda, and Kathy).

I asked Vicky, whose CT did not attend the interview, about whether she and her CT talked about FA. Vicky shared that she observed her CT do turn and talks and monitoring for who did and didn't understand concepts. She noted that she did not know how her CT attended to the students who did not know answers, saying, "the only thing I don't know what she really does, and I know it's hard because they're so many of them, is how do you go back and address that again?" In this statement, Vicky reflects how observations of her CT have influenced her own behaviors, but that she lacked an understanding of how the FA strategies were connected to next instructional steps.

Coursework, course readings, and the requirements of the TPA were referred to by Vicky and Swathi in their descriptions of how they developed their current understanding of FA. Explaining why she selected a particular clip to view, Swathi said, "that was intentional formative assessment. It's a requirement for the CalTPA … that was what I was hoping to send." As the VSR interview concluded, she asserted that the process of recording and selecting clips to submit for the "CalTPA has helped me understand what, you know, formative assessment is." Because the official Cycle 2 preparation materials do not refer to "formative assessment" but to "informal assessment," Swathi's connection between the TPA requirements and the stated subject of the VSR interview is noteworthy. Swathi was the only VSR-PST whose

comments and questions during the interview turned to whether and how particular clips characterized specific annotation requirements for the CalTPA, sourcing me (the interviewer and researcher) as a kind of mentor.

The CalTPA, its requirements and descriptions, was the only framework Swathi explicitly used to explain how she built her current understanding of FA. Vicky, however, referred to her CT, her supervisor, and to coursework she recalled from earlier in the year, both in response to why she used a particular FA strategy and to her overall self-assessment of her uses of FA. After viewing a clip where she sampled from various students during a whole group discussion, she said,

> I think we studied or read this, but it would probably be like a good time when you know, the person who does understand shares it, and then the person maybe that you knew didn't understand, have them repeat that back, so that, you know, that they're processing it or something?

In this statement, Vicky applied what she had read about in teacher education program coursework to what choices she made during instruction, in terms of FA. She went on to explain how she often repeats back and requests that students repeat back words or phrases as a strategy to support her majority ML students. At the end of the VSR, Vicky again referred to early coursework, tying together what she has learned in the teacher education program with how she teaches in the field. Vicky remembered talking about FA in the program before they began student teaching, noting that at some point the teacher education program focus slipped "into other topics, and like … you're making me realize that I do it more than I actually, like, know that I'm doing it, which is nice, cause it's like OK, yeah. Like I'm getting this." Here, Vicky referred to learning from the teacher education program and to learning about FA from the VSR interview. Both the recollection of teacher education program content and the semi-structured VSR interview supported Vicky's final

described understanding of FA as a concept and her awareness of how she was developing her ability to enact FA in her teaching.

Most VSR-PSTs (4/5) referred to components of the VSR interview protocol, including specific prompts, questions, and a review of the FA graphic (FA Wheel, see Appendix B) as supporting their framing and understanding of FA. After viewing the FA graphic, three VSR-PSTs used it to make additions to their FA concept maps. Amanda, explaining to her CT what had been reviewed so far in the interview, said, "A big, kind of, thread for me in this discussion has been about … the effectiveness of responding when I do things in-the-moment." As a final comment during the interview, she said that the VSR process was "really interesting from me. I learned from participating in this." Amanda attends to how the process of reviewing small clips and thinking about a particular skill of FA, probing questions, helped her consider more deeply how small actions and reactions affected student learning. Similarly, Kathy reflected, "I think I did learn a lot from this, I thought it was really helpful for me to be kind of talking this stuff out" and Sam said the process was helpful, "lots of self-reflecting there." Vicky, Amanda, Kathy, and Sam referred to the semi-structured VSR interview as a tool that supported their reflection and, in turn, their understanding of FA as a process. While Swathi frequently asked me for feedback (e.g., "I want to know your thoughts;" "What do you think about it?"; "What are your thoughts?") and used the VSR interview as a tool for affirmation of and suggestions for her CalTPA clips and reflection, she did not directly refer to the VSR itself as a tool that supported her understanding of FA.

A natural ability for instructional dialogue was referred to by VSR-PSTs Kathy and Swathi, indicating a lack of a conscious framework or model for FA.

Kathy, who described her use of probing questions as "crowdsourcing these definitions, instead of giving it to them … getting their answer and then like building off of it, and … giving it to them in that way," explained that it was "kind of, like, my natural way of doing things and I think these clips are like, just kind of, me doing my thing." Swathi also described a situation as a "natural" interaction, where she framed a seemingly unrelated student comment as an affirmation of how the student's response fed into her teaching topic, proofreading. She said, "It was just natural, I mean … look, is this what you (student) are talking about? He's an English learner, he probably couldn't explain it through his words." Kathy and Swathi's assertions that their natural way of conversing and working to understand students is conspicuous amongst the VSR-PST interviews. An innate capability for FA-oriented dialogue is only mentioned twice, both in comments speaking directly to thoughts occurring during a clip. Because both Kathy and Swathi more frequently alluded to other models beyond a natural ability, in addition to the evidence from Vicky, Sam, and Amanda's transcripts, the data suggests that the VSR-PSTs' understandings of FA were affected by a myriad of resources and models and in varying degrees. These resources included their observations of and conversations with CTs and Supervisors, the VSR interview itself, and teacher education program coursework and requirements.

Planning and Using Questions to Model and Elicit Student Use of Language

Most (12/17) of the Entire Cohort showed deliberate intentions to follow up on students' thinking and responses through specific questions written in their lesson plans. In their enacted lesson videos, all but one PST enacted at least one follow up questioning move, to ask a student or students to elaborate or to extend a thought and

used the student's own words. All PSTs in the Entire Cohort provided at least one explicit language model in their lessons, including the use of graphic organizers, frontloading vocabulary, sentence frames/starters, the use of gestures, and whole class charts. PSTs whose classes included more than 40% MLs, including the 5 VSR-PSTs and 3 additional PSTs from the Entire Cohort, generally planned for and employed a greater variety and use of language models and more explicitly attended to students' use and application of language than PSTs with fewer than 40% MLs in their classrooms. However, the kinds of spoken responses the PSTs planned for and elicited varied across these eight PSTs. Elicitations ranged from rote choral responses and requested verbal repetitions to probing for more open-ended responses, encouraging students to use their own words, and helping students make explicit connections to the lesson's disciplinary vocabulary and language structures. Below, the first subsection describes how PSTs consciously planned for and used follow up questions to respond to and recognize students' own words. The second subsection describes the kinds of language models PSTs planned for and used in classrooms where there were more than 40% MLs.

Planned Eliciting

All but one PST in the Entire Cohort indicated at least one specific question or strategy to respond to and elicit students' everyday language in their lesson plans. Table 4 shows the percentage of MLs in each PST's classroom, how many probing questions each PST listed in their lesson plans, how many follow-up questions each PST asked during their enacted video, the length of the PST's recorded lesson, and the average number of probing questions asked per minute of the lesson (number of enacted questions divided by minutes of lesson). The last column shows the number

of additional FA moves the PST indicated as strategies to look for student understanding in their lesson plan, including comprehension checks, monitoring, think-pair-share conversations, written work completed during a lesson, extended wait time, and vocabulary clarifications during read alouds. The table is sorted by PST's average probes/minute.

Table 4

Entire Cohort's Planned and Enacted Probing Questions

Name (* indicates VSR-PST)	% MLs	# of Planned Probes	# of Enacted Probes	Video Length	Average Enacted Probes/ Minute	Additional Planned FA Moves
Sam*	42	1	5	12:01	.42	5
Chad	4	2	15	48:22	.31	0
Katie	3	2	7	22:49	.3	7
Marla	21	1	9	39:38	.3	4
Swathi*	62	0	8	30:30	.26	3
Amanda*	50	2	2.5	13:15	.23	0
Adelyn	45	1	3	15:49	.2	3
Stephanie	6	1	4	20:16	.2	4
Tara	30	1	6	35:55	.17	4
Nadine	11	2	6	42:23	.14	4
Kathy*	43	0	3	26:20	.11	5
Betsy	38	1	2	30:44	.07	1
Vicky*	80	1	2	34:09	.06	4
Daniel	94	0	2	34:43	.06	2
Rose	50	0	1	38:43	.03	4
Lynn	4	1	0	30:01	0	4
Macy	0	0	0	45:04	0	2

While the Entire Cohort planned probing questions and/or FA strategies to follow up on student responses, to elicit further information or anticipate needing to clarify, there was considerable variation in whether and how PSTs enacted responsive questions during instruction. For example, Chad, who planned two specific probing questions and no listed no specific FA moves, enacted 15 probing questions in his 48-

minute lesson, the second highest per minute use across the Entire Cohort. He asked most of his questions during an opening whole group activity, where he asked several students to elaborate or expand on how their shared examples of a "dilemma" fit the definition they constructed at the very beginning of the lesson. Chad not only elicited students' own words and examples but also helped them connect and deepen their lived examples to his ultimate teaching point, an investigation into the ethical dilemma Africans faced regarding the slave trade. Whether or not he was conscious of this focus is not fully visible in his data. In his reflection, he wrote that he "gave students a lot of space to think of dilemmas that they also faced in their life … many students came up with their own ideas of a dilemma and presented it with the classroom." While he did not specifically plan to elicit student responses, Chad did take the opportunity to give his "students a lot of space to think" during his lesson and recognized the value of class conversation in his reflection.

Sam, a VSR-PST who recorded the most probing questions per minute (.42), planned his small group lesson to "focus on meeting our class challenge which is struggling to take a risk and be wrong at times." He wrote that he structured the lesson in the "I do, we do, you do" format, so that students would have a model of the language required for the task but, importantly, would be encouraged to work together and share "ideas with each other and working to come to an answer students as a team can be proud of." This lesson objective was enacted vividly in his lesson, through use of his planned questions and strategic wait time after asking questions. During the VSR, he paused the video at a moment where a student was at the board and had circled the root of the word 'telegraph.' Sam explained that at this moment, he had recognized that another student had their hand raised to answer his question,

but he was

> Hoping that the student at the white board can walk us through, right? I want her to really show us exactly what she's thinking. And at this point, she's circled it, she's showing me that she does know, she got exactly what I wanted her to get out of it, I just need her to put it into words…It's not about having the right answer so much as putting something forward for the rest of the students to think about.

Sam prioritized the students' own words. He worked to elicit and provide the space the student at the board needed to put the concept into her own words, moving toward his teaching point. Simultaneously, he attended to his goal that students would work "to come to an answer students as a team can be proud of." For Sam, his teaching was not about hearing the student say the "right" answer, it was about having the students use their own words to show their understanding. He planned for this in his lesson, providing structured opportunities for students to come to the board, show their thinking, and to collaborate on a group model of the activity.

Swathi also had a high number of probes per minute (.26) compared to the Entire Cohort. During her VSR, she explained that "I personally feel planning, being deliberate about when I do a formative assessment is important. It's, I (the teacher) understand. It's not just yes/no that's the level, but then deliberate questions…to understand the student gets the bigger or the broader question that you posed." While her lesson plan listed two planned questions and no planned probes, her plan included other FA moves, including turn and talks and increased wait time as a strategy to support students' awareness and use of language. For Swathi, though her lesson plan did not reflect many specific questions, it seemed that throughout her lesson enactment she was consciously aware of other informal FA strategies that she regularly used but did not write down in her plan. She attended to students' own words and actively worked to elicit and explicitly connect their spoken words to the

concept she aimed for in her lesson. For example, after several isolated exchanges where Swathi tried to help a ML student who struggled to put their understanding of a concept into written words (Why do we edit our writing?) over the course of her video, Swathi ultimately wrote out what the ML student said on a separate piece of paper. When asked what she was thinking when she made that choice, she explained, "You tell me, I write it. That's it. It's still you presenting it orally, but you don't have to write it. I write it for you, is (for you) to learn." Like Sam, Swathi prioritized the students' own words and way of expressing understanding of the concept, and directly connected them to her teaching point.

Two of the VSR-PSTs' CTs also described deliberate attention and built-in structures as features of responsive FA and questioning. Amanda's CT, Ms. Carly, shared thoughts about how she sees FA as an intentional act of looking for and responding to students' understanding. She said simply: "doing that every second of every lesson is kind of the primary job of the teacher." After Ms. Carly left, Amanda processed this idea out loud, noting that while sometimes a teacher needs to clarify for students or redirect students' thinking in-the-moment, there is an aspect of FA that can be planned, "stuff that could be built into the lesson, like … I'm gonna check for their understanding here, do they understand the goal … or I can just spontaneously decide that it would be helpful to dig deeper, or check in with them." Similarly, after Kathy's CT left the VSR conversation, Kathy called on a comment her CT made. She recognized that FA is more than just frequent checks, it is more like "kind of, building in a system of formative assessment." Built-in, flexible FA strategies, attention to students' in-the-moment understanding, and deliberate plans to elicit students' own words during a lesson were present in all the PST lesson plans and

reflections that when enacted, contained high uses of probing questions. While Kathy's enacted probes per minute were below the Entire Cohort's average, her VSR reflection shows she was coming to understand FA as conscious attention and deliberate action towards eliciting student understanding. She began to describe FA as a system that could be built into and expand her frequent use of IRE dialogue structures to include questions and feedback between students' responses and the teachers' evaluations.

While most of the Entire Cohort demonstrated planning and/or use of follow up questions in their lesson plans and enactments, there were two PSTs who did not enact any audible follow up questions or prompts in response to students' contributions to classroom dialogue in their video enactments. In their reflections, both students described concerns in their students' ability to listen actively and stay on task. Lynn listed one planned probe but did not ask the question in her video. In her video, she modeled taking notes with a class example of a democratic leader. One student shared that they already knew something about the leader she was presenting. After this comment, there was space for the PST to potentially elicit more information from the student, to activate their prior knowledge and compare it to the article the PST used to model the class activity. Reflecting on her heavy focus on the academic language of her lesson, Lynn wrote that she "should have used dialogue and context to help form a more robust contextualization of the words." Lynn recognized that she missed opportunities and explained that increased dialogue and responsive questioning could have enhanced her students' understanding.

Nearly half of Macy's 45-minute video was spent orchestrating a Zoom conversation with a visitor who presented on what technology was like in 1963. The

Zoom visitor was the lead instructor for this large portion of the enacted lesson, which did not leave much recording space for PST Macy to illustrate how she facilitates classroom discussions. In her reflection, Macy noted this missed opportunity, explaining that she had planned to "take ideas from the turn and talks" to model the Venn diagram writing activity. To explain the deviation from her plans, she focused mostly on how she wished she would have coordinated better with the adults who she had solicited as guest speakers and technical support (her CT). Despite not being able to fully plan or enact follow up questions, both Lynn and Macy showed limited increased awareness of the relevance of eliciting students' words in pursuit of guiding them toward the learning objectives.

Providing language models

Part of the evaluation criteria for the lesson plan, enactment, and reflection assignment completed by the Entire Cohort was to provide descriptions of, rationales for, and reflections on whether and how the PST met TPE 1.6 and TPE 3.5. The assignment description and state-provided materials of these two TPEs (University, 2022, CTC, 2016) read:

> TPE 1.6: Supports students' first and/or second language acquisition by using research-based instructional approaches, including focused English Language Development2, Specially Designed Academic Instruction in English (SDAIE), scaffolding across content areas, and structured English Immersion
>
> TPE 3.5: Adapts subject matter curriculum, organization, and planning to support the acquisition and use of academic language within learning activities to promote subject matter knowledge of all students.

TPE 1.6 directly addresses supporting students' language acquisition via research-based instructional approaches. TPE 3.5 examines how PSTs adapt and plan to support students' acquisition and use of academic language. Critiques of this terminology are described in Chapter 2.

As described earlier, there is a connection between the state-mandated performance assessment and the TPEs. This study centers language in FA practices; therefore, the TPE's emphasis on "academic language" (and therefore CalTPA and incorporated into the Course Assignment) was incorporated into the second half of the research question discussed in this section. This research question explores the extent to which PSTs in ML-dense classrooms provided language models (or, using terminology from the CalTPA and the TPEs, models of "academic language"). Models of academic language were coded in lesson plans if they were described in lesson plan sections asking for language demands (e.g., "How will you give attention to language") or directly related to a connection to the phrase "academic language." Opportunities for students to use language (oral or written) were coded in explicit plans (e.g., students will pair share), written and VSR reflections, and VSR recalled thoughts (e.g., "I'm having them repeat back").

While the Entire Cohort listed many different planned and provided language models, including demonstrated talk moves (e.g., wait time, turn and talks), sentence frames, graphic organizers, and read alouds, the quality and quantity of planned and enacted opportunities for students to use academic language varied in what PSTs looked for and identified as student uses of academic language. Some PSTs prioritized students' own words as they related to the targeted lesson vocabulary and others seemed satisfied with students' choral responses and students who gave responses the PST sought. Vicky's objective of the latter prioritization is illustrated in how she said she looked for students who could take "the words out of my mouth." Table 5 shows models of academic language that the eight PSTs in classrooms with greater than 40% MLs planned to use, as well as the planned and enacted

opportunities their students had to use academic language (oral or written).

Table 5

PSTs' Planned and Enacted Models of "Academic Language"

PST & % MLS ***VSR-PST**	**Planned Models of "Academic Language"** Written in Lesson Plan		**Opportunities for Students' Use of "Academic Language"**
Sam* 42%	• Collaborative discussions • Pair Share • Group discussion • Group Models • Sentence Frames • Outline	• T-Chart of domain specific words, words students don't know • journals writing • Essay	• collaborative discussion • pair shares • coming to/showing on whiteboard • writing in journal
Swathi* 62%	• Word Bank • Gestures • Read Aloud • Images	• oral collaborative conversations • Turn and talks • Video	• gestures • choral repetition • class discussion • Turn and talks
Amanda* 50%	• Finding Evidence in a multiple-choice collaborative game	• make a timeline • Collaborate and converse	• creating timeline • finding evidence with small groups • class discussion
Kathy* 43%	• graphic organizers • Collaboratively talking with a peer	• PowerPoint • Teacher Model • Sentence Starter • Class Discussion • Partner Discussion	• class discussion • pair share • graphic organizer writing • Choral repetitions
Vicky* 80%	• answering questions out loud with a partner and with the whole class • sentence frames	• We will/I will discuss • choral responses • Big book • Images	• discuss with small groups • Whole class share • gestures • choral responses to sentence frames • repetition after teacher
Adelyn 45%	• Read Aloud • Gestures • Oral collaborative conversation	• Modeled writing activity • Sentence Stem	• oral collaborative conversations • collaborative written assignment (graphic organizer)
Daniel 94%	• Visual + Oral Review of High Frequency Words	• Sequenced Pictures • Video	• repetition after teacher • pointing to image representing students' oral response
Rose 50%	• Charted Visual of Author's Purpose • Class discussion	• Sentence Frames • Read Alouds	• filling in oral sentence frame • class discussion

The elementary students in the PSTs' classes were provided multiple models of academic language and given opportunities to use the PSTs' targeted academic language. Sam and Swathi, whose average probes per minute were in the highest range of the Entire Cohort, provided models and opportunities for student application that consciously emphasized collaboration and guiding students to use their own words. For example, Sam's plan included asking students to come to the whiteboard and add to the graphic organizers (t-charts, filling in an outline) as part of his small group work. His emphasis on getting students to use their own words is described in the previous subsection. Swathi's lesson plan described using gestures and repetition as a means to support students' acquisition of English. However, in her enactment and description of her lesson in her reflection, Swathi also asked students to predict and provide their own examples and connections to particular vocabulary in turn and talks and whole group discussions throughout her read aloud. Both Swathi and Sam first elicited responses from their students and then connected the students' responses to the language (vocabulary and structures) necessary for their lesson's objectives.

For the other six PSTs with high populations of MLs, however, the teaching orientation, as initially described in their lesson plans and demonstrated in their video, leaned more towards getting students to provide specific responses. While these PSTs often asked students what words might mean or what they knew about a topic (Kathy called this strategy "crowdsourcing"), these PSTs often ultimately wrote or stated specific, prepared definitions, recasting students' words into the form and phrasing they had planned. The priority seemed to be to provide students' explicit instruction so that the class could meet the language demands through seeing and hearing the targeted, academic form or definition. Repetition also helped PSTs check that

students understood their roles in relation to the academic language necessary to complete the activity. For example, Amanda explained that in asking students to repeat back assigned roles and duties, she wanted to "make sure that they really understand what their roles are, so they know what they're supposed to be doing, and what they're looking for, so they can be goal oriented during the quiz." This kind of repetition helped her realize that the students did not understand how she was using the word "text" in relation to a timeline. When she asked students to point to the text and they faltered as a group, she recognized this as an indication that she needed to clarify what was meant by "text" in that circumstance. In her written reflection, she framed this dialogic exchange as adapting to students' needs in-the-moment, feeling "that students needed clarification about the task at hand." While not fully recognizing it in her written reflection, she also supported students' deeper understanding of the language necessary for her lesson objective. In her VSR interview, she explained that in this moment, she "was trying to give them that word and have them repeat it back to me, just to kind of sew pieces together." Amanda worked to help the students, through repetition, connect the idea of a "text" to the word "timeline," connecting the concept across the content areas of literacy and social studies.

Adelyn, a PST with 45% MLs in her classroom, illustrated a progression in her thinking about her provision of and reasons for choosing models of academic language in her lesson. In her lesson plan, Adelyn listed a read aloud, gestures, repetition, class discussion, a modeled writing activity, and the use of sentence stems as planned models of academic language. Her plan also indicated that she would provide space for a class discussion and collaborative work on filling in a graphic

organizer. The plan centered her own words and structures as the models and hoped for use of academic language in her lesson. For example, she wrote that she planned to "repeat a lot of the key ideas in a variety of ways in order to help make the information as accessible as possible to ELLs." In her written reflection, she wrote, "as I read through the book, I made sure to gesture for words I thought may have been unfamiliar or complex. I also continuously repeated and restated what was happening in the story for the students." In both her plan and her reflection, Adelyn, the PST, is the main user and model of language – "I read," "I made sure," "I thought," "I … repeated and restated." In her reflection, she does not describe if or how she elicited students' responses or provided opportunities to practice using language in relation to her lesson's content. However, in the final paragraphs of Adelyn's reflection, she recognized that the students did not have a chance to come to their own conclusions. She wrote that because the students struggled with the written component after the read aloud and instruction, she "felt as though I gave them too much," going on to say that in the future she "will try and work with a larger group of students to brainstorm and get ideas out and then dictate for them as they watch." Like Amanda, Adelyn's progression in thinking about her planned and enacted uses of models for language expanded across her data artifacts. While teacher-oriented repetition, gestures, and sentence stems are useful guides that provide helpful structures for students to enter into and participate in academic conversations (convergent FA), PST-provided models alone did not necessarily help students apply language on their own (divergent FA).

Upward Trajectories, Varying Slopes: PST FA Learning Progressions

From the first questionnaires completed in the fall to the final VSR interviews

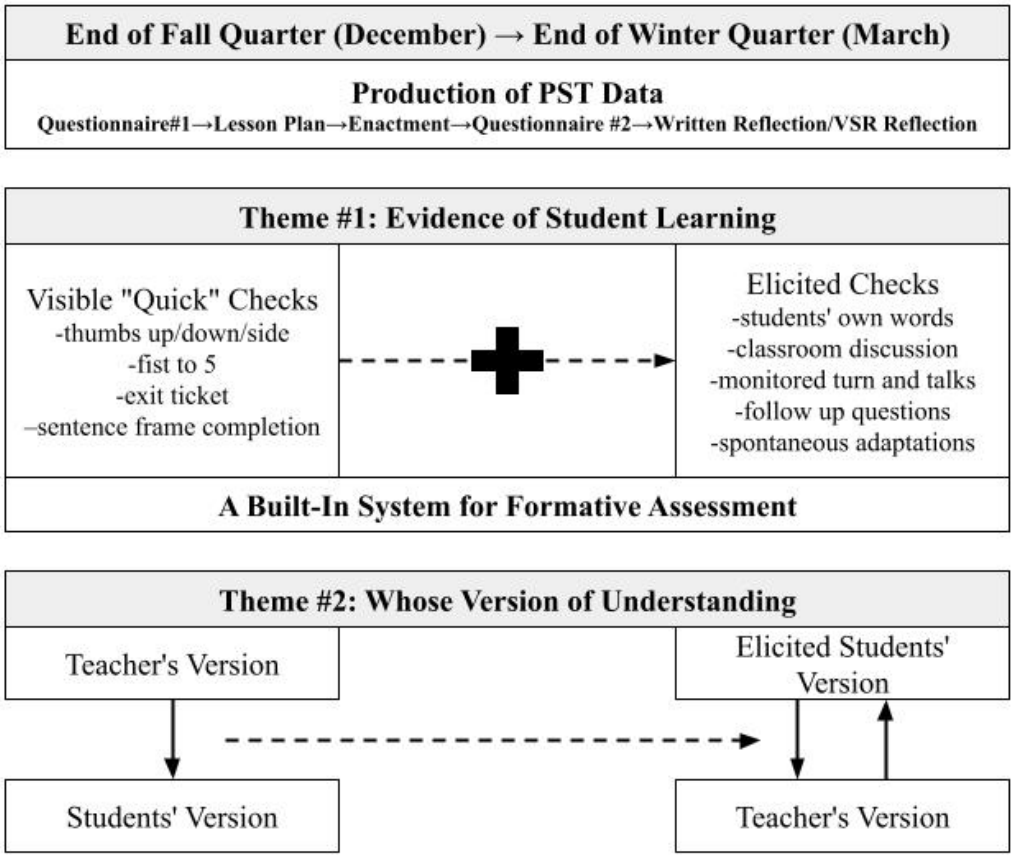
completed at the end of the winter quarter, each VSR-PST deepened their understanding of FA as a concept and a strategy for identifying what and how students understand the content of their lessons. As the preceding sections have shown, the Entire Cohort described a range of practices in-the-moment of teaching to follow up on or in reflective noticing of missed opportunities to follow up on student responses. In varying degrees, the Entire Cohort showed more awareness and understanding of the utility of probing questions to uncover and elicit students' thinking in their elementary classrooms.

This final section describes two specific movements in the VSR-PSTs' development trajectories of understanding FA as a concept and enacting it as a practice, aligned with the two themes introduced at the beginning of the chapter and attended to throughout the previous sections: 1) a shift in what PSTs seek and consider as evidence of student learning and 2) whose version of understanding (the PSTs' lesson objective or the students' ways of knowing) is foregrounded throughout a lesson's dialogue. These general learning shifts are illustrated in Figure 3. In this study, the PSTs' understanding of FA deepened and expanded, aided by a combination of factors described by the PSTs themselves. These factors include accumulated student teaching experiences, the structure of the teacher education program assignments, and observations of their CT teaching. PSTs frequently mentioned receiving support in their understanding of FA via models from and mentoring conversations with CTs. Additionally, 4 of the 5 VSR-PSTs directly referred to the process of engaging in structured reflections after the recorded lesson as a means to help them understand the relationship between probing and FA. Through the interaction of these resources, the VSR-PSTs showed a deepening and

expansion of their awareness of the utility of probing questions as a component of the FA process to uncover and elicit ML students' thinking in elementary classrooms.

Figure 3

PSTs' Shifts in Learning Across Themes of Evidence of Student Learning and Whose Version of Understanding



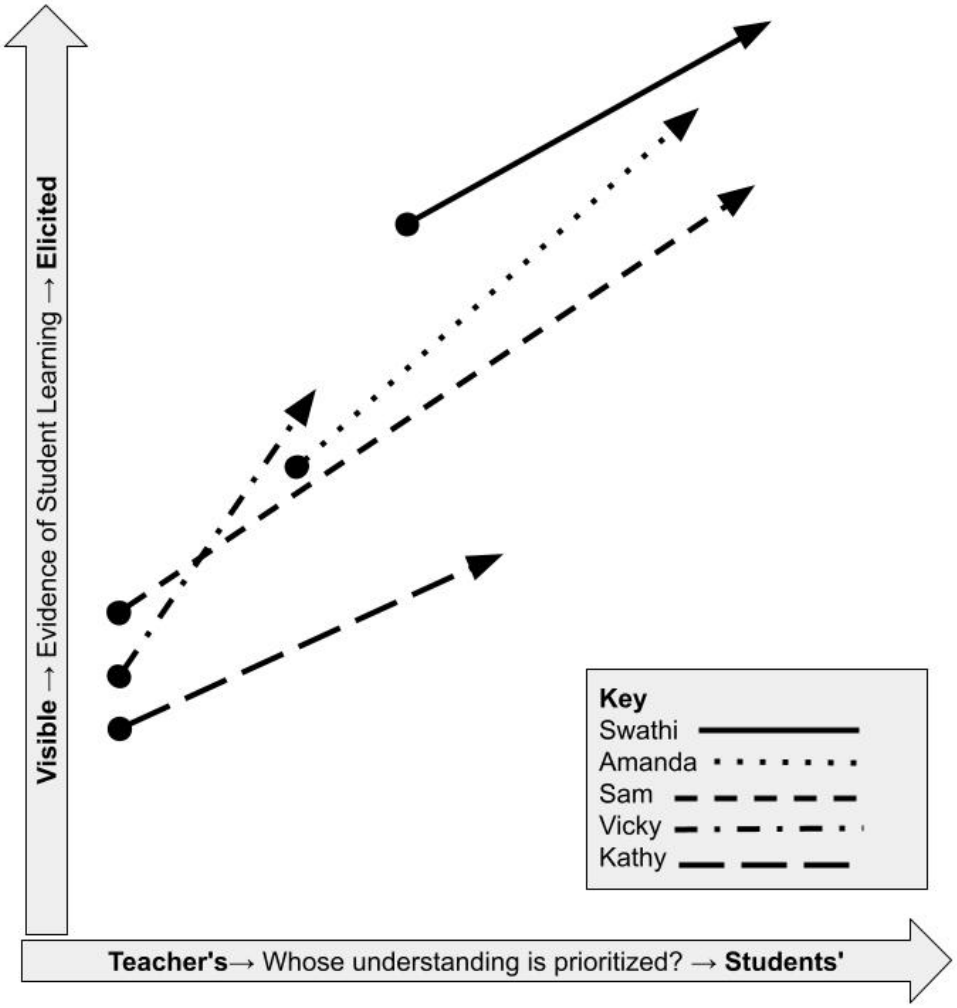
In varying degrees, each VSR-PST developed a more expanded view of utilizing probing questions to uncover and elicit ML students' thinking in elementary classrooms. Some learning trajectories began with sparse definitions and guesswork (Kathy, Vicky, Sam). These PSTs emphasized visible evidence and prioritizing the teacher's understanding. Amanda's initial definition of FA included active phrases (adapting, collecting, responding) and elicited/responsive evidence, but was vague in her description of whose understanding oriented these instructional moves, saying,

"Um, yeah. Those are the most, I think, key features. Like, some sort of data collection, or just better understanding them." Among the VSR-PSTs, Swathi's first conceptualization of FA was the most sophisticated, illustrated by the phrases, "bridge between student understanding and teacher teaching" and "key to differentiation." Her understanding was the least affiliated with visible evidence and was more geared toward an emphasis on student understanding, though the teacher's version is accented in her initial response - as she explained it is the teacher's job to make sure "that every kid gets it."

Figure 4 depicts approximations of the VSR-PST's developmental trajectories, as evidenced by data from their VSR interviews, on a two-dimensional scale. The vertical dimension ranges from descriptions of FA as visible, binary evidence (thumbs up/down, exit tickets) to oral elicitation and open-ended follow up questions. The horizontal dimension ranges from prioritizing a teacher's specific version of academic understanding (a correct response, a particular word) to students' everyday ways of understanding and explaining. To be clear, FA as a full concept and process, encompasses all these levels of understanding and all the strategies are needed to support students' learning. Both convergent and divergent forms are necessary and useful to support students' learning (Pryor & Crossouard, 2008). Movement forward or up within the scale does not mean a "better" version of understanding FA, but a more robust and sophisticated understanding. The use of arrows on the figure are meant to capture the relevance of this development, as a path that includes the VSR-PSTs' initial knowledge and extends towards ongoing and deepening understanding.

Figure 4

Approximations of the VSR-PSTs' Developmental Trajectories



Initial points are placed in reference to VSR-PST's first concept map as well as any additional explanations provided by the VSR-PST as they created it. Each line ends with an arrow, illustrating approximations of VSR-PSTs' final understandings as shown in their revised concept maps and explanations, and recognizes that learning continues to occur past the VSR-PST's participation in the study. Lower placements indicate understandings of FA that described evidence of student learning as visible (e.g., thumbs up/down/sideways, exit tickets) and higher placements indicate descriptions that included elicited and dynamic forms of FA (e.g., conversations,

shifts in teaching). Placements further to the left indicate prioritizing the teacher's understanding (e.g., "test to see the progress of students") and further to the right indicate foregrounding students' understanding.

Taken together, the five VSR-PSTs illustrate potential variations and patterns in how they came to understand FA as a concept in relation to their ability to purposefully enact responsive FA in-the-moment, as demonstrated over the length of their VSR interviews. Descriptions of how each VSR-PST came to their final expressed understandings during the VSRs are shared below.

Kathy: "Having these other components and these other ways of explaining it"

Kathy was the only VSR-PST to complete multiple VSR interviews. As noted in Chapter 3, the second and third interviews were dropped from the analysis. I did not include these two VSR interviews, as they discussed different lessons and Kathy did not elect to add to her FA concept map in either event. The fourth interview was not a VSR. The sole purpose of this interview was to include Kathy's CT in the process. The conversation focused on parts 3 and 4 of the interview protocol, those that involved the CT and a final opportunity to revise the concept map.

Among the VSR-PSTs, Kathy's developmental trajectory had the fewest directly observable changes, the smallest slope, and the most fits and starts. After viewing the FA graphic, she added "follow up questions" to her concept map. Explaining her first map, she said, FA is a "kind of alternative to (summative assessment), just kind of like, making sure." Her observations and responses to "Did you see FA or probing in this clip? How?" centered around her "natural way of doing things" and "crowdsourcing these definitions." I presented a clip I identified as including a follow up question. Kathy explained this interaction as, "Yeah, she gave

her answer, and I said, oh yeah? Oh kind of like this? And then does that sound good? I think maybe that's probe-ish." As the VSR progressed, Kathy demonstrated an emerging ability to systematically recognize moments of probing and of opportunities to probe, when she prompted by the researcher to indicate any moments or missed moments of FA after viewing her clips. For example, in one clip, a student held up a book they were reading, and asked if it was an example of a biography. She said, "I kind of shrugged off that kid right in front, when he showed me his book … maybe saying more of like, okay, well that's more of a fiction. Do we think that's a biography, and you know, things like that, I think, would have been good."

Despite recognizing missed opportunities to elicit student thinking through follow up questions in the VSR and adding "follow-up questions" after seeing the FA graphic, at the end of the first interview, Kathy did not make changes to her concept map. She asserted, "I think I still kind of have the same thought about it, my same, like definition." A few days later, however, when I asked if she would like to add to or revise her map after her CT left, she took the opportunity to revise. She explained, "I think, actually, one thing that Ms. Rebecca said just now that made me think. Something I should be adding is, um, what I do next … you know, trying to elicit more from them, based on my assessment." Kathy's development was in fits and starts, less expressed in general explanations and more expressed when stimulated by watching selected clips, prompted by the researcher, and most vividly after hearing her CT relate FA to shared day to day teaching experiences.

Kathy's final statements add to this portrait of a self-assured learner, who views herself as a natural at classroom dialogue, and does not seem to fully understand how she has come to learn about FA. "I think I did learn a lot from this, I

thought it was really helpful for me to be kind of talking this stuff out." Yet, moments later she added, "I think my idea for formative assessment, like what it is, I think it's pretty solid," but ultimately asserted that "having these other components and these other ways of explaining it and hearing Ms. Rebecca's explanation, and I think that's all been great." Sandwiched between the two references to specific models of FA, Kathy expressed that she felt her understanding of FA was strong and not changed much from the very beginning of her VSR process, displaying confidence in her words, and showing this certainty throughout the transcript. However, there was observable evidence of Kathy's learning, in particular of her understanding that less observable strategies of elicitation and follow-up questions could be a component of FA. She demonstrated this learning when I prompted her to explain her video clips, added to her concept map after seeing the graphic, and, most notably, hearing her CT talk about FA.

Vicky: "You're making me realize that I do it more than I actually, like, know that I'm doing it"

Vicky's initial concept map and description of FA emphasized visible strategies and ensuring that her students would know the teacher-given content at the end of a lesson or a unit. Throughout the VSR interview and her revised concept maps, Vicky showed some deepening in her understanding of FA as a concept, most notably in the kinds of evidence she considered as FA. For example, after seeing the FA graphic, she adds several phrases directly from the wheel (pausing, questions, probing), but also wondered if and how the use of sentence frames fit with this understanding. Toward the end of the interview, she noted that sentence frames and repetition are helpful for ML students, giving them the opportunity to use language

with a structure to support their acquisition of specific English terminology. In her final explanation, Vicky shared that there are "so many different ways to do" FA and "ultimately it's figuring out what students understand and don't understand, and getting them to the point where they do understand." This last description indicates that she expanded her perception of what is evidence of FA, centered around a goal of getting students to understand as opposed to regurgitate a "correct" answer.

While there is a distinct expansion in what kinds of evidence support FA, Vicky retained a conceptualization of FA that prioritized the teacher's version of understanding. After watching a clip Vicky indicated as FA in her written reflection (the use of a red light/green light game, in which the teacher's directions of stopping at red and going at green was the objective), I shared three additional clips I had chosen as including probing interactions. After all three, Vicky identified the moment as an example of probing and explained each with a robust description, oriented toward comparing students' understanding to her lesson objectives. For example, she explained that she noticed that one student in a small group had the response she was looking for and responded by following up with the student. "I encouraged her to share with other kids in her group …. I even like, pick her to share her exact words, she got to the point." She explained when she prompts and questions students, she looks for students who have "the closest answer to what needs to, who would directly answer the question … I make sure that one person gives me an answer that's close enough to what I'm looking for." Vicky's recognition of the practice of seeking and using correct, teacher-chosen responses to follow up on as a form of FA is notable and contributes to her limited movement along the horizontal axis of Figure 4.

Vicky seems to attribute her movement along the vertical axis to a realization

that she was already doing so much in the realm of FA, as she watched and discussed the selected clips in the VSR process. She tied together early content from the teacher education program and the semi-structured conversation with me, saying, "you're making me realize that I do it more than I actually, like know that I'm doing it. Which is nice, cause it's like, OK, yeah. Like I'm, I'm getting this." Whereas Kathy exuded confidence throughout her VSR interview, Vicky's reflections throughout the VSR indicated a greater level of initial uncertainty in her ability to apply FA concepts and strategies covered in her teacher education program. Her ability to recognize FA as a versatile tool to uncover and elicit ML's thinking and understanding, albeit retroactively and in relation to the way she worded her learning objectives, arguably increased as a result of her participation in the VSR process.

Sam: "Lots of self-reflecting there"

To an even greater extent than Vicky, Sam's comments and responses during the VSR interview exhibited hesitancy and uncertainty throughout the conversation. Sam was notably self-conscious about his video, offering me apologies, wincing at a video still, and leaving ample pauses after I posed questions and prompts. His initial FA concept map reflected a significant misconception of FA. He explained it as formal assessment, "a classical … like standardized, very very formal" as opposed to informal. After viewing the FA graphic, he noted his misunderstanding and asked to add posing and pausing, together, to his concept map. He explained that he had been working on "posing and pausing in combination with each other … I've definitely been trying to work a lot on my pausing after posing questions, especially in questions that are to the whole group, and um, trying to get them all to think kind of together." In his first opportunity to revise his concept map, Sam's explanation

centered both using questions as elicitation and a prioritization on the students' understanding. The visual of the FA graphic prompted an immediate deepening of Sam's verbalized conceptualization of FA, something he had already been thinking about, but perhaps not in relation to FA.

Sam's hesitancy shifted to assertiveness while viewing his VSR clip. Like all the VSR-PSTs, he was prompted to unpack what he might have been thinking, and that he could pause the video at any time. Over one minute and twelve seconds of the clip, Sam interrupted to ask me to pause the video three separate times, launching into descriptions of what he was thinking and how each moment illustrated probing and FA, listed in Table 6. In just over a minute, Sam laid out a sophisticated understanding of how elicitation and follow up questions informed his instruction in that moment and connected to his ultimate goal of uncovering what his students understood in relation to his objective of identifying roots. This order - elicitation of students' understanding and then teaching point - is noteworthy, as is his description of each component of the FA process within the minute and twelve seconds.

Table 6

Segment of Sam's VSR Transcript

Teaching Video Timestamp	Explanation	FA Process
7:53	I think that's a good one. Um. So small little detail, but something I think, I, you know I think is important is, is letting the kids think through, er-show through their thinking, like telling the story of how they are approaching it, um. I like to let them walk through, like walk through their thinking with the rest of the group. I feel like that's really beneficial for the rest of the group's learning, too.	Eliciting
8:20	Here, um, another one of the students is raising her hand, right? She wants to answer, and I'm recognizing that, but I'm hoping, that the student at the white board can walk us through, right, I-I want her to really show us exactly what she's thinking. And at this point, she's circled it, she's showing me that she does know, she, she got exactly what I wanted her to get out of it, I just need her to put it into words. Um, so I'm trying to give her the time here to put it into words without pressuring her to, kind of, I don't know. It's not about having the right answer so much as putting something forward for the rest of the students to think about.	Noticing Interpreting
8:41	So here I'm just trying to draw attention to, um, well. The root. Just draw focus to it. Um, and make sure it's clear, kind of, what we're, really looking at, here, with um, some evidence that the students have been kind of working with as far as, you know, what's a telegraph? What's a telephone? How are are these things connected? Because we've been studying this for the past week or so.	Responding

The near immediate shift in his description of FA, stimulated by viewing his clip, is depicted with a steep slope to illustrate how the VSR process seemed to reveal what was already an intentional process for Sam but was not clearly or well described in his first concept maps. Similar to his concept map addition, combining pausing and probing, his VSR think aloud illustrates a focus on oral FA strategies and a priority of

getting students to use their own words. In the timeline of Sam's VSR, this moment is relatively early in the interview, but shows an even more complex understanding of FA that Sam did not initially express in creating and revising his first concept map. When I asked directly about FA his confidence and understanding of FA seemed low; however, when I showed the video clip, his observations and recalled thoughts clearly explained how the moments illustrated his understanding of FA. The video and VSR process seemed to uncover this covert understanding, simultaneously eliciting Sam's thinking and increasing his confidence in his understanding.

In the final revision to his concept map, Sam referred to two additional resources that supported his understanding of FA - his CT, who had just left the conversation, and his supervisor. Hesitancy in his response appeared again, as he took the opportunity to add to his map: "I feel like, um. I. So, I wasn't sure if this is like, I don't know, if it's good for me to add in." As described earlier in this chapter, Sam refers to what his supervisor says, constant checks for understanding, closing with more tentativeness, "I guess, is a big part of it for me." Sam's speech then picked up speed as he explained what constant checks for understanding meant to him, calling on his CT's words, adding another resource to his conceptual FA framework. In his final statements, Sam agreed that the process was helpful, "Yeah, lots of self-reflecting there." Sam's upward and forward learning progression was more about verifying and uncovering what he already understood then using resources to guide him to a deeper understanding. The VSR was a space for him to zoom into moments of his teaching and to take time to relate them to teacher education program concepts and TE models, with a supportive and non-evaluative facilitator, much like the video clip he described as evidence of his strategies to uncover his students' thinking.

Amanda: "I learned from participating in this"

Beginning with a balanced idea of the kinds of evidence that could illustrate FA, Amanda's development moved both forward and upward over the VSR interview. As described above, Amanda used gerund verb forms in her first concept map, indicating FA as a dynamic and active process. She was the only VSR-PST who used this active tense to this degree. In her first verbal explanations, she indicated seeking student understanding as relevant to FA, but her emphasis is not clear, as she frames the objective as "data collection, or just, better understanding them." Amanda spent much of her VSR explaining whose knowledge she tried to foreground. After seeing the concept map, she spent some time talking through the influence and role of probing questions in the contexts of small versus whole group discussions. She shared that while she tries probing questions in class discussions,

> Sometimes it's not appropriate for that moment, you know? I think probing questions work really really well, like one on one or in a small group, and I think they can work in a whole group setting, but sometimes, um, when I've tried this approach it, it verges on like, fishing for answers, which isn't ultimately what I want to be doing, so I'm sort of trying to, um, explore and find the balance with that.

Finding the balance and considering appropriateness of probing questions in a given moment is an apt description of Amanda's initial placement on the scale illustrated in Figure 4. Amanda explained that she does not want to be fishing for specific answers, implying that she would rather figure out what students know. Much of her focus in the lesson plan, reflection, and in her VSR statements centered around group collaboration, the quality and content of students' communication and contributions to each other during their shared activity. She referred to reflecting on her lesson as a strategy to think about students' understanding in relation to her teaching point, not simply whether or not they "got it." For Amanda, "it was interesting for me to kind of

see what, what types of questions were harder and think about why." Amanda recognized that monitoring students' contributions and engagement during her class activity was FA in action. For her, attending to students' comments as she circulated was conscious, a planned means of uncovering and eliciting students' thinking. Discussing this moment, she said she saw the students eliciting understanding from one another, and by moving among the small groups, she was able to see her students' thinking in action as they conversed with their peers.

Amanda's final revised concept map and explanation reflected a deeper and more complex understanding for her own ability to elicit and uncover students' understanding supported substantially by words from her CT, as described earlier in this chapter. She recognizes FA as "something that is always happening" due to the innate versatility of FA, saying, "it's really diverse, I think, what formative assessment can be." Amanda's learning trajectory accelerated with the presentation of the FA graphic, which helped her name some of the strategies she used and considered as FA. As she recalled her thinking in clips presented in the VSR portion of her interview, she continued to refine and expand her explanation, more to herself than to me, sharing her prior insights and reflections that occurred in between the enactment and her VSR. For example, she explained that "one suggestion that my CT already gave me about this lesson was … laying out an agenda" at the beginning of the lesson. She noticed that once the students knew there would be a game, "it clearly changed the way that they looked at the text."

Of the three VSR-PSTs to have a CT participate, Amanda fell into a mentoring-like conversation with her CT, asking to share a clip so she could ask for her CT's feedback. Amanda sought advice and insight from her CT, and my

participation was less prominent as they engaged in conversation. She asked Ms. Carly how her lesson "was effective or could have been improved as an in-the-moment response to students' understandings." Her request for feedback from her present CT, as well as to her reference to her CT's feedback earlier in the interview, positioned her CT as a substantive resource for Amanda's understanding of FA. Self-reflection, structured by the VSR protocol, was also a factor in her development. At the end of the interview, Amanda described the VSR process as "really interesting for me. I learned from participating in this." The guidance from the VSR protocol in relation to her video clips supported her ability and opportunity to expand and deepen her explanation of her ability for FA, as she defined it, enacted it in her recorded lessons, and planned to continue thinking about it in future lessons and as a professional.

Swathi: "This CalTPA has helped me understand what formative assessment is"

At the outset of her VSR interview, Swathi illustrated the most sophisticated understanding of probing questions as a means to uncover and elicit students' thinking. Compared to the other VSR-PSTs, her initial concept map responses were the highest and furthest along the scale depicted in Figure 4. In her reasoning of including the phrase "key to differentiation" to describe FA, also discussed in a previous section, she explained that

> The key to making a whole group work is effective differentiation. Like you do a little bit in front of the whole class and then you start sending kids off to work independently or you differentiate their instruction, or you stand near a kid, or you partner them, or you know what you have to do to make sure every kid gets it.

In this explanation, Swathi clarifies that she understands FA as an ongoing process that utilizes knowledge gathered during a whole group lesson. While she doesn't

specify how information is gathered at this moment in the interview, she did request to watch a particular moment as her first VSR clip. Before watching, I asked why she chose this moment in terms of FA. Swathi explained that she hoped to use the clip as the informal assessment clip required of the CalTPA and wanted the interviewer's opinion. She then elaborated on her means of eliciting evidence from students, explaining that she chose to bring two students together because she noticed hesitancy from them when she circulated among the students during the independent activity. She said, "I was walking around and I noticed that they did need some help and they're both writers who usually do well in small groups." She sought evidence of the students' understanding from their work in action. She intentionally planned the written independent activity as an opportunity to elicit evidence, and she perceived the chosen students' written expression, as it was, as needing support.

Swathi's attention to the kind of evidence she sought as well as whose understanding she foregrounded is evident in her request for a ML to show her what he meant on his work in his response to a follow up question, as opposed to asking him to put it into words. In this interaction, Swathi also explained that the CalTPA and its requirements were a significant factor in her ability to notice and respond to these students, in developing her skill to use probing questions. In her first concept map and verbal examples, Swathi's explanations lean toward getting students to a specific response. She uses the bridge metaphor to illustrate how students are brought to the teacher's objective, "to make sure every kid gets it." When a student made a comment that was off topic, she recognized their need to be validated, "to feel heard and seen. So I'm like okay, there you go, feel good … and I'm gonna get back to the lesson." While she affirms that the student offered good information, she ultimately

directed the dialogue back to the planned content of her lesson.

At the end of her VSR interview, Swathi deepened her explanation of FA, specifically in her description of whose knowledge should be foregrounded in the eliciting and teaching process. As explored earlier in the chapter, in her final comments she added that "planning, being deliberate" about when and how FA happens is critical to being effective with FA processes. Further, she delved into a conception of FA that was student-forward in its elicitation of understanding. She explained, "I want to understand what you (the student) think, or how you're playing around with this big idea, that thought in your head, and now that I have some information, I can plan my next steps." At the end of the VSR, she foregrounded the student's understanding, explaining that with that information she could then consider her teaching objective, to ultimately how she can help students to understand the "big idea" of the lesson, beyond a simple yes/no or filled in response. To support this forward movement along the scale, she referred to both her own self-reflection as well as her process of participating in the state credentialing process as drivers in her learning about and enacting FA. "I've been thinking, this CalTPA has helped me understand what, you know, formative assessment is." Structures for self-assessment, including the VSR interviews, the written reflection, and the CalTPA, were prominent factors supporting all VSR-PSTs' forward and upward trajectories in learning to utilize probing questions to uncover and elicit students' thinking in elementary, ML classrooms.

Chapter 5: Discussion and Implications

As discussed in Chapter 1, the field of teacher education research has shifted from solving problems to defining problems while using improved methodologies to uncover teachers' covert thoughts occurring as students learn so that teachers can teach more effectively. Teacher education research has established that teachers can learn to plan lessons that elicit students' thinking (e.g., Neel, 2015; Weiland et al., 2014), notice and interpret students' responses (e.g., Sun & van Es, 2015), respond to students more effectively (e.g., Ghousseini, 2017; Walkoe & Levin, 2018), as well as to reflect upon prior enactments in order to improve future instruction (e.g., Sherin et al., 2011; Thompson et al., 2016).

This dissertation explored how PSTs learned to integrate these skills to practice FA as a process (Council of Chief State School Officers, 2018) in elementary classrooms with MLs, highlighting the spaces between planning and eliciting and interpreting and responding. In these spaces lie opportunities for follow up questions and prompts, for uncovering what students think and how they think it. Effective teachers do this fluidly (Dewey, 1928; Heritage et al., 2009). Student responses to probing questions and prompts provide essential, personalized information, allowing teachers to adjust instruction. Through disciplined improvisation (Sawyer, 2004) driven by observed students' understandings, a teacher guides students towards learning objectives and meaningful learning. A teachers' ability to connect students' language resources to English for academic purposes (Hyland & Hamp-Lyons, 2002) necessitates the integration of these FA processes, paired with flexibility and reflexivity. The complexity of this practice is compounded in classrooms with high populations of ML students, where teachers may or may not be familiar with the

linguistic differences and assets of students' primary languages.

The results of this study illustrate how PSTs in one teacher education program learned to use probing questions to elicit and uncover students' thinking in elementary classrooms with high numbers of MLs. Chapter 4 presented the analyzed data in relation to each of the research sub questions and concluded with descriptions of each case study VSR-PSTs' learning and growth trajectories. That chapter also shared patterns of the PSTs' progressive development across multiple artifacts of learning created for one course assignment. It showed how interactions with various mentors and teacher education program structures helped PSTs learn, by building knowledge, skills, and ultimately, an increasingly reflexive understanding of FA as a diverse and multi-faceted process. These findings can help TEs better understand how PSTs understand FA and develop the FA practice of enacting responsive questions that probe and elicit deeper thinking and language for students in elementary classrooms with MLs, in the early stages of a teacher education program.

The literature and field are filled with pessimistic views of PSTs' ability to learn FA as a process. Bennett (2011), for example, argued that "teachers need substantial knowledge to implement formative assessment effectively in classrooms. It is doubtful that the average teacher has that knowledge, so most teachers will need substantial time and support to develop it" (p. 20). Contradicting this assertion, I show that there is a highly influential instructional space between PSTs' own responses (enactment) and reflections, a crucial juncture for PSTs' development of understanding and enacting this in-the-moment, integrated form of FA. In this chapter, after reviewing the limitations of this study, I offer an interpretation of the analysis, in relation to corroborating and conflicting literature. The dissertation

concludes with implications for teacher education practitioners and future research.

Limitations

While this study uncovered thinking and learning processes of PSTs, the data examined was from one relatively brief period of time, focused on one specific assignment in one teacher education program. Despite the vast array of data from the multiple components of the required assignment (lesson plan, enactment video, and reflection), the design did not include analysis of data from teacher education program lectures, other teacher education program assignments or required texts, individual PST-supervisor consultations, or any other contextual factors that likely influence PSTs' learning within a teacher education program. Likewise, the individual learning and educational histories of each PST were not explored - PSTs were not asked about their own experiences with FA in elementary and secondary classrooms. In future studies, these factors should be more explicitly considered. For example, the research design could be over the length of one to three years and include multiple VSR activities, to identify whether and how PSTs' understanding and practice of FA continues to develop or diminishes after completing a teacher education program. However, as this study focused on how PSTs learn FA as process, I made the decision to define the boundaries of the PSTs' development between their initial descriptions of FA (as seen through initial VSR-PST concept maps, identified FA strategies in lesson plans, and fall questionnaires) and descriptions at the conclusion of data collection (as seen through final revisions of VSR-PST concept maps, written reflections, and winter questionnaires).

A second critical factor and limitation of this study is the presence of evaluation: the assignment at the center of the data was graded, many PSTs submitted

portions of the enacted video as evidence to be evaluated in pursuit of their teaching credential, and the PSTs received written and oral feedback from their supervisors, as the recorded lesson fulfilled one of four required observations of student teaching per quarter (CCTC, 2019). In other words, the assignment was inherently oriented to parameters of summative assessment, to evaluating whether PSTs were able to illustrate their knowledge and skill. While many PSTs exhibited engagement in the course assignment as a cycle of practicing and self-reflection, as shown in their written reflections and through the oral VSR process, the fact remains that the assignment was graded and that the video would or would not be successful in their ability to meet the requirements for Cycle 2 of the TPA. It is plausible that PSTs may learn to 'talk the FA talk' but do not fully internalize or understand the relevance and necessity of developing in-the-moment FA practices.

This study suffers from the same central limitation as many studies of teacher education: the data is from one teacher education program, one small cohort (see Loughran, 2005; Vanassche & Kelchtermans, 2015). As recommended by Vanassche & Kelchtermans (2015), much attention has been paid to the relevance and rigor of the design, the questions that initiated the study and the theoretical frameworks that supported decisions made throughout the research process. As modeled through this discussion chapter and identified gaps of knowledge in Chapters 1 and 2, this dissertation adds to the accumulating knowledge of PST knowledge and skill growth (Zeichner, 2007).

"When the plan is in the real world:" Analysis of Findings

Chapter 4 was organized inductively, working to describe the data from the sub questions and building to the central question of the study. The conclusions

described below foreground the five VSR-PST cases, connecting the four research questions to illustrate an argument for patterns in how the PSTs in this study learned to utilize probing questions and prompts to uncover and elicit students' thinking in elementary classrooms with high populations of MLs. Through exploring how PSTs definitions of FA changed over time, in conjunction with the resources they thought about in-the-moment of responding and whether and how they planned for and responded to students in-the-moment, I offer robust illustrations of the variations and patterns in how understanding of responsive FA processes developed for the cases in this study. This work adds to and deepens the descriptions of the probing constructs developed by Duckor & Holmberg (2019), as the study emphasized the elementary level and ML-dense classrooms (as compared to single subject secondary classrooms and no specific attention to MLs).

The learning progressions for FA are described in relation to the two central themes identified in Chapter 4, 1) what the PSTs cite as evidence of student learning and 2) whose version of understanding is foregrounded. Using the words of VSR-PST Amanda, this is an analysis of what happened when the research design was put into action, "when the plan is in the real world and it's not, you know, the step by step that you plan, cause it's impossible for something to be that perfect, once it's happening." The data revealed patterns and trajectories in place of linear development, suggesting that responsive FA cannot be considered a predetermined set of skills or knowledge. That level of precision is impossible, and no PST will ever be fully at one level or another, just as no two PSTs will develop in exactly the same way.

In the sub sections below, I draw three conclusions. First, the data supports current literature on the novice teachers' ability to develop isolated and small

combinations of FA skills. This study extends the research base, suggesting that PSTs can develop more meaningful, deeper understandings of FA as an integrated process in short spaces of time, with limited, though strategically specific, structures and TE guidance. Second, while PSTs in classrooms with high percentages of MLs did illustrate a focus on surface level understandings and forms of language through emphasis on repetition and recasts (Saeb et al., 2016) and gestures as communication, the VSR-PSTs showed an increased understanding of FA through their grappling with how to balance addressing students' language form and the function of the students' language as it related to the learning objective at hand. Third, most PSTs were able to shift their focus of whose understanding—teacher's or students'—is prioritized in instructional dialogic exchanges. As Heritage et al. (2009) argued, teachers "need to infer the gap between the students' current learning and desired instructional goals, identifying students' emerging understanding or skills so that they can build on these by modifying instruction to facilitate growth" (p. 24). Teacher-specific objectives are essential to framing and keeping learning on track. However, teachers also must elicit and attend to individual student's understandings so that the teacher can facilitate tighter and more relevant connections from the student's everyday language to the language and understandings sought in learning objectives. In varying degrees, the VSR-PSTs in this study showed a growing and deepening awareness of this relationship, evidence of learning-in-action through reflection-on-action. The VSR-PSTs began to alter their understanding of the instructional progression from foregrounding SWBAT (Students Will Be Able To) teaching points and then eliciting understanding from students to the reverse, foregrounding and eliciting students' understanding and connecting these understandings the students' actual words, to the

SWBAT teaching points.

Learning Formative Assessment: Fits and Starts and Smooth Progressions

As described in Chapter 4, all VSR-PSTs illustrated growth in their understanding of probing questions and prompts as tools to uncover and elicit students' thinking in elementary classrooms with MLs. The analysis corroborates existing literature that argues that PSTs can learn individual components of FA. For example, PSTs can learn to plan for and actively engage with in-the-moment opportunities to notice student thinking through systematic analysis of others' teaching (Sun & Van Es, 2015). Each VSR-PST noticed probing and missed opportunities to ask probing questions in at least one, and more often all, of the clips shared during the interview. Additionally, as subsequent clips were shared and the interview progressed, VSR-PSTs' explanations and think-alouds grew visibly richer via the process of the semi-structured protocol and use of their own teaching as a stimulus. For some, the shift began after I shared the FA wheel (Amanda). For others, prior understandings were more clearly revealed (Sam) or learning accelerated (Vicky) as we viewed clips, as they had opportunities to recall what they were thinking in-the-moment.

In both Kathy and Swathi's cases, the approximated learning trajectories were shorter and shallower than the other VSR-PSTs. Neither changed their concept map after viewing and discussing the FA wheel, and both recalled thoughts that initially emphasized natural gifts for dialogue, as opposed to strategic choice-making. However, after Kathy's CT took part in the discussion and Swathi had used the final part of the interview to get additional feedback on her TPA clip, both expressed thoughtful revisions to their concept maps. As Sun and van Es (2015) argue,

"learning to systematically analyze teaching with video can help preservice teachers learn to enact practices that afford opportunities to access and examine student thinking" (p. 10). Unlike Sun and van Es's study, which emphasized viewing and learning from other teachers in action, this dissertation emphasized that opportunities to learn with video should strategically include use of PSTs' own teaching as a stimulus for reflection, allowing for meaningful and direct connections from their own practice to concepts and theories of learning discussed in the teacher education program.

The data supports findings from Singer-Gabella and colleagues (2016): PSTs can learn to elicit and leverage student thinking, yet many novices can elicit and consciously fail to effectively respond to or work with insightful misconceptions. As they argue, "novice teachers can learn to leverage" but there is difficulty in joining novices' skill of leveraging to their will to practice it. This analysis identified similar challenges in Kathy's case. Kathy was adamant about her understanding of FA from the first concept map she created. She continued to assert her confidence in her original definition in her last opportunity to revise the FA concept map, even as she called on and related to concepts her CT brought forth during her involvement in the interview. Kathy ultimately explained FA as a system, but her statements did not paint a reliable picture of a will to use a system of checks for understanding to actively use student elicitations to inform and make shifts in her instruction. Kathy was the only VSR-PST whose data did not fully suggest a volition aligned with prioritizing student understanding. The remaining four cases all showed more noticeable shifts in working out how to foreground student knowledge while retaining a focus on teacher objectives. This suggests that structured protocols and an emphasis

on using the PST's own enactment as a stimulus may enhance PSTs' will to shift practices in future enactments. Given their small case study of three teachers, it may be that Singer-Gabella and colleagues (2016) were shortsighted about PSTs' ability to learn to leverage student thinking. While contextual factors and PSTs' historied experiences undeniably play a role in what teachers believe and what they practice, in this study, there was a notable expansion in the majority of the Entire Cohort's demonstrated will for responsive FA practices that foreground students' understanding.

As with many studies that explore PST learning, this dissertation used and argues that structured reflections support learning (Singer-Gabella et al., 2016; Sun & van Es, 2015; Weiland et al., 2014). To observe and provide opportunities for self-assessment and reflection, I used the reflections embedded into the course assignment and the semi-structured interview protocol that included the strategic use of additional resources (FA wheel, CT participation). The majority of the Entire Cohort (15/17) showed distinct shifts in understanding of FA through differences between their lesson plans and written reflections, in their descriptions of elements of their lesson they would like to improve in the future. However, the VSR-PSTs, who were given the additional reflection opportunity, were able to deepen their understanding and recognition of probing questions more fully. This dissertation argues that given strategic structures, the PSTs who participated in VSRs with recordings from their own teaching illustrated significant expansion of their understanding of FA, across all its integrated components: eliciting, noticing, interpreting, responding, and reflection.

As the above paragraphs describe, all the VSR-PSTs demonstrated notable forward movement in their understanding of FA as an integrated process, a significant

accomplishment for a small window of time (a few weeks for the assignment, and just 45 minutes for the VSR interview). However, it is essential to recognize that these learning progressions were varied. Most VSR-PSTs began with a similar understanding of the probing concept. Most of these PSTs also moved from foregrounding the teacher's or lesson's version of a concept to considering ways to foreground and elicit students' understanding and ways of thinking. To some degree, all the VSR-PSTs showed a shift in their understanding of what kinds of data they considered as evidence of student learning, from visible gestures to elicited explanations. These shifts and changes in PSTs' thinking were supported by the use of specific resources, namely their CT (also documented by Russell, 2015, and many others), but also by the process of reflection structured by the course assignment and the VSR interview protocol. However, their conceptualizations began and ended with varying levels of understanding, set against the themes of 1) what evidence was sought and 2) whose understanding was foregrounded. The next two subsections attend to the relevance in these two shifts as potential pedagogical leverages, for TEs to support PSTs' ability to use probing questions to elicit and uncover students' thinking in elementary classrooms with MLs.

Formative Assessment, what does it look like?: "There's so many different ways to do it"

The PSTs in this study expanded their understanding of possible means to collect and respond to evidence through FA processes. PSTs' initial descriptions provided a strong foundation for this expansion. They first described FA structures as straightforward confirmations, homing in on convergent FA. PSTs illustrated FA as showing if students are or are not progressing towards learning objectives as a lesson

unfolds. Performing quick checks for understanding is a legitimate way to start the FA process. “Bringing the rules of the setting to the learners’ attention” sets the stage for a space where students can use or bend “the rules in novel, exploratory ways” (Pryor & Crossouard, 2008). Sun and van Es (2015) illustrate the act of intentional noticing as an instigator in the exploration and uncovering of student understanding and misconceptions (p. 8). The Entire Cohort emphasized the role of intentional, though shallow, noticing in their planned and enacted use of strategies like thumbs up/down/sideways and planned monitoring of student work.

Showing expansion in their understanding, by the end of the VSR interviews, three PSTs directly stated how diverse the process of FA is: “There’s so many ways to do it” (Vicky); “It can look like so many different things” (Sam); and “It’s just really diverse” (Amanda). Final descriptions included increasing alignment with divergent forms of FA. The PSTs explicitly attended to elicitation and less formal practices - both planned and improvised - as means to assess for student understanding in the midst of instruction. FA is “something that is always happening,” as Amanda described. Sam described it as a cycle of questions running through the teacher’s head: “How are we feeling about this? Where can we go from here? What do we still need from you?” Sam’s description aligns directly with Hattie & Timperley’s (2007) assertion that effective formative feedback addresses these questions. The VSR-PSTs initially offered lists of one and done strategies and moved towards describing FA as processual and ongoing. In terms of Duckor and Holmberg’s (2019) probing construct map, the VSR-PSTs moved from emergent towards varying degrees of intentional understanding, via exposure and guided reflection on specific examples from their own teaching.

Kathy's shorter movement along the learning trajectory was towards the lower end of the intentional understanding, according to Duckor and Holmberg's (2019) probing construct map. Though she recognized a ML and a missed opportunity with support from me during the VSR, she did not elaborate further as to why probing may have helped this student. After watching a clip where she asked for students to self-assess with their thumbs, Kathy explained that she tried to notice how students responded, saying "if it was like a significant thumb to the side, I probably would have stuck with it more." When I noted that there was a student with a thumb to the side, Kathy said, "She's one of the ELs actually. So that's good to know." Kathy recognized the relevance of using quick checks but did not yet independently fully notice or respond to them, in-the-moment or during her VSR. The reflective process of participating in the VSR with a more knowledgeable other highlighted the missed opportunity for Kathy. Her final description of what FA as an interactive built-in system captured this understanding, noting how the process necessitates that she "change what I'm doing or saying, or you know, trying to elicit more from them, based on my assessment." Kathy's ability to notice and respond effectively to an entire class's learning was not yet fully intentional. Through the VSR process, she was able to attend to this missed opportunity and primed by guidance from her CT and me, considered how built-in systems FA, those that loop back to students who show sideways thumbs, can move learning forward.

Expanding PSTs' understanding of what FA can look like is particularly salient for PSTs in classrooms with MLs. With multilingual populations especially, PSTs must quickly learn to distinguish between assessing for language and assessing for understanding of content. In varying degrees, primed by questions in the VSR

protocol, the VSR-PSTs in classrooms with high populations of MLs became more aware of FA as a process that can be oriented towards one or the other objective. In most interviews, the VSR- PSTs described how they might use quick checks and whole-class elicitations of self-reflections as a means to inform and adjust instruction in relation to MLs. As a study by Meskill (2009) shows, experienced teachers "simultaneously assess individual learner growth in English and content knowledge while pushing the instructional conversation toward improved comprehension and production" (p. 205). These simultaneous actions require PSTs to lean into the uncertainty between planned and responsive instruction, understanding a lesson's goal while seeking and allowing for flexibility in how students get there, based on the accumulation of information and student responses in-the-moment. It is not just what a teacher does to elicit and notice students' understanding. It is what a teacher does or does not do with this information as a lesson, unit, or school year unfolds.

The Entire Cohort's movement toward more actively responsive and less tangible and reactive FA strategies aligns with Saeb and colleague's (2016) study, noting that there is a difference between surface, explicit responses and implied feedback and dialogue that goes a turn or two further. The PSTs in this study learned to consider what instructional and dialogic choices can be made, after planned and improvised noticing strategies are put into action - the responsive actions that continue the FA process and seek to uncover students' thinking. In terms of MLs, Alvarez and colleagues (2014) argue that "in order to use formative assessment effectively with this population, teachers must attend simultaneously to the students' needs both in learning content and skills AND in developing the English required to express their learning" (emphasis authors', p. 1). The PSTs in this study consciously

used FA tools and instructional moves to attend to both parameters, but still need support in finding ways to move learning forward once they identify students' current understandings and linguistic needs.

At the center of this interaction between planning and improvised responses is a responsibility for the teacher to reciprocate all students' efforts to participate in classroom dialogue. Teachers should "provide students with supportive and safe environments where the fear of failure is mitigated by the sense that with errors come new opportunities to learn" (Walqui & Bunch, 2019, p. 44). In the quick checks for understanding initially described, PSTs encouraged a supportive environment of risk taking and self-awareness. As this study illustrates, PSTs' next steps are to understand and develop FA practices for identifying next steps for the student(s), for doing something with the information they have elicited and uncovered. PSTs, beginning with surface FA strategies, can learn how to facilitate instructional activities beyond quick checks that, while encouraging participation, by themselves lack momentum to drive student learning forward. This requires, as the next section describes, an understanding of FA that foregrounds students' own words and ideas in relation to PSTs' learning goals, as opposed to the inverse order.

Formative Assessment, for whose understanding?: "I try to make sure that they're tying into their everyday lives"

The VSR-PSTs and arguably many of the PSTs who did not participate in VSRs moved towards more deeply recognizing the relevance of students' understanding in relation to achieving learning objectives as a lesson unfolded. The ability to integrate student understanding and teacher understanding, in that order, to collaborate on new understandings is difficult. As Thompson and colleagues (2016)

recognized in terms of science education, “sharing intellectual authority is challenging. It requires teachers to deeply understand disciplinary content and students’ ideas well enough to move students forward in their thinking through a combination of social, cultural, and epistemic practices that challenge and refine thinking over time” (p. 51; see also Duschl, 2008 and Ford, 2012). There was a shift, across most PSTs in the study, in foregrounding whose understanding should be prioritized during instruction. In the initial data, the Entire Cohort’s lesson plans understandably emphasized the PST’s learning goals. Most video enactments also showed this priority, as PSTs called on students for ideas but during the lesson concluded the lesson segment by stating their own predetermined definition and seeking specific wordings as correct responses (e.g., Vicky).

All VSR-PSTs, though some more deeply than others, grappled with how to accomplish merging student and teacher ideas within the confines of a 45-minute lesson, while trying to stay true to the timings and carefully crafted wordings written into their lesson plans. Developing ML students’ understanding of content in relation to ML-lived experiences and linguistic assets is an oft cited goal in teaching MLs (e.g., Alvarez et al., 2014; Gibbons, 2006; Walqui & Bunch, 2019). Experienced teachers accomplish mediation of language and learning in several ways, including “mode shifting through recasting, signaling to the students how they can self-formulate, indicating where a reformulation is needed but handing this task over to the learner, and modeling alternative ways of recontextualizing personal knowledge” (Gibbons, 2003, p. 267). The last strategy, using students’ own knowledge and I add, own words, to frame academic concepts is another pedagogical practice that necessitates both skill and will (Singer-Gabella et al., 2016) and is necessary for

enacting increasingly effective FA processes.

VSR-PSTs who exhibited greater slopes in this area showed the will for prioritizing student understanding but not always the skill to create opportunities to do so in-the-moment of teaching. Sam was a PST who illustrated both will and skill, and his case provides insight as to how awareness of the utility of questions to uncover and elicit students' thinking is developed. Intentional, responsive deviations from planned lessons seemed more likely when PSTs were thinking about and considering potential responses from students while creating the lesson plan. These PSTs built in planned moments to elicit student responses as they occurred in-the-moment of teaching and were less concerned with completing the lesson as originally written. For example, though many things went 'wrong' with Sam's lesson, he was flexible and responsive to the unfolding situation. There was a fire drill, several students were called out for instructional therapy during his designated time, and he did not have time for the final activities he had written in his plan. Despite these unplanned events, his lesson plan specified several points for him to elicit student understanding, for him to use FA strategies in-the-moment so he could respond to their thinking in relation to the teaching point. In his lesson plan, he wrote that he would ask students, "Where do the roots of our words come from?" and THEN wrote that he would "Return student thinking to prior knowledge about (topic)." First soliciting ideas from students, and then connecting those elicitations, explicitly, to students' prior knowledge. Sam's learning objective is present in the plan but is in the background. Students' understanding is foregrounded, and his enactment showed the most follow up questions per minute of all PSTs in the Entire Cohort, despite the setbacks that occurred the day of his recorded lesson.

A description of Vicky's growth in this facet of FA exemplifies the necessity of attending to student thinking and understanding in relation to MLs. She said, "I try to make sure that they're tying into their everyday lives, so that it keeps them engaged, because one, they already don't know the language, so if they don't know the language and they don't even know what is the content, then, they're done." Consideration of how she planned her lesson, beginning with a conversation about students' experiences with traffic lights, indicates that though her instructional moves relied on choral responses and a search for a specific answer oriented to her learning objectives, she did intentionally attempt to foreground the students' every day and prior knowledge. This growth pattern was shared by VSR-PST Amanda.

Philip (2019) argues that "creating spaces for the improvisational dimension of teaching is essential for novice teachers to learn the relational and humanistic aspects of teaching." Learning ways to both plan for and elicit student thinking, particularly the thinking of ML students, necessitates acute and intentional awareness of the uncertainty embedded into the minute by minute and day to day act of teaching. The PSTs who were more successful in this space were more equipped to plan for and deal with this uncertainty (Floden & Buchman, 1993) in the midst of instruction.

Learning FA: Patterns and Trajectories

As the preceding sections have argued, given the reflective structures of the VSR and the written reflection component of the course assignment, the PSTs in this study showed deepening understanding of how probing questions can be used to elicit and uncover student understanding. Most PSTs began with a surface level understanding of what kinds of evidence served as FA and moved towards an expanded understanding, including consideration of evidence gathered from student

responses in-the-moment. Across this theme, upward trajectories were similar for the VSR-PSTs, though more robust understandings were developed by PSTs who planned for, enacted, reviewed, and discussed specific turns of talk sequences as evidence of probing. The exception is Kathy, whose growth was shallower than the other VSR-PSTs, perhaps due to a resolute stance on her conceptualization of FA at the time of the interview and in relation to her experience in the teacher education program.

Most of the VSR-PSTs' initially foregrounded teachers' understanding of concepts. The growth patterns in this theme were less cohesive. Two cases, Vicky and Kathy, engaged with the idea of student-forward instruction, but did not seem to have a clear idea of what this might look like in their own teaching. Sam's growth did not seem so much a shift in understanding as an opportunity for to clarify and provide an example of what he understood as FA in action as related to the discussion of probing questions in the VSR interview. His teaching enactment and recalled thoughts exemplified intentional levels of probing use (Duckor & Holmberg, 2019). Amanda and Swathi began with more complex awareness of eliciting student understanding. Like Sam, they explicitly planned for eliciting student responses in their lesson plans. Amanda's lesson plan and enactment began with a language-free activity of gradually revealing an image salient to the content while encouraging students to call out predictions. Swathi's first FA concept map included the concept of bridging. This again suggests that PSTs who have the will to plan for uncertainty and responsive interactions are better equipped to develop the skill and the practices for shifting instruction from teacher-worded goals to eliciting and using students' own words to create a version of the learning objective that is, more salient and more

meaningful to students.

Implications

Throughout this dissertation, I have laid the foundation for three specific implications, one tangible, one practical, and one theoretical. The first implication is that while useful, Duckor & Holmberg's (2019) probing construct map could more fully attend to descriptions of how the construct develops in relation to MLs and in relation to a teacher's own ability to recognize probing while enacting, whether it occurred, or missed opportunities. The second implication is directed to TEs and teacher education programs. Teacher education programs and TEs can amplify already-embedded opportunities, like assignment structures and guided reflection of recordings of PSTs' own teaching, for PSTs to learn to recognize the role of language in FA and to utilize probing questions to uncover and elicit students' thinking. Lastly, leading from the two former implications, this dissertation builds on existing sociocultural theories of teacher learning and teacher reflection. I suggest a theoretical conception of pre-service teacher learning within a facilitated reflective space, stimulated by the PSTs' observation of themselves: learning-in-action through reflection-on-action. The following subsections address each implication in turn.

Tangible: Enhancing Duckor & Holmberg's (2019) Probing Construct Map

Duckor and Holmberg's (2019) probing construct map was created primarily using data from middle school English Language Arts classrooms. The leveled descriptions in their 2019 version do not adequately address the distinction and relationship between a teacher's planned and enacted moves with MLs nor attend to spaces for a teacher's ability (or lack of ability) to notice opportunities for FA in- or post-action. This study reflects substantive differences in learning progressions in

both regards, among the Entire Cohort and especially among the VSR-PSTs. I recommend additions to the “emerging” and “intentional” levels, indicated in Table 7.

Table 7

Recommendations for Duckor & Holmberg's (2019) Probing Construct Map

Intentional	**Original**	*Respondents* who address probing's relationship to decision making and to probing's role in making understanding and thinking visible and why this is important. Probing's role in clarifying student understanding of intended learning target, fostering student responsibility for efforts toward the target, and informing formative feedback tends to be overshadowed by other teacher goals for probing (e.g., "uncovering misconceptions", checking understanding of academic language). They tend to enact lessons that include probing of "correct answers" and that encourage S-2-S probing. They tend to enact probing that targets either catalyzing movement toward the learning target or influencing student affect. They may be challenged to capitalize on what probing elicits. Respondents whose probing is noticeably better during one-on-one and small group configurations than it is during whole class instruction.	*Responses to tasks/items* indicate probing is potentially valuable to teacher or student decision making. Probes target uncovering misconceptions. Observation shows teacher, and sometimes students, using what probes make visible in attempt to advance student performance related to learning target. Observation shows probing of "correct answers", probing to uncover misconceptions and/or checking understanding of academic language. Observation demonstrates support of S-2-S probing, although explicit connections to how S-2S probing can support student understanding of the intended learning target and student ownership of efforts toward this target may be absent. Responses may indicate "teacher probing as formative feedback to students." Observation demonstrates teacher's quality of probing during one-on-one and small group configurations is much better than it is during whole class instruction.
	Recommended Additions	For MLs, acknowledge linguistic differences and attempt to use students' own words and/or experiences to connect to the language necessary for the learning target. *Respondents* recognize, but do not always successfully take advantage of, moments to probe in-the-moment.	For MLs, responses to tasks/items indicate that probing is potentially valuable to providing opportunities for students to use their own words with an objective of connecting students' words to the academic language necessary for achieving the learning target. *Responses* indicate that the teacher was aware of opportunities for probing as they occurred, but was not always successful in taking advantage of these moments (is better in one-on-one and small group interactions).

Emerging	**Original**	*Respondents* who contend the main purposes of probing are to spur student action and to make learners' thinking visible. They tend to rely on generic probes (e.g., "Why" or "please explain"). They tend to enact lessons where probing is not explicitly tied to informing possible formative feedback and enact most of their probing in one component of the lesson. Some respondents enact lessons where the wording and/or pace of probing mirrors students' needs, but the orientation of the series of probes is still primarily from the teachers' point of view. Most and/or best quality probing occurs during one-on-one or small group configurations. Respondents who are able to probe student thinking during one-on-one conversations, but not leverage this to probing well with small groups of students or during whole class configuration. Respondents tend to complexify their probing before a student responds. Some respondents may repeat or revoice student responses as probing or pro-probing.	*Responses to tasks/items* indicate probing relies on generic probing moves (e.g., "Why," "Say more….," "What do you mean?" as probes that are beyond "probing to manage" or "probing to engage." Observation shows that some probes do make some learners' present thinking somewhat visible. Observation may show that what gets elicited via probing gets used by students or teacher, but also that probing is not explicitly tied to formative feedback. Observation often reveals probes reside in a narrow range. Some responses to tasks/items indicate that during teaching the wording and/or pace of probing mirrors students' needs, but is still oriented primarily to the teacher's thinking **(and desired wording)**. Observation shows most and/or best quality probing happens with one student and occurs during one-on-one or small group configurations and not during whole class instruction. Observation shows teachers complexify probe(s) before students respond. Some responses to tasks/items indicate that the teacher repeats or revoices students' words as proto-probing.
	Recommended Additions	*Respondents* who tend to rely on probe-like follow up questions and prompts in relation to MLs' responses, including choral repetitions and rephrasing/recasting student responses to fit the teachers' desired language and learning objective. *Respondents* who do not typically recognize opportunities to probe in-the-moment nor moments when probing (teacher to student or S-2-S) occurs.	*Responses to tasks/items* …Observation shows that probes with MLs lead towards specific wordings or verbatim uses of academic language. Observation shows that teacher relies on choral repetitions and rephrasing of students' responses with a specific use and structure of academic language. *Responses to tasks/items* indicate that the teacher was not typically aware of opportunities for probing nor of probing interactions when they occurred.

Practical: What TEs and teacher education programs can do to enhance PSTs' learning of FA

This dissertation contributes to larger bodies of research that have explored and refined teacher education's understanding of how PSTs learn and how teachers across the career spectrum learn effective FA processes in elementary classrooms with ML students. While beyond the scope of data for this dissertation, Tes' deep knowledge and dialogic practice of FA is a presumed precursor to PST learning in this study. Exploration and attention to the content of Tes' pedagogical content and language knowledge of teaching PSTs about FA should be attended to in future research. Presuming that Tes share this dissertations' view of FA, I suggest a few practices that Tes can implement in their teacher education programs to enhance, extend, and potentially expedite PST learning. First, Tes should utilize reflective assignments that deliberately incorporate all components of interactive teaching (Jackson, 1968), including planning, enactment, and reflection. This corroborates the 2018 recommendation from the Council of Chief State School Officers, which noted that "while a novice formative assessment practitioner may focus on a specific practice along the way to developing fluency with that practice, any one of these practices in isolation is insufficient." Tes should intentionally integrate and simultaneously recognize the individual components of the FA process within the lesson plan structure. Further, connections between these components should be made explicit to PSTs. Most teacher education program lesson plan templates include sections that attend to elicitation, noticing, interpreting, responding, and reflecting, but over the arch of a lesson, as opposed to mini cycles of FA embedded throughout the lesson.

Given the prominent role of language in FA for all learners, teacher education programs should also consider critiquing and highlighting terminology used in the required credentialing portfolio documents, including "academic language" and "informal assessment." Tes should make time to interrogate the meanings and purposes of these terms, in relation to asset-based framing of the experiences, language, and knowledge students bring to the classroom. Thompson and Watkins (2001) argue that this fetishized and valorized concept has neglected the "power and utility of everyday language" (p. 568). As this dissertation has argued, it is essential for PSTs (and all teachers) to recognize and utilize the many resources students bring to the classroom in pursuit of various disciplinary learning objectives.

Building from these first two suggestions, this study emphasizes the value and potential of structured and semi-structured VSR sessions with PSTs in teacher education programs. While the study uses VS(Recall), attention to both VSR(ecall) and VSR(eflection) are necessary to enhance and explore the processes of PST learning. PSTs in many states are already required to video record themselves for credentialing purposes. In addition, supervisors must complete a minimum number of observations of PSTs each semester or quarter. This study makes clear that there are significant learning opportunities within short VSR structures, and this format could be used for developing a variety of effective teaching practices, from specific components of FA (e.g. noticing, van Es & Sherin, 2002) to FA as a process (as shown in this study), to use of a video recording, as opposed to a live rehearsal, that works to build mathematical knowledge for teaching (e.g., Ghousseini, 2017).

Theoretical: Learning formative assessment in teacher education programs: A challenge, not impossible

Learning FA as a process is a crucial component of learning to teach effectively. As Ms. Carly, a CT in the study explained, "doing that every second of every lesson is kind of the primary job of the teacher." However, if teacher education programs and Tes only teach skills and concepts in individual components through assignments, feedback, and course structures, then a significant opportunity for PSTs to learn and develop FA as a process is missed. The majority of the Entire Cohort showed growth learning FA, and those who participated in VSR interviews reviewing their own teaching showed the most significant growth. This study contradicts opinions of many Tes and teacher education researchers, who assert that FA is a process that is learned through practice and over time (e.g., Bennett, 2011; Kagan, 1992; Shavelson, 2008). As the results of this study show, learning informal, in-the-moment FA processes (the full set of skills, from eliciting through reflection) can be developed in the beginning stages of a teacher education program. Since FA is something that is done nearly every moment of teaching, should this not be at the foreground of teacher education programs? A solid foundation of FA practices amplifies the effectiveness of teaching (Black & Wiliam, 1998; Franke et al., 2009; Hattie, 2012; Lee et al., 2020; Sadler 1989). Explaining how FA practices are developed and learned by PSTs necessitates a theory of PST learning which, considering this study and technical advances of instantaneous video creation, does not yet adequately exist in teacher education research.

Throughout the chapters of this dissertation, I have attended to the role of sociocultural learning theory, as a conceptual framework to the research questions, a guiding factor in my choice of methodology, and as it informed my analysis choices and my interpretation of the data. I have argued that the PSTs in this study developed

a deeper understanding of the need for practices aimed at uncovering student thinking, over just a few weeks, when guided through their own enactments by more experienced others (e.g., the assignment structure, observations of mentor teachers, conversations with TEs, the VSR protocol). I posit that while there are certainly attributes of instinctual (Téllez, 2016) or natural (Atkinson & Shvidko, 2019) pedagogical strategies, FA as a process can be learned by and taught to PSTs much earlier than the literature would suggest (e.g., Bennett, 2011; Kagan, 1992; Shavelson, 2008). Combining sociocultural theories of learning, theories of teacher learning across the career spectrum, theories of reflection-in-action, and the use of VSR, I suggest that PSTs learn through complex and integrated interaction with others, and that this interaction necessitates learning to hold a mirror to their own practice: learning-in-action through guided reflection-on-action.

Over two decades ago, Ball and Cohen (1999) theorized that teachers learn by teaching and reflecting on their practice, and that because learning happens during and after action, teacher education programs should focus on PSTs' learning in and from practice. This theory of teacher learning attends to when learning happens but not how it happens. Studies exploring and explaining teacher learning tend to focus on binary expert/novice interpretations and descriptions of experienced and master teachers. How do PSTs learn to learn from practice? In other words, how does learning happen in the early stages of teacher education, in the shift from lifelong student (Lortie, 1975) to teacher? This question remains undertheorized and underexplored. However, I argue that this dissertation's analysis combined with sociocultural learning theories and theories of professional learning provide a basis for a sound theory of PST learning.

Like Ball & Cohen (1999), Lampert's (2010) contention that teaching is made up of distinct practices and can be learned by practicing also attends to when PST learning occurs but does not fully attend to how learning occurs. She does note that particular aspects of learning teaching in, from, and for practice need to be disambiguated. She indicates that practices learned through practicing should be at an "appropriate grain size for what should be practiced" and attend "to the learning of the composition of separate practices in actually performing the work of teaching" (p. 31). She further states that attention must be paid to what TEs contribute to PSTs' learning process, as PSTs learn in, from, and for their practice. She suggests that there is space to consider how PST learning happens within rehearsals for practice. Whether "rehearsals" are simulated practices without students, coached practices with small groups of students where TEs can and do step in to advise and support during instruction, or reflections on practice (with or without stimulation of video recordings) is not clear.

Lampert's (2010) point is that PSTs learn when teaching processes are slowed down and when PSTs are primed for an appropriate "grain size" of particular skills or concepts, while TEs help them attend to the "composition of separate practices." This view of learning is complex and challenging, for both the PST and the TE who is charged with facilitating the PSTs' learning. What is an "appropriate" grain size? What does it mean to attend to the composition of separate practices - does it need to be the full expression of the composition, or could it be a partial composition? As this study shows, "appropriate" grain size and the processes of composing separate practices differs by PST, though there are patterns and trajectories of development. Uncovering the various "hows" of each PST's learning was made possible by the

VSR process. Through the interactive and dynamic combination of assignment directions, PST and TE clip selection, priming, and probes, the PST learns. During this instructional interaction, the PST zooms in to break down the turns of talk and student exchanges into the individual components of FA (e.g., eliciting, noticing, interpreting, responding) and zooms out to see how the components work together as a cycle to support their students' understanding. For example, in Sam's description of how he worked to utilize pausing and probing together to support a student's confidence and willingness to state her thinking aloud.

None of this is arguable without a theory of PST learning that goes beyond a binary description of what novice teachers cannot do and what expert teachers can do. How does the novice develop? How does the novice get started? How does the novice move forward and accelerate their learning? To consider these questions, I return to Alvarez et al.'s (2014) description of FA. "Formative assessment functions as a mirror, reflecting to the student important information about his or her learning even as, at the same time, it reflects to the teacher important information about his or her instruction" (p. 4). I contend that an analogy of a mirror and consideration of the role of FA is useful in any theory of PST learning. PSTs learn while reflecting on their practice. This is optimized when PSTs are in a position to use a mirror (video) that reflects to the PST the important information about their learning. At the same time, the PSTs' mirror (video plus their expressed recollection and reflections) reflects to the TE important information about what a PST is understanding (or not) and how a PST is (or not) understanding any isolated or composed constructs of their teaching practice. Without video as a model and a stimulus, the TE and PST are limited in their ability to be explicit and specific about particular enacted turns of talk or exchanges,

of what did or did not happen while the PST was practicing.

To substantiate this argument, I return to Vygotksy (1978) and his contention that conceptual understandings (e.g., FA as a cyclical and dynamic process) are developed through social interaction, from an externalized social level to an internalized cognitive level. While Vygotsky describes the child's development, I argue that "child" is replaceable by "PST" in his description:

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals (p. 57)

The PST, like the child, learns first through observation and interaction with more competent others – for example, course readings, TE models, co-planning and co-teaching a number talk, or reflecting with or for a TE after an enactment. Internalization of concept happens on the individual level, inside the PST's mind. This process can never be fully observed by a TE. The use of a VSR process (which includes the metaphoric mirror, an appropriate conceptual grain size of primed focus and strategic prompts and questions) illuminates the PSTs' inner conceptions and misconceptions of teaching practice, and both are made more clearly and explicitly visible to the TE. The VSR process can make the PSTs' ripening functions more visible to the TE, facilitate PST learning-in-action, and enable the TE to instruct in a way that "marches ahead of development and leads it; ... aimed not so much at the ripe as at the ripening functions" (Vygotsky, 1986, p. 188). The reflection-on-action Schön (1983) that occurs within this interaction of PST-Video-TE is where and how PST learning takes place. This expression of PST learning argues that learning to reflect-in-action (to learn in, from, and for practice) is optimized and expedited when

reflection-on-action is facilitated by a TE using overt evidence of the PSTs' practice in tandem with open reflective processes that help the PST to make their understanding more visible to themselves and to their TE.

The role of reflection is an essential component of the PSTs' learning process. As Schön (1983) argued,

> A practitioner's reflection can serve as a corrective to over-learning. Through reflection, he can surface and criticize the tacit understandings that have grown up around the repetitive experiences of a specialized practice, and can make new sense of the situations of uncertainty or uniqueness which he may allow himself to experience. (p. 61)

This contention is valuable to understanding reflections' role in learning but does not provide an explanation as to how a practitioner learns to reflect in this way. As described above, I argue that learning FA requires the external support of a more experienced other, for example, course assignment or a conversation with a TE or other facilitator (Johnson & Golombek, 2003). These mediators help PSTs take an explicit inquiry or research-oriented stance towards their learning (Cochran-Smith & Demers, 2010). Schön noted, "the remedy to the mystification of practice and to the construction of reflection-in-action is the same: a redirection of attention to the system of knowing-in-practice and to reflection-in-action itself" (1983, p. 282). As a PST is learning to reflect on their practice, it is the role and responsibility of TEs to redirect the PSTs' attention to the system of knowing-in-practice and to the reflection-in-action itself. But this is challenging, if not impossible, to attend to in the midst of teaching. The VSR process provides the requisite mirror to reflect to the PST what reflection-in-action is, in their own practice.

I refer above to TEs (plural) and not to a single TE, as sociocultural theories of learning emphasize the role of various mediators in the process of learning. The

literature reflects this understanding of a complex and interactive framework for PST learning. Huizen et al. (2005), who offered a Vygotskian perspective on theories teacher education suggested, "the teacher-education environment will have to be structured and organized in such a way that trainee teachers are encouraged and supported to be participants in learning and to develop a professional identity in the course of their participation" (p. 285). A learning environment that explicitly offers opportunities for PSTs to be active participants in their own learning is a critical component for PSTs' development of teaching practices and identity as a teacher. Sun and van Es (2015) also expressed a view of PST learning that necessitates a thoughtful use of "tools and frameworks to help guide what they attend to in teaching, how they interpret these events, and how they draw inferences from these experiences to make informed teaching decisions" (p. 85). Here again, the question is how - how do these tools and frameworks facilitate PST learning? The tools and frameworks, when put together with a mirror image of the PSTs' own teaching and a reflective interaction facilitated by a TE, instigate and propel PSTs' learning.

To put this another way, "when the immediacy of the situation is not present, they are able to reflect on many more dimensions" (Borko et al., 1987, p. 87). Borko and colleagues express one essential component of the PSTs' learning process, memory. But as time progresses, memories become increasingly fallible. With video recordings, memories are made more reliable and accurate. When removed from the immediacy of the situation, the PST can be more attentive, open, and accurate in their recollections and reflections on components of their enactment, as opposed to a diluted memory of the event. Further, PSTs' own teaching videos provide "the opportunity to slow down the teaching process and reflect in ways not possible during

live observations" (Santagata et al, 2007, p. 138). To be clear: I do not argue that PST learning is not active and present in-the-moment as they teach. However, when removed from the moment, and shown a video of their own practice (as opposed to a visceral, experiential practice that gets modified and revised as time passes), the PST is not only displaced from the enactment but also shown a mirror of their practice in action. The PST can more reflect more deeply on more dimensions than from their memories or TE-prompting alone.

Theories of PST learning should attend to the process of how a PST learns to reflect on their actions, learning in, from, and for their developing practice. The use of VSR processes provides this needed mirror, for the PST and the learning theorist. As Geiger et al. (2016) argue, "video-stimulated recall can be an effective medium for promoting teacher professional learning, providing quality reflection and questioning are included as crucial elements of the processes" (p. 457). They further argue that for learning teachers (PSTs), the process of learning necessitates the presence of a TE (more competent or critical other) in developing PSTs' reflection and questioning practices. This is in line with Vygotskian perspectives of learning on a social plane before and as a concept becomes internalized within an individual. This argument is also made by van der Linden and colleagues (2022) who reviewed literature on the use of video coaching as a mediator for PST learning. They found that "reflection on one's own practices appears to be important for developing this type of knowledge within video coaching. However, it should be noted that teachers do not always reflect in ways that support their learning," (p. 151) and like this dissertation, found that guidance from more experienced others is beneficial (and I contend critical) for enhancing PST learning.

This extension of sociocultural theories of learning and reflection that I suggest, incorporating an argument that PSTs learning occurs through a systematic combination of learning-in-action and guided reflection-on-action, may seem too large a claim for such a small study. Regardless, the evidence from this study illustrates that there is space for enhancing PSTs' learning of FA practices by whatever term is selected: interactive decision making (Clark & Yinger, 1979; Housner & Griffey, 1985; Jackson, 1965), "withitness" (Kounin, 1970), "theory-in-action" or "reflection-in-action" (Schön, 1983), "deliberate practice" (Ericsson et al., 1993), "dynamic assessment" (Lantolf & Poehner, 2004; Litz, 1991), "adaptive expertise" (Hammerness et al, 2005), or "leveraging student thinking" (Singer-Gabella et al., 2016). Atkinson & Shvidko (2019) argued that "if pedagogy involves the fine details of interaction, then consciousness-raising regarding such details would be an important addition to teacher education" (p. 1106). The VSR-PST cases in this study illustrate that the use of PSTs' OWN videos, paired with a VSR semi-structured protocol that encourages PSTs to relive and reflect on the fine details of interaction, resulted in enhanced capacities for FA as a process through raising the PSTs' consciousness about their interactions with students.

VSR is a medium and a strategy that seems to move PSTs towards increasing levels of "withitness" (Kounin, 1970), of increased "reflection-in-action" (Schön, 1983). The VSR transcripts and twice revised FA concept maps show how PSTs learned this ethereal process, in real time. In varying degrees, the data showed the VSR process was helpful for PSTs with varying understandings of FA. While some VSR-PSTs were already enacting "reflection-in-action" processes, the VSR strategy gave their processes a name, FA, and showed me, the non-evaluative researcher and

teaching professional, that they understood the concept of FA at a high level, even if initial explanations did not match. Through the VSR process, they were better equipped to describe and identify the components of the process that may have led to or deterred student learning. For other VSR-PSTs, whose conceptualizations and enactments were more surface level, VSR offered an opportunity for the PST to observe and consider their own teaching in relation to learning FA. As Vicky noted, "you're making me realize that I do it more than I actually, like, know that I'm doing it." Some PSTs may only need a TE to point out small moments of probe-like interactions, allowing the PST to begin to imagine more deeply how their interactions might be extended even more deeply and consciously to enhance student learning.

In this last chapter, in addition to sharing limitations and general findings, I have emphasized the implications and future direction of this research agenda. By better understanding how PSTs understand and enact responsive questions that probe and elicit deeper student thinking and language in elementary students with MLs, particularly in the early stages of a teacher's professional learning, this analysis supports the future revision and construction of teacher education programs. Among other findings, it shines a light on PST learning that is already happening, perhaps more deeply than many TEs would believe. PST learning might happen even more effectively and meaningfully if VSR-like mentoring sessions are more frequently provided to PSTs, using supervisor and seminar structures that are already in place. Ultimately, this dissertation contributes to the thoughtful ongoing revision and development of preservice teacher education programs, as teacher education programs enact their own cycles of FA as a practice.

Appendix A: Probing Construct Map, Duckor & Holmberg, 2019

Probing Construct Map

More ▲	*Respondents* whose probing is adaptive to evidence of individual and groups of students' present understandings in relation to the intended learning target, context, and curriculum. Can explain what they anticipate to happen as a result of probing and why. They communicate concern for responding productively to student responses they cannot anticipate and can explain strategies that support eliciting and leveraging such responses in relation to learning target. They enact probes with relevant knowledge of students and learning progressions in mind. They enact ways to support students probing each other's thinking and performances. They tend to enact lessons that reflect multifaceted purposes for probing and integration of other FA moves to support probing. They tend to enact lessons that encourage student independence and interdependence related to probing and the generation and use of formative feedback. Respondents probe equally well regardless of configuration—whole class, small group, one-on-one—and consistently probe in each of these configurations during lessons.	Differentiated "adaptive"	*Responses to tasks/items* indicate patterned and responsive probing that includes productive teacher responses to information elicited by teacher and/or student probing and incorporated into further probing. Responses indicate that probing includes focus on student self-regulation of learning and that formative feedback students receive or generate is tied to data elicited from probing and linked to learning target. Observation shows productive handling of unorthodox responses to probing. Probing enacted reflects detailed and relevant knowledge of students, context, and curriculum, and may suggest use of learning progressions. Observation demonstrates a productive balance among probing technique/strategy, students' affective states, and learning goals and integration of other FA moves to support probing. Observation reveals configuration (whole class, small group, one-on-one) does not influence quality of probing, which is consistently done throughout the lesson, regardless of configuration.

(*Continued*)

Probing Construct Map (cont.)

Respondents who describe the purposes motivating probes/probing moves and attend to probing's role in generating formative feedback and in supporting student agency in efforts to progress toward intended learning target. They tend to enact lessons such that instructional decision making is contingent upon what is elicited from probing. They support student-to-student (S-2-S) probing strategically and integrate other FA moves with probing. They tend to enact probing that results in responses used by students and teacher to move students' learning forward in relation to the learning target. Respondents who use other FA moves (e.g., priming, pausing, and posing) to support probing. Respondents for whom episodes of whole class probing begin to reach the probing skill levels they demonstrate during small group and one-to-one configurations, though not consistently.	Strategic "purposeful"	*Responses to tasks/items* indicate teachers take up evidence of student performance in probing formulation or delivery. A variety of probing moves are demonstrated. Observation shows that student-to-student (S-2-S) probing occurs, supported by norms, routines, and scaffolds. Observation may show "extended episodes" of probing that are on topic and on task between teacher and students and students and students. Observation suggests attention is paid to using probing to improve formative feedback related to intended learning target that is available to students by teacher and students. Responses to tasks/items show other FA moves (e.g., priming, pausing, and posing) are used to support probing. Observation demonstrates episodes of whole class probing beginning to reach the probing skill levels demonstrated during small group and one-to-one configurations, though not consistently.
Respondents who address probing's relationship to decision making and to probing's role in making understanding and thinking visible and why this is important. Probing's role in clarifying student understanding of intended learning target, fostering student responsibility for efforts toward the target, and informing formative feedback tends to be overshadowed by other teacher goals for probing (e.g., "uncovering misconceptions", checking understanding of academic language). They tend to enact lessons that include probing of "correct answers" and that encourage S-2-S probing. They tend to enact probing that targets either catalyzing movement toward the learning target or influencing student affect. They may be challenged to capitalize on what probing elicits. Respondents whose probing is noticeably better during one-on-one and small group configurations than it is during whole class instruction.	Multistructural "intentional"	*Responses to tasks/items* indicate probing is potentially valuable to teacher or student decision making. Probes target uncovering misconceptions. Observation shows teacher, and sometimes students, using what probes make visible in attempts to advance student performance related to learning target. Observation shows probing of "correct answers", probing to uncover misconceptions and/or checking understanding of academic language Observation demonstrates support of S-2-S probing, although explicit connections to how S-2-S probing can support student understanding of the intended learning target and student ownership of efforts toward this target may be absent. Responses may indicate "teacher probing as formative feedback to students." Observation demonstrates teacher's quality of probing during one-on-one and small group configurations is much better than it is during whole class instruction.

(*Continued*)

Probing Construct Map (cont.)

	Respondents who contend the main purposes of probing are to spur student action and to make learners' thinking more visible. They tend to rely on generic probes (e.g., "Why?" or "Please explain"). They tend to enact lessons where probing is not explicitly tied to informing possible formative feedback and enact most of their probing in one component of the lesson. Some respondents enact lessons where the wording and/or pace of probing mirrors students' needs, but the orientation of the series of probes is still primarily from the teacher's point of view. Most and/or best quality probing occurs during one-on-one or small group configurations. Respondents who are able to probe student thinking during one-on-one conversations, but not leverage this to probing well with small groups of students or during whole class configuration. Respondents tend to complexify their probing before a student responds. Some respondents may repeat or revoice student responses as probing or proto-probing.	Unistructural "emergent"	*Responses to tasks/items* indicate probing relies on generic probing moves (e.g., "Why?," "Say more . . . ," "What do you mean?") as probes that are beyond "probing to manage" or "probing to engage." Observation shows that some probes do make some learners' present thinking somewhat visible. Observation may show that what gets elicited via probing gets used by students or teacher, but also that probing is not explicitly tied to formative feedback. Observation often reveals probes reside in a narrow range. Some responses to tasks/items indicate that during teaching the wording and/or pace of probing mirrors students' needs, but still is oriented primarily to the teacher's thinking. Observation shows most and/or best quality probing happens with one student and occurs during one-on-one or small group configurations and not during whole class instruction. Observation shows teachers complexify probe(s) before students respond. Some responses to tasks/items indicate that the teacher repeats or revoices students' words as proto-probing.
Less	*Respondents* for whom probing student thinking related to the learning target is not a primary concern in classroom assessment. They tend to enact lessons where student discourse is not rich and where "discussions," if they occur, exemplify "coverage and review," not processes supporting "uncovering" or "elaboration" of student responses. They do not probe student thinking regardless of configuration: whole class, small group, or one-on-one.	Prestructural "pre-probing"	*Responses to tasks/items* do not plausibly indicate that probing related to the learning target has occurred. Observations of teacher to student interactions in whole class, small group, and one-on-one configurations do not suggest probing.

Appendix B: VSR Interview Protocol: Post Lesson Enactment for UCSC Multi Subject MA/C Students and their CTs

Developed by Carrie Holmberg, revised by A. Patthoff

1. Student creates concept map and researcher reviews focus FA moves (probing) (5-10 min.)
2. Video stimulating recall: researcher's and self-chosen clips (20 min)
3. Exploratory conversation about FA and student with CT (10 min)
4. Close (5min).

Part 1a: Introduction

Hello. Thank you again for participating in this research study and for meeting with me today. I will be recording our zoom session and will handle all data in confidence per the consent form. If at any time you would like to interrupt or end this conversation, please feel free. Please let me know whenever you would like me to stop the recording, and I will turn off the recorder.

Today I am interested in hearing your reflection on the formative assessment questioning move, probing, in action in the lesson you video recorded. Particularly: what might you have been thinking and deciding, especially in relation to probing, inviting students to elaborate.

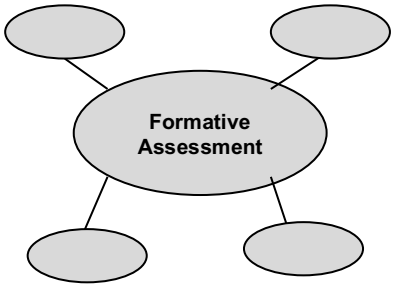
There will be a four-part structure to our session today:

1. First, you'll draft a concept map of your understanding of FA.
2. Next, we'll review a video clips from your lesson;
3. Then, we'll invite your CT into the conversation to discuss their understanding of FA/probing and expectations of FA/probing in their own classroom.
4. Finally, I'll invite you to talk about parts of your practice regarding the Formative Assessment moves of probing that may or may not have come up in the video discussion portion of the interview.

Part 1b: Create concept map and introduce FA moves wheel

[Analytic note: Student creates concept map to orient direction of discussion and provide a visual for students' understanding of FA. Subject may **add** or **elaborate on previous "notes"** or both at the end of the session].

- Direct participant to create a concept map for FA (see below for example) (give 2-3 min.): in google slides: have student share screen.



- Ask, “Looking over your concept map, is there anything else you’d like to add, revise, amend?” [use wait time]
- If s/he adds, probe, “Why is this important to add/revise/amend?”
- Ask, “What does FA mean to you?” [Allow 3-5 minutes]
    - Probe for clarification, if necessary.
- ***Ask permission and share the drafted concept map with researcher, return to researcher’s screen).**

Introduce the FA Wheel to explore the possibility of re-conceptualization of the “roles”/purposes, etc. of probing and to prime for participant’s attention to the FA move in the lesson enactment (and plan).

- Introduce the FA Wheel
- Say, “Take a moment to recall the lesson that was videotaped--” (Use wait time, Let “External Processors” talk to jog their memory.)
- Ask, “Thinking back on the recorded lesson you submitted, what stands out for you from the FA moves wheel?”
- Ask, “Can you recall any particular places in the enactment of the lesson that exemplify…
    - ...probing moves?”

Part 2: Video stimulating recall portion (30 min.)

[Analytic note: Purpose is to elicit evidence about **reflection.** Subject is providing evidence of relation between planning, enacting, and now reflecting on **e.g., next steps**]

A. [20 min] Elicit evidence about reflection on the exemplar clip researcher has chosen. (Researcher needs to have the clips prioritized. Note whether or not the subject has chosen one of the clips/episodes the researcher has chosen).
B. [10 min] Elicit evidence about reflection from 1-2 clips participant may elect to revisit from the recorded lesson.

2A. Regarding the clips the researcher has chosen:

Before pressing play for “Researcher Clip,” say:

As we watch, the goal is for you to reflect and “unpack” the clip. We can pause the recording at any place. I am really interested to hear your thinking and decision-making related to probing in this clip. Feel free to talk about **what you did** and would have **wanted to do, if anything,** at a particular moment in the clip.

As we go through this clip, feel free to talk about **what you anticipated, what you did** in-the-moment, and how, if at all, **you wanted to do something different.**

- This clip comes from the part of the lesson where…
- It begins with…
- Press “pause” at any time.

Researcher presses “play.” Teacher/researcher presses “pause”, and teacher reflects out loud.

Pose/Launch:

1. What are you noticing about probing in this clip? Does anything stick out?
2. Looking at this clip, do you have any thoughts NOW about planning this clip/segment/episode?
3. Are there any ELs in this class? Did the presence of these students affect your formative assessment moves? How?
4. What do you wish you had been able to do in this moment as you enacted the lesson segment/episode? Please explain. How does this relate to probing, or the FA moves generally?
5. If you were to fast forward and teach this [e.g., probing routine] again, what would you want to do?
6. Considering this video overall, do you have any other thoughts or reflections?

Probes:

- Say more… [elaboration]
- In terms of probing, what are we <u>not</u> seeing that is important to consider? [What's invisible?]
- Can you offer another explanation? [other explanations/possibilities]
- Tell me about your purposes for doing _____. [purposes]
- In terms of possible things to <u>try next</u> re: probing, what might you suggest? [contingency]

2B. Regarding any clip(s) the <u>teacher would like to revisit</u>:

Are there any 3–5-minute segments within this recording you would like to revisit? (If yes, continue, if no, skip to close). As you think about your lesson and select a clip, the goal is the same as before: for you to reflect and "unpack" the clip. Please talk about your thinking and decision-making related to probing. What were you thinking? Intending? What were you anticipating or surprised by?

Pose/Launch

- Are there any 3–5-minute clips within this recording you would like to revisit? (Allow time for the student to decide and set up the clip and note start/end points).
- As you think about your lesson and select a clip, the goal is the same as before: for you to reflect and "unpack" the clip. You'll talk about your thinking and decision-making related to probing. What were you thinking? Intending? What were you anticipating or surprised by?
- Which clip have you chosen?
- When does the clip begin? [Note the time marker. Go to that point on video]
- What is the ending point of your clip? [Note.]
- Before we watch the clip together, please tell me, why did you choose the clip?
- What is it about the probing in this clip that you'd like to talk about?

Before pressing pay at the start of the clip the teacher has chosen, say:

As we watch, the goal is for you to reflect and "unpack" the clip. We can pause the recording at any place. I am really interested to hear your thinking and decision-making related to the probing in this clip. Feel free to talk about **what you did** and would have **wanted to do, if**

anything, at a particular moment in the clip.

Teacher presses "play." Teacher presses "pause" and reflects out loud.

Pose/Launch:

1. What are you noticing about probing in this clip? Does anything stick out?
2. Looking at this clip, do you have any thoughts NOW about planning this clip/segment/episode?
3. (If ELs mentioned above) ... Did the presence of ELs affect your formative assessment moves? How?
4. What do you wish you had been able to do in this moment as you enacted the lesson segment/episode? Please explain. How does this relate to probing, or the FA moves generally?
5. If you were to fast forward and teach this [e.g., probing routine] again, what would you want to do?
6. Considering this video overall, do you have any other thoughts or reflections?

Probes:

- Say more… [elaboration]
- In terms of probing, what are we <u>not</u> seeing that is important to consider? [What's invisible?]
- Can you offer another explanation? [other explanations/possibilities]
- Tell me about your purposes for doing _____. [purposes]
- In terms of possible things to <u>try next</u> re: probing, what might you suggest? [contingency]

<u>Part 3: Invite the CT into conversation.</u>
Say to PST:
Before we invite your CT in the conversation, I'd like to remind you that the purpose of inviting your CT into the conversation is to hear how they interpret the probing moves you've identified, in light of the classroom context, their expectations, and your development over the quarter. The intent is exploratory, rather than evaluative. We do not need to watch any clips, unless you feel it would be helpful. Would you like to review any particular clip with your CT?

Invite CT into conversation/interview.

Hello. Thank you again for participating in this research study and for meeting with me today. I am audiotaping our session and will handle all data in confidence. If at any time you would like to interrupt or end this conversation, please feel free. Please let me know whenever you would like me to stop the recording, and I will turn off the recorder.
Today I am interested in hearing your reflection on the formative assessment questioning move, probing. Particularly: what expectations and routines do you have for Formative Assessment in your classroom, especially in relation to probing, inviting students to elaborate.

- "What does Formative Assessment mean to you?"
- "What stands out for you as examples FA?"
- "How do you know to elicit deeper or alternative responses from students?

- "What, if any, strategies do you employ?"

(If student has asked to review a clip with CT):
"As we watch, the goal is for us to reflect and "unpack" the clip. We can pause the recording at any place. I am really interested to hear your observations about the eliciting of student knowledge in this clip. Feel free to talk about what you modeled in prior lessons for your PST and would have wanted to say to encourage or support your PST, if anything, at a particular moment in the clip."

Part 4: Close (5-10 min)
Say:
This final section of the interview is intended to catch some of your thoughts, expertise, and practices regarding the FA moves that may not have come up yet today.

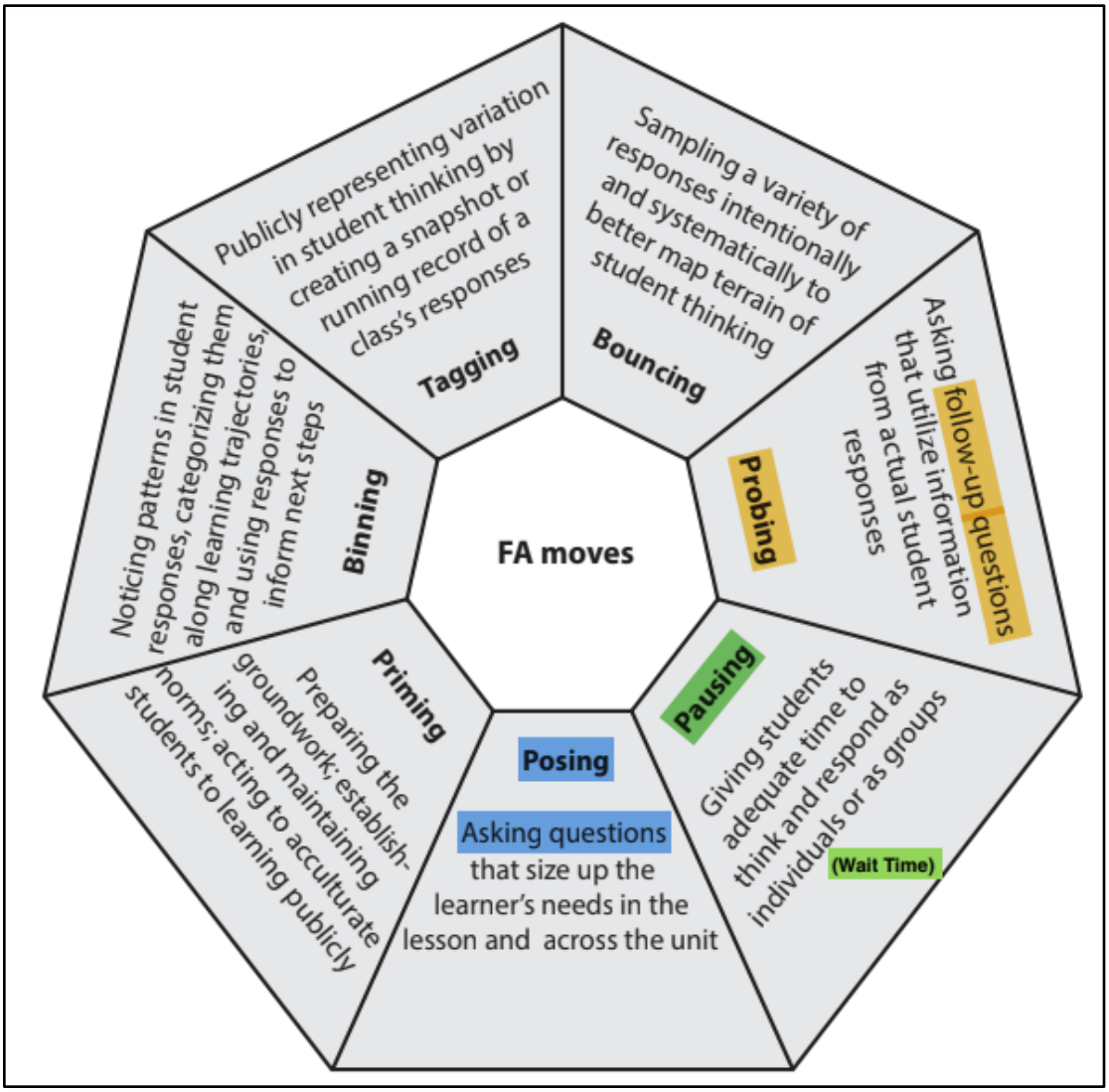
Pose/Launch:

1. Direct participant concept map created at the beginning of the interview.
2. Direct, "As you look over your concept map, you can add, revise, amend it now." [use wait time] (If possible, have participant use a different color, or mark additions/revisions in some way).
3. If s/he adds, probe, "Why is this important to add/revise/amend?"
4. Ask, "Considering this reflection process, what does FA mean to you?" [Allow 3-5 minutes]
5. Probe for clarification, if necessary.
6. Is there anything we missed today?
7. [Optional] How was choosing a clip for you? What sorts of things were you weighing in your mind as you were choosing?
8. In these clips and lessons, did you find yourself falling back on particular **"go to"** moves? Please explain.
9. If you **changed strategy "on the fly"** while making a particular probing move, please remind me why.
10. How do **students' responses'** (e.g., questions, body language, designations) fit into your FA moves? What role do they pay in your choice of what to do and adjust?
11. How does the "**curriculum or content"** (e.g., guide, pacing schedule, district textbook) fit into your FA moves? What role do they play in your choice of what to do and adjust?

CLOSURE:

Thank you again for today's interview. I learned a lot in this process, and I hope it helped you.
Do you have any questions before we end today's interview? [pause].

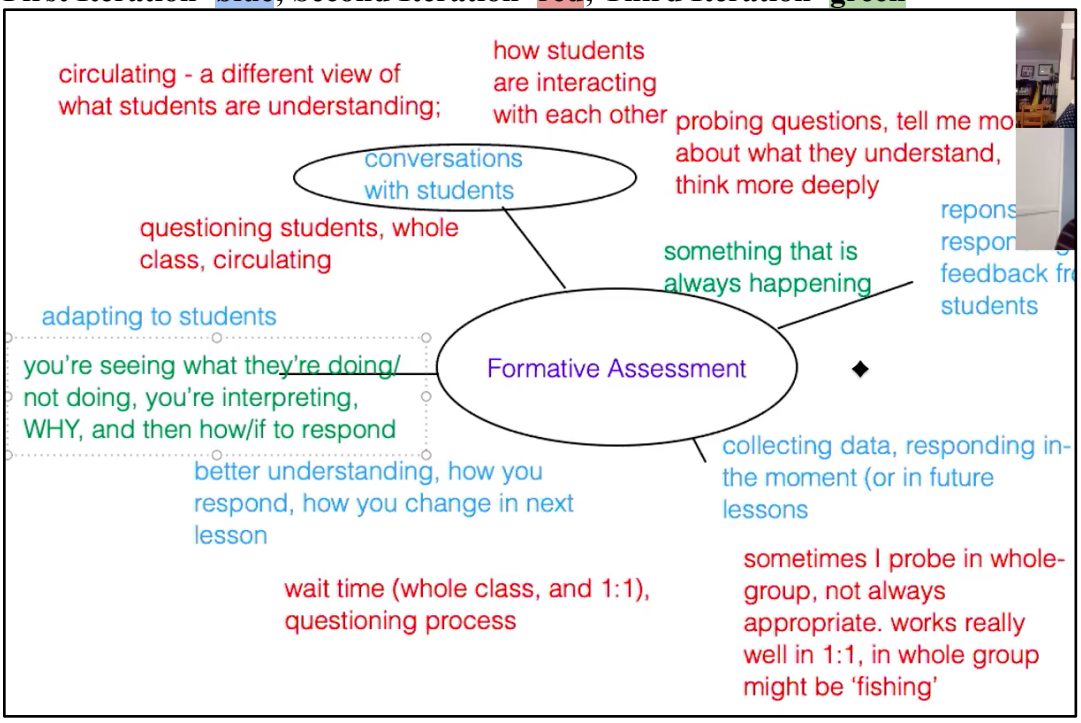
Appendix C: Framework for FA Moves (Duckor & Holmberg, 2019), Annotated version used during interviews shown here.



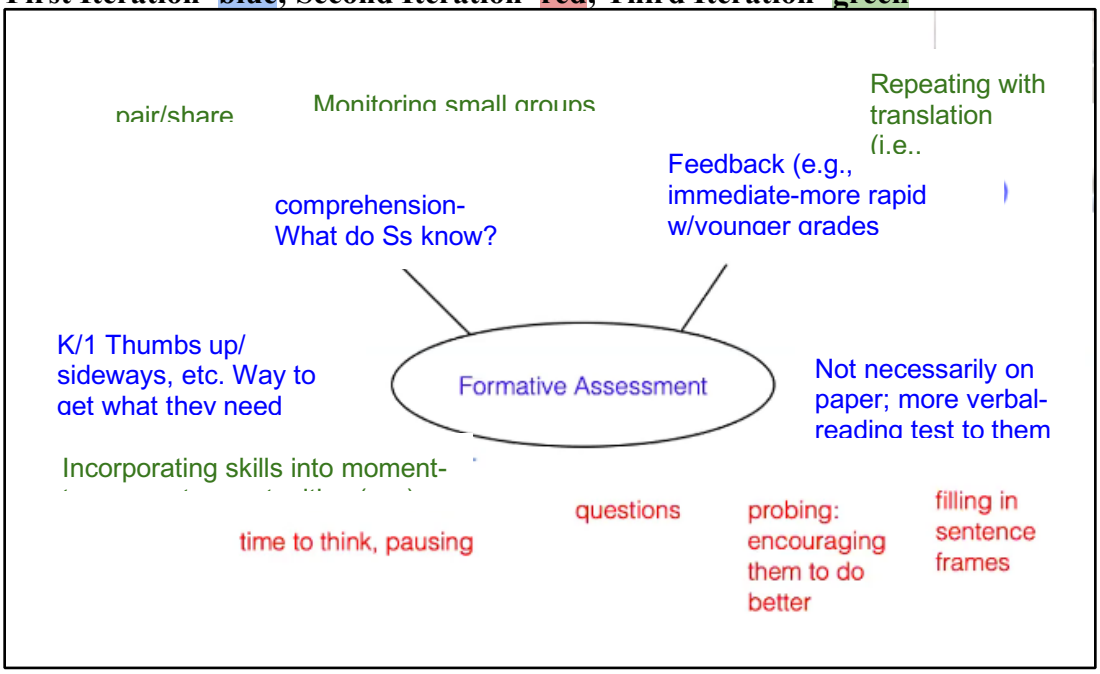
Appendix D: VSR-PSTs Concept Maps

First Iteration (blue): Concept maps were initially created at the beginning of the VSR interview with no discussion of FA. PSTs were directed to create a concept map of FA.
Second Iteration (red): After seeing and discussing the FA Wheel (Appendix C), PSTs were invited to add to or revise the first iteration of their concept map.
Third Iteration (green): After viewing and discussing recalled thoughts from clips taken from their video (and, if applicable, after having a dialogue about FA with their CT), PSTs were invited to add to or revise the first or second iteration of their FA concept map.

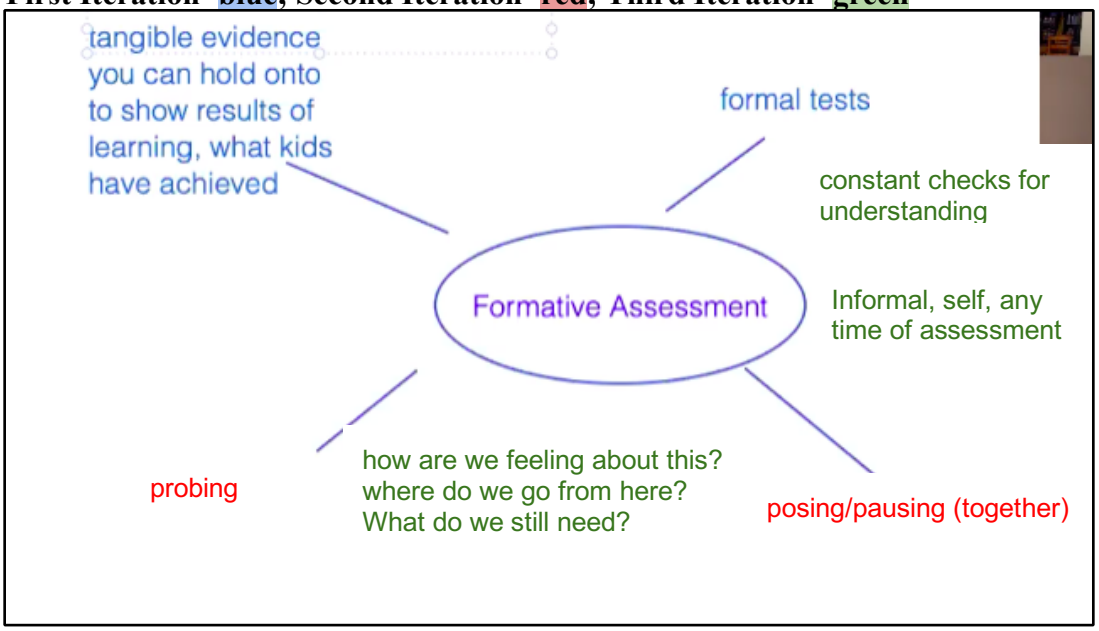
Amanda's Concept map
First Iteration=blue; Second Iteration=red; Third Iteration=green



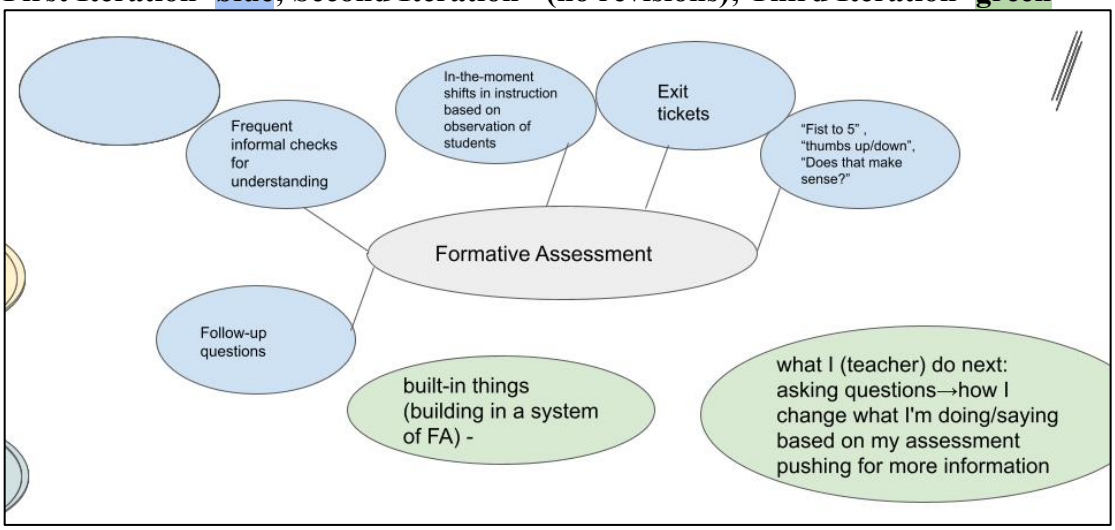
Vicky's Concept Map:
First Iteration=blue; Second Iteration=red; Third Iteration=green



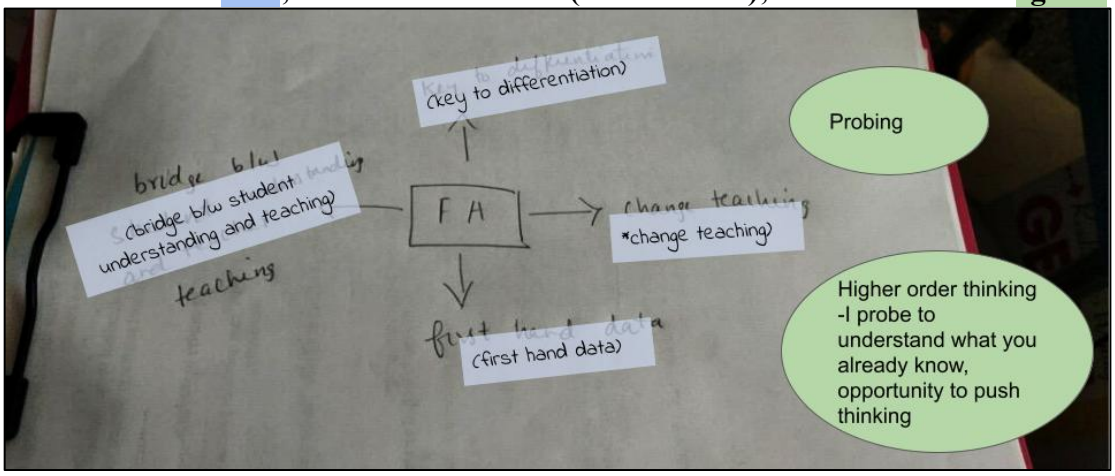
Sam's Concept Map:
First Iteration=blue; Second Iteration=red; Third Iteration=green



Kathy's Concept Map:
First Iteration=blue; Second Iteration= (no revisions); Third Iteration=green



Swathi's Concept Map:
(Swathi preferred to create her map pencil. She took a photo that she emailed during the first part of the interview).
First Iteration=blue; Second Iteration= (no revisions); Third Iteration= green



Appendix E: FA Questionnaire

For the following questions, please type a few phrases, sentences, or bullet points--just what comes to mind as you read the prompt.

1. What is your understanding of formative assessment at this point in the program?
2. What kinds of formative assessments do you use in your placement classroom?
3. What formative assessment strategies does your cooperating teacher use that you'd like to develop?
4. Are there any other formative assessment strategies you'd like to develop?

At this point in your Teacher Preparation Program, where do you fall on the Developmental Continuum for the following Teacher Preparation Evaluation measures?

Emerging 1	Emerging 2	Emerging 3	Exploring 4	Exploring 5	Exploring 6	Applying 7	Applying 8	Applying 9
Some Imple-mentation of Emerging level	Partial Imple-mentation of Emerging level	Full Imple-mentation of Emerging level	Some Imple-mentation of Exploring level	Partial Imple-mentation of Exploring level	Full Imple-mentation of Exploring level	Some Imple-mentation of Applying level	Partial Imple-mentation of Applying level	Full Imple-mentation of Applying level

TPE 1 Engaging and Supporting All Students in Learning
1.5: Promotes critical and creative thinking and analysis through activities that provide opportunities for inquiry, problem solving, responding to and framing meaningful questions, and reflection.
1.6: Supports students' first and/or second language acquisition by using research-based instructional approaches, including focused English Language Development, Specially Designed Academic Instruction in English (SDAIE), scaffolding across content areas, and structured English Immersion.

TPE 3 Understanding and Organizing Subject Matter for Student Learning
3.1: Demonstrates knowledge of subject matter, including the adopted California State Standards and curriculum frameworks
3.5: Adapts subject matter curriculum, organization, and planning to support the acquisition and use of academic language within learning activities to promote subject matter knowledge of all students

TPE 4 Planning Instruction and Designing Learning Experiences for All Students
Makes effective use of instructional time to maximize learning opportunities for all students.

TPE 5 Assessing Students for Learning
5.1 Demonstrates knowledge of the purposes, characteristics, and appropriate uses of different types of assessments

5.2 & 5.8: Collects and analyzes assessment data from multiple measures and sources (including information from IEP, IFSP, ITP and 504 plans) to plan and modify instruction and document students' learning over time.

To what extent is your knowledge/practice of formative assessment influenced by (Not at all/Moderately/Extremely):
Class work; supervisor conferences; observation of mentor teacher; observation of other teachers; your professors/lecturers; seminar classes; this survey; other influences name/list below.

Appendix F: Probing Scoring Guide

adaptive	**5**	**Anticipates where and how students typically get stuck and leverages student responses (and student-to-student probing) to advance multiple students' understanding of target content** Teacher/instruction/probing • includes focus on students regulating own efforts and strategies toward learning target • uses responses to probing to improve formative feedback available to students and productively handles "surprise" responses • probing tied to learning progression • integrates other FA moves for synergistic effects • occurs well and consistently throughout lesson regardless of configuration (1-on-1, small group, whole class)
purposeful	**4**	**Serves to benefit the generation of focused formative feedback and student agency in progression toward learning target and incorporates students' ideas, "presumptions" and words** • engages a range of student responses/performance "levels" to inform decision making, promote student agency, and improve formative feedback • scaffolds student-to-student (S-2-S) probing and promotes increasing student responsibility for exploring limits of "understanding" • reflects productive balance with learning goals and students' affective states • uses other FA moves, e.g., priming, re-posing and pausing, to support • episodes of whole class probing begin to reach probing skill demonstrated during small group and one-to-one configurations, though not consistently • uses probes to collaboratively construct accurate representation of student thinking/meaning
intentional	**3**	**Aims to make thinking visible, uncover misconceptions, and explore student explanations** • includes probing of "correct answers" • often demonstrates goal of extending dialogue between individual and groups of students and/or getting students to use academic language • features explicit support of student-to-student probing • supports student ownership of efforts toward intended target of learning, but this may not be foregrounded or done consistently • may be challenged to leverage on the fly what probing elicits • inquiry stance may appear as strategic guessing of student thinking/meaning (e.g., "Do you mean…?") • is noticeably better during one-on-one and small group configurations than during whole class instruction most of the time
	3-	• Explicitly makes student thinking visible, connected to learning task • Uses students' own words to clarify misunderstood concepts or academic language use

emergent	**2+**	• wording and pace of probing mirrors students' needs, but still is oriented primarily to teacher's thinking • May support student's academic language via re-casting student response with target AL.
	2	**Focuses on spurring student action; makes student thinking more visible to teacher; and/or giving hints (leading questions); making teacher thinking more visible to students** • probes are often closed-ended • applies generic "go to" probes (e.g., "Why?" "Say more…") indiscriminately • occurs mostly in one component of the lesson and mostly to "incorrect answers" • largely presumptive stance may appear as statements/clarifications about student thinking/meaning ("Oh, you mean…') • quality of probing during one-on-one configuration is the best probing that occurs (compared to small group or whole class probing attempts)
	2-	• re-introduces/re-states probe(s) without pausing before student can respond or answers own probe • revoicing/recasting is teacher-focused
pre-probing	**1+**	• revoicing or repeating or summarizing of student responses appears probe-like • probing occurs mostly or only during one-on-one configuration
	1	**No probing plausibly related to learning target occurs** • during lesson enactment regardless of configuration: whole class, small group, or one-on one • believes all questions are of equal use and does not distinguish among uses during a lesson

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