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Acts of Attention:

An Exploration of Teacher Candidates' Attention to Educational Encounters, and How It Relates to Task Formulation

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Education

by

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ABSTRACT

Acts of Attention:

An Exploration of Teacher Candidates' Attention to

Educational Encounters, and How It Relates to Action

By
Victoria A. Harvey

This study begins with the belief that the ways in which teachers see and attend to educational encounters matter for their actions in classrooms. Using microethnography as a framework, this dissertation explores the relationship between teacher candidate attention, problem formulation, and action. Through analysis of the M.Ed. inquiry reports of teacher candidates in a boutique teacher education program, this study answers the following questions: 1) What do teacher candidates' M.Ed. inquiry questions reveal about their attention and problem formulation? 2) How do these questions indicate possibilities for attention and action in a classroom? 3) How does candidates' attention change over the course of a year in the context of the M.Ed. investigation they complete in a teacher education program? 4) What do candidates' attention, problem formulations and actions as revealed in their M.Ed. reports indicate about the relationship between attention, problem formulation, and action?

The findings of the analysis reveal the ways in which teacher candidates are attending to the problems of their classrooms and how that attention might shift through the course of inquiry. As teacher candidates' attention shifts, it broadens possibilities for problem formulation and the actions a teacher might take in a classroom. In its conclusion, this paper

ultimately argues that the object of teacher education be to educate teacher candidates' attention.

CHAPTER 1

Introduction

How I Arrived at This Study

About two months into my first year as a middle school English teacher, I began to wonder if my teacher education program had failed me. I was doing everything they suggested – writing elaborate lesson plans, developing creative activities, making content relevant to students, and otherwise managing a good classroom. For the most part these things were working. I was excited to be in my classroom everyday. I was teaching great lessons. But, it felt like an unstable place to be. My efforts to be creative, relevant, and caring to students were not always met with the enthusiasm I expected, and despite using all the best strategies I had been taught, I knew I was falling short and didn't know why. The less students seemed interested, the harder I tried for the entire first semester.

Over winter break after that first semester, I knew that I needed to rethink what I was doing. I was tired of putting in countless hours and effort planning lessons that did not have the desired effect. I realized that I needed to figure out what else was happening. Though I did not have language to describe it at the time, I approached the second semester attending closely to what students were doing – how they interacted with each other, with me, and with the content and tasks. My efforts began to shift from focusing on my own teaching and lessons to focusing on what my students were up to.

When I came to grad school at Pacific Public University (PPU) several years later, I knew I wanted to research how teachers were being taught. I carried a naïve assumption from my own experience that they weren't being adequately prepared for the "realities" of classroom teaching. And, I knew this preparation had to do with more than fancy strategies,

but didn't know how. As I began learning from teacher educators and working with teacher candidates, I started to better understand what I first realized as a classroom teacher – good teacher preparation is as much (if not more) about learning how to *see* students as it is about lesson planning and strategies.

My first attempt to research how teachers see students in classrooms came about somewhat accidentally. I had set out to research co-teaching as a strategy for teacher education by interviewing some candidates about their co-teaching experiences. Through conducting interviews and analyzing interview transcripts, I saw more interesting things in the data than the information candidates provided on co-teaching. I began to attend to the ways in which these candidates were describing what was going on with students in their classrooms and the sense that they made of what was happening – in short, the problems of their classrooms. This led me to shift my attention from co-teaching, per se, and mine the interview data for the problems of teaching that these candidates were formulating.

From these interviews, I discovered that candidates were formulating problems of teaching by typifying what they saw into common problem formulations. For instance, candidates commonly formulated problems of relevance, participation, and student interest. These problem formulations often appeared to not be accurate descriptions for what candidates said they *actually saw* in their classrooms; rather they were abstractions that *looked similar* to what they were seeing. Candidates also described their actions based on the problems they formulated. (For example, one candidate believed she had a "relevance" problem in her classroom, so to make content relevant, she had students create Facebook wall posters for characters in a novel.) I realized that candidates could be acting from abstractions, rather than what they actually saw going on in their classrooms.

It is this realization that gave me a direction for this study: How do we prepare teacher candidates to see students in and the environments of educational encounters in ways that are authentic, meaningful, and transformative to their teaching practice? I found a place to look for this in Master's of Education program at PPU. The M.Ed. program at PPU requires candidates to spend a year looking closely and slowly at dense records of practice from their classrooms in order to better understand their students, their students' learning, and their role in it. The goal of the inquiry is for candidates to become more "alive and alert to the possibilities for learning" that inhabit their classroom. The originating problems, questions, or ideas that candidates explore give the inquiry a direction that has the potential to shape and broaden what they are seeing and attending to about learning and learners.

Throughout the inquiry, candidates record their questions, analysis of dense records, more questions and findings in informal writing and in formal writing that becomes part of a final M.Ed. report. As a product of the inquiry, the candidates produce an M.Ed. report that is an accounting of their problems and questions, the ways they attended to those problems and questions through close and slow looking at dense records of practice, and the ways in which their attention was changed (or not) throughout the course of the inquiry.

The 2014-2015 M.Ed. cohort allowed me to be part of their inquiries. I attended M.Ed. classes with them, collected multiple pieces of writing including their final M.Ed. reports, and facilitated an M.Ed. group that met weekly in the winter and spring quarters. These served as sites for formal data collection for this study. Additionally, I instructed many of these candidates in other classes in their teacher education program. Those interactions (and informal interactions around the campus of PPU) made me privy to informal observations of how the candidates were attending to their students' learning. To

put it another way, this study comes from a slow and close look at the ways in which my students attend to their own students' learning. My teaching of these candidates both informs and is informed by this research.

How This Study Fits With the Larger World of Teacher Education

This study begins with the belief that the ways in which teachers see and attend to educational encounters matter for their actions, and assumes an ontological position that the origins of action are not intra-mental, but rather are culturally situated and interactionally constituted. This project uses microethnography as a framework for exploring the relationship between teacher candidate attention, problem formulation, and action.

Theories about what matters for teacher action are abundant. And with these theories comes the promise that if teacher educators could educate teacher candidates in a particular way, then they will be able to shape the ways in which prospective teachers act in classrooms. Among the theories of what matters for teacher action is content knowledge (Ball, Thames & Phelps, 2008); pedagogical content knowledge (Shulman, 1986); knowledge of, in, and for practice (Cochran-Smith & Lytle 1999); teacher beliefs (Davis & Wilson, 1999; Konopak, Wilson, & Readence, 1994) meaning-making (Copeland, Birmingham, DeMeulle, D'Emidio-Caston & Natal, 1994), the apprenticeship of observation (Lortie, 1975), and decision-making (Clark & Peterson, 1978; Shavelson & Stern, 1981). And, most recently, research on teacher noticing (Goldsmith & Seago, 2011; Levin, Hammer & Coffey, 2009; van Es & Sherin, 2002) has come to the forefront of teacher education research, suggesting that teachers act in accordance with what they notice.

Each of these theories suggests responsibility for how teachers act in classrooms. That is to say, these theories maintain that teachers act based on their content knowledge,

beliefs, decision-making, etc. The existing literature on teacher action assumes an ontological position that the origins of teacher action are primarily cognitive. Thus, one object of teacher education has become to educate teachers candidates' knowledge, beliefs, decision-making, and other cognitive processes.

This study proposes to reach beyond current explanations of teacher action that treat the origins of action as a cognitive matter and looks to explain teacher action by exploring how context, framing, and extemporaneous classroom interactions impact the ways in which teacher candidates act in educational encounters. Using a framework borrowed in part from microethnography (Erickson & Schultz, 1997; Frake, 1997; McDermott, Gospodinoff & Aron, 1978; Mehan, 1980), as well as research on problem formulation (Csikszentmihalyi & Getzels, 1971 & 1975; Getzels, 1979 & 1982; Kagan, 1998; Runco & Okuda, 1988; Schön, 1986), this study examines the ways in which teacher candidate action might be a matter of attention and problem formulation – phenomena that are neither entirely cognitive, nor entirely interactional. Further, the project explores the relationships between attention, problem formulation, and task formulation as they might matter for what teacher candidates do in classrooms.

Using data from teacher candidates' M.Ed. reports this study will explore the relationship between attention, problem formulation, and action. The M.Ed. serves as a report of the inquiry that teacher candidates are doing in their classrooms. Data from various points in the M.Ed. process holds the potential to reveal candidate attention and problem formulation, the ways in which candidates' attention and problem formulation change throughout the course of a year, and the relationship between candidates' attention, problem

formulation, and their actions in educational encounters. This study seeks to answer four primary questions:

1) What do teacher candidates' M.Ed. inquiry questions reveal about their attention and problem formulation?

2) How do these questions indicate possibilities for attention and action in a classroom?

3) How does candidates' attention change over the course of a year in the context of the M.Ed. investigation they complete in a teacher education program?

4) What do candidates' attention, problem formulations and actions as revealed in their M.Ed. reports indicate about the relationship between attention, problem formulation, and action?

The Shape of this Dissertation

After this introduction, there are two conceptual framework chapters that examine the literature and explore the ways in which the literature relates to this present study. The first conceptual framework discusses literature related to problem formulation, microethnographic methods of study, and teacher noticing and the implications of each of these for this dissertation. The theory in the second conceptual framework merges existing frames from literature, with findings from the data in this study to develop new theories of attention, problem formulation, and task formulation as they relate to teaching.

After the introduction and conceptual frameworks, the first analysis chapter examines teacher candidate inquiry questions as a way to see how they might indicate candidates' attention and actions, and provide a framework for further study. From the analysis of candidate inquiry questions, multiple research questions emerge, including: 1) What do these

questions reveal about teacher candidates' attention and problem formulation? 2) How do these questions matter for the ways in which teacher candidates are attending to their classrooms and formulating the problems of teaching? 3) How does a candidate's attention change over the course of a year in a teacher education program? 4) What is the relationship between attention, action, problem formulation, and task formulation?

The questions that the first analysis chapter bring up shape the data collection and analysis of the next chapter. In the second chapter, I look closely at the M.Ed. reports of the five candidates I facilitated in an M.Ed. group. These reports indicate the trajectories that these candidates' attention takes over the course of the year-long M.Ed. inquiry. The analysis of these trajectories reveals the ways in which candidates attention changes throughout the inquiry, and how candidates' attention shapes their problem formulation and task formulation. The analysis also reveals that there are particular things that impact candidates' changes in attention.

The final analysis chapter takes a more concentrated look at the factors that impact a candidate's change in attention and compares the ways in which these factors work for each of the candidates in the study.

Finally, this dissertation concludes with a discussion section that suggests implications of this research for teacher education.

CHAPTER 2

Conceptual Framework

This study draws on literature from three primary areas: teacher noticing, problem formulation, and microethnography in order to explore the ways in which teachers attend and act in classrooms and to develop an ontology of teacher action. The literature on teacher noticing provides a beginning for how to look at teacher attention, but reveals a gap by assuming an ontological position that is primarily intra-mental. Literature on problem formulation holds promise for explaining teacher action, but is not specific to teaching. Finally, the literature from microethnography serves as a framework for examining teacher action as culturally situated and interactionally constituted. Combining these three areas of research, I will outline how each will inform and contribute to the research and theoretical framework of this project.

Teacher Noticing and its Relationship to Teacher Action

Research on teacher noticing examines the mutually constitutive relationship between what teachers notice in their classrooms and the meaning they make from what they notice. The meaning making drives future noticing, and the noticing drives meaning making. This mutually constitutive construction occurs intra-mentally (i.e., inside the head) and is portrayed in the literature as the shaper of action. It initially appears that this line of research moves away from the particularly teacher-centered, cognitive aspects of teaching, such as teacher beliefs beliefs (Davis & Wilson, 1999; Konopak, Wilson, & Readence, 1994) and decision-making (Clark & Peterson, 1978; Shavelson & Stern, 1981), and more towards a student-centered, explanation of what might shape teacher action. Close reading reveals that

the new research on teacher noticing shares a cognitive origin for teacher action with other existing research on teacher action.

What is teacher noticing? Teacher noticing includes both seeing and interpreting phenomena in classrooms. Common definitions include observing and identifying (Goldsmith & Seago, 2011; van Es, 2011), attending (Levin, Hammer & Coffey, 2009; van Es & Sherin, 2002), interpreting (Goldsmith & Seago, 2011; van Es & Sherin, 2002), internal monitoring (Mason, 2011), and making connections to principles of teaching and learning (van Es, 2002).

Perhaps most commonly, noticing can be defined as seeing and identifying the concrete phenomena that one observes or identifies in a classroom. These observations come from listening to students and taking into account what one sees in the classroom (van Es, 2002). The noticing is based on "identifying key features of classroom interactions and student work" (Goldsmith & Seago, 2011, p. 170). The operative word here is "key," as there is an aspect of interpretation even in the observation. While the research on teacher noticing does not point out that the act of noticing is interpretive (by the very act of noticing, one is interpreting what deserves notice), it does explain how interpretation is a characteristic of noticing. Some of these authors discuss interpreting by that term (Goldsmith & Seago, 2011; Mason, 2011; van Es, 2011), while others (Hammer, Elby, Scherr & Reddish, 2004; Russ & Luna, 2012; Levin, Hammer & Coffey, 2009; Scherr & Hammer, 2009) talk about interpreting as an act of framing.

Interpreting. Interpreting is the way in which teachers think through what they are seeing in a classroom in order to make some sense of it. For example, teachers need to be able to recognize similarities and differences in students' work and "generate plausible

interpretations of students' work" that include determining strengths and weaknesses (Goldsmith & Seago, 2011). Interpreting also involves reasoning about what one observes (van Es, 2011). This reasoning is done in effort to understand the origins of a student's thought or action, or understand what is meant by a particular student comment. Thus, teachers are generating cognitive interpretations of students' cognition. Careful and sustained noticing allows teachers to generate multiple interpretations about what they are observing (Mason, 2011).

Framing. Many researchers talk about the interpreting that teachers do of observed phenomena as an act of framing. Hammer, Elby, Scherr and Reddish (2004) describe framing as, "a particular way is to interpret [an event] in terms of structures of expectations based on similar events" (p. 9). Russ and Luna (2012) describe framing as "a tacit understanding of what is going on" (p. 285). According to these conceptions, frames are primarily intra-mentally constructed. A person interprets an event (a mental process) based on the expectations he or she has formed (also primarily mental) or tacit understandings (mental constructs). Thus, when framing, a teacher is interpreting what is taking place in her classroom based on what she expects should be taking place. Though there might be a contextual element to this framing, Russ and Luna (2012) emphasize the cognitive (i.e., intramental) aspects of framing. They state, "while we also acknowledge the role of interaction and context in shaping framing, we treat framing as a cognitive process and isolate it to single teachers" (p. 288). The cognitive construction of framing excludes contextual influence and does not consider cultural influence.

Framing serves to drive noticing and thus, researchers can infer a teacher's framing from her noticing. Conversely, researchers can also infer a teacher's noticing from her

framing (Russ & Luna, 2012). Teacher noticing is contingent on their framing of a particular task. What a teacher observes and infers about students, "depends in part on how they frame what they are doing" (Levin, Coffey & Hammer, 2009). If, then, a teacher frames the task of teaching as delivering information to students, then the teacher will be primarily noticing her own speech, actions and thoughts in the classroom. She might also notice how students are "coming along" in understanding the information she is providing them. If, however, a teacher frames the task of teaching as one of helping students develop their own understandings, she is more likely to notice student thinking and how students are working to make sense of concepts. A self-perpetuating cycle of framing and noticing develops, in which teachers are unable to notice new phenomena or frame existing phenomena in new ways without dramatic interruption to their habits of framing or what they are noticing.

Attending. Another key component of noticing is attending and attention. This term is used almost interchangeably with noticing in much of the research (Levin, Hammer & Coffey, 2009; Mason, 2011). Mason (2011) describes attention as both observation and the medium through which observation takes place. Attention is the concerted effort to understand what is taking place in a classroom instance (van Es, 2011). This attention can take three forms: macro attention, meso attention, and micro attention. Macro attention is the object or source of attention. Meso attention is the beliefs that inform the attention. Finally, micro attention includes multiple ways in which the objects of attention might fit together, including relationships between them and shared properties (Mason, 2011). Attention, according to these researchers, can be seen as a concentrated noticing. It can serve the purpose of exploratory observation (Mason, 2011) or, it can serve the purpose of providing a diagnosis (Levin, Hammer & Coffey, 2009).

Origins of noticing. The origins of noticing seem to share roots with other cognitive (i.e., intramental) explanations of teacher action. Beliefs, knowledge, resources, goals, and expectations all play a role in teacher noticing. These five origins of noticing are discussed in the literature with little mention of how they might be different from each other, particularly beliefs and knowledge. Goldsmith and Seago (2011) and van Es (2011) both state that beliefs and knowledge influence what and how teachers notice in the classroom.

Sherin, Russ and Colestock (2011) also incorporate expectations into what might influence a teacher's noticing. They remark, "a teacher's expectations and knowledge influence how the teacher perceives events that take place in the classroom" (p. 81). These expectations of what should happen in a classroom cause teachers to notice the things that are outside of what they expect might take place. This sounds similar to Clark and Peterson's (1978) description of teachers noticing an interruption to the routine.

Schoenfeld's work on teacher goal setting and decision-making (2010) also continues into the research on teacher noticing. He attributes teacher noticing to other components of teacher cognition stating, "what teachers notice, and how they act on it, is a function of the teachers' knowledge and resources, goals, and orientations" (Schoenfeld, 2011, p. 233). This indicates that teacher action is shaped by beliefs and knowledge with noticing possibly as a mediating factor. Given these explanations of the origins of noticing, noticing appears to be a byproduct of teacher beliefs and knowledge, offering a cognitive explanation for teacher action.

Why noticing is important for teacher education and how it relates to action. Research on teacher noticing provides an explanation for teacher action that is based on the idea that teachers act on what they notice. What teachers observe and how they interpret or

frame what they observe, as it connects to other principles of teaching and learning or past experiences, shapes the actions that teachers take. In short, teachers, "act on what they notice" (Schoenfeld, 2011, p. 230). Noticing as a shaper of action gives teacher educators new possibilities if they are looking to change teacher behavior.

One importance of noticing is that it can give teachers new ways to act as they learn to notice in new or particular ways. As Mason (2011) points out, the discipline of noticing is "arranging to alert oneself in the future so as to act freshly rather than automatically out of habit" (p. 37). This provides opportunities for teacher educators to change the ingrained habits of teacher candidates and refocus their awareness and attention.

The development of a new way of noticing is what Sherin, Russ and Colestock (2011) have termed "professional vision." Borrowing from Goodwin (2004), Sherin, et. al. define professional vision as how the members of a group frame the tasks before them. In a study on teacher noticing, Sherin and van Es (2009) sought to develop teachers' professional vision through a video club. By using video from teachers' classrooms and asking teachers to work together to notice and interpret classroom events, the researchers documented changes in the ways in which the members of the video club framed the task of teaching. The researchers observed that both the object of the teachers' noticing (the macro attention according to Mason, 2011) and the method of the noticing (the micro attention – Mason, 2011) changed as teachers engaged in the practice of noticing and discussion video in the club. This research holds promise for teacher educators looking to redirect candidates' attention.

Gaps in the literature on teacher noticing. With its emphasis on getting teachers to notice and attend to what is taking place in the classroom, the research on teacher noticing comes close to an explanation of teacher action that is aligned to what I am seeing in the

data. I also resonate with Mason's (2011) interest in using noticing as a way to change teaching habits. However, this research still poses many epistemological and ontological mismatches with this study.

The ontology underlying this research considers the origins of teacher action to be a cognitive/intramental phenomenon. Russ and Luna (2012) explicitly state that noticing and framing occurs in the "individual minds of teachers" (p. 288). This excludes interactional and contextual influences on and explanations for teacher action. According to the microethnography literature, action is (at least in part) shaped through the ongoing framing and reframing of interaction as we participate in it. This ontological approach more closely mirrors Frake's (1997) suggestion that participants in a scene create sketch maps as they both read and create the map of interaction.

Additionally, the focus in some of the literature on noticing "the unexpected" as an indicator of noticing well (Sherin, Russ & Colestock, 2011) precludes an explanation of teacher action focused on noticing more routine and commonplace instances in a classroom and making them available for critique. A complete explanation of action must also include classroom happenings that appear to be ordinary and often continue unquestioned. The literature on noticing appears to center on noticing the extraordinary without challenging the ordinary. Typical classroom actions might go unnoticed by the research on noticing.

Finally, the literature on noticing tends to take a stance of naming a problem and finding a corresponding solution. While explaining how action stems from noticing, the researchers in this area seem to suggest that the nature of noticing centers on identifying problems that already have a known solution (Sherin, Russ, Sherin & Colestock, 2008). For instance, if a teacher notices student behavior that gets framed as off-task, the teacher's

actions will be to solve that problem, likely in familiar ways. These solutions focus on solving the practical problems of teaching (Schoenfeld, 2010). This also fits with the presented problem formulations that Csikszentmihalyi and Getzels (1975) discuss in the problem formulation literature. While in some cases, there are readily solvable problems of teaching, there are many others that are more complex and require further attention. My concern is that connotation of noticing as a passing, sudden or accidental way of seeing could lead to identifying problem/solution pairs that are mismatched.

While the literature on noticing holds promise because it grounds teacher action in what is being attended to in a classroom, it still leaves room for less cognitively-oriented explanations for and ways of attention and action. I propose to add to the literature on noticing by combining the importance of teacher noticing (or rather teacher candidates' habits of attention) with a more culturally and contextually situated ontology of teacher action.

Problem Formulation and its Relationship to Action

Much of the literature on problem formulation comes out of creativity research and focuses on divergent thinking, rather than teaching. Problem formulation occurs when a problem situation, or a situation requiring action, has been identified. In a classroom, this can be as seemingly minor as a student asking to go to the bathroom or as seemingly major as a student challenging the very content a teacher is trying to instruct. Problem situations present themselves in two primary way: 1) "when a response to a given situation is blocked." 2) And as "questions raised or to be raised for inquiry" (Getzels, 1982, p. 40). The complexity of the problem situation and the action that might result from it is dependent on how one formulates the problem.

Identifying and defining the problem. Once a problem situation occurs, the teacher must identify and define it, also known as formulating the problem (Runco & Okuda, 1988; Sapp, 1997). Problem identification simply acknowledges the problem situation, while problem definition, "assists in focusing the individual's attention, energies, and gathered information on a specific set of circumstances or concepts" (Sapp, 1997, p. 284). The first step in problem definition is to determine if the problem situation is ill-structured or well-structured (Moore, 1994; Silver, 1994) also known as ill-defined and well-defined (Schön, 1986; Csikszentmihalyi & Getzels, 1971). This can be assessed by, "how much of the problem is clearly given at the start, how much of the method for reaching solution is already at hand, and how general the agreement is as to what constitutes a good solution" (Csikszentmihalyi & Getzels, 1971, p. 47). Well-structured problems are ones that have a very clear formulation. Ill-structured problems tend to be more ambiguous in nature, requiring the problem solver to do the majority of the problem formulation as well. Problem definition does not just take place at the outset of the problem situation, but rather is a recursive process with problems continually identified and defined as a teacher works to attend to what is taking place in her classroom.

Well-structured and presented problems. Well-structured problems, also called presented problems, do not provide opportunities for problem formulation in the same way ill-structured problems do. Presented problems have "a known formulation, a routine method of solution, and a recognized solution" (Csikszentmihalyi & Getzels, 1975, p. 101). Presented problems appear almost as scripts for a given situation, and present themselves as problems for solution, rather than problems for discovery.

Problem solving for presented problems calls forth the implementation of an automatized routine for dealing with the presented problem situation. Presented problems tend to be solved by habitual actions that are "accessed and executed unconsciously" (Kagan, 1998, p. 494). By recognizing the structure and solution to these problems, one merely needs to select "from available means [a solution] best suited to established ends" (Schön, 1986, p. 40). Solving presented problems in teaching thus becomes a matter of trying to match a teaching strategy or routine to a problem.

A move from defining a presented problem to accepting a matched solution can be problematic in several ways. (And by problematic, I mean that it can create more problem situations.) Firstly, solutions can put a halt to thinking. Getzels and Csikszentmihalyi (1975) explain, "A problem produces tensions driving the organism to think, it ceases to think when the problem is resolved" (p. 92). In solving a problem, one's thinking is completed once the problem appears to be solved. Conversely, in finding problems instead of solving them, the discovery and creation of problems recursively leads to more thinking. Secondly, "the quality of the problem that is found is a forerunner to the quality of the solution that is obtained" (Getzels, 1979, p. 168). Without a good problem, there can hardly exist a good solution. While the natural move that one might make when identifying a problem situation is to seek a solution, Getzels (1982) argues that the alternative to seeking solutions is to examine a problem situation until you discover more problems.

Ill-structured and discovered problems. Finding more problems begins with defining a problem situation as ill-structured. Ill-structured or discovered problems are, "characterized by uncertainty, disorder, and indeterminancy" (Schön, 1986, p. 16). They are not familiar and do not come with a known solution. "Ill-structured problems lack all the

representations of well-formulated problems" (Moore, 1994, p. 177). In Ill-structured problems, the practitioner defines the problem as "a unique case" (Schön, 1986, p. 129). Kilpatrick (1987) explains, "ill-structured problems lack a clear formulation, a procedure that will guarantee a solution, and criteria for determining when a solution has been achieved" (p. 134). Without an ordered structure, familiarity, and known solution, ill-structured problems call for a different course of action than well-structured ones. Well-structured problems call for the application of known solutions to the problem, while ill-structured problems call for new problems to be discovered. In discovered problem situations, one must come up his or her own formulation of the problem and own method of solution. Discovered problem types, "do not yet have a known formulation, a routine method of solution, and a recognized solution" (Getzels & Csikszentmihalyi, 1975, p. 101-102).

Without a known problem or known solution, one is left to discover or find the problems that might exist in an ill-structured problem situation. (The terms problem discovery and problem finding are used interchangeably in the literature.) Schön (1986) contends that there is actually, "a problem in finding the problem" (p. 129). Discovering or finding problems does not come easily. It takes thought and skill to discover good problems. Lee and Cho define problem finding as, "the ability to think, initiate, and formulate questions or problems in ill- or moderately-structured problem situations" (p. 114). Essentially, problem discovery is the ongoing reformulation of a problem situation, through thoughtful and skillful reexamination of the problem situation. In other words, it's the ongoing identifying and defining of problems.

What is it, exactly that one is doing when problem finding? Ramirez (2002) names three essential characteristics of problem finding. (1) examination of the interconnection of

things (2) exploration of possible and alternative problems and (3) asking the right question. All of these are reticulate (i.e., connected in a web-like manner) in the problem finding process. In a study on problem discovery, Csikszentmihalyi and Getzels (1971) found that discovered problems require a large number of problematic elements be considered before the problem becomes structured, either unusual elements are to be selected as foci of the problem, or a more usual element is selected, but it is thoroughly explored through multiple sensory channels before it becomes a parameter of the problem. In discovering new problems, a teacher must consider multiple elements of a problem situation, ask questions that both examine "the interconnection of things" and explore possible alternatives (Ramirez, 2002, p. 21).

Problem finding is not problem solving. As might be evident, problem finding greatly differs from problem solving. Problem solving is "a process of closing a gap between an initial state and a goal state; problem finding is the act of discovering [and widening] that gap" (Lee & Cho, 2010, p. 113). Problem solving can be said to be reductionist in that it is an attempt to narrow, simplify, or limit competing or contradictory phenomena. Problem solving limits the parameters of the problem situation to come to a conclusive end, while problem finding opens (or even breaks) the parameters of the problem situation to expand problematic phenomena.

The work of problem finding is recursive and reticulate, while the work of problem solving is executionary. Problem finding leads to a perpetual cycle of formulating and reformulating problems through the trial and error of solutions (Schön, 1986). It also explores the relationships between multiple problems and multiple solutions. Problem solving is executionary in that it both literally requires the execution of a pre-scripted plan,

and metaphorically executes (terminates) the problem situation. In a study of artists' problem formulations, Sawyer (2000) describes the differences between problem finding and problem solving: "A problem-finding painter is constantly searching for her or his visual problem while painting – improvising a painting, rather than executing one. In contrast, a problem-solving style involves starting with a relatively detailed plan for a composition and then simply painting it" (p. 153). A problem finding approach to a problem situation differs from a problem solving approach in that there is constant reformulation (that is, re-identification and re-definition) of the problem situation, which continually broadens one's attention to the relationships afforded within the problem situation.

As discussed earlier, problem finding is important because it generates thinking, allows for more quality solutions, is a stimulus for knowledge, and is associated with creativity. This study will also explore how problem discovery might be important for broadening teacher candidates' attention to their students' learning and lead to more possibilities for action in educational encounters.

The origins of problem formulation: Cognition, culture, and context. Similar to other research on teacher action, attempts have been made to explain where problem formulation is located. Some researchers attempt to explain problem formulation as an act of cognition. Mumford, Reiter-Palmon and Redmond (1994) talk about problem formulation as a "cognitive process" that is a part of creative thought. Kagan (1998) also talks about the "cognitions needed to design and execute" problem formulations (p. 498). Others who situate problem formulation cognitively talk about the influences of knowledge on problem formulation. Lee and Cho (2010) refer to thinking as a part of problem formulation and state that knowledge of the content of a problem also correlates with problem finding. The

cognitive component of decision making can also figure into problem formulation. Lampert (2001) discusses decision making as "figuring out" and deciding both the what and how of a problem. Even Csikszentmihalyi and Getzels (1971) talk about problem discovery as having a (cognitive) attitude predisposing one to engage in problem discovery.

Not all researchers attribute problem formulation to cognitive origins. Many find the ontology of problem formulation to be contextually situated and culturally constructed. Goodwin (1994) explains how, "The ability to see a meaningful event is not a transparent, psychological process, but is instead a socially situated activity accomplished through the deployment of a range of historically constituted discursive practices" (p. 607). Goodwin essentially proposes an understanding of problem formulation that goes beyond the cognitive and takes into account the influences of culture and context on the ways in which individuals identify and define problem situations.

The culture of teaching has attitudes of problem formulation embedded in it (Csikszentmihalyi & Getzels, 1971). Teachers enter into the profession presented with well-structured problems that leave little room or support for them to find new problems or solve the presented problems in new ways. Upon entering the profession, a teacher becomes further enculturated into the culture of teaching until they, "carry out actions, judgments, and recognitions, often automatically and without seeming to think about them [as habits], all appropriate responses to the enculturation of teaching" (Moore, 1994, p. 181). Though human tendency is to construct problems on a case-by-case basis, "in school, problems are given" (Kilpatrick, 1987, p. 125) often through an "apprenticeship of observation" (Lortie, 1975). The presented problems of schooling (and thus, teaching) change the availability of discovered problems for teachers, because the problems of teaching appear to have already

been defined. Teachers are "ill-equipped" to shift from problem solvers to problem finders because their tasks have been largely codified (Kagan, 1998). The codification of solutions to presented problems, signals to new teachers that their job is to follow the coda, not discover new problems. Thus, the job of a teacher becomes to solve problems by matching the presented problem to the codified solution. This carrying out of the coda or habits of teaching limits the availability of problems a teacher might formulate.

In addition to being impacted by the larger culture of teaching and schooling, teacher candidates' problem formulations can be impacted by the local culture or context in which they teach. Moore (1994) observes how, "teachers become bound by the culture of school in defining appropriate problems for solving, problems based on their interpretation of the tacit understandings within the cultural framework" (p. 181). The ways in which problem situations tend to be identified and defined by a school can strongly shape the ways in which an individual teacher formulates the problems of teaching within the context of her own classroom.

An improvisational framework might also provide a contextually-situated explanation for problem formulation. In an improvisational framework, problem formulation develops from the ongoing interpretation and interaction of the actors within a given context. Temporal constraints on teaching are such that problems must often be formulated improvisationally "at the speed of an eye blink" (Erickson, 2011, p. 23), as teachers, "constantly change both the problem context and solution context" (Moore, 1994, p. 180). Improvisational problem formulation is contingent on the actions of the participants in a particular context. The exchange of action and speech amongst actors in a context creates a, "problem-finding process that is collaborative and emergent" (Sawyer 2000, p. 154).

Problem formulation in social situations (such as schooling) is an ongoing improvisational action, based on the actions and interpretations of all the participants in the social situation. The nature of schooling is scripted such that teachers are presented with problems for solving. The nature of learning, however, is improvisational such that teachers and students need to collectively and emergently find the problems to solve.

Problem formulation cannot be exclusively located in cognition, culture, context or improvisational action, but rather is a product of the ongoing mutual constituency of cognition, culture, context and action (Erickson, 2011; Csikszentmihalyi, 1996; Moore, 1994; and Schön, 1994). Moore (1994) contends that, "problem finding in teaching appears to be more than peripherally influenced by social, cultural, and ecological systems, as well as by cognitive heuristics (p. 176). Erickson (2011) further explains how this works: "Students can be seen to be making meaning interpretively in the same time as their teachers. The stream of meaning making is thus a product of social ecology, mutual influence within real-time performance that is produced by the conjoint actions of teachers and students together" (p. 23). The simultaneous nature of meaning making and action suggests both a culturally and contextually constituted problem formulation that is constantly being renegotiate through interaction.

Problem formulation in teaching. Typically, the problem situations of teaching appear as well-structured problems that come with a well-defined solution. Moore (1994) points out that, "teachers typically work on presented problems of subject matter given to them by textbook publishers, curriculum directors, administrators, and school boards" (p. 177). As a result, teachers often identify and define practical problems with known solutions

(Lampert, 2001). These practical problems of teaching reduce the act of learning and the content taught to only what can be solved and measured.

Erickson (2011) cautions against the danger of formulating presented problems in teaching. He explains,

> As teachers notice what is happening in the classroom as a whole, from a 'batch processing' perspective that is encouraged in contemporary teaching practice . . . there is a tendency to use deportment evidence as a proxy for evidence of student understanding . . . It is easy to mistake the appearance of student attention and understanding for genuine attention and understanding (p. 22).

When teachers' problem formulations are primarily based on the presented problems of teaching, they often miss or misconstrue what is truly going on in their classrooms. In an attempt to match what they see in their classrooms to a known problem/solution pair, teachers can fail to notice what is actually taking place and mistake what they observe for a presented problem. If teacher action is shaped by problem formulation, these misformulations of the problems of teaching can lead to ineffective action in the classroom. Teacher candidates must learn how to define problem situations in new ways so that they can discover new problems for teaching.

The research on problem formulation seems to hold promise in explaining what shapes teacher action. The ways in which teachers formulate (identify and define) the problems of teaching might impact the actions that they take in the classroom. Through identifying and defining problem situations, teachers will either seek solutions for presented problems or find new problems for teaching. The solving or finding of problems might account for the actions that they take. Problem formulation is a move away from the

cognitive explanations for teacher action and toward an explanation of teacher action that is contextually situated and culturally constituted.

Microethnography and its Relationship to Action

Microethnography explores the ways in which action is culturally situated and interactionally constituted. Rather than providing an explanation for action that is primarily intra-mental, these researchers seek to locate the origins of action in the mutual constituency of mind, culture, context, activity, and interactivity. Microethnographic literature examines the ways in which action is shaped by these factors and also shapes these factors. The theories represented in these readings, "emphasize the relational interdependency of agent and world, activity, meaning, cognition, . . . and the socially negotiated character of meaning" (Lave and Wenger, 1991, p. 50). This body of literature explores the relationships between culture, context, action, and interaction to form a theory of action.

Context shapes action . . . Which shapes context. A context is a given situation in which both participants and culture structure what is taking place. Contexts provide participants with cues about how to act, and "are constituted by what people are doing, as well as when and where they are doing it" (Mehan, 1980, p. 137). In a context, an individual and the collective of individuals make sense of what is going on through the context they created and act accordingly. The actions and interactions of participants in a context, "signal how messages are to be interpreted from moment to moment" (Erickson & Schultz, 1997, p. 23). The interpretations of these messages then guide the actions of participants and contribute to the continued shaping and reshaping of the context. Thus, contexts are socially and interactionally constructed by the, "collaborative doings [that] constitute the social organization of [an] event" (Erickson & Schultz, 1997, p. 25). As people act and interact,

they create a context for their current and future actions. Through action and interaction, "people constantly formulate the contexts of their behavior" (McDermott, Gospodinoff & Aron, 1978, p. 248). The contexts that participants formulate help them interpret the ongoing actions of other participants and structure their own actions.

Participants in a context continually work together to define their actions and interpret the actions of other participants. In the use and construction of contexts, participants engage in an ongoing "negotiation and renegotiation of meaning" (Lave and Wenger, 1991, p. 51). This negotiation of meaning often results in participants coming to consensus about action and interpretation. The consensus is not static, but rather is done in such a way to, "allow for the sequential proposal and possible confirmation of their consensus (McDermott, Gospodinoff & Aron, 1978, p. 266). People decide together what counts as acceptable behavior within a context that they have created, and continually renegotiate this consensus.

In addition to defining action in a context, participants in a context continually work together to conform each other's behavior to the context they have established. Through action and interaction, participants, "orient each other's doing or not doing of the formulated order" of the context (McDermott, Gospodinoff & Aron, 1978, p. 249). When a participant in a given context behaves in an unexpected way, the context can either reformulate, or other participants can "correct" the behavior of the other. Conversely, participants in a context can reflexively structure their activities in such a way that the context is changed by the behavior, rather than the behavior changed by the context.

Culture shapes context, which shapes action . . . Which shapes culture. It seems a somewhat false distinction to talk about context and culture separately, as contexts are shaped by, and shape, culture. Frake (1997) explains the ways in which culture and context

work together to shape each other and shape action. He describes society as an, "organization for the production of social occasions, or 'scenes,'" and culture as a, "script for planning, staging, and performing scenes" (p. 41). In this description, Frake points out how action occurs within contexts, or organized pieces of society. Both the contexts and the actions within those contexts are occur through the ongoing framing and reframing of interactions influenced by culture. Culture is the primary frame (Goffman, 1974) by which societal contexts are structured and by which action is shaped. Thus, to clarify, I will use the term "frames," instead of culture to describe existing expectations for interaction, and framing to describe the mutual construction of meaning through interaction.

As framing shapes contexts and actions, it becomes further codified into a "grammar" (Heath, 1982). This grammar is an, "abstract theory that provides the rules individuals within the society have to know to produce, predict, interpret, and evaluate behaviors in given settings or social interactions" (Heath, 1982, p. 34). The grammar becomes such a part of the ongoing framing of interaction that it tacitly shapes actions within given contexts. Contexts can either solidify or change the grammar through the actions of participants by socializing members. Contextual socialization, "becomes the interactional and symbolic process involved in the transmission and acquisition of cultural knowledge" (Mehan, 1980, p. 134). Contexts, then, have the power to both transmit cultural knowledge as well as shape the ongoing framing that participants do as they interact.

Similarly, participants in a context both receive others' framing and contribute to the ongoing construction of the framing of interaction. Frake (1997) describes the ways in which framing functions to guide participants as well as the ways in which participants guide culture. Firstly, framing is interactionally situated and executed; it is not, "simply a cognitive

map that people acquire." Participants do not simply think their way through scripted actions. Secondly, participants simultaneously frame through both map-reading and map-making. Together, participants work to understand the mappings of interactions by revising and improvising them in the manner of "sketch maps." These are maps that have a loose direction that gets solidified through interaction. Thirdly, the sketch map can either confirm or challenge the existing frames. Rather than following a codified set of practices, a sketch map treats frames as fluid and open to reconstitution. While existing frames inform the ongoing creation of the sketch map, the sketch map provides participants with the opportunity to challenge those frames and chart a new course.

Since context and framing are continually redefined by participants' actions, interactional environments are not solidified constructs. Instead, they are a constantly changing, "generative process" in which participants continually act to produce the future of both the individual and the group (Lave & Wenger, 1991). Erickson (1997) states, "Interactionally constituted environments can change from moment to moment. With each change, the role relationships among participants are redistributed to produce differing configurations of concerted action" (Erickson, 1997, p. 22). As people interact, the nature of what they are doing continually changes. These generative process contributes both to identity formation of individuals and groups (Lave & Wenger, 1991), as well as to culture and contexts more broadly.

Framing and context in classrooms. The transmission of existing frames is particularly evident in school. School is a place of societal enculturation and is dependent on existing frames for much of its contextual grammar. Mehan (1980) describes school as, "related to and to some extent dependent upon the society surrounding it" (p. 135). The rules

of classroom contexts often mirror the rules of society at large, and vice versa. Classroom contexts provide unique opportunities for exploring the impact of the grammar of schooling, as well as the generative processes participants engage in while negotiating the creation of their sketch maps. These contexts are unique because of the improvisational nature of learning (Lave and Wenger, 1991), the oft-competing agendas of students and teachers, and the role expectations for students and teachers (Mehan, 1980). Thus, there seems to be an inherent tension in classrooms between a well-defined, existing grammar and improvisational learning that demands the ongoing sketch mapping of the context as participants interact.

Within classroom contexts, "there are preferred patterns of behavior proscribed for members of the classroom community" (Mehan, 1980, p. 136). These might be considered the existing frames of classrooms. Mehan describes the unique ways in which classroom contexts frame behavior by typically utilizing an IRE (Initiation, Response, Evaluation) sequence of discourse. In an IRE sequence, the teacher initiates a question, a student gives a response, and a teacher evaluates the student response. This contextual construction of discourse has a great impact on the ways in which problem formulation and problem finding exists in this context (I will explain this more in detail later).

The IRE sequence establishes a context for classroom discourse that often appears as "adjacency pairs" in which there is an "obligation" for a particular response (Mehan, 1979). Teaching then becomes set of "initiation acts" which compel particular replies (Mehan, 1979). The classroom context guides participants to behave in a particular way, while taking their behavior as continual reinforcement or reconstruction of the context. The pairing of action and context shapes both future action and future contexts. These actions either fall in line or out of line with the existing contextual constructions of behavior. Either way, the

actions of participants in a classroom serve to reinforce or adjust the existing context for discourse and behavior. They frame and reframe the actions of the context. Within the context, "participants can rely on the sequential relationships among different behaviors to inform them of their context" (Erickson & Schultz, 1997, p. 24). Thus, participants' actions are both informing them of how to act in the context, while also shaping the context.

Through continual negotiation and renegotiation by participants, contexts get created improvisationally. Classroom contexts are particularly improvisational in nature, because, "Learning itself is an improvised practice" (Lave and Wenger, 1991). Similarly, context is an improvised practice. The creation of context does not follow a script. While there are formulated cultural expectations for many contexts, members of the group extemporaneously negotiate, come to consensus, and continually reshape contexts. The improvisational nature of context creation combined with the improvisational nature of learning make classrooms potentially powerful locations for change.

Classroom contexts are also unique from many other social contexts because they tend to be less socially constructed due to the role expectations for student and teacher and the teleological nature of learning. Teachers approach an educational encounter with one particular agenda, while students often approach the encounter with a different agenda (Mehan, 1980). There then exists a persistent negotiation of whose agenda will be carried out within the classroom context. These negotiations create a set of exchanges that "illustrate a recurrent, but often overlooked aspect of classroom interaction-the development of emergent features-ones that are spontaneous, unplanned, and student generated" (Mehan, 1980, p. 143). Teaching, and the construction of classroom contexts, is improvisational – often so

because both the students and teacher have an agenda to accomplish in a given day. When these agendas don't match, there are improvisational moments of action.

The relationship between frames, context, and problem formulation. The grammar of schooling and the improvisational nature of learning create a unique dilemma for teachers and teacher educators. Teachers learn how to teach through deep and prolonged socialization into the grammar of schooling that begins as an "apprenticeship of observation" (Lortie, 1975). Their socialization into the culture of teaching brings with it particular problem formulations. Getzels & Csikszentmihalyi (1975) call these presented problems. Many of the problems that teachers formulate are inherited (or presented) from the existing frames of teaching and schooling. This has an impact, then, on the ways in which they are able to formulate problems of teaching. By being presented with a well-structured problem situation and a series of presented problems, teachers often see the task before them as solving presented problems. The temporally-sensitive, fast-paced nature of teaching can tend deemphasize the ill-structured problem nature of learning in favor of the expediency of well-structured, presented problems with known solutions.

Contexts that participants create for themselves determine the ways in which problems might be formulated within a given context. Participants can negotiate a context in which members are presented with problems they are expected to solve. Conversely, contexts in which problem discovery and exploration are emphasized would encourage members to find new problems, rather than accept presented ones.

The context of a classroom can powerfully shape action through the ways in which the teacher formulates the problems of teaching and enables her students to formulate the problems of learning content (Ball, 1993; Lampert, 2009). Through constructions of

behavior and learning, a teacher and students work within the context of a classroom in ways that either limit or expand their collective and individual abilities to find and solve problems (Sapp, 1997).

Through her own problem formulations, a teacher can direct the ways in which students formulate problems of learning (Sapp, 1997). McDermott, Gospodinoff & Aron (1978) describe a scene in which the way a teacher formulates the problem of reading provides a formulation of reading for her students that leads to particular actions.

> In a classroom reading lesson, when the teacher says, *Ted you're not looking at your words*, she clearly formulates what everyone should be up to at that time; she describes the behavioral markers of the reading positioning, orients to someone not doing that positioning, and finally holds the child accountable (p. 251).

In the context of this classroom, the teacher formulates reading as a presented problem of "looking at your words". In this scene, the teacher not only formulates the problem of reading as a presented problem with a known solution, she also provides the students with the exact solution to this problem. The context of this classroom shapes the ways in which students can formulate the problem of reading (as one of looking at words), and the actions available for them to take.

Teachers can also limit student problem finding through creating a context of "known information questions" (KIQs). In his description of the IRE context of many classrooms, Mehan (1979) explains how teachers often pose questions to which they know (and are looking for) one particular answer. Mehan (1979) gives the example of asking the time. In a context other than a classroom, the question of, "what time is it" does not carry with it a known response. In a classroom, "what time is it" carries with it only one acceptable

response. This kind of known information question formulates the problem of time telling as presented, allows for only one solution, and ignores the method of solution.

The ontological positioning of microethnography serves as a framework for exploring teacher problem formulation and action as situated in the constitutive relationship between framing, context, cognition, and (inter)action. This study uses microethnographic framework and methods to examine the ways in which context, framing, and interaction impact teacher candidates' problem formulations and actions.

CHAPTER 3

An emerging framework for this study

From the data in this study and the theoretical frameworks described in the literature on interactional theory and problem formulation, I have begun to develop an emerging conceptual framework that is both informed by and informs my analysis of the data in this study. This framework emerges from an exploration of *attention*, *problem formulation*, and *task formulation* and the relationships in which these phenomena are held.

Attention

Attention, as it is used in this study, represents a relatively sustained viewing of a feature of or relationship in a classroom environment. A candidate's attention makes things available to be seen or not, by calling forth something for closer inspection. Attention directs what candidates see in a classroom and what they see directs their attention. To attend to something or give something your attention is to look at it closely and sometimes slowly to find out more about it. Attention is the direction of one's vision, presence, and actions toward something in an environment; it is the stretching toward a feature of or relationship in one's environment. Etymologically, attention shares roots with terms like caring for, concentrating on, and being present.

While attention is similar to "noticing," (a term used in the literature) and noticing is one aspect of attention, the ways in which "noticing" is talked about in much of the literature on teacher noticing is not what is meant by *attention* in this study. In literature on teacher noticing, noticing is sometimes portrayed as an act of interpretation (Goldsmith & Seago, 2011). Etymologically speaking, noticing can be described as pointing out, recognizing, remarking, observing, or recording for later.

When it is defined as "recognizing" or "observing," noticing can be a part of *attention*. In order to know where to direct your energies, you first must observe or recognize (in other words, *see*) a place for those energies to go. Noticing, however, carries with it a connotation of passing, sudden, or accidental observation, while attention carries with it a connotation of sustained, directed, or deliberate seeing. To differentiate between these connotations, this study uses *attention* to refer to the direction of one's seeing and attending to environments and their components in a relatively (more than passing) sustained way.

From the data in this study, attention can be *narrowed* or *broadened* through what is taken into your field of vision as you attend to something. When one's attention is broadened, it considers the conditions and factors of an environment and the way they work together to form an ecology. Broadened attention sees multiple factors in the environment and how they work in relationship to one another. When one's attention is narrowed, a singular phenomenon is extracted from the environment. Narrowed attention involves isolating one thing from a larger ecology.

In addition to *broadening* and *narrowing*, there is another component to attention: *focusing*. It is important to note that focusing and narrowing are not the same thing. Focusing brings one factor *of* the environment to the forefront of one's vision for concentrated study, without excluding the presence of the rest of the environment. Focusing can actually lead to broadened attention as it directs one's attention to the ecology of the environment by exposing the relationship of one factor to the larger environment. Narrowing, however, can limit one's attention as it makes the rest of the environment unavailable to be seen. While both focusing and narrowing reduce the complexities of an

environment, narrowed attention excises one factor *from* the environment in a such a way as to render the rest of the environment not present. (See "The Function of Questions" and "A Celestial Metaphor" in chapter five for further explanation of narrowing and broadening.)

Figure 3.1. A representation of the differences between narrowed and broadened attention.

The images above closely match what is meant here by narrowed attention v. focused attention. The image on the left is a close-up image of a single blade of grass, showing the subject in great detail, including drops of dew that have settled on it. This image is meant to represent narrowed attention. While it reduces the complexities of an entire field of grass to make a single blade *available* for deeper study, it also extracts the blade of grass from the rest of the field, making the rest of the environment *unavailable* to be seen. It is as if this single blade does not exist in an environment, or at very least we have no way of knowing what environment it exists in. The image on the right is also a close-up image of a single blade of grass. This image is meant to represent focused attention. While it also reduces the complexities of an entire field of grass to make a single blade available for deeper study, it does not exclude the rest of the environment. This image maintains the blade of grass in relationship to its environment and retains the rest of the environment – soil, root systems,

other grass blades, maybe even the amount of sunlight it receives – in view and available for study. Also available is the ecology of how all of those component parts work together in relationship to one another to impact that single blade of grass.

Problem formulation

Problem formulation is the ways in which candidates formulate what needs to change in a given situation. Problem formulation occurs when a problem situation, or a situation requiring action, is identified. Candidates formulate problems as they participate in and make sense of what classroom occurrences require of them as a teacher. Problem formulation can occur before an educational encounter, in that candidates might come to classroom interactions with preexisting problems of teaching. Problems can also be formulated during interactive teaching as a candidate participates in the ongoing construction of meaning through interaction with students, subject matter, and other factors of the classroom environment. Both before and during interaction, problem formulations can be either *presented* or *discovered*. Problem formulations can also be *solution-oriented* or *vision-oriented*.

Problems that are formulated as *presented* have "a known formulation, a routine method of solution, and a recognized solution" (Csikszentmihalyi & Getzels, 1975, p. 101). Presented problems are ones you might expect to hear teachers formulating. These are the problems that are "presented" for teachers to solve through culturally transmitted expectations, and specify some things as relevant and others not in a problematic situation. Presented problems are typically solution-oriented problems, or problems that are oriented toward finding a solution. Because they are routine, presented, solution-oriented problems typically carry with them routine solutions.

Conversely, problems that are formulated as *discovered* do not have a known formulation or known solution. These ill-structured problems do not carry pre-determined solutions. Discovered problems are ill-structured because they do not carry with them the structure of a known formulation and known solution like presented problems do. In formulating discovered problems, one examines, "'the interconnection of things' and explore[s] possible alternatives (Ramirez, 2002, p. 21). Discovered problems are typically vision-oriented (as the data in this study reveals) because you have to see beyond the problems that are presented to you in order to discover new ones. Discovered problems require one's attention to be continually redirected to the problem situation to see what is actually happening.

There is a symbiotic relationship between attention and problem formulation. The problems available for you to formulate are contingent on what you see and attend to and the way you formulate problems directs your attention. If you something hasn't entered your attention, it is not available to be formulated as a problem. Once a problem has been formulated, it gives you things to see and attend to. For example, presented, solution-oriented problem formulations can narrow a candidate's attention to only attending to how the solution is working in the problem situation. Discovered, vision-oriented problem formulations call forth continued attention to multiple aspects of the problem situation as they reveal infinite problems available for discovery. Vision-oriented problem formulations give candidates more to attend to.

Task formulation

Task formulation is the ways in which candidates formulate what there is for them to do in an educational encounter. A candidate formulates their task by answering the question,

"what is there for me to do here?" Task formulation is held in relationship with problem formulation in that if a candidate has a solution-oriented problem formulation, their task will be to "solve" the problem. Presented problem formulations carry with them presented task formulations, which take the form of commonly recognized solutions. Similarly, if a candidate has a vision-oriented problem formulation, his or her task will be to direct his or her attention to the problem in ways that are likely to lead to the discovery of new problems. Discovered problem formulations carry with them unknown and unlimited possibilities for action that require ongoing attention to and reformulation of the problem.

Problem formulation and task formulation closely mirror each other as candidates' problem formulations carry with them possibilities for action. According to Gibson's (1979) theory of affordances, one perceives what is taking place in the environment (formulates problems) by what one makes of what there is to do with what is seen. This theory maintains that perception and action are inseparable. To distinguish problem formulation from task formulation, we might say that problem formulation is the specification of the differences between what is currently happening and what you want to have happen in a problematic situation. Task formulation is what is available for you to do with a discovered problem formulation, or what you think you should do with a presented problem formulation. Sometimes these can be the same, but as the data of this study indicates, sometimes problem formulation and task formulation can differ.

The relationships between attention, problem formulation, and task formulation

The narrower a candidate's attention is, the more likely they are to formulate presented, solution-oriented problems; conversely, the broader a candidate's attention is, the more likely they are to formulate discovered, vision-oriented problems. Presented problems

are given to us with known task formulations that are more defined, more constrained, and less open to other problem formulations. They give us a less accurate, but more certain, vision of teaching, because the problems are presented to us most of the time in ways that show us the way things are and the way things *should* be – the differences are visible, isolable, and less complicated.

Discovered, vision-oriented problems generally have a larger gap between what is currently happening and what you want to have happen. The more that needs to change in the problem situation, or the farther apart the accounting is of the ways things are and the way things should be, the more complicated the task formulations will be. Task formulations for discovered problems are more ambiguous, more open, more contingent, and more preliminary, as there is much more that can exist in the gap between the actual and the desired. Discovered problem formulations and their accompanying task formulations reflect a vision of teaching that is accurately uncertain.

In a classroom, this difference might look like a simplified solutions versus the problem is an entire ecology for solutions. For example, the difference between a student's behavior needs to change, versus, the environment in which the kid is behaving needs to change. A change in the environment could include just one factor or condition, but more likely, will include a complete change to the entire environment, as one change likely leads to new problems and tasks.

Perhaps, the relationship between attention, problem formulation, and task formulation is best explained through a metaphor. Say you walk into a room, see a picture and some tools on the ground, and are presented with the problem of displaying the picture for people to view. You look at the tools and a familiar-looking hammer and nail catch your

attention. You pick up the hammer and a nail, hammer the nail into the wall and hang the picture on it. You have formulated a solution-oriented, presented problem of hanging the picture on the wall, and formulated your task as affixing the picture on the wall. Done. Problem solved.

Given this same problem situation, there are multiple options for ways to reformulate both the problem and the task, both together and separately from each other. Now let's say you approach this same problem with a more broadened attention. You look at the tools before you and pick up a drill, screws, wire, and other tools. You look closely at these, but instead you grab the familiar hammer and nails. This time when you hammer the nail into the wall, you see that it is less secure once it punches through the drywall, and that by moving the nail over a few inches, you can hammer it into a stud, making it more secure. You might also realize that if you use two nails, the picture will hang more evenly. You've seen a lot more – more of what is in the environment and more of the ways things in the environment might work together – and your attention has broadened to what counts as attached, but your problem formulation (hang picture on wall) and task formulation (nail picture to wall) essentially remains the same.

Now let's say that your broadened attention also broadens your problem formulation and task formulation. You see the picture and all the tools, but this time you formulate the problem not as one of hanging the picture on the wall, but as getting the picture at eye level. You take another look at the tools, pick up some wire and hooks that you affix to beams on the ceiling, and hang the picture from the wire at eye level. In this case you have changed your problem formulation from affixing the picture to the wall to displaying the picture at eye level. Your task formulation has also changed from nailing the picture to the wall to

hanging the picture from the ceiling. Your attention to the environment has allowed you to discover new problems beyond the one you were presented with, and has changed what is available for you to do in this situation. It also changes what you might attend to next.

If the problem formulation is solution-oriented, then the task formulation is narrowly defined as solving the presented problem with a routine solution. If the problem formulation is vision-oriented, then the task formulation more broadly defined as seeing more, looking harder, and gathering more information. In teaching, if a problem is solution-oriented, it is generally a presented problem and the action for the teacher to take is to apply a known solution. If the problem is vision oriented, then the thing there is to do as a teacher is discover or create the new problems through ongoing attention and problem reformulation.

CHAPTER 4

Context and Methodology

The conceptual framework described above calls for methodologies that go beyond the study of cognition and examine the co-constituent relationship of frames, context, cognition, and action. Perhaps the most typical way to study action within these theoretical frames is to employ the methods of ethnography because it is centered on an approach to cultural understanding. Ethnography, "seeks to describe and understand the cultural experience of others" (Spindler & Hammond, 2000, p. 39). These cultural experiences also include the framing, contextual, and cognitive sense making that individuals and groups do through action and interaction. This chapter describes the context and data for this study, as well as the ethnographic and grounded theory approaches I intend to use to collect and analyze the data.

Context

This study will be conducted in the teacher education program at a large public university in coastal California that I will call Pacific Public University (PPU). This boutique teacher education program (TEP) is a thirteen-month program in which approximately 80 teacher candidates a year earn a teaching credential and most also complete a Masters of Education (M.Ed.). Candidates take a variety of university classes and are placed in local schools for observation and student teaching.

As a primary component of their program, candidates are placed in local schools for observation and student teaching from the first day of school. Secondary candidates have three student teaching placements – two in the fall and one in the spring. During their first

fall placements, candidates are on a local school campus three days a week, and do a three-day student teaching takeover. Elementary candidates have a similar placement experience.

For classes at PPU, candidates in TEP are separated into cohorts by credential type – secondary, elementary, and educational specialist. Within these cohorts, they take a variety of classes together during the thirteen-month program. One of the classes that candidates take is designed to guide them through the M.Ed. inquiry.

In order to earn their M.Ed., candidates conduct an inquiry into their classrooms during their yearlong student teaching placements. The inquiries are designed to help candidates see *more* of what is already going on in classrooms, as well as to see *differently* the possibilities for learning that are available in their classrooms. The inquiry process requires candidates to collect records of practice from their classrooms (often video), analyze the records of practice, and report their inquiry questions, analysis, and findings in the M.Ed. report.

Harvey, Raley, Oxelson, and Scalzo (2015) explain that the M.Ed. inquiry is an opportunity for teacher candidates to better understand their own students, their students' learning, and their own role in that learning. The goal of the inquiry is for candidates to become more *alive and alert to the possibilities for learning* that inhabit their classroom. Candidates begin their inquiry with questions about what they are seeing in classrooms. These originating "problems" or "questions" or "ideas" that candidates explore can give the inquiry a direction that might reveal candidates' attention toward and problem formulations about learning and learners.

Candidates investigate their inquiry questions through close, slow looking at dense records of practice in the company of others. The best material for analysis will capture the

real complexity of children and their learning, and so will include more information – more "variables" – than candidates are actually looking for. Harvey, Raley, Oxelson, and Scalzo (2015) call these materials "dense records of practice." Video recordings of classroom life (and transcripts) provide the densest material for excavation of candidate inquiry questions because they allow candidates opportunities to see more than they likely initially saw in the moment of teaching. Other supplementary records can include audio recordings, observations and other fieldnotes, photographs, and lesson plans. The ability to slow down naturally-occurring life (through close looking at these dense records) allows candidates access to details and patterns invisible to the "naked" eye that must see and interpret life as it is happening in real time. Through close and repeated looking at these records, candidates are able to see not just individual events in their classrooms, but the movement of these records through time knits together relationships between discrete moments to form an ecology of occurrences. Seeing more can be disruptive to a candidate's questions and problem formulations. This means that the questions and problem formulations will change over the course of the inquiry as candidates analyze dense records of practice.

Through close, slow looking at dense records of practice, candidates conduct analyses on these records. Raley, Scalzo & Oxelson (2015) describe the analysis that the candidates do as "*doing something to record(s) of practice* to make it possible to see new things, as well as to see things in new ways." Specifically, the analysis candidates do might include transcription of video and coding of those transcripts. Candidates might also compare and contrast, sort, categorize, label, count, rank, sequence, or deconstruct their data in an effort to see more and see differently. Through this analysis, candidates typically generate claims about what they are seeing and discover new questions to investigate. The claims and

subsequent questions that candidates generate have the potential to offer a researcher much information about the ways in which they are attending, formulating the problems of teaching, and acting in educational encounters.

A critical aspect of the M.Ed. process requires candidates to work shoulder-to-shoulder with each other in small groups as they analyze dense records of practice (e.g., audio/videorecordings, complex texts). Repeated looking at dense records, closely and slowly, especially in the presence of other people who can and will notice different things, has the potential to disrupt a candidate's attention, as it demands that candidates confront multiple formulations of tasks for their own teaching. Others can help in seeing the things that haven't yet been seen, and asking questions about these things that haven't yet been asked. Again, seeing more can be disruptive to a candidate's questions and problem formulations, often leading to a shift in a candidate's attention.

The M.Ed. class is designed to help guide candidates through this process and through the shifts in their attention. The class meets a dozen or so times for three hours throughout the year. Class meetings help candidates develop ways to advance their inquiry through inquiry questions, identifying dense records of practice to investigate those questions, learning methods to analyze those dense records. A key component of the M.Ed. is the shoulder-to-shoulder work that candidates do with each other, and class meetings provide candidates time to challenge each others' attention through looking at dense records together. Sometimes during class and sometimes as homework, candidates are asked to complete and submit various pieces of writing that might include analysis of a dense record, their current inquiry questions, an informal reflection on where they are at in the inquiry

process, illustrations of their inquiry, and responses to other prompts. These writings often make their way into candidates' final M.Ed. reports.

In addition to the M.Ed. class, students are placed in M.Ed. groups in the winter and spring quarters. These groups are composed of 4-5 students and a facilitator who is usually a graduate student at PPU or a graduate of TEP and currently a classroom teacher. M.Ed. groups typically meet on a weekly basis for the second half of winter and all of the spring quarter. Group meetings are set by the group members, as needed, and last anywhere from 1-3 hours. The secondary cohort's M.Ed. groups are mixed content area groups, and the elementary and educational specialist cohorts are in groups together. A group meeting might look like a group member bringing in a video from the classroom, telling the group what s/he sees, and asking the group what else there is to see in the video. A group meeting could also look like group members mapping out the relationships between the things that they are seeing in their classrooms, and trying out those relationships with other group members.

The group meetings are designed to help candidates in their inquiries by creating a place for their attention to be broadened to other things that they might be missing. Through looking at dense records of practice together and reading each other's writing about these dense records, groups work together to broaden each other's attention. Group members ask questions of each other, prompt each other to see more than what was initially seen in dense records, and challenge each other's problem formulations. The facilitator acts as just another group member, but can help prompt discussion and argumentation if there is a need.

Once candidates complete their full M.Ed. reports at the end of the spring quarter, they meet in their M.Ed. groups to review a draft of the report. Each candidate gets a peer review meeting that lasts about three hours. Before the meeting, the candidate submits a

draft of their full report, which is read by group members before the meeting. During the peer review meeting, the group members discuss one candidate's work, finding places where the candidate might need to reanalyze a dense record or reconsider claims. The facilitator takes notes on the meeting and gives them to the group members. After their peer review, candidates revise their M.Ed. reports and submit them to faculty for examination.

As mentioned the final product of the M.Ed. inquiry is the M.Ed. report. Each M.Ed. report follows roughly the same structure. The first chapter after the introduction is a framing chapter where candidates essentially tell the story of their inquiry. In the framing chapter, candidates describe their inquiry questions, give a summative accounting how they investigated those questions, and briefly describe their findings.

The second chapter of the M.Ed. is an analysis chapter where candidates report in detail on their investigation of an inquiry question, which typically evolves into multiple other questions as the inquiry progresses. Candidates investigate these questions through collecting and analyzing dense records of practice. They describe their collection and analysis of the records in the first chapter, and explain what their analysis reveals to them. As analysis of one record brings new revelations and questions, candidates either re-analyze the record or collect additional records to help investigate these questions. The process of questioning, collecting records, analyzing those records, and discovering findings that lead to more questions is generally repeated around three times in the first chapter. We call those rounds of analysis. The first chapter concludes with questions the candidates' rounds of analysis have raised that they want to continue to explore. The inquiry that is reflected in the first chapter is conducted during candidates' fall student teaching placements.

In the winter, candidates continue their inquiry by looking at literature that is related to their inquiries. Candidates select literature from peer-reviewed research, professional teaching methods, poems, and novels. Typically they choose somewhere between 3-5 articles and/or books to explore. Candidates are encouraged to choose literature that will further broaden their attention and help direct the next chapter of their inquiry. We find that they most typically draw on peer-reviewed research and professional teaching methods literature. Candidates write about what they read, how what they read fits or does not fit with the analysis they have already done, and what new questions the readings raise for them. This writing composes the second chapter of their M.Ed. report, and typically concludes with questions that shape what they will investigate next in their inquiry.

The final chapter of the M.Ed. report is a second analysis chapter that follows the same pattern as the first. Candidates have questions, often from their exploration of the literature and their first chapters, they investigate these questions through analyzing dense records of practice, and report on their analysis and findings. The M.Ed. report finishes with a conclusion that suggests ways that candidates might continue their inquiries as they begin a full-time teaching placement in the fall.

Data for this study

For this study, I will be looking at the M.Ed. work of 26 secondary credential candidates from the 2013-2014 secondary cohort of PPU's TEP. All of these candidates consented to participate. Though there were 33 candidates who participated in at least one stage of the M.Ed. process, seven candidates were excluded from analysis for various reasons, including incomplete work, muddled writing that made the candidate's thinking

indecipherable, and stated intent not to continue with the M.Ed. All participants in the study are referred to by pseudonyms.

The data for this study comes from two primary sources: Candidates' written report of their analysis of a dense record of practice early in the M.Ed. process and peer review drafts of candidates' full M.Ed. reports from the end of the M.Ed. process. The candidates' early writing was used to establish the questions that candidates were asking in their inquiries, and explore what these questions might reveal about their attention and problem formulation. This analysis led me to examine the full M.Ed. reports of the five candidates I worked with as an M.Ed. facilitator to see how their attention and problem formulation changed (or didn't) throughout the process of the M.Ed. inquiry. inquiry.

Data Analysis

For the analysis of this data, I used an ethnographic approach (Mehan, 1978; Spindler & Hammond, 2000) and grounded theory methods (Charmaz, 2002) to code question types and candidate problem formulation as revealed in the data. I used the two-step process described by Charmaz, beginning with open coding which forced me to make analytical decisions about the data. I then did multiple additional rounds of more focused coding to, "sort, synthesize, and conceptualize [the] data" (p. 684). Much of this work of coding was done through charts in which I continued to add columns of codes through each round of analysis.

Ethnography as a method for data collection and analysis. The nature of the data and my position as researcher/participant lends itself to ethnographic methods of data collection and analysis. An ethnographer's work is one of participant observation in which the researcher is immersed among the subjects of study in order to gain an emic perspective

of their culture. Spindler and Hammond (2000) recommend work at a site over a long period of time, and the collection of a large volume and variety of materials. This approach is also supported by Delamont (1991) who suggests the collection of a variety of data. Though my study is somewhat limited in scope, I have collected data at two strategic points over the course of a year.

Through participant observation and sustained immersion, an ethnographer can put together an account of participants' actions within a cultural and contextual structure. (McDermott, Gospodinoff & Aron, 1978). In order to adequately research action, an ethnographer also must understand the social and cultural structures in which that action takes place. For this study, I was a participant-observer throughout the year in which teacher candidates conducted an inquiry and wrote a report of their inquiry for their M.Ed. As a participant-observer, I attended the candidates' M.Ed. classes as an unofficial teaching assistant, facilitated an M.Ed. group, and worked with candidates as an instructor in other classes. Through these various forms of participation, I was able to collect a variety of both formal and informal data.

Constitutive ethnography. While there are many branches of ethnography (micro ethnography, discourse analysis, etc.), the approach that seems most appropriate to the situated study of action in educational settings is constitutive ethnography. Other methodological approaches, such as correlational studies and field studies are not adequate for this study's research because they do not take into account the cultural and contextual influences on action (Mehan, 1978). In order to best understand patterns of action, researchers must also study and take into account social structuring and social facts that influence these patterns. Constitutive ethnography, by Mehan's (1978) definition is an

"exhaustive study of behavior flow" (p. 37). This study does not look at isolated incidents or even clusters of behavior, but rather looks at behavior as connected – connected to other behavior and to a social and societal structure.

In constitutive ethnography, analysis of the data should be conducted at the "interactional level" (Mehan, 1978). Through studying interactional sequences without emphasis on cognitive inferences, a researcher can understand how the cultural and contextual structure of a classroom might shape teacher action. The interactional approach to analysis is vastly different from the cognitively-based think-aloud and stimulated recall approaches used by researchers studying cognitive origins of teacher action. Interactional analysis holds at its foundation that idea that participants co-construct action in a particular context. Mehan (1978) explains, "through their collaborative interactional work, participants structure routine events such as lessons. This work is 'interactional' because it is a joint production of teacher and students" (p. 49). Interactional analysis holds the underlying assumption that teachers and students jointly produce events in a classroom by following and sketching cultural and contextual maps (Frake, 1997). The analysis in this study will consider the interactional events situated within a classroom context in order to understand teacher candidate attention, problem formulation, and action.

Careful observation and description

Careful observation and description are the linchpins of ethnography and constitutive ethnography. Most ethnographers fully immerse themselves in a community for extended periods of time to carefully observe and document the actions and culture of that group. Scribner's (1997), Wieder's (1974), and Peshkin's (1986) ethnographic studies serve as models of immersive ethnography and "thick description" (Geertz, 1994). The data for this

study comes from my own immersion in candidates' M.Ed. inquiries. I use both the candidates' thick descriptions in their reports of inquiry, and my own thick field notes as data for analysis.

Ecological validity

Another methodological consideration is the ecological validity of the research study. To maintain integrity in the data collected, it is important that the data be collected in ecologically valid ways. Cole, Hood & McDermott (1997) list three criteria for ecologically valid research.

1) The research must maintain the integrity of the real-life situations it is designed to investigate
2) The research must be faithful to the larger social and cultural contexts from which the subjects come
3) The analysis must be consistent with the participants' definition of the situation

These three criteria suggest that educational research conducted in laboratory-like settings is not ecologically valid. Ethnographic research conducted through immersion in the subjects' community is more likely to be ecologically valid.

Frake (1997) also cautions against "white-room ethnography" in which all relevant context is stripped from the subjects of study. If, as stated above, action is constituted through culture and context, action must be studied within particular cultures and contexts. Scribner (1997) suggests that in order to truly understand the object of study, researchers should, "take a look at the actual phenomena under natural conditions" (p. 355).

The data for this study was generated under natural conditions. Teacher candidates in this study proceeded through their inquiries as they typically would, and data was collected at

various points in their process. The candidates' inquiries and reports of inquiry were not disrupted by the collection of data for the study.

Grounded theory as a method of both data collection and data analysis

Grounded theory as conceived by Glaser and Strauss (1967), is a method for data collection, coding, and analysis by which theories emerge from data, fit the context, and generate applicable and useful analytic explanations. A grounded theory approach to research begins with data collection and extends to data analysis. In the collection of the data, a researcher must be careful not to approach her research with predetermined ideas about what there is to be found. Spindler and Hammond (2000) suggest, "the observer should not begin with specific hypotheses or even highly specific categories of observation, but should let the cultural process reveal itself through immersion first in the environment, then in the data" (p. 46). Through careful observation, the researcher can uncover cultural structures that the participants might not even be aware that they have.

A grounded theory approach to analysis is one in which the categories of analysis emerge from the analysis itself. Grounded theory allows a holistic approach to data in which the researcher can make sense of the data through emerging themes. In formal grounded theory, a researcher can study a sociological concept, such as stigmas. In substantive grounded theory, a researcher can study an empirical area of sociological inquiry, such as a classroom (Glaser, 2007). Substantive grounded theory uses coding that emerge from the data set to identify patterns in the data and produce a theory of what is taking place that emerges from the data itself, rather than preconceived notions.

For this study, I began to interrogate and systematically explore what the data was saying (Delamont, 1991). Rather than looking deductively for evidence of a particular

phenomenon, I found that an inductive examination of candidates' reports of inquiry led to the development of codes and categories. These codes and categories began to reveal what mattered for the participants' attention, problem formulation, and action (Charmaz, 2001). I used the two-step process described by Charmaz, beginning with open coding which forced me to make analytical decisions about the data. I then did multiple additional rounds of more focused coding to, "sort, synthesize, and conceptualize [the] data" (p. 684). Much of this work of coding was done through charts in which I continued to add columns of codes through each round of analysis. The analysis I began to do focused on developing new analytic propositions, rather than verifying preexisting ones. (Emerson, Fretz, & Shaw, 1995, p. 143). This approach also provides room to acknowledge the human relationships (present in the candidates' work and my relationship to the participants) that shaped the nature of the present study (Charmaz, 2007). I plan to continue using this method with the additional data I will be analyzing.

CHAPTER 5

Question Types and the Functions of Questions:

To begin investigating the ways in which teacher candidates are attending to students and their learning, and formulating the problems of teaching, I first looked to the report of the inquiry they were doing in their M.Ed. The work of the M.Ed. requires candidates to ask questions about what is happening in their classrooms and look at dense records of practice to help them investigate these questions. The questions that candidates ask (and the records they collect) reveal what they are attending to in their classrooms and suggest particular problem formulations. For instance, if a candidate asks, "how do I get students to participate in a math congress," they are attending to participation and formulating a *presented problem*. This is a presented problem because it is a known problem with a known solution or predetermined action (get students participating). If a candidate asks, "what is happening when a student takes a long time to answer a question," they are formulating a discovered problem. This is a discovered problem because they have discovered it through attention to an educational encounter. It does not carry with it a known solution or predetermined action. Studying the questions candidates ask as they do their M.Ed. can provide clues about a candidate's problem formulation. The questions can also evolve, revealing the ways in which candidates' attention shifts throughout the course of an inquiry. Finally, the questions offer a glimpse of how and why teachers act in a classroom, and how teacher educators might change teacher candidates' actions.

The analysis in this chapter derives from looking at early writing that the candidates did for their M.Ed. The candidates were first asked to generate questions they might have about their classrooms. These questions could have come from practical problems they were

trying to solve, “warm or cold spots” in their classrooms, something they might value or care about in regards to learning, or other things they saw and wondered about as they were beginning their student teaching. From their inquiry questions, candidates were asked to collect records of practice, choose one record of practice and analyze it, and write more questions that their analysis raised. Candidate analysis can take many forms, but is designed to help the candidate closely examine a record of practice for the purpose of better understanding what is taking place in an educational encounter (See Appendix 1). These early writings were around 1-3 pages in length, including the initial questions, analysis of dense records, and new questions that were raised by the analysis. I read the writing of 33 teacher candidates, and from these chose 26 candidates to analyze. Seven candidates were excluded from analysis for various reasons, including incomplete work, muddled writing that made the candidate’s thinking indecipherable, and stated intent not to continue with the M.Ed.

My analysis of candidate writing focused on their questions to establish a starting place for the possible trajectories of change a candidate might experience in his or her attention and problem formulation throughout the work of the M.Ed. From close examination of candidate work and conversations with candidates, the M.Ed. instructional team (of which I am a part) determined that there were four different types of questions they seemed to ask: solution-oriented questions, explanation-oriented questions, value-oriented questions, and vision-oriented questions. Using the framework of these four question types, showing in Table 5.1, I analyzed the 26 candidates’ writing to determine what types of questions they were asking.

Table 5.1: Framework of question types

Question Type	How the question is typically phrased	What the question seeks to do
Solution-oriented	How do I do _____? How do I make _____happen? What should I try now?	Find a solution to a practical classroom problem
Value-oriented	What's (most) important for? Is _____ really important? What else besides _____ is important?	Explore and confirm what matters or is valuable for students in an educational encounter
Explanation-oriented	Is _____ true? How does _____ work? Why does _____ happen? Why isn't _____ happening? What else besides _____ could matter for _____?	Explain how things work or the relationship between phenomena
Vision-oriented	What does _____ look like? How will I know _____ when I see it? When does _____ happen? Where can I find _____? When _____ happens, what else can I see happening?	See what is going on in an educational encounter or understand a phenomenon in order to see more possibilities for learning

I began by reading the inquiry questions in the candidates' writing and coding for the question types in Table 5.1. While an initial look at candidate inquiry questions offered some information about their attention and problem formulation, it was necessary to read past their question and into their analysis and future questions to get a true sense of the types of questions that candidates were asking. Initial coding of the questions simply based on how they were phrased did not always accurately reflect the actual orientation of the inquiry question. For example, a candidate question who asks, "What things (projects/homework/my presence, etc.) get my students attempting to get into math?" initially appears to be an explanation-oriented question. That is, it explains what gets students attempting math. Upon closer examination of the candidate's analysis of the record of practice, and the other questions the candidate asked, it became clear that this candidate's question was actually oriented toward *how* she could get her students to do math – a solution-oriented question. As

will be further discussed in this chapter, these two questions bring with them very different ways of attention and problem formulation. I discovered that the surface form of the question isn't always clear, and determining a question type requires information beyond the question itself.

Thus, it became necessary to examine both the textual and temporal context for the orientation of the question. Looking at other questions, claims, and analysis surrounding a candidate's inquiry question, as well as where the candidate was headed in the inquiry both before and after the question better reveal the true orientation of question being asked, as well as a candidate's attention and problem formulation.

The analysis in this chapter began by attempting to answer the question: what kinds of questions about teaching and learning are teacher candidates asking? In the process of conducting the analysis, three other questions emerged: 1) What do these questions reveal about teacher candidates' attention and problem formulation? 2) How do these questions matter for the ways in which they are attending to their classrooms and formulating the problems of teaching? 3) How does candidate attention and problem formulation matter for action?

Solution-Oriented Questions

The first type of inquiry question a candidate might ask is a solution-oriented question. These question types focus on asking how one might go about doing a particular task as a teacher. These questions often start with "how do I ___?" For example, a candidate might ask, "How do I get students to ask questions when they don't understand something?" Solution-oriented questions seek to solve a practical classroom problem. They often come with a pre-formulated notion of the task of the teacher – that task is to solve these particular

problems. In this data set, only two of the twenty-six candidates ask solution-oriented questions that were not accompanied by questions of other orientations.

One candidate, Sean, looks to solve the problem of group work. His inquiry begins with seeing that students are not working effectively in groups, and he proposes creating a "tool" to try to make group work more effective. Sean has a proposed solution (the group work tool) that he plans to test through his inquiry to see if it is actually solving the problem of effective group work. He explains,

> I want to create a tool that would minimize distractions from other students, through a seating chart. What makes an effective and productive group for ALL members? I could use this tool to test group structures and figure out the components that create the best groups.

While the question of what makes an effective and productive group seems promising and like it might be more vision-oriented, Sean's formulates his task as using the tool to solve the practical problem of group work, rather than reconceptualizing his task, the students' task, or any other aspect of the educational encounter. In this example, Sean formulates the problem as one of ineffective group work, and sees his task as creating and implementing a tool for group work. Sean's problem formulation directs him to attend only to the effectiveness of group work, and his task formulation directs his attention to solving the effectiveness problem.

Amber also focuses the start of her inquiry around a solution-oriented question. Amber begins with making multiple claims about students, including their experience with writing essays, their language abilities, and their fear of being wrong, that do not appear to be supported by analysis. Amber formulates these claims as a problem of student engagement,

"I want to see how I can improve engagement, whether it's through tasks that require a higher level of emotional attachment, or creative writing, or group debates." She orients the start of her inquiry around finding a solution for the engagement problem that she sees in her classroom. While she already has ideas for what this solution could be, she goes on to describe how she's formulating the task of solving this problem. "I think as a teacher I should spend time with my students emphasizing that there are no wrong answers as long as you can properly back up your answers." Similar to Sean, she has already formulated a presented, practical problem and what she might do to solve it without a full accounting of what is taking place in the educational encounter.

Vision-Oriented Questions

Vision-oriented questions are the antithesis of solution-oriented questions. Rather than seeking a solution, these questions orient a candidate to look more closely at what is going on in an educational encounter. Vision-oriented questions might ask about what a particular phenomena looks like, such as, "what does risk-taking look like in a classroom." Vision-oriented questions open a candidate to see more things, more relationships, and ideally, more about what might matter for student learning in an educational encounter.

One candidate, Katie, begins by asking, "What does comfort/discomfort in the classroom look like?" She goes on to explain that she watched a video of her students doing a simulation and, "noticed who was interacting the most with each other and who was not." Katie describes the way in which a group of five boys are interacting with each other and then wonders, "Is this some demonstrating that they are comfortable and engaged at the same time around each other? What kinds of relationships are going on here?" Katie begins with a vision-oriented question ("What does comfort/discomfort in the classroom look like?"), that

leads her to ask more about the relationships in the educational encounter ("What kinds of relationships are going on here?"). Katie's question leads her to see more things (comfort and discomfort) and see more relationships in her classroom that might matter for student learning. Katie's vision orientation allows her to discover new problems in the educational encounter.

Another candidate, Kari, starts her inquiry by looking at connections in a classroom. She wonders about connections between students and connections between students and teachers. This interest in connections also continues to broaden what Kari sees and looks for in the classroom. She asks what a lack of human connection looks like, and how language affects the connections in a classroom. Not only is she seeing more about connections and the relationship between language and connections, but the question itself draws her attention to discovering more relationships in her classroom.

Gina, a social studies candidate, begins with an "interest in knowing more [about] why, when, and how students ask for help/questions." This initial interest in student questioning leads Gina to look at video of students asking questions and code the video for question types, including clarification, exploratory, and checking-for-accuracy questions. Through this analysis, Gina discovers that students mostly ask clarification questions, which are not the types of questions that she wants her students to primarily ask. Knowing that she wants students to ask more exploratory questions, leads her to ask, "What influences student inquiry? Is this the same as asking for help? Why is it risky?" These next questions hold even more potential for Gina to discover more of what might matter for learning.

Ivan starts his inquiry by describing a "cold spot" in his classroom, in which he noticed how students reacted to another student who needed extra time to answer a question

in class. Ivan discovered that a student who needed the extra time, became the recipient of a "bail out" from another student. This bail out involved another student whispering the correct answer to the question. Ivan saw more about the relationships in his classroom by seeing this pattern of interaction among students and it led him to ask questions that would lead to seeing even more. To investigate these questions, Ivan then looked at what happened before and after the bail out and noticed that before the bail out, he rephrased and reposed the question to the student (the bailee). He believes that this might have led the other student (the bailer) to whisper the answer. He also noticed that after the answer was whispered, the bailee responded by saying, "Shhh!" and slamming his hand on the table. Ivan deeply explores the relationships between these students through multiple rounds of analysis of his video, and continues to see more about the ways these relationships are working in the classroom.

Patty, a teacher candidate in a middle school Spanish classroom, begins her inquiry troubled by the off-task behavior of her students. Through the process of video analysis, she discovers that there is more for her to see than on or off-task student behavior. Patty first realized that she needed to look harder at what is going on her classroom when she saw that the student who always appeared to be off-task was performing well in her Spanish class. She writes, "The juxtaposition of his off-task behavior and calling out with the answer he gives that is so spot-on, baffles me." This "frame clash" (Agar, 1994) between expected student performance and actual student performance leads Patty to videotape her class. Initially, though, Patty did not see more than what she was looking for – her off-task student. She wrote of her first look at the video, "The only thing I noticed was that Brandon was not writing the vocab words down, but instead drawing something that he later shows to the

student behind him." Patty's looking for on/off-task behavior leads her to only see what she was looking for, and miss other things. After conversations with peers and instructors, her attention began to shift when she watched the video again and saw that, "while drawing, he is repeating the [vocabulary words] to himself." This led Patty to a new way of attending to what was going on. Instead of focusing on getting Brandon on task, she began to focus on what learning looked like for Brandon. She started to ask, "Is off-task really off-task? And what does learning look like anyway? Does learning look like writing like I thought before? Or can writing even be the opposite of learning, and you actually retain more by just listening?" Patty is clearly seeing more ways in which Brandon might demonstrate learning, and her attention is broadened to more of what might matter for learning.

Explanation-Oriented Questions

Using the framework of question types, explanation-oriented questions inquire about how things work and/or the relationship between phenomena. For example, a candidate might ask, "Why do students collaborate on one type of activity, but not another?" A question like this seeks to examine the relationship between collaboration and classroom activities in order to explain why one activity "works" better than another. I analyzed explanation-oriented question types by reading the question and determining that a question was explanation-oriented by the ways in which it sought to explain or examine a relationship between two or more classroom phenomena. After determining a question was explanation-oriented, I read beyond the inquiry question and into candidate analysis of the record of practice, and other claims and questions visible in candidate writing. In this second round of analysis, it became clear that candidates were not really asking explanation-oriented questions. Though initial coding suggested these types of questions to be explanation-

oriented based on the way they are phrased, that categorization did not accurately characterize the nature of what a candidate was asking, as revealed by the writing surrounding the inquiry question.

Through analysis, I discovered that though some questions appeared in surface form to be explanation-oriented, in actuality, the content of these questions oriented either towards solutions or toward looking further (vision). I determined if an explanation question was solution-oriented by looking at how the candidate wrote about the desired outcome of investigating that question. If the desired outcome was to solve a practical problem, then I called the question an explanation/solution question. When a candidate asks an explanation/solution question, they appear to be looking for an explanation that can lead them to a practical solution. Another category of explanation questions seemed to do something different entirely. Rather than pointing the candidate toward a solution, these explanation questions pointed the candidate to look further. If the candidate described an interest in looking at other variables, I called the question an explanation/vision question. For the candidates who asked explanation/vision questions, their inquiry question called forth an investigation of other variables. When a candidate asks an explanation/vision question, the explanation question prompts the candidate to look more at what is taking place in the educational encounter. I will further explain these joint question types in the next two sections.

Explanation questions with a solution orientation. Explanation questions with a solution orientation appear on the surface as though the candidate is seeking to explain a relationship or phenomenon in the classroom. In these cases, however, the explanation question is the surface form of an underlying solution orientation. Of the 26 candidates in

the study, four asked questions that appeared explanation-oriented on the surface, but were surrounded by analysis, claims, and other questions that indicated a solution-orientation. Looking across time, beyond just the initial inquiry question and into early analysis and later claims and questions, makes clear that the candidate is really looking for a solution to a practical teaching problem, rather than an explanation of a phenomenon. Examples of these types of questions are discussed below.

One candidate, Julio, states that he is, "looking to see how students are affected when they don't receive clear instructions and how that affects their performance." A World Languages teacher candidate, Julio initially appears to be looking to explain the relationship between instructions given by the teacher and student performance. His further questions reveal, though, that he is looking to see *how* he should give instructions, which is a solution-oriented question. He lists further questions that he wishes to pursue, like, "How much instructions should be given in Spanish/English?" And whether he should give oral or written instructions. These additional questions suggest a solution-orientation, indicating that his task as a teacher is to give clear instructions to his students.

A second World Languages teacher candidate, Jorge, begins by "trying to see if there was any effective group work going on" in his classroom. Jorge explains that he watched a video clip of his class and realized that he forgot to give directions to students before he asked them to group up and begin working. This led him to change his questions to, "Does giving clear directions make a difference in effective group work? Do the group members impact productivity in group work?" Both of these next questions have the potential to be explanation-oriented questions in that they attempt to explain the relationship between directions and group work and group members and productivity. In reading Jorge's analysis,

it becomes clear that the explanations these questions might yield are only in service of a solution. Jorge describes, "I saw a pattern in all groups that had any questions regarding what they were supposed to be doing. Right after I explained to those groups they started writing and going to the board." Jorge sees that after he goes to individual groups to answer their questions, they begin the task he assigned. Rather than discovering an explanation that could lead to a change in his problem formulation, Jorge sees the relationship between giving directions and group work as solving the problem of getting his students to work in groups. He is essentially asking the solution-oriented question, "how do I get students to do group work," and discovers that the solution is to give better directions. At no point, does he question what "effective" group work might be or what counts as "clear" directions, which might have the potential to change what he does in this educational encounter.

Annie, a math teacher candidate, who also appears to have an explanation-oriented question, reveals an underlying solution orientation. Annie begins by asking, "What things (projects/homework/my presence, etc.) get my students attempting to get into math?" She seems to be looking to explain what gets her students to do math. Through analysis of a record of practice, Annie describes giving students a concept map assignment, believing that students would be more likely to do it than a traditional assignment because it is "creative." Annie discovers, however, that fewer students actually did the concept map than traditional assignments. Annie has a solution orientation that establishes her task as one of solving the problem of getting students to do math by giving students something "creative" to do. When this doesn't work (fewer students actually did the math), she changes her problem formulation in order to keep the same task formulation. Annie's initial problem formulation was solution oriented - to get students "attempting to get into math." When her solution does

not work, she changes the problem to getting students to earn higher grades on the math that they are doing. She sees that while the concept map did not get more students to do the work, it did yield higher scores for the students who did it. She concludes, "I can see that more students got full credit on the homework assignment that allowed creativity, than the traditional worksheet homework." This conclusion allows her to keep her solution orientation, and her task remains to give students "creative" assignments. Her questions, and the way she formulates her task do not allow her to see relationships or explanations for how things might be working in her classroom. She does not open herself to possibilities of seeing more or differently by maintaining a solution orientation and task formulation.

A final candidate, Natasha, asked an explanation-oriented question that served to find a solution about teacher involvement. She began by asking, "Does teacher involvement make a difference?" This explanation-oriented question seeks to explain the difference (though she doesn't state for whom or what the difference will be made) that a teacher could make. Like the other candidates, though, her next question, "How much involvement is needed to keep students on the right track?" indicates a solution orientation. Essentially, she is asking how to I keep my students on the right track, or how do I keep them on task.

Explanation questions with a vision orientation. Like explanation/solution questions, explanation questions with a vision orientation appear on the surface as though the candidate is seeking to explain a relationship or phenomenon in the classroom. In these cases, however, the explanation question is the surface form of an underlying vision orientation. In these question types, candidates begin by seeking an explanation for a particular phenomenon, but discover a need to ask further questions about the phenomenon itself, like what it looks like and when it happens.

Katrina begins her inquiry by asking, "When is frustration good for learning?" Through the process of looking at video of students working in groups on a worksheet about isotopes, Katrina begins to discover that there are multiple types of frustration that a student can have. Rather than just seeking to explain the relationship between frustration and learning, Katrina shifts her orientation toward vision questions ask about frustration during group work. Though the questions initially seem to continue to explain the relationship between frustration, learning, and group work, Katrina states, "As I was analyzing the video clip, I learned a few things about how group dynamics play a role in the level of frustration." She goes on to describe how she observes through the video that, "peer relationships affect whether or not a student is willing to participate in a group." She also describes a student who typically doesn't participate who is working with a group to complete the task, leading her to ask, "What was it about this group that made him participate despite this frustration?" Though she comes back to a rather explanation-oriented question (the relationship between group work, frustration, and participation), her vision has begun to broaden into seeing more than just frustration and participation in her classroom. Katrina has found a new problem and is now better able to see and attend to peer relationships as she looks to explore how those relate to the initial phenomena.

Another candidate, Martha, starts her inquiry by noticing that students are asking "unhelpful" questions. She decides to investigate, "when and why students were asking these 'unhelpful' questions (and folded into this what an unhelpful question is)." Martha describes the process of looking at video of her students and coding the transcripts for unhelpful questions and also the question type, which include "shouted-out" questions, "logistics" questions, "attention-getting" questions, "content" questions, and other question

types. Through this analysis, Martha discovers that the question types do not necessarily correlate to what she initially believed were unhelpful questions. She writes,

> I was expecting there to be a correlation between questions that were shouted out and unhelpful questions, but this definitely did not seem to be the case. I was also expecting attention-getting questions to be unrelated to content, but this also was not 100% true.

Martha has seen more relationships than she initially thought were possible. Initially, Martha thought that "shouted-out" and "attention-getting" questions were unhelpful. Through trying to explain when these "unhelpful" questions were occurring, Martha begins to see more possibilities for questions from her students than she initially realized. Now, she is able to see that questions that might initially appear unhelpful because of their form (i.e., shouted out), might actually be helpful.

Karen begins her inquiry by wondering about the relationship between ownership and student learning. She asks, "How does ownership effect student learning." In seeking to explain this relationship, Karen describes that her student are able to get a "free response question" correct on a test, but they do not get a question about the same concept correct when it is presented as a fill-in-the-blank question. She determines that free response questions allow students ownership over their content knowledge, and begins to look at how other activities and supports (such as sentence frames) in the classroom allow students ownership and to what extent. Karen's initial question about the relationship between ownership and student learning leads her to see and look for more possibilities for ownership and learning.

A fourth candidate, Jenny, appears to be asking an explanation-oriented question about relationships, but this question quickly leads her inquiry into vision-oriented questions. Jenny begins by wondering, "How a teacher's response affects student learning, confidence, and participation in the classroom." Specifically, Jenny looked at how wrong answers were treated in the classroom. She noticed that in one classroom when a teacher either pointed out an incorrect answer or engaged the class in pointing out an incorrect answer, the student who gave the wrong answer would stop participating. After noticing this, Jenny began to look more for how teachers treated wrong answers and what affect it had on students. In another classroom she observed, Jenny found it strange that she wasn't hearing "wrong answers" from students, which led her to look more. Jenny noticed that answers in this classroom did not appear wrong because the teacher continued to ask more questions to help the student realize on her own that the answer was incorrect. Jenny saw that this caused the student to continue to engage in the task and the dialogue, rather than to stop participating. Jenny's search for an explanation of the relationship between teacher responses to wrong answers and student learning, confidence, and participation, led her to see and look for more ways in which the relationship between a teacher, student, and an answer might work in a classroom.

A final note on explanation questions. There was one candidate who asked an explanation-oriented question that did not obviously appear to include a solution or vision question. This candidate looked at student work in order to explain how they were solving math problems and to explain if there was a link between the way that math problems were being solved and a student's willingness to show vulnerability. She writes, "I was looking at methods used, how far they attempted problems they didn't know, and how this might relate to their willingness to show vulnerability." In short, she was looking to explain a student's

willingness to be vulnerable by how they solved math problems. While this seems to point to an underlying vision-orientation, there is not enough visible in what the candidate wrote to categorize the question as anything other than an explanation question.

Though it might not seem largely significant, the discovery that the surface form of explanation questions was not indicative of the actual question orientation was important for understanding candidate problem formulation. The orientation of a candidate's question provides clues for what a candidate is attending to and the ways in which candidates are formulating the problems and tasks of teaching. Question orientation also became a linchpin for understanding the starting point of candidates' trajectories of change in problem formulation and understanding how questions might impact these trajectories of change. This will be discussed further in the section on the function of questions.

Questions That Shift: From Solution-Oriented to Explanation-Oriented

In analyzing question types, there were some questions that began as solution-oriented, but that appeared to shift toward an explanation orientation as the candidate proceeded through the initial stages of inquiry. These cases are different from the other cases in which a question appeared to be of one type, but was actually another. In these cases, candidates, through the process of looking at records of practice in order to find a solution, discovered that there was more for them to see than just the solution. These were not explanation-oriented questions that appeared to be solution-oriented questions, but were questions that began to change over time as the candidate engaged in inquiry. The candidates were not initially asking explanation-oriented questions that appeared as solution-oriented questions, but they were looking to explain the solutions they had tried or considered.

As I coded question types, there were three candidates that started with a solution orientation: Adam, Katherine, and Amelia. When I read further into their inquiry, I noticed that the orientation of their questions actually seemed to shift. These shifts reflect the beginning of a broadening of their attention, which will be discussed in the next section.

Adam started the report of his inquiry by stating, "the current focus of my attention is how to get students to ask questions when they don't understand." Clearly a solution-oriented question, Adam focused on *how* to get his students to do a particular behavior. Through the process of looking at video and recalling what took place in his class, Adam discovers a student doing the desired behavior, and begins to seek an explanation for it. He writes,

> *One student raised her hand and when I walked over she told me, 'I don't get it.' I'm not focusing on what she didn't understand, but why she was able to ask me that question. What did I do to allow her to ask that question?*

Adam moves from simply wanting a solution to the problem of students asking questions to wanting an explanation for what happens when students ask questions. He starts to look at the relationship between his actions and student actions. His question begins to shift from a how-to question (solution-oriented) to a question that demands that he look further at what is taking place in the educational encounter.

Katherine began her inquiry wanting to solve the problem of getting her students on task. She noticed that they were snapchatting and taking photos on their phone, and "clearly not engaged in the assignment." While her initial task formulation was to get students engaged and working on the assignment, Katherine, "began to wonder why so many students were off-task and what may have led to this behavior." This shift from a solution-oriented to

an explanation-oriented question leads her to look at, "an earlier part of the [video] clip in order to determine how this assignment was introduced in the first place." Rather than fixing her attention on getting students back on task, Katherine opens the possibility of a new problem formulation by seeing her task not as getting student back to work, but as looking harder at the circumstances surrounding the off-task behavior. Thus, there is a shift from a solution-orientation of "I must get students back on task" to an explanation orientation that seeks to understand what is really taking place for students in the educational encounter.

Amelia also begins her inquiry with a solution-oriented problem as she wonders how to get one of her students writing. She explains that this student, who she calls "C" will not write when he is asked to: "I assign free-writing to the class and C does not start to write." Her task is to get C to complete the assignment. When, "multiple attempts to simplify and demystify the writing assignment" fail, she "eventually asked C to draw something instead." After giving C an opportunity to draw, Amelia notices that he "manages to produce a story by the end of the period." This leads Amelia to begin asking explanation-oriented questions, such as, "what helped him: personal attention, being allowed to draw, being told he could do it, or something else?" The search for, and application of, a solution brings Amelia to question why the solution worked. Though it is not clear at this point in her inquiry if Amelia will continue with an explanation orientation, there has been some shift from solving a problem to exploring what worked. At very least, it seems as though Amelia has had her attention opened to other things that might matter for the educational encounter.

In each of these three cases, the candidates' questions shift from a solution-orientation to an explanation-orientation. The explanations that the candidates seek require them to attend to more phenomena in the educational encounter. This attention seems to

point the candidates toward a vision-orientation, as they find the need to see more of what is happening in order to understand what is going on. These shifts in attention also move candidates from formulating presented problems of teaching to discovering new problems. I find myself excited when candidate questions shift because the shifts hold potential for demonstrating the ways in which candidates' attention might shift throughout the course of an inquiry. While the data I analyzed for this section only represents a small portion of candidates' reports of their inquiry, these three case studies reveal that it might be possible, through inquiry, for candidates to broaden their attention to other factors that might impact the educational encounter.

Why Questions Matter: The Functions of Questions

On the surface it appears that candidates ask at least four question types (solution, values, explanation, and vision) in their inquiries. The above analysis revealed that the content of candidate questions, or what the questions seek to do, comes down to three orientations: solution, explanation, and vision. (Candidates did not directly ask values questions, though it might be said that what they value for learning is revealed in the other questions they ask. An exploration of candidate values is beyond the scope of this project.) Though there are four types of possible surface orientations for questions and three possibilities for the content of questions (their actual orientation), there appear to be only two ways in which questions function to impact what candidates see and do in an educational encounter.

Questions can either *narrow* or *broaden* the ways in which candidates see and act in an educational encounter. Figure 5.1 depicts the way in which surface question orientations might be distilled down to the way in which a question functions to impact candidate

attention in an educational encounter. While it might seem obvious that questions either narrow or broaden the possibilities for action available to a candidate, it is important to establish the orientations and content of the questions in order to accurately determine how a question is going to function. It is only by looking first at the surface orientation, then at the actual content of the question through examining what a candidate does with the question (analysis and future questions) that the function of the question can be determined.

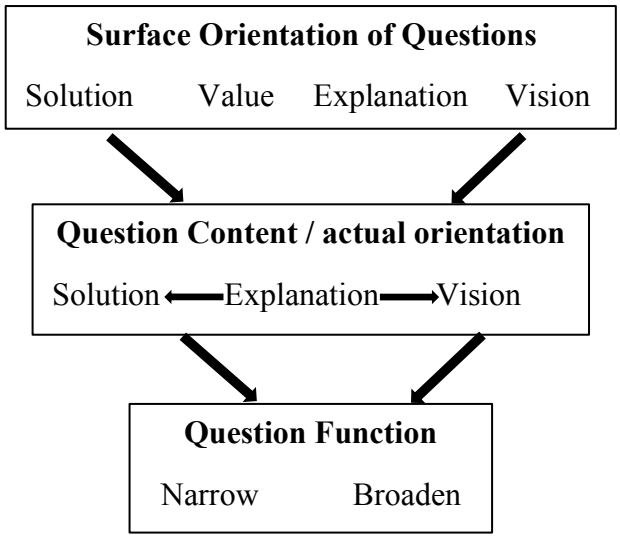

Figure 5.1: From surface-orientation to question function

There are many possibilities for how questions might narrow or broaden the ways a candidate sees and acts in an educational encounter. For example, solution-oriented questions appear to narrow a candidate's attention to students and their learning, by directing the candidate's attention to one problem in search of one solution. Vision-oriented questions broaden a candidate's attention by prompting the candidate to see more than one phenomenon and begin to examine relationships between students, their learning, and the candidate's role in that learning.

Given this new framework of the functions of questions, I went back to the candidates' writing and examined how the question types that the candidates asked served to either narrow or broaden their attention. The data revealed that there are particular ways in which a question can serve to narrow or broaden a candidate's attention. Table 5.2 shows the ways in which questions might narrow or broaden, and how a few of the candidates fit this framework. I chose to focus on 18 candidates whose work clearly demonstrated the ways in which their questions narrowed or broadened their attention. I will explain the ways in which a candidate's attention can be narrowed or broadened in the next sections.

Table 5.2. Narrowing and broadening

	Narrowing	Broadening
Seeing phenomena as discrete or bounded	Sean Amber Jorge Natasha	Adam Katrina Martha Karen Jenny Katie Kari Gina
Theory of student and teacher action	Sean Amber Julio Annie	Amelia Jenny Ivan Patty

Narrowing questions. Narrowing questions limit a candidate's attention in two primary ways: 1) seeing phenomena as discrete or bounded; 2) constricting conceptions of the teacher's role or actions the teacher might take. The ways in which a question serves to narrow a candidate's attention is made clear by what the candidate asks or does next with their question. The analysis and additional questions that follow indicate how a candidate's initial question might either narrow or indicate a narrowing of a candidate's attention.

Seeing phenomena as discrete. One way in which questions can narrow a candidate's attention is by directing them to see phenomena in an educational encounter as discrete or bounded. This ontology of educational encounters circumscribes particular phenomenon as discrete from other phenomena, or, presumes a simple, causal relationship between phenomena. In this type of narrowing, two things can happen: 1) discrete phenomena are seen by themselves. For instance, a candidate might only sees students off task without seeing other phenomena in the educational encounter. 2) Phenomena are seen in simple, causal relationships. For example, when a candidate sees students' discrete behavior as a sign of disengagement, they are seeing a simple relationship between the behavior and engagement, without considering other relationships that might be at play. There were three cases that clearly demonstrated this type of narrowing.

Sean's questions about productive group work led him to see group work discretely and separated from student relationships to each other or the subject matter. Sean's exploration of a solution to his group work problem narrows his focus to simply seeing how "efficiently" students can complete a task. At very least, he misses seeing student learning, instead only seeing student task completion. Additionally, he appears to miss seeing what students might do for each other's learning within the groups and only attends to what

students might do for each other's task completion. Through his solution of the group work tool, he defines a simple, causal relationship that assumes that the right combination of students in a group will ensure that the students compete the assigned task "efficiently." His solution-orientation narrows what is available for him to see about relationships among students and between students and the subject matter. Not only does he see narrowly (only students' efficient task completion), but what is available for him to see is also narrowed. Narrowing his attention effectively blinds him to other phenomena available to be seen.

Similarly, Jorge also narrows his attention to a circumscribed, causal relationship between giving directions and group work. Jorge determines that if he gives directions to students before he puts them into groups, then they will work effectively in their groups. By narrowing his attention to the impact of one solution on his problem, Jorge misses more complex relationships among students within a group and between groups. Jorge concludes, "Right after I explained to those groups they started writing and going to the board." The borders that Jorge draws around the problem and perceived solution exempt examination of other relationships and phenomena that might also impact the educational encounter.

Amber's question about how to improve engagement through specified tasks narrows her attention to the effects of those tasks on engagement. Amber does not broaden her attention to examine what engagement might look like for her students, but rather appears to have a pre-formulated idea of it, against which she measures particular tasks' effectiveness. She sees these tasks as indicative of engagement, without examining other phenomena that might also contribute to engagement, or even questioning the idea of engagement itself. Amber establishes a simple, causal relationship between particular tasks and student engagement that narrows her attention and keeps her from seeing other phenomena.

Limiting conceptions of student action and teacher action. Another way in which a candidate's attention can be narrowed is through limited conceptions of the actions a teacher or student might take in a given educational encounter. Seeing phenomena as discrete and circumscribing phenomena to simple, causal relationships, can impact the possibilities for action that a candidate might see. These limited possibilities for action are most visible in solution-oriented questions when a candidate sees a problem and proposes one solution for the problem.

Sean, Amber, Julio, and Annie demonstrate limited conceptions of teacher action in their proposed solutions to practical classroom problems. After explaining the problem of getting students to do productive group work, Sean proposes only one action for the teacher to solve this problem: creating a seating chart. Similarly, Amber suggests that she, "should spend time with my students emphasizing that there are no wrong answers," in order to solve the problem of improving engagement. Annie's solution-oriented task formulation establishes her task as one of giving students something "creative" to do in order to get them to do math. Finally, Julio sees his actions as determining, "how much instructions [to] give in Spanish/English," and whether he should give oral or written instructions. Each of these candidates seems to have only one teacher action that fits with their problem formulation. Their task formulation is limited in that it does not consider other actions that the candidate might take in order to impact the problem formulation, or how their actions fit within the larger ecology of the educational encounter.

When question orientations narrow a candidate's attention it can lead the candidate to miss seeing possibilities for learning that are available to them in an educational encounter. They might either miss these possibilities entirely or misconstrue them as being something

else. All of the candidates whose vision was narrowed through their solution-orientated questions missed seeing complex relationships and multiple possibilities for action. There seems to be a relationship between solution-oriented questions and presented problems that I will look to explore in future chapters.

Broadening questions. Broadening questions open a candidate's attention to more – more complexity, more possibility, more options – more of what is happening and might happen in an educational encounter. Broadening questions expand a candidate's attention in three primary ways: 1) Seeing phenomena in complex relationships; 2) Seeing more possibilities for student or teacher action. 3) Seeing more of the environment of the educational encounter. Unlike narrowing questions which reduce a candidate's vision to discrete instances or simple relationships, broadening questions open a candidate's field of vision see phenomena as dynamic and situated within infinite, complex relationships. This broadening enables candidates to take a more ecological view of what might at first appear to be an isolatable, easily interpretable instance. By seeing more ecologically, candidates might become better able to imagine more possibilities for student learning and their role in that learning.

Figure 5.3 shows the ways in which candidates broaden their attention. Candidates whose attention broadens tend to shift their attention in more dynamic ways than candidates whose attention remains narrow. These candidates might focus in on something for closer examination, but their attention remains broadened to complex phenomena, relationships, and possibilities for action.

Figure 5.2. Ways in which candidates' attention broadens.

Seeing phenomena in complex relationships. Seeing phenomena in complex relationships considers relationships among students, between students and the teacher, between students and subject matter, and between the teacher and the subject matter. Candidates who approached their inquiry from this ontological position broadened their vision in a way that explored greater complexity in these relationships, and in some cases appeared to imagine new possibilities for these relationships.

Relationships among students and between the students and teacher. Six candidates broadened their vision to seeing more complex relationships among students and between the students and the teacher.

Katrina started her inquiry by looking at frustration as students were working in groups on a worksheet on isotopes. While she initially saw a simple relationship between frustration and the task (certain tasks = frustrated students), as Katrina continued to examine this relationship, her attention began to broaden to seeing relationships among students that leads her to inquire further about, "how group dynamics play a role in the level of

frustration." Katrina's field of vision came to include more complex relationships among students, and between students, the task, and their levels of frustration.

Katie's attention in her inquiry toward students interacting with each other led her to see, "who was interacting the most with each other and who was not." Though her attention is already oriented toward complex relationships and interactions, it broadened further by leading her to look at how these interactions might relate to comfort and discomfort. Katie is able to imagine more options for what these interactions might indicate (comfort/discomfort), beyond just how they appear on the surface.

Like Katie, Kari starts her inquiry with her attention already oriented to complex relationships in her classroom. Her interest in "connections" between students and between students and teachers continues to broaden what Kari attends to. The very nature of Kari's inquiry question continues to broaden her attention to complex relationships as she imagines multiple possibilities for connections in an educational encounter.

Ivan's attention was also oriented toward complex relationships at the start of his inquiry. His in-depth analysis of a video led him to see a pattern of interaction among students that further broadened his attention. Ivan's questions about the "bailout" that he saw on the video drew him to look further at the relationships working in this educational encounter, particularly between the bailer and the bailee. Ivan's broader attention enables him to imagine other possibilities for what students might do for each other's learning. Furthermore, Ivan begins to examine the relationship between teacher and students. He observes that his rephrasing of the question preceded the bailout, and he begins to wonder about how his relationships with students impact their relationships with each other. Though

it began broad, Ivan's attention broadens even further to seeing phenomena in reticulate relationships with each other.

Two other candidates, Adam and Jenny, broaden their attention to the relationships between students and teacher. Adam's attention broadens from focusing on the discrete problem of getting students to ask questions, to seeing a relationship between his actions and student actions. He begins to investigate the impact that he, as the teacher, might have on student questioning. Jenny's examination of how teachers handle wrong answers leads her to further explore the relationship between teacher responses, student confidence, and participation. Her attention is broadened to more complex relationships between multiple phenomena in an educational encounter.

Relationships between students and subject matter. Four candidates broadened their attention to seeing more complex relationships between the students and the subject matter, or the subject matter as represented by a particular task.

Katherine's inquiry began by looking at students' off task behavior as a discrete problem that needed solving. Through the process of looking at video, Katherine began to examine what might have led to this behavior. She started to attend to the ways in which particular tasks were introduced and how concepts were taught. Katherine's attention broadened beyond just student behavior to seeing how this behavior was related to the task and the subject matter.

In her inquiry, Karen wondered about the relationship between "student ownership over their content knowledge" and learning tasks. She saw that free response questions seemed to allow students greater ownership, which led her to look at other activities and learning supports and question how they might or might not support student ownership.

Karen's initial question about the relationship between ownership and student learning broadened her field of vision to see and imagine more possibilities for how ownership might impact learning, and what ownership might look like for learners in an educational encounter.

Two other candidates, Martha and Gina, both have their attention broadened to the ways in which students relate to subject matter through questions. Martha began her inquiry expecting that students who shouted out answers would have "unhelpful questions." Through analysis of a video, that included coding students' question types and correlating those types to how the questions were asked, Martha noticed that the ways in which students asked questions did not correspond to the type of question they were asking. Martha began to see that students could ask questions about the content in various ways (including "shouting out" and "attention getting"). Martha's attention started to broaden beyond just how students were asking questions and she began to see the ways in which students were interacting with the subject matter through their questions. Gina initially observed that her students were asking questions in class, which is what she wanted them to do. Upon analysis of video, though, she discovered that most of her students were asking clarification questions, which was not how she wanted students to relate to the subject matter. Gina then broadened her attention to looking at what gets students to ask more inquiry-like questions, and began to examine the different ways in which students might deepen their relationship to the subject matter through questioning.

Newly discovered possibilities for student or teacher action. Questions also served to broaden candidates' attention by leading them to discover new possibilities for student actions or their own actions in educational encounters. Some of the candidates (like Ivan and

Katherine) whose attention was broadened to seeing phenomena in complex relationships also began to imagine new possibilities for action in educational encounters. There were two candidates whose writing did not explicitly indicate broadening in the ways they saw complex relationships, but indicated broadening in how they formulated their task in an educational encounter.

At the beginning of her inquiry, Amelia formulates her task as getting her student, C, to do a writing assignment. When this does not work, she formulates her task as one of getting C to complete the assignment by drawing. As she watched the video of the encounter between herself and C, Amelia sees that C's approach to the assignment begins to change and he begins to write. In seeing this, Amelia's task formulation broadens from getting C to do work to observing what C is doing and what helps him learn to write.

Similarly, Patty begins her inquiry focused on getting Brandon on task. Through looking at video, she discovers that Brandon is not as off task as she initially thought, and she begins to focus on what learning looks like for Brandon. Rather than formulating her task as one of getting Brandon on task, Patty broadens her task formulation to the task of seeing more about Brandon's learning.

In some ways, it seems a false distinction to separate the multiple ways in which a candidate's attention might broaden through their inquiry questions. Seeing more complex relationships calls forth new possibilities for action, or new *task formulations*, for teachers and students. As a candidate sees more and discovers new problems in an educational encounter, they must become responsible to the new task formulations that these new problems require of them. Once they discover the complexity of relationships in a

classroom, it is nearly impossible not to respond with reconceptualized actions that are responsive to the complexities.

Narrowing and broadening: A celestial metaphor. The ways in which questions narrow and broaden a candidate's attention might best be understood through the metaphor of star gazing (Raley, 2014). Imagine looking up at the night sky to study a particular constellation. In order to focus your attention on that constellation (absent a telescope), you can take a toilet paper roll, hold it to your eye, and fashion a make-shift scope that directs your attention to that constellation. In effect, you have narrowed your attention to only that constellation, ignoring the other stars and celestial bodies around it. The toilet paper roll blinds (and binds) your vision to anything outside of its tube. When a question narrows a candidate's attention, it is as though they are effectively looking at a phenomenon in the educational encounter with a toilet paper roll against their eye. Not only can they not see other phenomena around the object of their attention, but those phenomena aren't even available to be seen as long as their attention is so myopic. Additionally, the toilet paper roll makes whatever is visible appear more clear and closer for deeper study.

Now, imagine looking at the same night sky with a laser pointer instead of a toilet paper roll. The laser pointer can still direct your attention toward a particular constellation, but does not limit your ability to see the galaxy around it. Though you might spend time studying the particular constellation, there are endless possibilities for seeing how that constellation relates to other heavenly bodies. In effect, your attention is broadened beyond a particular constellation to how that constellation is situated in a larger galaxy of stars. The laser pointer removes the binding of the toilet paper roll, opening up infinite possibilities for where you might direct your attention. When a question broadens a candidate's attention, it

is as though they are looking at an educational encounter with a laser pointer. The pointer might direct their attention to a particular phenomenon, but it also keeps their field of vision open to how that phenomenon is situated among others.

If we want to help candidates see more – more of their students, more possibilities for learning, more of the subject matter – we need to help them ask questions about educational encounters that will broaden their attention. The broadening of attention has powerful implications for changing what candidates do in educational encounters.

Chapter 6: Trajectories of Attention

Introduction

After examining candidate questions and seeing the ways in which inquiry questions can serve to narrow or broaden a candidate's attention at the initial stages of inquiry, I turned to look more deeply at five candidates' full M.Ed. inquiry reports to see if there were changes in their attention over time. In short, I wanted to see how the process of inquiry – that is, looking closely and slowly at dense records of practice – impacted the narrowing or broadening of these candidates' attention.

As candidates attend to what was going on in educational encounters, they formulate problems of student action. These problems can be presented and solution-oriented or discovered and vision-oriented. As discussed in chapter three, problem formulations also lead to task formulations as candidates figure out what there is for them to do in an educational encounter. This chapter explores the ways in which candidates formulate problems of student action and formulate tasks to respond to these problems.

As I discovered in the last chapter, candidates in this study formulate presented problems, solution-oriented problems, discovered problems, and vision-oriented problems (see chapter five for more explanation). Presented problems are problems are ones you might expect to hear teachers formulating. These are the problems that are "presented" for teachers to solve through culturally transmitted expectations for teachers. Solution-oriented problems are problems that are formulated to find a solution. Presented problems are also usually solution-oriented problems, or problems that are oriented toward finding a solution. Because they are routine, presented solution-oriented problems typically carry with them routine solutions. Discovered problems are ill-structured problems that do not carry with

them the structure of a known formulation and known solution like presented problems do. Vision-oriented problems are problems that are formulated to help you see more of a problem situation. In formulating discovered problems, one examines, "'the interconnection of things' and explore[s] possible alternatives (Ramirez, 2002, p. 21). Discovered problems are typically vision-oriented (as the data in this study reveals) because you have to see beyond the problems that are presented to you in order to discover new ones. Discovered problems require one's attention to be continually redirected to the problem situation to see what is actually happening.

The analysis of this chapter also revealed a new way in which candidates might formulate problems. In addition (and often in relationship) to the problem formulations above, candidates also formulate problems as either problems of student cognition or problems of the environment. When a candidate formulates a problem as one of student cognition, they look to explain student action as an expression of something going on inside of the student. A cognitive approach basically says that something in a student's head (their motivation, home life, etc.) makes them act in a particular way. This approach looks to explain student behavior by what is going on intramentally for a student. The data in this study reveals that candidates who have presented or solution-oriented problem formulations also tend to formulate problems as problems of student cognition.

In contrast to cognitive explanations, candidates could explain student behavior as a process and product of the environment. When a candidate formulates a problem as one of the environment, they look to explain student behavior as a response to conditions of the environment that might include people, tasks, the physical space, and other contextual conditions that might exist in an educational encounter. Candidate can also look at the

relationships between these environmental conditions to see how they form the ecology of an educational encounter. When a candidate formulates a problem of ecology, they look to see the ways in which multiple environmental conditions work together in mutually constitutive relationships. The data in this study reveals that candidates who have presented or solution-oriented problem formulations also tend to formulate problems as problems of student cognition, and those with discovered or vision-oriented problem formulations tend to formulate problems as problems of the environment.

Methods of analysis. The five candidates chosen for analysis in this chapter were the candidates I facilitated in an M.Ed. group during the 2013-2014 school year. (This group and the M.Ed. inquiry is described in chapter four.) The analysis below is a chronological accounting of the ways in which candidates' attention shifted or did not shift throughout their inquiries, as was evidenced in their M.Ed. reports.

I approached the analysis for this chapter by reading through each of the candidates' full M.Ed. reports multiple times, and highlighting the places that indicated the candidate's attention, problem formulation, or task formulation. I then coded these data points using an open-ended coding system (Charmaz, 2012), in which the codes generated from what I saw in the data.

The analysis below provides an accounting of each candidate's trajectory of attention, organized chronologically by how the candidate organized their M.Ed. report. Each trajectory includes an introduction to the candidate, then an exploration of the ways in which the candidate's attention shifted or did not shift through the three chapters of their M.Ed. inquiry report.

Trajectory 1 – Attention that Remains Narrow: Sean and the Problem of Effective Group work

The first candidate whose work I analyzed was Sean. Sean is a teacher candidate whose inquiry takes place in a high school physics classroom. His student teaching placement is in a suburban high school in coastal California. My analysis of Sean's initial writing about his inquiry questions indicated that he had a solution orientation and that his attention was narrowed to finding a solution to his practical problem of effective and efficient group work.

As the analysis below will reveal, Sean's attention continued to remain narrow throughout his inquiry, as he appears to use the inquiry to validate existing, presented problem formulations, rather than broaden his attention to discovering new problems. Even when records of practice create some frame clashes (Agar, 1994) with his assumptions in the third chapter of his inquiry, Sean holds fast to presented problem formulations, not allowing what he sees in his records of practice to shift his attention.

Seeing more, but remaining narrow: Sean's chapter 1. Sean is prompted to look at group work by what could be called a "cold spot" – seeing something in a classroom that does not feel right to him. In this case, Sean saw that when students were working in groups, one student appeared to be doing all the work while the other group members did not participate. He writes, "In the end, I watched one student doing all of the work while his group members sat around doing nothing." This observation leads him to wonder, "which of these various kinds of groups are effective, and which are not, in maximizing student learning." This question initially appears to provide Sean an opportunity to attend to groups

and their effect on student learning. There is potential for this question to broaden Sean's attention to the ecology of the educational encounter.

Sean determines that students are more likely to work "effectively and efficiently" if they are "engaged," and that they are more likely to be engaged during lab activities where they are working in groups. This logic is somewhat problematic in that he assumes students will work effectively and efficiently in lab groups, but he has already determined that students aren't working effectively and efficiently in those groups. He narrows his attention to looking at both these specific groups and also for what seems to be a pre-conceived idea of "effective and efficient."

As he begins to take video of groups working together during lab time, Sean further narrows his attention to solution seeking. He asks, "How do you create groups that will all work effectively and efficiently?" By asking this question, Sean appears to disregard attending to what might count as effective or efficient, what students are actually up to in groups, how the environment of the classroom impacts the groups, or a host of other pathways that he might examine to help him better attend to students and their learning.

Additionally, though Sean introduces the idea of engagement (students are more likely to work "effectively and efficiently" if they are "engaged,"), he does not explore the relationship between engagement and group work. Instead, he takes on a narrowed pursuit of a solution to his practical group work problem, asking a "how to" question. It is possible that his question shifts to a "how to" because either 1) he does not see the relationship between groups and engagement or 2) he does not know how to approach seeing and looking into such a relationship.

Instead of exploring these relationships, Sean turns to looking for what he calls "positive" and "negative interactions in groups. He writes, "I wanted to try to see what interactions took place, and which were positive or negative." While the start of his inquiry seemed as though he would look for interactions within groups, he looks at a video to see interactions between groups. Sean loosely transcribes about 20 minutes of video, and codes the video for interactions that he calls, "intergroup friendship, intragroup friendship, intragroup romantic, intragroup productive, and teacher proximity (where students would, 'progressively get quieter and more focused as we moved closer to their table')." Figure 6.1 shows this loose transcription.

Time	Event	Relationship
6:30	Group five begins to lose focus on their work.	
6:57	I come by group five briefly encouraging them to stay on task and then leaves the room.	Teacher proximity
8:20	Group five starts talking to group four and group six with one student holding the review packet and pointing to it. Others are not talking about the packet.	Intragroup friendship Intragroup productive
8:40	A boy from group five begins to poke a girl from group four about every ten seconds. Students from group seven are not focused but notice me about two lab groups away and watch closely.	Intragroup romantic Intergroup friendship

Figure 6.1. A screen shot of Sean's transcript with coding.

In this transcript, Sean writes very a generalized accounting of what is taking place in the classroom. It is not clear how he came to look for these specific interactions or determine his coding scheme. And, it is difficult to ascertain how he came about the codes from the information he provides in the transcript. (I will further discuss how candidates' approaches to inquiry potentially impact their attention in a future chapter.)

Viewing the video, transcribing it, and analyzing it allows Sean to see more of what is going on in the classroom than he originally envisioned. He writes about seeing three new things through the transcribing and coding video:

1) "all interactions occurred either within a single group, or between adjacent groups;"

2) "way more layers of groups than just the assigned lab groups" in the classroom;

3) "the proximity of the teacher influences group behavior as well."

All of what he sees through analysis of video provides openings for a shift in Sean's trajectory of attention, calling forth opportunities for Sean to formulate new problems and tasks for teaching.

Instead, the transcription and coding of this 20 minutes of video leads Sean to wonder, "whether [interactions between groups] affected the student's [sic] engagement in the activity, or even the quality of the work" and how various types of relationships "affect academic efficiency and productivity." While Sean's attention shifts slightly from the composition of a single group to what he calls "intragroup interactions" (interactions between groups), the direction of his attention remains on efficiency. And, though he mentions engagement, it appears through his description of student action that he is really talking about work completion.

Sean's analysis also does not change his problem formulation; rather it solidifies the formulation of a presented problem about what students are doing and what there is for the teacher to do. Sean writes,

> This round of analysis revealed much about the different interactions that occur between students. The most obvious tend to be those that do not reflect good

> academic behavior for teachers tend to be more focused on keeping troublesome students tuned in to the activity, and not on their friends.

Here, Sean accepts the presented problem of students who are interacting in ways that "do not reflect good academic behavior" (an assumption and description that goes completely unchecked). Formulating this presented problem comes with clearly defined tasks for the teacher – in this case, "keeping troublesome students tuned in to the activity."

Although Sean sees more of what is actually happening in his classroom, it is not clear that seeing more leads to any change in Sean's problem formulation or task formulation. Sean still sees a practical problem of students working efficiently and effectively in groups, and still formulates his task as one of getting them to work efficiently and effectively.

After analysis of this dense record of practice (the 20 minute video), Sean's habits of attention do not seem to have shifted. He concludes his analysis of this record of practice by stating,

> All of this data revealed much about the community within a classroom. Teachers can assign lab groups and try to regulate which students work together and which do not . . . There were no interactions that took place between groups that were separated. I feel that this is a key piece of information and can be used advantageously by the teacher. Friends can be placed near each other to possibly promote positive work habits, or they can be separated if they keep each other off task too much.

While he sees that there is much to discover about "community" and relationships within a classroom, Sean retains a solution-orientation. He accepts the presented problem of getting

students to work together, and it's accompanying task of moving students around into groups that will work together. Instead of formulating his task as one of discovering new problems by further exploring the classroom community, his task formulation is to "regulate" how he groups students, in order to make groups "efficient" and "effective."

Given his self-proclaimed task formulation, it is surprising that Sean states the next move in his inquiry is to "more deeply explore the relationships that are present in a classroom." This sounds as though it might provide him opportunities to discover new problems. Sean looks for these relationships in an AVID classroom, where he is not allowed to film, but takes field notes. In his analysis of his notes, Sean quantifies the relationships that he sees:

> There were a total of twenty-seven interactions, seven of which involved the students participating in positive academic behavior. This behavior included explaining how to properly use a word in a sentence, debating the prompt, or even attempts at refocusing others onto the task. Fortunately, this percentage roughly matched the percentage of positive academic behavior of the second video transcription, revealing that, given the chance, students will engage in off task behavior with friends about three quarters of the time.

Here, Sean makes clear how many interactions he saw, how many of those interactions he considered "positive academic behavior," and a description of what positive academic behavior looked like in his observation. He does not describe, however, what the other 20 interactions looked like or further explore the conditions for positive academic behavior. He concludes that students will engage in off-task behavior ¾ of the time, but does not explain what he saw that led to that conclusion.

This report of analysis does not reflect how Sean is exploring the relationships present in the classroom (what he said he would be doing). Instead, the analysis seems directed toward evaluating student behavior as on or off task. In the analysis of this second record of practice, Sean formulates the same problem as he did in his first analysis – students are not "on-task." Sean's attention continues to be narrowed to whether or not students are completing a task. He does not attend to the multiple possibilities for how they might be completing the task. There are also opportunities for Sean to broaden his attention to the environment in which students are supposed to be completing a given task (including examination of the task itself), to the relationships amongst students, even to a close examination of what students are actually doing when they are off task. Instead, Sean narrowly directs his attention to if students are on task or off task.

In the first chapter of his inquiry, Sean did see more of what was taking place in his classroom. He states, "There are many more types of relationships than I originally thought." Although he sees more, his attention is not broadened, and he retains the same presented problem formulation: the off task problem. Given this problem formulation, Sean's task formulation as a teacher is to use the interactions he sees to make students more productive. He concludes his first chapter, "a teacher's best hope for academic productivity is to maximize the positive interactions that every group encounters, yet distribute these interactions as evenly as possible among the groups." While there were openings for Sean's attention to shift as he saw more in this inquiry, his trajectory of attention remained narrow throughout the first half of his inquiry.

Opportunities to broaden through exploring literature: Sean's chapter 2. Chapter two of the M.Ed. inquiry report provides candidates an opportunity to explore literature

related to their topic of inquiry. A review of literature can serve to broaden or narrow a candidate's attention by giving them other things to look at when they return to analyzing dense records of practice in their third chapter. Sean's examination of the literature appears to keep his attention narrow.

Sean begins his exploration of the literature asserting, "Social standing of students and student groups play a huge role in a classroom as well as the interpersonal interactions among the students and with the teacher." Thus, he looks at literature on student social status to help him further understand more about how students work in groups.

The literature on social status provides Sean with frames for seeing students as "low-status," "high-status," or "medium-status." He also picks up terms from the literature, like "free-rider" and "leadership" which give him new ways to talk about students and their behavior. While these frames could help Sean see more or what is going on in his classroom, or, more importantly, see students and the environment differently, they appear to do nothing beyond provide him with a point of interest. He writes, "The 'average' student offers plenty of interesting detail of how individual students interact within a group, but these details do not offer assistance in dealing with finding a successful combination of high- and low-status students." Despite being provided with an opportunity to broaden his attention to the ways in which students of varying social statuses interact with each other, he maintains his attention firmly on how to group students in a, "successful combination of high- and low-status students."

Sean's focus remains on "successful" groupings, rather than on how students are actually interacting. If he could focus more qualitatively on how students are actually interacting with each other, he might discover new ideas about what counts as successful

grouping. He has essentially boxed himself into a corner in that he can only see interaction in light of "successful" (presumably on-task) behavior. This narrowed attention leads to very narrow task formulations, which further limit what he might see in future interactions.

Sean's exploration of the literature on student social status appears to reinforce his existing habits of attention and surface his assumptions about students. Even when the literature offers him openings to shift his trajectory, he holds fast to presented problem formulations. In one example of this, he describes an article talking about how Charles Darwin and Charles Lyell, "could work off of each other to argue their ideas until one (eventually Lyell) realized that his ideas were flawed." Sean recognizes that, "situations like this can be very fruitful for students, especially friends, because they can challenge each other to work harder and to create arguments supported by evidence when disagreements occur." But, then he concludes,

> The challenge with this idea, however, is that with adolescents there is not much of a desire to be challenged by friends (except maybe with sports). Instead, if friends are grouped together, they choose to socialize and end up becoming distracted from the material for at least a little bit of the time. In order to preserve the educational opportunity that friendship support or even competition may offer, I think that close friends should be separated yet still kept close enough to be able to compare themselves to the other.

Sean does not take this opening to reformulate the problem of how students might work together, see how environments might shape student behavior, or imagine new possibilities for the educational encounter. Instead, he has preconceived notions of what students do, can

do and should do, and what the role of the teacher is based on what he already assumes about students.

Finally, Sean's exploration of the literature reinforces his solution orientation. He comes across an article, "discuss[ing] the many ways that a teacher can behave in a classroom." This article also offers an opportunity for Sean to broaden his attention by describing how, "these behaviors directly affect how likely a student is to participate in activities or turned off they will be during discussions." Sean could formulate a problem of attention, examining how teacher behavior (an element of the environment) might impact students. Instead, he formulates a task that "solves" particular student behavior with a matched teacher behavior. He writes,

> If a class tends to be very squirrely, the teacher may need to fall into the strict section, and if the class doesn't try very hard to find the correct answer or convince themselves of a concept, then the teacher may need to be more uncertain of the students to make sure that they are on the right track.

While it is not exactly clear what each of these proposed behaviors mean, the idea is still the same. Sean's task formulation is to match what students are doing with a particular teacher behavior.

Sean concludes his literature chapter with a possible opening to shift his attention. He states, "I do not believe that the 'perfect' lab group can be discovered because moods are always changing, and relationships are constantly fluctuating." Knowing that he can't discover the perfect lab group might open Sean up to exploring more about the environments in which lab groups function in various ways. This statement, though, does not appear as though it will direct his attention to the environment because he seems to assume that the lab

groups' performance is based on what is taking place inside of students' cognition, (their moods).

Frame clashes provide opportunities to broaden: Sean's chapter 3. Sean begins the third chapter of his inquiry asking, "what roles do students take on during group activities, does a student's self-worth influence the role they take on, and what does strong self-worth look like in a classroom?" These questions stem from his discovery of "free riding" and "leadership," and his investigation of social status in the literature. To explore these questions, Sean decides to "investigate students on an individual level in order to flush [sic] out some details about the roles that they could take on." In order to see this, he conducts interviews with questions designed to, "address students' subconscious feelings, their metacognitive ability, and their awareness about the future." Sean defines metacognition as, "how well students can think about their contributions to a group." It seems that by investigating students on an individual level, Sean is moving away from examining the environment and toward individuals. This appears to be a move to situate the problem formulation inside student cognition, rather than in the environment, which raises questions about a candidate's possible task formulations.

Sean's investigation of students on an individual level starts with a survey that asks questions such as, "On a scale from 1 to 10, 10 being the most, how comfortable are you socially in this class?" and, "What role do you feel you take on during group activities? Explain." Sean finds that some of the answers to these and other survey questions are not what he expected, and they make him, "second guess [his] previous opinions on student leadership." He initially assumed that more "academically successful" students would take on leadership roles in groups, but learned from the surveys that all of the students stated that

they take on a leadership role in groups, even though they aren't very academically successful or don't have "social control." He writes,

> This all surprised me because I typically think that the students with the lower grades typically feel like they do not understand the material as well as the other students so they would not want to be in the leadership position. The responses I got completely tore down my assumptions.

Clearly, Sean sees more than he did and there is a great opportunity for his attention to be broadened to new ways to seeing students in environments. Though he states that the responses tore down his assumptions, what he does next does not indicate that his attention has shifted.

The frame clash from the surveys offers the possibility for Sean to formulate new problems and new tasks. Sean turns instead to cognitive explanations for what students might be up to. He suggests that even though students think they're taking on leadership roles, they might actually not be. He writes, "it could also be that students may consider *any* [emphasis added] participation on their part an example of leadership." Rather than further exploring how students take on particular roles in certain environments, Sean dismisses his findings from the survey by attributing them to student cognition. Sean goes on to further wonder about student cognition, specifically about how the roles students choose in a class indicate their self worth.

Sean's next action, both in his classroom and for his inquiry, is to give students roles that they might take on in a group and ask them to rank the roles in order of preference. This task formulation was presented to him in the literature and continues to fit with his solution-oriented problem formulation of making effective groups. He writes, "my literature review

revealed how if students have roles during groups, the group can perform at a much higher level than if there is simply one person taking over and controlling what the group does." Sean takes the possible group roles of facilitator, timekeeper, material manager, and reporter from the literature and presents them to students. He describes this process and his rationale for doing this:

> I gave each student the task to rank these four roles from one to four in order to preference and give reasons for their number one choice. My hope was that this ranking would reveal what kinds of roles each student preferred and that I could find any patterns in the data . . . I was expecting to see that grade correlated to certain roles such as students with higher grades ranking the facilitator or reporter role first.

This is almost identical to what Sean was looking for in the first survey – a correlation between group role preference and grades. From these surveys, Sean expects to see a distribution of role preferences that reflect the distribution of grades in the class. What Sean discovers in a quantitative analysis of the data from this second survey is that, "timekeeper drastically out ranked every other role and was desired by 47% of the class."

This finding contradicts what Sean was expecting to see, providing an opportunity for him to broaden his attention. When he did not get the expected results, he could have broadened his attention to look at the roles he presented students with, their perceptions of the roles, or even his assumptions about students with higher grades. Rather than allowing this finding to broaden his attention, he looks for findings that will more closely match his expectations.

Turning back to the ranking survey, Sean looks at students' second choice to see if it is close to their first choice. He believes that, "the facilitator and the reporter have more

public duties than the other two," and assumes that if students choose facilitator or reporter for their first choice, then they will choose the other for their second choice. Similarly, if students choose timekeeper or material manager for their first choice, then they will choose the other for their second choice. In other words, he sees facilitator and reporter going together and timekeeper and material manager going together.

Sean conducts this analysis to test his assumptions about the correlation between group roles and self-worth. He explains,

> My thinking behind this decision was that if self-worth really does come into play when students take on certain roles, then those that have higher self-worth will be more likely to choose the two roles that require more of a presence in their group.

Once again, Sean is situating explanations for student action within their cognition (self-worth), rather than in the environment.

The analysis that he does to look at students' second choices provides him with a frame clash and another opportunity to shift his attention, as he discovers that not all students who selected a "public" role for their first choice also selected it as their second choice. He writes, "Obviously, my original assumptions about the connection between facilitator and reporter were flawed." He sees that his ideas about the roles that students might choose are different from what they actually choose – a frame clash. A second opportunity to broaden his attention comes when he looks at students' stated reasons for choosing a particular role and discovers,

> Three students said they were good at keeping people on task, which I felt was more of a facilitator duty than a timekeeper duty. This revealed to me that there is probably

some cross over between the four roles and possibly even confusion about what the roles are expected to accomplish.

It seems that Sean's understanding of what the group roles entail and students' understanding of what the group roles entail is different. This finding is an opportunity to examine a feature of the environment, in this case group roles, and shift his attention beyond student cognition.

Instead of examining the environment and the roles, Sean goes back to student cognition. He looks again at the survey results for why students chose a particular role and discovers that, "a total of 28 out of 44 reasons related to students recognizing their own abilities." This leads him to conclude that, "there actually was a sense of a student's self-worth represented by the role they chose." In this case, Sean sees in the data what he was hoping to see – that there was a connection between students' self-worth and the role they take in groups. He does not explore areas in the data that are unexpected or are outside of what he planned to see.

Sean continues his analysis in the third chapter by looking at student grades to see how they correlate with the roles that they chose. He calculates the average grades for students who select each role, and assumes that students with the highest averages will chose the facilitator and reporter roles. Once again, the data creates a frame clash with his expectations; students who selected facilitator actually have the lowest average grades in the class. Rather than shifting his attention or formulating new problems and tasks, Sean looks for a way to validate his original assumptions by looking at how student social status correlates with choice of roles. He comes to conclude,

I went back and looked at which students specifically had ranked facilitator as their top choice, and it was in fact a majority of students who were much more adept at

social interactions during class than the rest of their peers. Technically this means that my assumption was correct with a slight variation: the more public roles are taken by the students with high academic self-worth *or* high social self-worth.

Sean's initial assumptions (and possibly his ideas about inquiry) appear to get in the way of a shift in his attention. He seems to use the data to prove his hypotheses, rather than broaden his problem formulation or task formulation.

Sean's task formulation is to make sense of what students are doing based on what he already thinks he knows about students. This can be seen in the previous example, and in a later example where he looks at the grade distribution of the roles and concludes that, "being a facilitator is an inviting role to students. Anyone can be the leader of the group if they feel up to the challenge. This solidified my belief of the importance of having a public leadership role during group activities." Sean's habits of attention appear to be firmly rooted in seeing presented problems. Even when those problems present themselves in unexpected ways, he seems unwilling to formulate new problems. His tasks as a teacher remain unchanged, as he continues to keep his attention narrowly on validating his problem formulations.

The remainder of Sean's chapter 3 continues in a similar manner; the data presents him with new problems to formulate, but he continues to eschew the broadening that this data calls forth. At one point, he even surveys students about their choice of role again, but this time leaving out the timekeeper role because it seems to be skewing the results he wants. He justifies this decision by stating, "If students had truly desired to be time keeper, I think that they would have picked material manager [as their second choice] instead of facilitator or reporter." Again, a cognitive explanation of student action. In the end, with enough

manipulation of the data, Sean sees exactly what he had planned to see all along – that students with high grades take on the role of facilitator or reporter.

Sean concludes his inquiry by providing a glimpse into his task formulation. He states in his conclusion chapter,

> To promote the best collaboration in groups, students need to each take on the roles that they are the most comfortable with, and to not force students into roles that they do not desire. This can be accomplished by somehow balancing the various forms of self-worth and making sure that every student feels like they can contribute in some way.

Sean's task now appears to be to create balanced groups. Looking back to the start of the inquiry, he is in the same place that he began – creating groups that would work efficiently and effectively. It seems as though the trajectory of Sean's attention remained narrow throughout his inquiry.

Though Sean's inquiry offered him multiple opportunities to broaden his attention, his attention remained narrowly trained on "solving" the problem of group work. There are several key ways in which Sean's attention remained narrowed.

1) He formulated problems as problems of individual student cognition, rather than as problems with the environment. He also formulated problems of individual students, rather than students in relationship to the environment.
2) He persisted in attempting to solve the presented problem of group work, rather than discover new problems that might exist in these educational encounters.
3) He held firmly to assumptions about students, schooling, and teaching that did not change even when confronted with potentially contradictory evidence.

4) He seems to have a conception that inquiry involves proving a hypothesis and quantifying where possible, rather than exploring ideas and examining evidence that is unquantifiable.

Each of these ways of narrowing will be discussed in a further chapter.

Trajectory 2 – Attention that fluctuates between narrow and broad: Melissa and the problems of checking for understanding and classroom management

Melissa is a teacher candidate whose inquiry takes place in both a middle school physical science and a high school physics classroom. Unfortunately, Melissa did not submit any initial writing about her inquiry questions, so her initial problem orientation is no available. The analysis in the first chapter does not include an account of Melissa's early questions. Thus, her first M.Ed. chapter is the starting place for analysis of her attention and problem formulation.

As the analysis below will reveal, Melissa's attention appeared to both narrow and broaden throughout her inquiry. Her analysis created some frame clashes that shifted her attention toward the environment of the educational encounter. She also retained some narrowed task formulations that were not responsive to these frame clashes.

Opportunities to broaden while solving practical problems: Melissa's chapter 1. Melissa begins her inquiry with a practical classroom problem. She sees that she can't tell if students understand a concept and is prompted to search for strategies to "accurately check for understanding." Similar to Sean, she starts by looking for a solution. Melissa describes the start of her inquiry:

> Initially, I was curious about the practical question of how to tell whether or not my students understand the content that I want them to understand. Through analyzing

various ways I had checked for understanding in my classroom, including test and homework questions, I developed a fuller idea of how to accurately check for understanding.

Some of the questions that initially guide her inquiry appear slightly broader than just the solution-oriented "how to" check for understanding. These include, "What does understanding look like? How can I tell if a student understands the content? How can I tell how deeply a student understands the content?" She also includes, "What strategies can I use to best assess student understanding?" Her questions represent a mix of vision- and solution-oriented, and it seems at this point that her inquiry could either narrow or broaden her attention, depending on which questions she pursues.

Early in chapter one, Melissa sees something in a dense record of practice that causes her to shift from a solution orientation to look more closely at and ask more questions about what students are doing. As she was grading tests from her high school physics class, Melissa saw that, "one student did not accurately complete any calculation questions, but was able to draw a graph and analyze visuals completely accurately." This surprises her and makes her wonder, "what, or how much, he truly understood about the content of that unit." As her problem formulation broadens beyond a student getting answers right or wrong on a test, her attention starts to broaden to relationships in the educational encounter – relationships between the student and content and between the student and the task.

Melissa goes on to look more deeply at this student, Javier's, test, and sees that though he got a lot of questions wrong, he actually had "good answers" that weren't completely wrong. Seeing more than what she anticipated in this student's work, Melissa is

prompted to wonder further about this student's understanding of the physics concepts. She explains,

> I knew his bad performance was not a simple failure to understand because many of his test questions included answers with no work, or work with no answers . . . Did the test help me see what he did and did not understand? If so, why? If not, how could I have altered it to make it a better assessment of his understanding?

As Melissa begins to wonder both about the student's understanding and about the test, her attention begins to broaden to not only consider more things about this student, but also to consider how a condition of the environment (in this case the test) might impact the student.

Though it appears that Melissa's problem formulation and attention has begun to shift, her task formulation remains the same. She is still looking to "solve" the problem of student understanding, and proposes, "putting a variety of questions on [her] assessments, including math problems, written constructed response questions, and visual questions." She states that this solution will help her, "better gauge students' understanding of content because it gives them multiple ways to show what they know." Melissa's task formulation in this case is to give students multiple ways to show what they know so that she can better assess their understanding. Though this proposed solution could serve to narrow Melissa's attention toward solving the problem, it actually appears to focus her attention in a way that allows for a broader exploration of student understanding.

Melissa next turns to analyze a test where the same question appears twice, but in two different forms. She anticipates that students will likely get both questions correct or both wrong. When she looks at student performance on these questions, she is surprised to find

that 14 students answered both questions correctly, 5 answered both wrong, and 5 answered 1 right and 1 wrong. She explains,

> This led me to almost the opposite of my initial general conclusion about checking for understanding. I initially thought that giving students more than one way to show what they know would help me better gauge their understanding of the material. At this point I am beginning to think that if a student can only answer one type of question about something, then they do not really understand it.

The unexpected results in the data lead her to attend to what counts as understanding. She begins to wonder if an answer on a test is really an accurate indication of a student's understanding of a concept.

To explore this further, she goes back to Javier's test for further analysis. In reading Javier's test more carefully, Melissa sees that the parts of the test that Javier did correctly indicate a deep understanding of the concept, but that he performed poorly on the test overall because he did not understand the algorithms required to get the test questions "correct." Melissa realizes,

> That a student that understood only the algorithmic side would have gotten all of these problems correct, despite perhaps having no deeper understanding of what average speed really means. This seems flawed. The test allowed students to only understand the algorithmic side and did not reward students for also understanding the conceptual side.

Through this analysis, Melissa's attention broadens to not only how students might demonstrate understanding, but to what they actually understand. Melissa's task formulation, however, does not appear to shift with this broadened attention, and she concludes, "Because

of this, I am, once again, realizing the value of checking for understanding of one concept in more than one way." She still appears to formulate her task as one of solving the checking for understanding problem by giving students multiple opportunities to show what they know.

Interestingly, Melissa's solution orientation does not appear to impede the broadening of her attention at this point in her inquiry. Melissa continues to look at other dense records to further explore students' conceptual understanding, and unlike Sean does not appear to be trying to validate pre-existing assumptions. She turns next to look at an 8th grade Physical Science test that she gave students in her first student teaching placement. This test had two "free response" questions that Melissa describes as, "essentially the same question asked in different ways because the answer for both of them requires the student to know that elements are differentiated by the number of protons in an atom." Melissa looks at student responses to these questions and discovers two things. Firstly, she sees that 5/35 students got one of the questions right and one of them wrong. Secondly, she sees that many students had the exact same answer, and that the answer was what her cooperating teacher had given them word-for-word the day before.

These two findings from the data seem to further broaden Melissa's attention by challenging her problem formulation. Checking student understanding is no longer just a problem of students having multiple ways to represent what they know. While it initially appeared that she had found a solution to her checking for understanding problem (give students multiple ways to show what they know), Melissa's analysis of this dense record no longer convinces her that she should just give students multiple ways to demonstrate their

knowledge. Nor is she convinced that they should only be given one way. Melissa explains her uncertainty around her task formulation:

> I am still not totally convinced of this new point of view. It is reasonable that a student may not be able to answer *every* type of question about some piece of content but will still understand it. Given that, if I just happen to ask the "wrong" type of question for that student, then they will not be able to show me what they now in the one opportunity I have given them. Thus, there still seems to be some merit to giving students more than one way to show what they know.

This struggle to determine what she should do provides an opportunity for Melissa to further broaden her attention. Without a firm commitment toward one solution to the checking for understanding problem, Melissa might be open to formulating new problems and new tasks that go beyond seeing and checking for student understanding in test answers.

At the conclusion of her first chapter, Melissa proposes to explore the conflict in her task formulation by designing and giving students a test that asks multiple questions about each concept. This is meant to give students more than one way to show what they know. She writes, "testing the same content in different ways allows me to differentiate those who really know it from those who may just have a base level understanding." This assessment allows her the possibility of seeing a fuller spectrum of students' understanding of concepts, not simply if they knew the concept or didn't.

The conclusion to this chapter indicates that Melissa is still open to further broadening her attention, but that she is also narrowed into embracing a solution. She writes,

After looking into the problem of how to adequately check for student understanding, I have come up with a few strategies that allow students to better express what they know, which allows me to better see both what they do and what they don't know.

Through the analysis she did in this chapter, Melissa's attention broadened to seeing more about student understanding. She sees more of what students know, more ways in which students might demonstrate knowledge of a concept, and more variations in student understanding (beyond just they did or did not understand). Her attention is also broadened to seeing how aspects of the environment (in this case test questions) might affect students' ability to demonstrate their understanding and what she is able to know about their understanding. Melissa's problem formulation has been broadened beyond whether or not students understand, and toward the complexities of their understanding. Her attention also appears somewhat narrowed by a solution orientation, centered on "strategies" to check for student understanding. Her task formulation remains the same – to check student understanding through tests. This might be considered a broadening of the problem formulation in that there are more ways to see what students know, but a narrowing of the task formulation in that she has defined limited strategies for doing this.

The questions that Melissa proposes for further study indicate that she will continue to broaden her attention. She asks, "What can I see in a classroom that will reveal whether or not a student understands something? How do students act when they reach an understanding? What does it look like when a student is not grasping the material?" These questions indicate attention that is broadened to new potential problem formulations, and that is not narrowed in on the application of a solution.

Melissa's first chapter indicates a tension between an interest in broadening (as revealed by her questions) and an urgency to solve the problem of student understanding. Melissa continues to formulate her task as the application of strategies to check student understanding, which prevents her from fully broadening to all that there might be to see and attend to in this educational encounter.

Literature that "solves" the problem: Melissa's chapter 2. For her literature chapter, Melissa reads literature on assessment. Much of what she read offers strategies for multiple forms of assessment, such as using more formative assessments and using graphic organizers as assessments. Her exploration of the literature is solution-oriented, and leads her to conclusions like, "The second article I read further solidified my conclusion that teachers should check for understanding in more than one way."

The solutions that she finds in the literature mirror the solutions that she arrived at in chapter 1 of her inquiry, and the literature does not seem to challenge her problem formulation or task formulation. The problem remains that she wants to know what students understand, and her task remains to do this by checking their understanding in a variety of ways. She sees in the literature that,

> One single way of checking for understanding will not work for 100% of students. Because of that, it is important to check for understanding in a variety of ways. This includes putting a variety of different types of questions on a test, providing students with many opportunities besides tests to demonstrate their understanding, and giving assessments that include calculations, writing, graphic organizers, oral presentations, and visual representations, among other things.

While the literature might have given her more strategies to try beyond varied test questions (e.g., oral presentation and visual representations), it does not appear to impact her attention, problem formulation, or task formulation. A change in task formulation is not having more of the same thing to do (in this case, more strategies to try), but having new things to do.

It seems that although Melissa's attention was broadened to seeing more about student understanding throughout the course of her chapter one, her literature review moves her back to where she started this inquiry. She states,

> The conclusion that I reached at the end of chapter one—that checking for understanding is done best when students are given multiple ways to show what they know—rang true through my research on assessment. For this reason, I feel that my work in this area has somewhat wrapped up.

This is one reason why a solution-orientation that persists throughout an inquiry can be troublesome. Melissa thinks she found the solution to the problem of checking for understanding (give students multiple ways to show their knowledge), and now she can be done attending to this phenomenon – at least in her inquiry. Since her task formulation was to solve the problem or student understanding, she sees no reason to continue discovering new ways that this problem might be formulated. It seems as if the solution narrows her attention, preventing her from further discovering problems in this area or further exploring student understanding beyond how it appears on an assessment. As a result, Melissa abandons this topic of research and moves to another practical problem in her chapter three.

More opportunities to broaden while solving practical problems: Melissa's chapter 3. Melissa begins the third chapter of her inquiry with some clear assumptions that lead her to pursue questions about classroom management. She reveals her assumptions,

stating, “I began focusing on classroom management this semester during my student teaching in order to prepare for the lower-level classes that I will most likely have next year.” While it initially appears that she is looking to solve a practical problem of teaching, one that is also a “presented problem,” the question that guides her inquiry indicates an interest in broadening her attention to exploring what good management and a positive classroom environment look like. She wonders, “What does good classroom management and a positive classroom environment look like?” The combination of her existing assumptions about students and classroom management, combined with a more vision-oriented question make it difficult to determine if she begins this chapter with a narrow, solution-orientation or a broader vision-orientation.

As she starts the chapter, Melissa analyzes observation notes from three different classes at the high school where she is student teaching. Melissa’s first observation is in a conceptual physics class, where she sees and documents student behavior that includes off-task talking, students throwing beach ball, and students not working on class-related work. She concludes that, “this is an example of a class that has ineffective classroom management and a negative classroom environment.” From this observation, she determines,

> A positive classroom environment is one that enables student to learn the content, as well as to learn other skills and responsibilities. A negative classroom environment, then, is one that hinders students from learning content or valuable skills and teaches them lessons about life that will cause them to be less successful in the future.

This definition of positive and negative classroom environments has the potential to narrow her attention as she observes two other classrooms.

Next, Melissa turns to look at an English 12 AP class. Here, her attention seems to be broad as she sees beyond her stated definition of what counts as a positive environment. Though she concludes that the environment is mostly positive and well managed, she,

> noticed that White students were more comfortable speaking loudly, speaking without waiting to be called on, and generally participating than Latino/a students in the class. This racial divide, among other things, led me to believe that while this classroom environment appeared positive for many students, it was most likely negative for some students in the room.

This observation indicates that Melissa's attention to the environment includes how it serves all students. In this way, it seems that her attention has broadened in that she sees beyond just how "students [are enabled] to learn the content" and attends to how students are interacting in the environment.

Similarly, though her next observation of a ninth grade English class is primarily focused on the strategies that the teacher uses to manage a classroom, she remains open to the possibility that a well-managed classroom does not equate to a positive environment. About her observation of this class, she writes,

> All of [the teacher's] strategies accomplished their purpose, and I understand why she was recommended to me as the ultimate teacher to see for classroom management strategies. In my opinion (and that of many other teachers and administrators) her classroom is effectively managed. However, I was left undecided about whether or not the class had a positive classroom environment.

This indecision about whether this well-managed class is a positive environment leaves an opening for Melissa to shift her attention and formulate new problems. She could begin to

explore the relationship between a well-managed and positive class, examine student responses to these classroom environments, or pursue multiple other lines of exploration to better understand positive classroom environments.

These three observations leave Melissa wondering, "if the students agreed with [her] about what characteristics made for a positive or negative classroom environment." To find out student perspectives, she gives them a survey. The survey asks questions such as, "What class do you think you learn the *most* in? Why? Which of your classes has the most *positive* "vibe" or environment? What is it about that class that makes it feel like a positive environment?" Melissa finds from the surveys, "that students overall agreed with what [she] believed to be a positive or negative classroom environment."

From the results of the surveys, Melissa moves quickly to solution-oriented task formulations. Students indicate that friendships are important for positive environments, leading Melissa to conclude, "that community-building activities at the beginning of the year might have much more effect on the classroom that I realized." Here, she seems to formulate her task as one of doing community-building activities, rather than further explore what students mean by friendship and how friendships work in positive classroom environments.

Melissa's next move seems to further indicate a solution-orientation. Many student surveys mentioned her cooperating teacher, Mr. M, as having a positive classroom environment, so she turns to an examination of Mr. M's classroom to see what he does to create a positive environment. Melissa uses both video and observation notes as her records for analysis. In watching the video, she sees,

> three concrete things that Mr. M does that stand out to [her] as promoting a positive environment: frequently checking in with students individually throughout class, greeting students at the door, and letting students call him by his first name.

Melissa goes on to describe counting the number of times that Mr. M checks in with students. Here, her attention is trained on what the teacher is doing to create a positive environment. She describes how she observed Mr. M greeting students at the door and letting them call him by his first name. Her observations do not include how students respond, but do include speculations about why these teacher actions might create a positive environment. She concludes that his actions, "help build respect and show care, which are aspects of a positive environment," but does not state what she sees from students that indicates respect and care.

Once again, it is difficult to say that Melissa's attention is entirely narrowed or entirely broadened from her analysis of this record. In some ways it is narrowed because it is trained on the teacher's actions. And, other writing in her inquiry would indicate it is trained there for the purposes of figuring out her own task formulation. Her attention appears to miss how these teacher actions relate to student actions, therefore narrowly formulating the problem of a positive

environment as one composed of certain teacher actions, without regard to student response. In other ways, her attention has broadened to see multiple things a teacher might do to create a positive environment, and broadened to seeing how discrete teacher actions "work in combination with the other things [a teacher might do] to make [a] classroom even more positive. Given this, I would conclude that Melissa has seen more – more ways that a teacher might act in a classroom and more relationships among those actions. She has not

necessarily shifted her attention to something other than finding a solution to the problem of positive classroom environments.

(Sierra)	Go closer in
(Valerie)	Oh oh!
(Sierra)	Go closer! Like right here
(Minerva)	Wait…
(Valerie)	Oh oh I know I know! *(Runs around table to computer)*
(Sierra)	No, move this one!
(Jacky)	Oh my god.
(Minerva)	Right here?
(Valerie)	No
(Minerva)	Over a little bit?
(Valerie)	Yeah. No but then you have to have one right here.

Figure 6.2. Melissa's transcription of student conversation in a positive classroom environment

Through analyzing one more record of practice in her third chapter, Melissa turns to look at what students might do in a positive classroom environment. Melissa looks at a video that she believes shows a positive classroom environment and transcribes the conversation among the students (Figure 6.2). From this transcription, Melissa sees that students, "are willingly working together and helping each other. They are working towards accomplishing a goal, and they are doing it in a positive way, with smiles, productive suggestions, and voluntary participation." Melissa's analysis of the transcript leads her to see more of how students might act and interact in a positive environment.

What she sees in the transcript provides opportunities for Melissa's attention to broaden toward seeing how the environment makes these student actions available. She might look at the task, group compositions, and relationships in the classroom, amongst other things, to continue to broaden her attention, problem formulation, and task formulation.

Instead, though, she seems to return to her solution-oriented problem formulation of how to create positive environments through classroom management. She concludes,

> My initial impression is to still say yes- this interaction was made more possible by effective classroom management. The students knew that they would be held accountable for completing something, since both Mr. M and I had checked in with the group during this 10 minutes asking about what they were doing and what they were going to do next . . . I still believe that positive classroom environments lead to an easier time managing the classroom, and that effective classroom management leads to a more positive classroom environment.

While her attention broadened to seeing more than what she initially saw about classroom management and positive environments, Melissa essentially states that her problem formulation and task formulation remained the same.

Melissa's third chapter, much like her first, serves to broaden her attention, but does nothing to shift her problem formulation and task formulation. Though she sees more, she returns to formulating the same problems and same tasks to solve these problems.

Melissa concludes her inquiry with an emphasis on the problems that she "solved," rather than on new discoveries that she made. She writes,

> My exploration of checking for understanding has left me with some concrete ideas on how to best assess student understanding of content . . . Similarly, the exploration on positive classroom environments and classroom management has also left me with some conclusions and questions.

She closes her inquiry with two questions, one vision-oriented: "What does understanding look like?" and one solution oriented: "How can I assess a students' understanding if they

lack motivation to display their knowledge to me?" Melissa's conclusion and closing questions mirror the rest of her inquiry as there is primarily a solution-orientation ("concrete ideas" and "conclusions"), but there is still an opening to shift her attention ("questions").

Throughout the course of her inquiry Melissa had multiple opportunities to broaden her attention beyond solving practical teaching problems. It appears as though Melissa's attention broadened when

1) She looked beyond right/wrong test answers to see more deeply what students understand about a concept.
2) She began to question what counts as student understanding of a concept.
3) She questioned what counts as a positive classroom environment.

Melissa's attention seemed narrow relative to the places where it was more broad when

1) She thought she "solved" the problem of checking for understanding by giving students multiple ways to show their knowledge.
2) She concludes that certain classroom management strategies will lead to a positive classroom environment.
3) Her task formulation remained narrow, giving her fewer things to attend to

Unlike Sean who seemed to have narrowed his attention throughout his inquiry, Melissa seems to go back and forth between narrowing and broadening throughout the course of her M.Ed. report. She ends both of her lines of inquiry, however, with rather narrowly defined solutions that indicate a return to a more narrow problem formulation and task formulation.

Trajectory 3 – Focused attention that moves beyond solutions and toward vision: Ivan and the problems of student-student help and collaboration

Ivan is a teacher candidate whose inquiry takes place in a high school English classroom. Like Sean, his student teaching placement is also in a suburban high school in coastal California. My analysis of Ivan's initial writing about his inquiry questions indicated that he had a vision orientation and that his attention was broadened to seeing how students interact to help each other in an academic situation. (This is discussed in greater detail in the chapter 1.)

As the analysis below will reveal, Ivan's attention continued to broaden throughout his inquiry. He conducted fine-grained analysis on dense records of practice that led him to see much more both about his students and about the environment of the educational encounter.

Focused attention through fine-grained analysis leads to broadening: Ivan's chapter 1. Like Sean Ivan's inquiry begins with a cold spot in his classroom, and like Sean and Melissa, he sees this cold spot as a practical problem that needs solving. For Ivan, this cold spot is a moment in his teaching where he sees that it takes one student, Nelson, much longer to answer questions that Ivan poses to him. Ivan describes this cold spot: "Since Nelson was taking longer than usual, I felt anxious for him to either provide an answer or simply admit that he did not know. I also remember regretting calling on Nelson, or at least cold calling on him." At first Ivan looks to solve the problem of Nelson taking a long time to answer, but as he looks at the video to help him solve the problem, he realizes that there is more for him to see. Ivan explains,

"while my inquiry [at first] involved solving or attempting to solve practical problems, I fortunately found new things to look for on the way."

Through a very fine-grained analysis of video, Ivan discovers that it takes Nelson thirteen seconds to think after Ivan initially asks him a question, and before Ivan re-poses the question. Ivan calls this the "Thinking Time event." Ivan also sees that when he re-poses the question to Nelson that another student "helps" Nelson by whispering, "no," leading Ivan to conclude, "that the Initial Question Being Posed and Thinking Time events were the antecedents to the student-student help." He does not remember seeing this student-student help during teaching and decides to watch the video again to further explore this event.

When he takes another look at the video, Ivan finds that he cannot identify which student whispered, "no" to Nelson. While his is unable to determine from the video which student provided the help, he sees things that, "suggest that other students and more importantly Nelson noticed the help." He decides to analyze the video again to, "look more deeply at the varying reactions to the student-student help."

In the next look at this dense record of practice, Ivan hears another student saying, "shh," and sees Nelson slam his hand down on the desk. While he is not entirely sure of what to make of this event, Ivan thinks this student who says, "shh" might also be helping Nelson by giving him more time to think. It is only after all of this looking, that Ivan begins to formulate a problem by wondering, "which act of help works best. Giving the answer? Letting Nelson spend more time to think?"

Thus far in his inquiry Ivan is seeing more – more of what students are up to, more of the interactions in his classroom, and more of the relationships amongst the interactions. Ivan's attention in focused primarily on one student, but not narrowed to the exclusion of the

environment in which that student is acting. It appears that through focusing on one student, his attention has actually been broadened to micro actions that he did not see or attend to in the moment of teaching. The cold spot he experienced in the moment of teaching directs his attention toward the interactional environment in which this cold spot took place. Ivan's attention leads him to formulate a problem of student-student help. It is not yet clear what his task formulation is, but at this point, he appears to be formulating his task as one of looking more at how students help each other and how that help is received.

From his focused look at one student, Ivan next broadens his attention to explore how other instances of student-student interaction? might show how students other than Nelson receive help from their peers. In looking through video for a record to analyze, though, Ivan finds that Nelson is the only student who seems to be receiving this kind of help from his peers. Finding this curious, he looks at another video of Nelson receiving help.

In the next video for analysis, Ivan poses a question directly to Nelson (an act he calls cold calling), and sees that once again Nelson takes a long time to answer. This time, there is six seconds (which is triple the time that it takes the previous student to answer) after Ivan poses the question and before there is an instance of student-student help. While the instance of help is not captured on video, Ivan gathers that a student gives Nelson the answer because Nelson, "slams his fist" down on the desk and "shout[s], 'shh!'"

This 44 seconds of video broadens Ivan's attention, directing him to discover new problems. First, Ivan sees that, "Nelson's strong reaction to [another] student helping him caused a significant number of his peers to notice." Ivan then goes on to analyze the video for eye gaze and sees that while only one student was looking at Nelson prior to the "shh," most of the class turns their attention to him after. Ivan realizes, "that although student-

student help may be delivered discreetly, a strong reaction can make it public very quickly. Ivan also sees that unlike in the first video, Nelson is the one to "shh" his fellow student. Ivan begins to question if it was, "possible that Nelson learned how to use the interjection 'Shh!' from the first time around to advocate for his own learning."

This question (of Nelson's learning) broadens Ivan's attention beyond just seeing how students help each other, but to also formulating problems of how and what students are learning from each other and how they regard each other in these instances of "help." Ivan writes,

> What I discovered is there are variations not only to how students react to help, but also in how the classroom reacts to the student in need of help. With these strong reactions, the class learns more about what to expect from student-student help.

This seems like a powerful realization in that Ivan appears to recognize that student actions shape the environment and frame future actions. Essentially, he is seeing the environment in a more ecological way – the relationships among people and among sequences of interactions. A student's reaction to an offer of help tells other students how help is to be treated and responded to in this environment. This realization brings with it new problems for how students "help" each other in this environment.

In order to further explore these problems, Ivan turns to look at video of students helping each other in a non-academic situation. He explains, "The fact that the first two videos are teacher-led, class-wide activities makes student-student help appear "high-stakes" . . . Are there instances of student-student help that are low-stakes? If so, what does this low-stakes student-student help look like?" Though it is not totally clear, it appears that Ivan is

formulating his task as one of further exploring how the environment impacts student-student help.

Ivan finds this "low-stakes" help in a video of a group of students waiting for the class period to end. The students are not expected to be participating in any structured academic task, and Ivan and his cooperating teacher are not in the video, and therefore not near the group of students. In the video, Ivan sees a social situation in which one student helps another by telling him that a third student is getting in his backpack. Ivan sees a difference in this help situation in that the "help" is not discreet like it is in the Nelson situation. Ivan writes, "Abel deliberately helped Kent," by directly, "telling Kent that Ryan was looking at his backpack." This help was given, "in a way that was significantly clearer than the discreet way Nelson's unknown helpers did in the past two artifacts." This video indicates to Ivan that student help is different in low-stakes situations than high-stakes situations. In low-stakes situations, students help each other in direct ways that are not discreet. In high-stakes situations, students help each other discreetly.

Ivan also sees a similarity between this help situation and Nelson's situation – in both cases, the help was not wanted. Ivan observes Kent "reacting negatively" to Abel's help by grabbing his backpack and not showing "any sign of gratitude" to Abel for closing his backpack. This leads Ivan to infer that, as in the case of Nelson, the student-student help was not wanted, and makes him question if both instances of student-student help should actually be considered help. Ivan describes the new problem he has discovered:

> Both Nelson in saying "Shhh" to his helper and Kent checking his backpack suggest an unwanted/unwelcome response to the help being provided for them. This finding worries me because I originally thought that student-student help was only

unwelcome in high-stakes teacher-led activities and settings. For Abel's help to not be trusted is a little concerning.

Ivan's observations have opened an opportunity for him to formulate problems around trust in the classroom. Whether he reformulates the problem as such is not clear as he comes to the end of his first chapter. Ivan concludes this chapter stating that he will continue to attend to student-student help in collaborative group work situations.

Ivan's chapter one is a solid example of focused but broadened attention. Through fine-grained analysis of primarily one student, Ivan attends to a lot more of the environment in which this student acts. It is not clear that his task formulation changes – he starts the chapter attending to students and concludes it without any mention of solution, but rather continued avenues for attention.

A brief literature review that narrows his attention: Ivan's chapter 2. In his brief literature review (four pages), Ivan writes about a body of literature he reads that suggests a teacher's task is to teach students how to work in groups. This seems a narrowing shift from the complex ways in which he was thinking about group work at the end of his first chapter. Ivan concluded his chapter one with an interest in looking at group work to show him more about student-student help. The literature seems to suggest, however, that he shift his attention to, "students can be taught to work purposefully in groups." Ivan's reading of this body of literature has the potential to shift his attention to solution-oriented, presented problems.

Ivan also reads *Quiet* by Susan Cain, which challenges him to, "explore activities where introverts can feel comfortable and capable." This seems in contrast to the other

literature he read in that the task formulation suggested by this literature appears centered on attending to interactions in groups, rather than teaching students to work purposefully.

It appears that Ivan emerges from his literature review with a mix of solution oriented and vision oriented problem formulations. He concludes his review by stating, "I realized how necessary social interactions are for students in a classroom. Social interactions can be mixed in with lessons so that students become active speakers and listeners." This seems to indicate that he is oriented toward "solving" the problem by mixing social interactions with lessons. He also states, "I feel that exploring how students speak with each other (I will call them intermediate social interactions), will give me a better assessment of how students learn from each other." This seems to indicate a vision-orientation in which his task is to continue examining the environment in which students are learning. The start of Ivan's chapter three reveals what the literature actually does for his attention.

Student collaboration: A problem of student cognition or a problem of the environment?: Ivan's chapter 3.

A note about Ivan's third chapter. While it is not very evident in the peer review draft of Ivan's M.Ed. that was analyzed in this study, Ivan's trajectory of attention actually shifted significantly in his third chapter. As his M.Ed. group facilitator, I was privy to conversations about Ivan's inquiry that indicated a strong solution orientation and clearly defined assumptions about students at the start of this chapter. While it did not make its way explicitly into this M.Ed. report, Ivan began his third chapter with an interest in "training" students to collaborate. Only through conversations in the M.Ed. group did Ivan shift his attention from how to train students to seeing how students were actually collaborating in his classroom.

While there are very few indications of this initial solution-oriented problem formulation, there are a couple of hints, such as when Ivan writes, "Upon realizing that these students were *capable* [emphasis added] of collaboration." This indicates his initial assumption that students were not capable of collaboration without training. At the end of the chapter he also writes, "the way this chapter's focus group collaborated on various tasks within a short amount of time so well made me feel better about whether students *can* [emphasis added] collaborate." Again, he reveals his initial assumption (that might have carried through most of this chapter) that students were not capable of collaboration.

Though my knowledge of the shifts in Ivan's attention has the potential to bias the ways that I analyze his writing, I have done my best to maintain integrity to the data available for analysis in his third inquiry chapter. This said, I am also sensitive to nuances, such as the examples above, that another researcher might not have otherwise attended to.

Ivan begins his third chapter with what appears to be a solution orientation. He writes, "In order to improve my own implementation of group work for my future classes, I want to analyze the kind of group work that is going on right now as a student teacher." Initially, Ivan formulates a presented problem based on what he read about group work in the literature, and he formulates his task as "training" students to collaborate.

Not far into his investigation of collaboration, Ivan realizes that he is, "not too sure what collaboration looks like," and decides to look at video to help him figure it out. From what he sees in the video, Ivan writes,

> Because collaboration involves different criteria, I limited my focus to three over a specific amount of time: 1) whether students were talking to each other about the task

at hand, 2) whether students were looking at one another and 3) whether students wrote things down on their paper.

These criteria lead Ivan to summarize that collaboration, "is a combination of focus: [on] the work/task at hand and each other."

With this definition of and criteria for collaboration in mind, Ivan looks at a video where he sees students making and talking about funny faces. Ivan concludes from this video, "Three minutes of making funny faces was a clear indicator that collaboration on the *academic task* [emphasis added] was not happening." While Ivan, "would pose that these students did collaborate on having fun," this observation leads him to wonder, "how having fun compares to class tasks . . . What kinds of tasks compel students to collaborate on the academic tasks?" Here, Ivan seems to shift his attention to environmental conditions: fun and class tasks.

Through looking at this video, Ivan broadens his attention to more ways in which students might collaborate than he initially envisioned. They can collaborate on having fun and on class tasks. He further sees,

> This group rejected the class task and created their own fun and social task. This task proved collaborative worthy as they demonstrated maintained [sic] both eye contact [and] conversation with each other over a significant amount of time. But to answer my original question, this group did not collaborate on the classroom task.

Ivan's discovery that a task might be "collaborative worthy," or not, continues to direct his attention toward a factor of the environment.

Ivan next turns to look at collaborative tasks more deeply. This shift in his attention reflects a shift from looking at student behavior during a specific, academic task to exploring a broader range of tasks in the environment. Ivan explains this shift:

> Round 1's question had me focus on the academic collaborative task, while round 2 had me aware and open to many collaborative tasks. By using this more inclusive question for round 2, I paid attention to and noticed more collaborative conditions that I wouldn't have noticed for round 1.

Again, Ivan's broadened attention leads him to formulate new problems that are situated in the environment, in this case environmental "conditions" for collaboration.

To further explore collaborative conditions, Ivan looks at video of a group who he believes is not collaborating. Ivan does the same fine-grained analysis that he does in chapter one and records students' behaviors in a one minute, sixteen second group interaction. He then codes each of these behaviors, and comes to realize that the group is collaborating to trick him, the teacher, into thinking that they have read and understood the text.

Ivan describes two ways in which he sees the group collaborating to trick him. First, he sees students making "shallow" observations about the text. For example, "Student R described the story with empty adjectives like 'succulent' and 'awesome'. These contributions specifically honed in on the text, but rather shallowly described the story." Secondly, he describes a pattern of incorrect/correct responses where one student would make an incorrect statement, and another in the group would follow it with a factually correct statement. For example, "Student K provided an incorrect answer regarding the setting ("1800's") at 53:18. Student J immediately corrected K (53:19) with her answer ("1903!")."

Ivan goes on to describe the ways in which students collaborate based on the above examples:

> In this way, the group collaboration involved distinct roles that all members had to play; Student R was the comedian while Student J and K played the audience. The laughter might not have occurred and sustained itself without R's insistence. Conversely, Student R's ridiculous comments might not have worked if his group members were annoyed or scared. With the original question of factors that led to collaboration, my role as teacher played less of a factor than each member's role to each other.

Through fine-grained description and analysis of the relationship between student actions, Ivan concludes that students in this group are collaborating to trick him.

Ivan definitely sees a lot more, shifts his attention to seeing how groups are actually collaborating, and formulates new problems of collaboration. While he does not explicitly state his task formulation, he realizes that, "since these are middle school students, they are learning to interact with each other as they interact." This discovery indicates a new problem formulation of how students learn from each other, and holds possibilities for new task formulations as Ivan realizes not just that he needs to teach students to collaborate, but that their own collaboration and interactions teaches them how to interact.

From his examination of video, Ivan then turns to look at work of the first group of students who were not collaborating on the academic task. Because he did not actually see students doing any work during group time, he does not think that there will be much to see, but hopes that, "their work would indicate why the group did not work together." When Ivan begins to look at the student work, he experiences something of a frame clash when he sees

that, “all three members provided a significant amount of completed work.” This leads him to ask, “Are there any characteristics of the students’ individual work that either suggest the possibility of collaboration or explain why collaboration was impossible?” Ivan then looks more deeply at a worksheet of questions about a text that students were meant to complete collaboratively in small groups.

What Ivan discovers in these student work samples significantly broadens his attention to more complexities of student collaboration, and leads him to discover new problems and tasks. Ivan first looks at the student work samples to see if the members of the group have common answers to the questions on the worksheet. He sees that students have the same answers for the first few questions of the work sheet, which he describes as, “simple tasks like writing the author or title of a short story.” In looking both at the student answers and at the questions, Ivan realizes, “that the original task that I gave to students was semi-collaborative; they were encouraged to work together for productivity, but they did not necessarily need each other to do so.” Because of what he realizes about the nature of the task, Ivan also discovers limitations to what this record of practice can show him. Since, “the academic task was easy and did not require students to collaborate or hear the input from a peer,” the student work, and even the video, “cannot significantly show me as the teacher such a complex task like collaboration.”

Through these discoveries, Ivan’s attention is broadened to seeing more of the environment in which students do group work. As he begins to attend to the “collaborative task” and what it requires of students (productivity) he has new problems available to formulate about the environment – problems around tasks that merit collaboration. These new problems bring new possible task formulations that go beyond getting students to

collaborate and exploring and designing tasks that are collaborative, and situations in which collaboration is required.

Ivan further broadens his attention and problem formulation of what counts as collaboration when he looks again at this dense record of practice. Ivan sees that students have different answers to the "more complex and interesting" questions on the worksheet. In looking at the questions that students had different answers to, he initially assumed that they did not collaborate because their answers were different. He then begins to question if students' same or different answers can even be a sign of collaboration at all. He writes,

> The students obviously had a different understanding of the story's big idea. But did their different answers mean that they did not collaborate? And I realized that even if these students had the same answer for the "Big Idea" section, unanimity of one answer cannot be a clear sign of collaboration.

This realization indicates a broadening in his problem formulation of what might count as collaboration and how he might investigate it.

Ivan emerges from analysis of this dense record with these questions: "What kinds of tasks clearly require group collaboration? Which kinds of students will enjoy these tasks that clearly require collaboration? How do these fundamental collaborative tasks do things that individual or semi or anti-collaborative tasks do not?" These questions indicate new problems and tasks for Ivan to formulate about both the environment (what tasks, how do the tasks work) and about student cognition (which kinds of students). Ivan further indicates that his attention has broadened by describing how, "slippery it was to assess collaboration from the work samples." Ivan has no longer formulates a simple problem of students collaborating or not, but instead sees the problem, and the investigation of it, as much more complex.

In his final round of analysis for this chapter, Ivan looks again at the video he started the chapter with, but looks at an earlier portion, before the group work begins. He approaches his exploration of the video with these questions: "Could there be something wrong with the group? Could there have been something wrong with the task? If so, what were they and what can I do as a teacher to avoid these problems?" These questions seem to indicate that his attention is caught between broadening to the larger environment (task and teacher) and narrowing to student cognition (something wrong with the group).

To investigate these questions, he begins watching the video nine minutes before the clip he first analyzed. During this segment of video, students were supposed be working individually, but he wanted to see if there was some collaboration during this time. He first sees that students do not all finish silent reading and begin work at the same time. He also sees that not all students are done reading and ready to collaborate at the same time. He realizes, "how important readiness was for genuine collaboration to attempt to begin." Again, he broadens his attention to seeing something in the environment that impacts student collaboration.

Ivan also sees that students begin collaborating before the group work time formally begins, and that the formal commencement of collaboration actually stops the collaboration that was already taking place. Ivan describes this:

> These students were able to collaborate with each other during individual time without any prompting from me, their teacher. They discussed the story and maintained eye contact with each other throughout their discussion. They were even able to write and record some of their collaborative findings with each other.

> However, once I made announcements that interrupted their collaboration, the collaboration ended and turned into off task behavior.

Ivan broadens his attention here to how student collaboration happens naturally and to other environmental factors that might impact collaboration – in this case, an interruption from the teacher. Ivan's discovery that collaboration happens naturally seems to be a frame clash with his assumption at the beginning of the chapter that students did not know how to collaborate and he needed to train them.

What he sees leads Ivan to conclude, "as natural as it was for this group to collaborate, their process is susceptible to distractions; both of my doing and their own." Again, Ivan seems to be in the balance of explaining student behavior as impacted by the environment (his distraction) and their own cognition (their distraction). This balance seems further indicated by the questions he asks next: "How do friendships and personalities fit into the way students collaborate with each other? What kinds of tasks bring out collaboration reliably for all students?" These questions reveal that his attention is divided between student cognition and the environment by questions about personalities (student cognition) and tasks (environment).

Ivan concludes his inquiry by providing the reader a valuable glimpse into his attention, problem formulation, and task formulation. His conclusion also alludes to earlier problem formulations and solution orientations that were not explicit in the report of his inquiry. Ivan writes,

> I came into this inquiry looking for clear-cut solutions to my practical teaching problems. Why did this student react so negatively and how do I prevent that from happening? Why aren't these students collaborating with the time that I give them?

> In that process, I focused on the way these students interacted with each other and the task that I gave them. I was not able to find the clear-cut solutions to say making student-student help more positive in high stakes environments or having students comply by collaborating when the time calls for it. I did expand my thinking about what student-student help looks like. I was able to see how collaboration can be a function for academic tasks, but collaboration naturally occurs for other social reasons as well.

These concluding statements indicate an overall broadening of his attention (expanding his thinking and seeing that collaboration occurs naturally) and possibilities for new problem formulations and task formulations.

The statements above and Ivan's next steps indicate that he is not trying to solve practical teaching problems at this point, and that he might be formulating his task as one of investigating and changing the environment in which students learn. He writes,

> For my next step, I think about how at times, the natural interactions of students with each other contrast with schooling. Students can socialize about their day in low stakes settings. Students can discuss a good story. How is it then that the schooling and academic functions sometimes go wrong in their attempt to simulate the everyday interactions with group work?

These questions reflect a vision-oriented problem formulation that is situated in exploring environments, rather than student cognition, and suggest a task formulation that calls forth further exploration and making changes to environments, rather than students.

Throughout the course of his inquiry, Ivan's attention broadened as he looked at video. Seeing new things in the video led Ivan to see even more new things and broaden his attention. It appears that Ivan's attention broadened when

1) He focused analysis on one student, which allows him to see the ecology of the environment in which that student acts.
2) He saw that environmental conditions impact student collaboration and begins to question what tasks are collaborative-worthy.
3) He discovered that students learn how to interact from each other as they interact.
4) He realized that students naturally collaborate with each other and there is more than one type of collaboration.

Ivan's attention narrowed when

1) He formulated cognitive explanations for student behavior.

Trajectory 4 – Broad attention that leads to newly discovered problem and task formulations: Katherine and the problem of engagement

Katherine is a teacher candidate whose inquiry takes place in a middle school Spanish language classroom. Her student teaching placement is in a suburban middle school in coastal California. My analysis of Katherine's initial writing about her inquiry questions indicated that she had a solution orientation of how to get students on task that quickly shifted to an explanation orientation and that her attention was broadened to seeing why students were off task. (This is discussed in greater detail in the chapter 1.) As the analysis below will reveal, Katherine's attention continued to broaden throughout her inquiry, as discovered problems led to more problem discoveries.

Broadening and reformulation of solution-less problems: Katherine's chapter 1.

Katherine appears to begin her inquiry similarly to Sean and Melissa, with a solution-oriented, practical problem: off-task behavior. Also similar to Sean, Katherine's inquiry is prompted by a "cold spot" from her observations of classrooms, and from her own experience as a student. She writes, "off-task behavior has always been a frustration for me in school, even before becoming a student teacher," and goes on to describe her "impatience" with her "less-focused" high school peers. She also describes a moment in the second week of her first student teaching placement where she observed, "a room full of first-year Spanish students as they chatted, giggled, texted, researched irrelevant Google images or simply sat in the corner disengaged from the task."

While these observations might lend themselves to an inquiry that is looking to solve the problem of off-task behavior, Katherine shifts early in her exploration to considering other questions about student engagement. (She uses the terms "on/off task" and "engagement" interchangeably in the first chapter of her inquiry.) She asks, "Why aren't the students engaged? What encourages a student to engage in the task? What does engagement even look like?" Questions like, "what encourages a student to engage in a task" could also take on a solution orientation, but from the beginning of this chapter, she broadens her vision beyond just what an individual student might do, and considers multiple aspects of the environment. She explains, "Rather than blaming [students] as 'the problem,' I see the importance of considering additional factors, especially those related to the teacher, the lesson or the environment." Already, her problem formulation seems to go beyond cognitive explanations of student engagement and into the environments in which they are engaged or not.

Before Katherine begins formal analysis of her first artifact, she sees student action in ways that further broadens her attention and problem formulation. In looking at video of students, she discovers, "the problem isn't that students *aren't* engaged, but that they are engaged in something other than the academic task at hand." Seeing this indicates that Katherine is looking more broadly conditions of the environment, giving her new problems that are located in the immediate environment (the task at hand), rather than in student cognition.

Formal analysis of her first artifact further broadens Katherine's attention. Katherine chooses to video record a group of students because she, "noticed their tendency to be focused on everything *other than* the academic task." She calls this group the "Snapchat group." In watching the video of the Snapchat group, she also sees other students captured on the video and begins to, "wonder why so many students were off-task and what may have led to this behavior." She decides that, "before delving into these questions, [she would] begin with the observable behavior. [She] took note of every behavior [she] was able to observe of the eleven students in the frame." Katherine creates a thick description of student behavior to help her investigate why student are off-task.

From this thick description of student behavior, Katherine turns to categorizing the behavior as on- or off- task. As she categorizes, she begins to question, "What is considered 'off-task behavior' in the first place?" Through attempting to categorize behaviors like organizing school papers and a student asking the teacher about a grade, Katherine's attention becomes broader, and she begins to reformulate the problem of off-task behavior. She writes,

> This process of sorting made me realize that the difference between on-task and off-task behavior is not black and white as I once believed. I assumed that any behavior that was not directly related to the academic task of the lesson was not benefitting students and their learning. This analysis encouraged me to see students' behaviors in more detail and to take them into deeper consideration. Just because a student is not participating in *my goal* for them as a teacher does not mean that they are not focused on their learning.

Katherine's realization is indicative of her attention broadening to what students are doing. She also reformulates the problem around student learning, rather than on task completion. No longer is the problem that students aren't on task, but that they might not be focused on learning.

Katherine's new problem formulation brings with it a broader formulation of her task as a teacher. She attends to more of what students are doing, reformulates the problem as one of learning, and formulates her task as not just one of getting students working or even learning, but as a task of further attention. Katherine explains,

> The fact that the number of off-task behaviors overwhelm the number of on-task behaviors worries me as a teacher. There must be a reason so many students are not engaged in the task, but what is it? I feel that it is my goal as a teacher to investigate this in order to make changes that positively encourage my students to learn in the classroom.

Her task formulation here is to see more, not just get students on task. She sees her task as continuing to discover new problems, not just solve the presented problems of teaching.

In her discovery of new problems, Katherine turns to explore more of what might impact student engagement in the lesson. She examines the purpose of the task, student interest in the task, and student understanding of the teacher's expectations, under the assumption that all of these would contribute to student engagement. Katherine observes that when she introduced the task, she didn't ask students to pay attention and she didn't make the purpose of the task clear. Since the purpose wasn't clear, it wasn't likely to engender student interest, and they were working on textbook pages, which also wasn't likely to generate interest. She concludes, "the lack of these three themes in the introduction of this task led me to believe that the students' behaviors are not necessarily unwarranted." Since the task is one factor of the environment, her conclusion here is another example of situating her problem formulation (and possibly her task formulation) in the environment. By changing the way that she introduces the task, she is changing something that is in the environment. She sees the problem as not one of student cognition, but as one of environmental conditions.

After her discovery of what is happening in the environment, Katherine does not propose solutions in the ways that Sean and Melissa did. Although she does say what she might do differently, ("stop the class and take a couple of minutes to introduce the review pages, explain the directions for each section and, perhaps, begin a few questions together"), she does not stop broadening her attention with a proposed solution. Instead, she goes on to ask, "When did students switch to off-task behavior? Do any students alternate between on-task and off-task?" She continues to formulate her task not as one of getting students engaged or making the "three themes" present, but as one of continuing to attend to student engagement.

Katherine's next round of analysis keeps broadening her attention by directing it to the events surrounding where she thinks off task behavior began. She describes,

> I began my analysis by re-watching the video clip at the point when the textbook review pages were introduced. I hoped to see when the off-task students switched off-task . . . I realized many students, including the "Snapchat group", never got on-task to begin with!

This realization further broadens her attention by making her wonder at what moment students actually might have been on task. She goes back in the video to a moment when she thinks she has everyone's attention, and transcribes the 13 minutes between that moment and "the task" – the textbook review.

Through analysis of this 13 minutes of video, Katherine discovers, "the initial point of off-task behavior, the role of one student in initiating distractions, and the impact of the teacher's presence," leading her to ask, "Why did students immediately turn to off-task behavior?" This question leads her to look again at the environment and asks questions more about the environment than about students. While Katherine could narrow her attention like Sean and Melissa by asking a solution oriented question of how to get students on task or limit distractions, she instead broadens her attention to investigating environmental conditions. In her wondering about why students turn to off-task behavior, she discovers many more problems, including one student who causes a distraction for others and the impact of the teacher's presence.

She also formulates another problem – whether students who appear to be on task really are. Katherine writes,

> It *appeared* to me that students were working on the task, but were they? Was their reaction to my presence (facing forward and looking at their paper) an attempt to *fake* on-task behavior? How does one truly analyze on-task behavior and off-task behavior if on and off-task behavior are not so clearly identifiable?

Again, her problem formulation is vision oriented, and her task formulation is to continue to explore the problem. Conversely, a solution orientation would conclude that because students looked on task when the teacher walked by that they were, and therefore the task of the teacher is to increase her presence for off task students.

Katherine continues to attend to this by looking at student test scores to see how apparent on/off task behavior during the test review task correlates to students' scores on the test. Through analysis of the test scores she discovers that, "the off-task students received both the highest and the lowest scores on the exam." Without a clear correlation between test scores and on/off task behavior, Katherine experiences something of a frame clash. She explains, " I assumed that off-task behavior was bad for learning and on-task behavior was good for learning. How does that explain, then, the three off-task students with high grades?" Katherine goes on to describe what this frame clash does for her attention and problem formulation:

> Analyzing the students' grades in comparison to their in-class behavior produced several findings. First, it contradicted my assumption that students who appear on-task in class receive higher grades on assessments (supposedly, a sign of their learning). Second, it suggests that off-task behavior may not only manifest because of disengagement or other "negative" reasons. Instead, I wonder if mastery of the material sometimes also contributes to off-task behavior . . . I now see that both

> students with high and low grades could see a lack of purpose in the assignment, but for different reasons.

Katherine has once again reformulated the problem beyond on and off task behavior or even learning of the material to a problem of "mastery" of the material, as she wonders what impact mastery of the material has on student engagement.

Again, Katherine's task formulation is not to solve the newly discovered problem of mastery, but to broaden her attention further into the environment. She turns to look at video in which student engagement was present, and specifically looks to see if the three themes of purpose, interest, and understanding (that she initially thought played a role in engagement) were present. Katherine's dense record is a video in which students are playing a review game for a test, instead of doing the textbook questions. She sees in the video that, "The purpose is briefly explained (to review), the rules of the game were clearly and explicitly stated and, being that it was a game, I assumed there would be more student interest in the task." She then assumes, that because, "these themes [were] present, more on-task behavior would be present as well." Katherine sees in the video that more students are on task than off task, and all students are on task in the beginning, but some lose engagement. She also sees that a student who is typically off task is actually on task at the beginning of this activity.

Katherine next turns to do the same grade correlation that she did for the previous activity. She compares students' on task behavior during the test review game to their test scores. Similar to her early analysis, Katherine finds that the,

> results are opposite of what is expected. The student with the highest test score for chapter two was not engaged throughout the end of the review game (Jaeden), whereas the student who received the lowest score was (Eddie) . . . This greatly

emphasizes my earlier findings that on-task behavior is not directly related to higher grades and off-task behavior is not directly related to low grades.

Once again, Katherine experiences something of a frame clash between her expectations and the data. It is possible that this frame clash is what prompts her to continue to discover new problems and ask vision-oriented questions; a solution is not plainly available for this problem. When Katherine realizes that her, "belief that on-task behavior leads to better grades does not hold true for all students," and that, " the 'more-engaging' review game did not necessarily benefit *every* student more than the textbook review," she is left without a presented solution and is in a position to continue to formulate new problems and tasks.

Katherine ends her chapter one with a series of questions:

> If students appearing to be on-task are not necessarily doing any better than students who appear to be off-task, then what is the relationship between in-class behavior and student achievement? What is the role of on-task and off-task behavior in student learning, if any, and what can I do as a teacher to encourage student learning and engagement in my classroom?

While the last question of "what can I do" might indicate a solution orientation, Katherine closes her first chapter by writing,

> My goal for further research is to direct my attention toward ways in which the teacher can encourage engagement in the classroom. Does engagement only relate to lesson purpose, interest and understanding, or are their other factors to consider as an instructor, such as student-teacher relationships, student-student relationships and classroom culture? I plan to investigate these topics in order to determine their effect

on student engagement and performance. These questions and curiosities will be the focus of subsequent chapters.

Her task here is formulated as one of investigation, not problem solving.

Literature offers new problems and tasks for formulation: Katherine's chapter 2. For her literature chapter, Katherine read research on student engagement. While the literature could provide her solutions to the engagement problem, as it did for Sean and Melissa, in this case it seems to give her more to look for. The articles she reads describe how choice, meaningfulness of the task, student identity with the task, ownership, and real world connection to the task all contribute to student engagement. These ideas lead her to, "wonder about personalization, ownership and identity, and the ways in which the presence of these in a lesson affect student engagement in the lesson." While Katherine, "had never recognized the importance of identity and ownership," she became most interested in real world connection to the task.

Through reading literature on student engagement, Katherine's attention is broadened to factors in the classroom environment that might affect engagement. She also sees the ways in which these factors might work in relationship to impact engagement. She explains how one researcher, "separately points to 'real world connections' as a motivation strategy, yet [she] chunk[s] this with purpose and meaningfulness because [she] see[s] them as interdependent. If a task mirrors a real-world situation, it should naturally encompass meaning and purpose." This discovery and problem formulation of the relationships between these factors has the potential to impact Katherine's task formulation as she goes forward in her inquiry. She explains,

> During chapter one, I emphasize the importance of designing lessons with task purpose in mind. However, I now believe the focus should not only be designing meaningful lessons, but also making the purpose of these lessons transparent to students. In my efforts to design lessons with purpose during the last few months, I realize I have focused little attention on explaining these goals to my students. Rather, I assumed students would naturally understand the relevancy of the lesson to their own lives. In chapter one, I focused on the importance of student interest in the material, but identifying with and owning the material encourages a new level of connection with the learning process.

At very least, what she discovers in the literature gives her new insight into her practice, as she realizes ways in which her teaching might be affecting students.

The literature that Katherine read does not provide her solutions to her teaching problems, but rather new frames for formulating these problems and her tasks as a teacher. She leaves her exploration of the literature wondering, "how the implementation of these factors influence student engagement in class, and how this contributes to student performance." She asks, "Do students perform better academically when lessons are designed with choice, identity and real-world application in mind?" With this question in mind, she describes the next steps of her inquiry, stating, "I intend to focus my attention on comparing student engagement when these factors are and are not present. This will require me to determine what student engagement looks like and how it can be measured." While there is the slightest bit of solution orientation here – she wants to get students engaged (which, isn't a bad thing!) -- she recognizes that her task is to continue looking, and

maintains a vision orientation to figure out what engagement looks like and how it can be measured.

New problem formulations as "solutions" to past problems: Katherine's chapter 3. To begin exploring the questions that the literature raised for her, Katherine gives students a choice of activities to learn new vocabulary. She also gives students a survey, asking them which activity they chose and to rate how interesting, exciting, and relevant it was on a scale of 1-5. The survey also included an open-ended question about what would make the activity better. As she analyzes the survey, Katherine sees that the mind map activity had the highest scores for relevance, while drawing a picture of the vocabulary words had the highest scores for interest and excitement. Unlike Sean and Melissa who took survey results as a way to solve their problems, Katherine takes these results as an opportunity to look further and broaden her attention.

To do so, she looks at the open-ended question answers and sees that students' responses to the question of how to improve the lesson go beyond the three factors she thinks will lead to engagement, and include things like time and additional choices. She also sees that eight students put that there was nothing to improve, but also did not give the lesson a "5." She explains that the results, "further demonstrate the lack of connection between these descriptors and engagement. It also suggests that students see 'interesting' and 'exciting' in a lesson much differently than I do as the teacher." Her attention is also broadened to what might count for students as interesting and exciting. Seeing that her ideas of interesting and exciting are different from students' ideas holds the potential to broaden her attention beyond the ways she is formulating the problem of engagement. This is very different from Sean's analysis of surveys. Katherine sees ways in which students might see engagement differently

from how she does, while Sean does not realize how students might see group roles differently from how he does.

These survey results lead to significant problem and task reformulations for Katherine. First, Katherine broadens her attention beyond how the three themes of choice, identity, and real world application impact student engagement. She writes about this broadening:

> I began this chapter focusing on the three themes of student choice, identity and real world application, and their impact on student engagement. However, these varied comments suggested to me that there was much more to consider and look for. For example, what is the impact of social grouping on engagement? Are students more engaged when they work with others or individually? Furthermore, what is the impact of drawing, art and creativity? Are students more engaged when they have freedom to express themselves creatively?

Secondly, Katherine recognizes the importance of broadening her attention and the ways in which it might impact her problem formulation. The ways that Katherine is thinking about her attention and problem formulation excites me as a researcher because they hold new possibilities for her task formulation. She writes,

> I figured from the beginning of this inquiry that more than just three factors played a role in student engagement, but I kept my focus on those three factors in order to keep my inquiry simple. This analysis taught me that it is almost unnatural to confine engagement, interest or excitement to so few factors. I felt it was unnatural because students referenced many factors and ideas in their responses that were not related to

> the three I began with. Their perspectives mattered to me and I felt it was important to account for them.

By recognizing her own narrowed (she writes, "focused") attention, Katherine comes to understand the ways that it can impact how she is formulating the problem of engagement. Katherine consciously discovers a need to broaden her attention so that she can better account for the wide range of student perspectives and engagement in her classroom.

Finally, given this new problem formulation of finding the multiple factors that might lead to engagement, beyond just the "three themes" she initially proposed, Katherine formulates her task once again as one of further investigating engagement. She explains,

> The responses provided by my students suggest that a wide range of factors influence engagement and should be considered in my analysis of engagement. Therefore, my next round of analysis attempted to further explore the factors that impact engagement in order to best find where engagement does and does not occur in my classroom.

Katherine's task formulation is not just to solve the engagement problem or even to try to figure out engagement through a pre-determined set of factors, but instead she broadens to infinite possibilities of "factors that impact engagement." She sees narrowing her attention to these factors as "unnatural" and "confining" and has formulated her task as one of broadening her vision.

Katherine's problem and task formulations as described above are much different from how Sean and Melissa formulate their tasks. Sean and Melissa welcome the narrowing that confining a phenomenon to a few factors can bring because it makes a solution much more obvious. This makes sense when you have a solution-oriented problem formulation.

The inflection point that broadens Melissa's attention is looking at student responses beyond her initial coding scheme. This is also unlike Sean who makes what he sees fit within his initial coding scheme, and unlike Melissa who dismisses what she sees in favor of her coding scheme. Katherine, unlike Sean and Melissa, allows her inquiry to be guided by individual cases, rather than a rigid quantification of students and records of practice.

The discoveries that Katherine makes from her analysis of these surveys leaves her knowing that she needs to, "further explore the factors that impact engagement," but not quite sure how to begin. Katherine gives another survey to students, not for the purpose of exploring those factors, but for the purpose of helping her figure out where to look next. She writes, "my goal was to use the survey to guide the focus of my next steps of research." She does not intend for the survey to provide her answers to her questions, but instead intends, "to ultimately look at video footage from [her] classes, and hop[ing] that student responses to this survey would help guide [her] analysis." The survey asks questions such as, "describe what makes a class, lesson or activity engaging. What is an example of an activity that was engaging?"

What Katherine discovers in these surveys serves to create another frame clash for her with what she read in the literature. She sees that student responses about what make them engaged are different from what the literature says leads to engagement. For Katherine, this data, "confirmed engagement is not a concept easily reduced down to three factors." While she does find some evidence of the "three themes" in student responses, it is "very minimal," leading Katherine to, "question the validity of the literature." While she recognizes that surveys are not always the most accurate way to identify what is engaging for

students, she still finds it, “intriguing that the factors so highly referenced in the literature are not common in student responses.”

Instead, the student responses indicate that students are engaged by things that are, “fun, hands-on, creative, artistic, and social.” This could be yet another place for Katherine to stop in her inquiry, believing that she has a solution to the engagement problem – just give students fun, creative group activities to do and they will be engaged. As we saw with Sean and Melissa, survey responses can offer candidates solutions. For Katherine, however, the survey responses offer her yet another opportunity to reformulate the problem, and she begins to ask, “What counts as fun? What is it about social interactions that contributes to engagement? Does the participation of one's peers encourage engagement?” Katherine’s task now becomes to investigate the relationship between engagement and social interactions.

Katherine takes this investigation a step further by wondering if social interaction might account for differences she noticed between her first and fifth period classes. She sees in the surveys that, “the idea of ‘whole group participation’ was suggested in the results from fifth period but not first period. This began to explain the different feelings I had in the two classes.” This is a significant moment for Katherine’s attention and problem formulation because she sees more in the data than just student responses to the engagement problem, and begins to formulate a new problem of social interaction. This leads Katherine to,

> consider the influence of this social phenomenon on engagement . . . I wondered what impacted this idea, such as classroom connections, lack of community building, or simply the unique mix of students in the classroom . . . This was a point of interest I hoped to better understand in later research, especially in my analysis of video footage.

Here, Katherine indicates that she is beginning to formulate a new problem – one that is still related to engagement, but is not the same problem she has been formulating. At this point, her inquiry gets deeper and wilder as it goes beyond the bounds of engagement. While she is still connected to the idea of engagement, she's willing to deviate from the "three themes" of engagement that she found in the literature and go into rather 'wild' territory of student social interactions to figure out the engagement problem in fifth period.

Before she looks at video footage, Katherine goes on to analyze the survey question that asks students what activities are most engaging and discovers that the top two responses from both classes are projects and games. She also sees that these activities might relate to other engagement factors students listed: fun and social. Additionally, Katherine discovers that fifth period has a much broader range of what they think is engaging. This discovery leads her to realize,

> as a teacher, I have certain expectations about which activities s*hould be* engaging for students . . . Even when I taught using lessons and activities I believed were engaging, I still felt a lack of engagement in the room. The range of responses from period five conveys the importance of understanding the preferences and learning styles of individuals in the classroom. Perhaps the greater range of learning needs in fifth period is what makes the class seem less engaged with any given activity.

Katherine's attention here is broadened in ways that we can believe might lead her to act differently. Although there is a slight move into student cognition (the preferences and learning styles of individuals), she still situates the task formulation in the environment – to create different activities.

Katherine experiences yet another frame clash in the survey results when she sees that students who she would describe as "engaged" because they complete their work and participate in class, state that nothing in Spanish class engages them. She realizes, "just because a student is more or less on task and completes his/her work does not necessarily mean that he/she is truly engaged." This realization provides Katherine with a new task formulation: "Their responses suggested that I needed to look at more signs of what engagement is/isn't aside from just on/off-task behavior and participation." Again, Katherine's task formulation is to do more looking at the environment, not just "get students engaged." All of her attention to and reformulation of this problem seems to matter for what problem she might eventually solve. Because Katherine thought certain students were already engaged, "solving" the problem by "engaging students" (through whatever strategy) isn't necessarily going to solve the problem. At this point, the only task for Katherine to formulate to really solve the engagement problem for these students is to continue looking.

As she continues looking, Katherine finds more possibilities for task formulation. Seeing that student responses suggest that their engagement in an activity or lesson is highly based off of the involvement of their peers, suggests to her, "the great impact of peer relationships and interactions in the classroom." Recognizing this impact, she writes, "If students' willingness to engage is based on their peers' involvement, what does that tell me about the design of my lessons or classroom? Here she is situating her task formulation in the environment, not in student cognition. The task for her to do isn't "how to get students to do this thing," but "how do I design environments for them to be able to or want to do those things."

With her attention directed by the student surveys, Katherine next analyzes a video from a moment that she remembered students being engaged to, "see engagement as students participated in order to better understand what engagement looks like and what contributes to more student engagement." In this video of students playing a vocabulary relay game, she sees students smiling, laughing, and participating. These observations help Katherine, "elaborate on [her] working definition of engagement," but also bring up new questions as she begins, "to wonder whether or not the engagement I saw was good for learning."

As Katherine analyzes the video and transcribes student actions during the relay game, her attention is once again broadened – broadened to student behavior, and also broadened beyond her working definition of engagement. Katherine writes,

> When I looked further, I realized that not all the *signs* [emphasis added] of engagement I saw resulted in behaviors that were positive for learning. I *assumed* [emphasis added] that students (such as Garrett at 2:08) were engaged in the verb relay game because they were smiling, participating and seemed to be having a good time.

What she discovers, however, through closer looking at this video, is that Garrett and the other students on his relay team are not engaged in the task, but are engaged in social interaction. She sees that students in this group are writing "X" for each step of the relay, instead of writing the verb conjugations for different subjects, as they were meant to do.

Seeing this broadens Katherine's attention to what else might be going on in the classroom beside initial appearances. Katherine writes,

> The signs I saw (smiling, laughter, passing the whiteboard) initially signaled to me that this group was enjoying the activity and was engaged in the task. However, I

> later realized they were more engaged in their social interaction than the task. This suggested to me that there may be different types of engagement taking place in the classroom at one time. I began to describe these as task engagement and social engagement.

These observations give Katherine new problems to formulate. While she initially saw only one type of engagement – task engagement – she now sees social engagement which brings with it new problems and new tasks.

Though she arrives at the conclusion of her inquiry shortly after this analysis, Katherine formulates her next task as one of exploring the differences between task and social engagement and the relationships between the two. Katherine ends her inquiry wondering, "how social engagement can be utilized to positively encourage learning." She asks, "How does learning compare when there is and isn't social engagement? Is social engagement a necessity for learning?"

In short, Katherine's inquiry is messy and wild. While Sean and Melissa's inquiries formulated neatly presented problems for solution and identified possible solutions, Katherine's continued to spiral through multiple problem and task formulations as her attention to each problem mad available further problems for discovery. In this way, Katherine used new problem formulations as "solutions" to previous problems. Katherine's inquiry also seems to indicate that solutions do not always "solve" problems. This is evident in the way she exposed that the problem she was exploring was often only what is visible on the surface and that the "real" problem often requires more looking.

Throughout the course of her inquiry Katherine's attention continued to broaden as she discovered new teaching problems. It appears as though Katherine's attention broadened when

1) She experienced frame clashes that occurred when she expected to see one thing in a dense record but saw something else
2) She discovered new problems that required attention to new phenomena and problem reformulation.
3) She formulated tasks that involved examining and changing the learning environment, rather than individual students.
4) She continued to attend to the learning environment when she tried something new.
5) She looked at dense records multiple times and in multiple ways.

Trajectory 5 – Broad attention that continues to broaden: Kari and the problem of connections

Kari is a teacher candidate whose inquiry takes place in a high school and middle school English classroom. My analysis of Kari's initial writing about her inquiry questions indicated that she had vision-orientation that looked to examine complex relationships in her classroom. (This is discussed in greater detail in the chapter 1.) As the analysis below will reveal, Kari's attention continued to broaden throughout her inquiry, as she discovered new complexities of classroom connections, and she broadened her attention to the ways in which these complexities formed the ecology of the environment.

Starting broad: Kari's chapter 1. Unlike the other four candidates in this study, Kari does not appear to be looking to solve any practical problems at the beginning of her inquiry. Instead, her inquiry is prompted by the work that she did in her summer

Foundations of Teaching courses. These courses led her to engage in, "an ongoing, messy, and illuminating struggle to understand the roots of learning." After seeing a "cold spot" in a classroom, which she describes as, "an unsettling interaction between a teacher and a student," that left her, "feeling uneasy," Kari began to, "consider the relationships between teachers and students and students with their classmates." Kari's inquiry centers on the question: "What is the role of human connections in an individual's learning experience?"

Kari begins to explore this question in her first chapter by first investigating "what does human connection look like in the classroom?" She conducts a series of observations in three classrooms, looking for connections, and taking observation notes. Through initial observations, Kari starts to see that there is a difference between what she calls "connections" and many of the interactions she saw. This led her to wonder about the difference between interactions and connections. She forms a "working definition" of both:

> Interactions happen in the classroom when an individual does something in accordance with another person. In human connections, individuals are influenced by each other in a positive and constructive way. Like interactions, connection requires accordance, but it also insists on the cooperation and the unspoken mutual respect between two or more people. Connections are reciprocal.

This working definition gives Kari a frame for her observations and leads her to code what she sees in her observations as either interactions or connections. It also made her wonder if, "the type of connections [she] was looking for, those that were natural and led to an extension of learning, were visible in the classroom, or even permitted when they were not part of the lesson."

In one observation, Kari observes and takes notes in an AVID (Advancement Via Individual Determination) class, and sees students participating in a class routine known as the "weekend update." In the weekend update, the teacher asks students about their weekends, and they share what they did. When Kari first observed this, she thought, "the teacher [was] simply using the time to check in with the students." Though she does not have video of the classroom, Kari has thick field notes that include student and teacher dialogue, which, "made [her] think otherwise." Through examining her field notes of the instance, Kari sees that the teacher, "extend[s] the students' narration by asking questions and requesting elaboration." She also sees that students do the same for each other. Kari concludes that, "on the surface, this social conversation gives students a voice and provides the chance to develop a classroom community." She also broadens her attention to see that, "on an even larger scale, it supports the belief that learning is a social activity." Additionally, Kari broadens her attention to see that, "this interaction sparked a connection between the students as they found ways to relate to each other outside of the academic world."

Through looking at the specific dialogue and behaviors of students in this interaction, Kari broadens her attention to the environment in which this interaction takes place – the connections among students and between students and the teacher. She also broadens her problem formulation beyond social interactions to the ways in which social interactions might impact the learning of academic content. Kari describes this as she questions, "whether or not students would transfer the practice of active and positive discussion to learning academic content."

To investigate this question, Kari observes an eighth grade English class as they have a discussion about World War II. A large portion of the students in this class are also in the AVID class she observed. Kari "transcribed the conversations and looked for relationships within the dialogue by noting what the teacher and students were saying." This description of the observation indicates that Kari's attention remains broad by not just looking at isolated instances or extracting selected conversations or behaviors, but by intentional and concentrated attention to the relationships in the environment. There does not appear to be any solution orientation in her topic or methods of analysis. She observes, takes notes, and then interrogates those notes for what might be going on in the class in order to see more. She formulates her task as a teacher to figure out what is happening, not solve a problem.

In order to see if connections were being made in this class, Kari's analyzes her observation notes for patterns of interaction. She first lists, "the order of what was said and done in class," which allows her to, "examine the cause and effect of various scenes." Kari explains that she, "chose to sequence these segments of the class to illuminate patterns or differences through time." Again, Kari conducts her inquiry in a way that seems intentionally designed to broaden her attention beyond what is obviously available to be seen and into less apparent phenomena (patterns) that have the potential to change her problem formulation. These patterns form the ecology of the environment.

Through her analysis of the patterns of interaction in the WWII conversation, Kari sees that students share personal connections to the topic and use patterns of questioning and answering that, "propel" the academic conversation. Kari's transcription of student dialogue reveals that, "students confronted new ideas with continuous dialogue and meaningful conversation. The class members listened to others, orally announced their knowledge, and

questioned the information that their peers were sharing." Kari concludes from her transcription and coding that, "the process of thinking aloud, connecting to prior knowledge, and sharing ideas with each other, that was embraced in the [weekend update] conversation, transferred to the discussion about the history of World War II."

Kari's observations and analysis of her observation notes help her to identify what she means by connections in a classroom. She writes,

> As I watched, and later in the review of my observation and analysis, I saw that this was the type of connection that I was looking for. I was searching for moments when students were actively asking questions, sharing knowledge and building on the thoughts of others.

This discovery could narrow Kari's attention by defining "connections" as "asking questions, sharing knowledge, and building on the thoughts of others." It could also serve to broaden her attention by allowing her to focus on how these three components of connections work together to form an environment's ecology.

It appears from her next question – "How do human social connections affect student learning?" – that her attention might further be broadened to the environments in which these connections exist. While her last observation helped her see if and how students, "transfer the practice of active and positive discussion to learning academic content," this observation is meant to help her see if that practice affects their learning.

Kari looks next at a video she took of students in an ELD (English Language Development) class where students are doing research on drug use. She transcribes the conversations and interactions amongst a group of students and sees in the transcript that one student, Jenn, "was comfortable enough in her surroundings to ask questions . . . This

particular student seemed curious to learn and unafraid to ask her question." She then wonders about the environment in which this interaction takes place and how it, "affect[s] the student's willingness to ask questions." While Kari could ask question about student cognition, such as what is it about this student that makes her comfortable enough to ask questions, she once again directs her attention to the environment and how it impacts students.

Kari's investigation here is also different from Melissa's. Melissa saw student behavior and concluded that it was a positive environment. Kari sees student behavior and asks what in the environment impacts that behavior.

From the three observations in her first chapter, Kari developed a working definition of connections, saw interactions amongst students, saw how social interactions might transfer to academic settings, and began to explore how student interaction might impact their learning. This broadened attention leads her to formulate new problems that go beyond what might be a presented problem of helping students make connections in a classroom, and gives her new task formulations. Kari concludes her chapter, stating,

> The "Weekend Updates" from the AVID class showed me how classrooms can use social connections among students, in the process creating positive learning conditions. But the "Weekend Update" artifacts from AVID did not provide me with the evidence of how personal connections and how taking time to discuss personal interests can motivate or extend learning. On the other hand, the "Weekend Update" and the discussion that followed within the 8th grade English class, showed that the chance to communicate with others and establish personal connections can potentially influence the participation and learning that occurs within a classroom.

This seems to indicate that her problem formulation shifts as her attention shifts. She begins to formulate a problem of using connections to extend learning, and a task to create environments where students develop connections that will extend their learning. To help investigate this new problem and task, she states that her next step will be too look at, "When are connections made in the classroom?"

Literature that further reformulates the problem and task: Kari's chapter 2. With attention directed toward, "creating an environment for social learning," Kari approaches her exploration of the literature looking to see more of what contributes to environments where students are making connections. Her reading leads her to literature on "belongingness," in classrooms, and an article by Baumeister and Leary (1995) that discusses how belongingness that goes beyond "mere social contact is crucial" for students. From this, Kari formulates new problems and tasks as she begins to wonder, "what belongingness looks like in a classroom. How can a teacher identify a student's feeling of belongingness? And if this is known, how can a teacher modify or develop this sense of belongingness?" It appears as though Kari reformulates the problem of connections in classrooms as one of belongingness, and her task as one of identifying students' feelings of belongingness and further developing them.

With ideas of belongingness in mind, Kari also reformulates the problem of connections more complexly. She wonders, "how the communication and connection that is created or already exists can be used to motivate students as they learn academic content." The problem now is not the creation of connections, but finding the connections that *already* exist amongst students in an educational encounter, and using those connections to "motivate" students' learning.

This newly discovered problem leads Kari to discover yet another problem. She writes, "if teachers create a space for the potential of human connection, are the students essentially missing out on a more organic bond with others that they would have forged on their own?" The new problem seems to center on a concern that a teacher's task formulation could be misplaced. She is formulating a problem that calls forth a new task formulation – not interrupting the connections that already exist.

Both of these discovered problem formulations lead Kari to significantly reconceptualize her task as a teacher. Her task is not necessarily to create a space for human connection or to try to create human connections. While that might be one task, the newly formulated ecological view of her task is to pay attention to the bonds that students naturally form and the ways in which they might form them. Additionally, Kari seems to recognize the significance of this ecological task formulation. She writes, "the events that occur in one surrounding impact the learning and development [of students] in another setting. As a result of the connectivity between settings, I have come to realize the importance of the teacher's facilitation of these connections." This indicates a further broadening of Kari's attention, but suggesting a problem formulation that goes beyond a single classroom, learning environment, or educational encounter, and into a greater sense of a student's interactions in the world both in school and outside of it.

Trying out solutions that offer new problems and tasks to formulate: Kari's chapter 3. Kari leaves her exploration of the literature with her attention broadened and new problem and task formulations. She starts her third chapter interested in discovering, "what connections look like, where social bonds are created and maintained, and how comfort [with] and interest in others can motivate students towards an extension of learning." In

order to investigate these questions, Kari gives students a survey in order to, "narrow [her] focus and guide the next steps of [her] inquiry." By giving a survey, Kari does not "narrow" her attention toward finding a solution or simplifying her problem formulation, but rather focuses it on students' understanding of the classroom social environment in order to further broaden her problem formulation.

As Kari analyzes the survey responses, she also looks for relationships between students' responses to each of the questions. The first question of her survey asks students if they "keep their thoughts in, instead of sharing them with the class." Kari explains that this question might show her, "how students might feel vulnerable or confident within a classroom." While students' answers to this question alone might provide Kari with some information, she looks beyond their answers to this question and starts connecting student answers to multiple questions. For instance, she writes, "As I looked over the responses, I noticed that many of the students who held their thoughts in during class, also mentioned that they were afraid of their classmates' responses or thoughts about them." She also finds that student responses to these two questions relate to another question about how relationships affect students' performance in class: "Of the students who mentioned that they do not share in class, 37 of them claimed that it was somehow due to the influence of another person or group of people." This finding connects to yet another question about what motivates students to learn, as she sees that students' most common response is another person, like family, friends, or teachers. From her analysis of the relationship between students' answers, Kari discovers, "the survey pointed out that students' participation, performance, and motivation, is most often impacted by the thought of how it affects others or how others may react."

Kari's discovery in the survey opens the possibility of new task formulations as she asks, "if students are influenced by others in regards to their participation, performance, and motivation in class, what is my role in their learning?" Kari's next step is to analyze the survey question that asks students what advice they would give to their teachers. Kari sees in these responses that students say things like, "teachers should be supportive, take time to give extra help, and get to know students." She also sees statements that suggest that a teacher should create "respect" and "trust" in a classroom. Kari concludes that these are, "statements related to making connections with students." Given that she sees many such statements in student responses, she begins to wonder, "what these suggestions might look like in a classroom. For example, [she] began to wonder what respect and trust looks like." Again, she could formulate her task directly from the survey responses by supporting students or giving them extra help, but instead, she formulates her task as understanding what these suggestions actually mean.

In addition to these findings, Kari sees two other things in the surveys that direct her attention. First, the survey reflected the, "drastic impact of family on students' academic lives." Second, one student writes that her advice to teachers is to, "make students feel worthy." Both of these discoveries lead Kari to consider new problems. She asks if teachers could, "have a larger influence if they shared some of the qualities of a family member?" She also questions how she, "could construct the conditions for students to feel worthy." Both of these questions guide her to formulate the task of, "apply[ing] these student suggestions to [her] instruction and see[ing] whether or not they help [her] to create connections with the learners. While there is a possible solution orientation here (how to), her task formulation remains vision oriented to *see* the connections with learners.

Additionally, her task formulation is situated in changing the environment, not individual student cognition.

Kari's next move is to, "systematically apply some of the student's advice from the surveys into [her] teaching practice." She begins by "connecting" with students who requested more attention from the teacher in their surveys. Kari holds "check-in" conversations with three students and sees that two of the three volunteer to read in class (and they hadn't before). While Kari could assume that her problem is solved, she approaches these findings cautiously, writing, "The short 'check-in' conversations that I had with each student should not be seen as the direct reason for this change." Though there seems to be some solution to the problem, Kari's attention remains broadened.

Kari continues to have "check-ins" with students who seem to struggle in the class. These check-ins are not always welcomed by the students and leave Kari with new problems to formulate. During one check-in, the student, Bryan, expresses that Kari is "making it hard" on him. Another check-in with Esau seems to be unwanted as the student does not respond to her questions or efforts to help him with the assignment. This leads Kari to wonder, "if there was a time when teachers could try too hard to make the students feel connected and comfortable." Kari ends her third chapter, "curious about students who received support, attention, positive feedback, but still lacked motivation and engagement in class."

As she concludes her inquiry, Kari indicates her present task formulation, writing, "a teacher is responsible for finding ways to provoke and promote thinking, ensure accountability, and to give students the opportunity to share his or her ideas, opinions,

confusion, and worries." She also writes about how her problem formulation shifted during this inquiry:

> Instead of questioning how connections influence learning, I now ask myself how I can create and build on connections in my future classrooms. My exploration of this inquiry has moved from defining connections, to visualizing them, and to seeing the effects of connections on students. Finally, my inquiry has pushed me to think about how to creating [sic] connections. I often find myself coming back to the question why I want connections in the classroom? What is it about relationships, social bonds, and profound connections that encourage learning?

Kari's problem and task formulations changed throughout her inquiry as she saw more and her attention was broadened to the ecology of connections in a classroom.

Kari ends her inquiry with the question: "How I can create connections to ensure an extension of learning?" While this seems like a solution-oriented question, it is a well-earned solution orientation that came after looking deeply. And, if this inquiry is any indication, she will continue to broaden her attention and problem formulations as she investigates this question in her first year of teaching.

Throughout the course of her inquiry Kari's attention continued to broaden as she discovered new teaching problems. Kari broadened beyond merely seeing conditions of the environment of educational encounters, but also to seeing how these conditions worked together in an ecology. It appears as though Kari's attention broadened when

1) She saw how social interactions might transfer to academic settings and began to explore how student interaction might impact their learning

2) She reformulated her task from creating connections to seeing the connections that were already in the environment
3) She saw how student survey responses related to each other
4) She investigated what student suggestions for the teacher might look like in an educational encounter
5) She saw how multiple conditions in the environment worked together in an ecology.

Conclusion

This chapter was an exploration of five teacher candidates' trajectories of attention and how their attention narrowed or broadened throughout their M.Ed. inquiries. The analysis of these trajectories reveals that there are several key factors that impact the ways in which (and whether or not) and candidate's attention narrows or broadens. These factors are

1) Assumptions about students, teaching, and schooling
2) Frame clashes that occur when these assumptions are challenged
3) The degree to which candidates attend to student cognition or the environment
4) The orientation of a candidate's problem formulation and task formulation – solution or vision
5) Candidates' ideas about inquiry

While each of these factors might work separately to impact a candidate's attention, in the cases above, they worked in mutually constitutive relationship to broaden or narrow a candidate's attention throughout the course of their inquiry. Each of these factors will be explored in greater detail in the next chapter.

Chapter 7: Influences on Candidates' Attention

After tracing candidates' trajectories of attention, it became clearer that there were some common influences that impacted the shifts in candidates' trajectories. These influences direct candidates' attention and matter for whether and how their attention shifts. These influence points are assumptions, frame clashes, an ecological view of educational encounters, and idea about inquiry. The analysis reveals that each of these inflection points are not separate, but work in relationship to each other, along with candidates' problem and task formulations to impact shifts in attention.

Assumptions

Most candidates come into teaching with assumptions about students, teaching, schooling, subject matter, and the ways in which these things might work in relationship. These assumptions could come from many places, including their apprenticeship of observation (Lortie, 1975) and the cultural grammar of schooling (Heath, 1982). Candidates' assumptions can serve to narrow a their attention, causing them to miss or misconstrue what they see in an educational encounter when it does not fit with their assumptions. Assumptions can also provide opportunities for frame clashes. These frame clashes, or differences between what is expected (assumptions) and what actually happens, can serve to surface, make visible and potentially disrupt candidates' assumptions and lead their trajectories of attention to shift. Frame clashes will be discussed in the next section.

An analysis of candidates' assumptions reveals that there are multiple ways in which assumptions can manifest to impact attention, problem formulation and task formulation. First, candidates' assumptions can be either generalized or contextually situated. The candidates with generalized assumptions made assumptions about student cognition (i.e.,

students want to take the easy way out). This is an assumption about the cognition of students in general, not about a specific student in a specific context or environment. The candidates with contextually situated assumptions made assumptions about the environment or students within an environment (i.e., students appeared to be on task). Second, candidates' assumptions seem to fall on a spectrum from disruptable to fixed. Some candidates' assumptions are less tightly held and more open to disruption, while others' assumptions remain fixed, even when confronted with evidence to the contrary. This spectrum also relates to the generalizability of the assumption. Analysis of candidate trajectories revealed that the more generalizable a candidate's assumption was, the less likely it was to change through a frame clash, thus, the less disruptable and more fixed it was for a candidate.

In their M.Ed. reports, some of the candidates explicitly state their assumptions, while in other places the assumptions are not as explicitly stated, but possibly inferable from other things that are written. In an effort not to assume anything about candidates' assumptions, I only analyzed the most explicitly stated assumptions here. Candidates assumptions direct *my* attention because of how they reveal themselves in candidates' attention and how they function to impact that attention.

Sean's assumptions. Of the five candidates in this study, Sean had the most, and most explicit, assumptions about students. Sean clearly states two assumptions about what students want and don't want in classrooms: "most students prefer school to be easy," and, "with adolescents there is not much of a desire to be challenged by friends." These assumptions about students might come from his own apprenticeship of observation (Lortie,

1975), as he writes 1½ pages about his own high school experience of doing all of the work during "collaborative" assignments.

Sean's first assumption hangs together with other assumptions he has about how students should act during particular activities. When he gives a survey to his class, Sean asks students what types of lab activities they prefer. Student responses indicate labs that Sean thinks are "easy," and he deems their responses unreliable because of his assumption that "most students prefer school to be easy." Sean makes an assumption both about student preferences (easiness), and about the easiness of lab activities.

Sean's second assumption limits what he makes available to students. Assuming that, "with adolescents there is not much of a desire to be challenged by friends," Sean determines that friends should not be in a group together. Rather than seeing the ways in which friends might help each other's learning, Sean's assumptions lead him to a narrowly formulated problem, and determine his task formulation – create groups in which friends don't work together. His own limited task formulation also limits what becomes available to students in this educational encounter.

In addition to assumptions about students, Sean also makes known his assumptions about what teachers want and should do in educational encounters. Early in his inquiry, he writes, "the dream of most, if not all, teachers, involves all groups of students working efficiently and effectively." This assumption about how teachers want classrooms to function carries with it the task formulation of getting students to work in groups "efficiently and effectively." This assumption directs his attention, shapes the problems he formulates in the first chapter of his inquiry and determines the tasks he has available to formulate to solve those problems.

Sean goes on to describe a teacher's "ultimate goal" as one of, "inspir[ing] students to pursue a higher education in their field of study." This assumption about the goal of a teacher also leads Sean to particular problem formulations and task formulations. Sean explains how his assumption of this goal informs his problem and task formulations, writing, "to do this [inspire students] students have to be invested in the material, and that requires every teacher to wonder how they can create a lesson that will engage students and get them thinking." Here, Sean has formulated a problem of student investment and a task of engaging students and getting them thinking. The assumption of the goal of a teacher likely impacts his attention as it calls forth this problem and task formulation.

Whether Sean's assumptions are correct, reasonable, or justified is not important to this study. What is important is that these assumptions seem to prevent Sean's attention from broadening and his problem and task formulations from changing. Instead, they seem to narrow his attention by directing it toward confirmation of, rather than challenges to, his assumptions. Sean's assumptions are generalizable and fixed and make frame clashes unlikely, as will be discussed in the next section.

Melissa's assumptions. Melissa's assumptions about the kinds of students she will have as a first year teacher form the basis of the third chapter of her inquiry. She writes, "I began focusing on classroom management this semester during my student teaching in order to prepare for the lower-level classes that I will most likely have next year." Not only is there an assumption about what it means to be a first year teacher, there are possibly multiple embedded assumptions here about what it might mean to be a student in a "lower-level" class. At very least, we can see that she assumes that students in these classes might create classroom management problems that she will need to solve. Melissa's generalized

assumptions about students and managing students seems to narrow her attention by directing her to examine classroom management in solution-oriented ways in her third chapter.

Katherine's assumptions. Unlike Sean and Melissa, Katherine's assumptions appear to broaden her attention. Katherine's assumptions seem to also be different from Sean's and Melissa's in that they are not so much generalized assumptions about students and teaching, but are more specific assumptions about the students in her classroom and what is taking place in an educational encounter. For example, Katherine writes, "I realized many students, including the 'Snapchat' group, never got on-task to begin with." This indicates that Katherine assumed that there was a point at which students got off-task. This is an assumption about what is taking place in the environment, rather than an assumption about students in general. Katherine's assumptions broaden her attention through frame clashes, which will be explored in greater detail in the next section.

Ivan's assumptions. From facilitating his group, I know that Ivan had quite a few assumptions about students and teaching that did not directly reveal themselves in his M.Ed. report. There are few hints in his writing about the assumptions he held at the start of his inquiry. In the introduction to his inquiry, Ivan writes, "I was originally worried about student groups not being capable of keeping on task. I therefore avoided student group work and activities . . . students can be taught to work purposefully in groups." This writing reveals assumptions about students and teaching that impact his initial problem and task formulations. Ivan assumes that students are "not capable" of working in groups. This assumption brings with it a formulation that the problem is group work, and a task formulation to avoid group work. Another assumption that students can be taught to work in groups also brings a task formulation that he must "train" them to collaborate.

Ivan's assumptions direct his attention at the start of his third chapter, but unlike Sean and Melissa, his assumptions do not impede shifts in his trajectory of attention. Ivan's assumptions seem more contextually situated than Sean's and Melissa's were. Like Katherine, he makes assumptions about *his* students and how they work in groups in the classroom. Ivan's attention broadens as his assumptions are challenged by what he sees in his inquiry through frame clashes.

Kari's assumptions. Kari likely also brings assumptions about students and teaching to her inquiry; however, they did not seem to impact her attention as much as they did for the other candidates in the study. This also means that Kari seemed to have fewer frame clashes, as will be discussed in the next section.

From this analysis, there seems to be a correlation between the impact of assumptions on their attention and the orientation of their problem formulations (solution or vision oriented). As in the case of Sean, and to some extent Melissa, candidates' assumptions seem to narrow their attention toward verifying their assumptions. In other words, candidates with more fixed assumptions want to "prove" that their assumptions are true in their inquiry. Similarly, these candidates' solution-oriented problem formulations narrowed their attention toward a solution. Additionally, these candidates, who had less of a shift in their trajectories of attention (as explained in the previous chapter), also seemed to have more generalized assumptions about students. On the other hand, for candidates who had vision-oriented problem formulations, as in the case of Ivan and Katherine, their attention broadened to see past their assumptions during frame clashes. These candidates contextually situated assumptions also correlated to greater shifts in their attention.

Frame Clashes

Frame clashes seem to be held in relationship with assumptions. Frame clashes, as they are defined in this study, are places where something unexpected happens. Frame clashes occur for candidates when they approach a dense record of practice expecting to see one thing, but see another. Frame clashes occur when candidates have assumptions (about students, the environment, tasks, their role as the teacher) that are confronted with opposing evidence in their dense records of practice. In other words, a frame clash is when what one sees happening is different from what was expected. Frame clashes can impact a candidate's trajectory of attention by calling forth new things for a candidate to look at to explore a problem.

Without a frame clash, assumptions appear to narrow a candidate's attention toward "proving" the assumption through the data. Assumptions that are confronted by a frame clash can serve to broaden a candidate's attention by exposing an inconsistency between what is assumed and what is actually happening. Generalized assumptions seem to be less susceptible to frame clashes, whereas contextually situated assumptions about students in an environment seem more open to the transformative possibility of a frame clash (Katherine is a good example of this). The findings in this section emphasize the importance of educating candidates' attention toward the immediate, contextualized environment where they will likely form assumptions that can be opened to change through attending to what is actually taking place.

Frame clashes for Sean. Sean experiences some frame clashes in the third chapter of his inquiry when his ideas of the roles that students might choose are different from what they actually choose. These frame clashes come as he analyzes data from student surveys

and does not get the results that he expects. Sean has some strongly-held assumptions about both students and about roles that students might take as members of a group. These assumptions get challenged by the data from student surveys, but the frame clashes he experiences do not seem to have any impact on his trajectory of attention.

First, Sean is surprised that students with lower grades select a leadership role as their first choice in a survey about preferred group roles. One of Sean's assumptions is that the group roles of facilitator and reporter are "public roles" that only students with high grades would want to hold. Instead, the surveys indicate that students who have lower grades want the role of facilitator as much as students with higher grades. Sean writes about his surprise at this finding:

> This all surprised me because I typically think that the students with the lower grades typically feel like they do not understand the material as well as the other students so they would not want to be in the leadership position. The responses I got completely tore down my assumptions.

Sean experiences a frame clash when the data from his survey contradicts his assumptions about students.

Sean is further surprised when he looks at students' second choice for a group role and finds that students who do choose to be facilitators do not choose the more public role of reporter as their second choice. This surprises Sean because he assumed that students were making choices about the roles based on which role was more public. Sean concludes, "obviously, my original assumptions about the connection between facilitator and reporter were flawed." In this frame clash, students do not appear to see the roles the same way that Sean does.

In Sean's case the frame clashes he experiences do not lead him to change his trajectory of attention. While he could have used these frame clashes to reformulate the problem of group roles or students' group participation, he continues to see the things he intended to see, and formulate the same problems and tasks.

Frame clashes for Kari. Similar to Sean, frame clashes do not seem to do much for Kari's trajectory of attention, but for different reasons. Unlike Sean, Kari does not seem to have a lot of assumptions about students; or, at least these assumptions were not as evident in her inquiry. Therefore, frame clashes were either not as evident to me as the researcher or not as impactful to her trajectory of attention. The most obvious frame clash that I found occurred at the end of her inquiry when her, "understandings about making connections with students was challenged by [her] interactions with Bryan and Esau." Kari realizes through these interactions, "that students are not always immediately motivated by relationships." This realization impacts her attention by leading her, "to consider the role of the teacher and how it is more important to some students than others." Since Kari had such broadened attention, problem formulations, and task formulations throughout her inquiry, it is not clear that this frame clash did much to shift her trajectory of attention.

Frame clashes for Melissa. For Melissa, an initial frame clash serves to give direction to her inquiry. At the start of her inquiry, Melissa assumes that if students know a concept, they will be able to answer multiple questions about that concept. This assumption is challenged when Melissa, "notices that on a specific test, one student did not accurately complete any calculation questions, but was able to draw a graph and analyze visuals completely accurately." This discovery directs Melissa toward a investigating student understanding of content.

While Melissa's attention is broadened toward "how much, [students] truly understand about the content of [a] unit," her problem formulation and task formulation remain the same. In the end of her first chapter, Melissa comes back to her initial assumption that if students truly understand a concept, then they should be able to answer multiple types of questions about that concept.

Frame clashes for Ivan. Ivan experiences two frame clashes that appear to impact his trajectory of attention. One frame clash occurs when he sees students' reactions to the "help" that they receive in a "low-stakes" social setting. Ivan assumed that students would "welcome" help from their peers in social settings, but this observation reveals that not all help is welcome, and leads him to question if these interactions count as "help" if they are "unwelcomed" by the student being helped. The frame clash, "worries [him] because [he] originally thought that student-student help was only unwelcome in high-stakes, teacher-led activities and settings." The frame clash leads Ivan to wonder about trust in his classroom and shifts his attention beyond just how students are helping each other to whether or not students are helping each other and how trust plays a role in this.

Ivan experiences a second frame clash when he collects work from a group that appeared to not collaborate during group time. He expects that there will not be much for him to see, but is, "surprised that when [he] collected the work from the class, all three members provided a significant amount of completed work." This frame clash leads to a shift in his attention from getting students to collaborate to exploring collaborative-worthy tasks. This shift in attention also brings with it a new problem formulation to figure out what tasks actually require student collaboration.

Frame clashes for Katherine. Of all the candidates in the study, frame clashes appear to most significantly impact Katherine's trajectory of attention. Katherine's first frame clash comes when she sees that the "'Snapchat' group never got on-task to begin with." Before viewing video of this group at work, Katherine assumed that the students had been on task and then got off task. This frame clash shifts her attention toward examining what counts as on-task behavior. It also gives her a new problem formulation to not just figure out how to get students on task, but to figure out what it means for students to be on task.

As her attention shifts toward examining on- and off-task behavior, Katherine experiences a second frame clash when she realizes that on- and off-task behavior does not seem to correlate with grades. Katherine initially assumed that, "students who appear on-task in class receive higher grades on assessments." Again, this frame clash leads to a shift in Katherine's attention. Rather than only looking at students and their behavior, Katherine begins to attend to the environment in which this behavior takes place. She, "wonder[s] if mastery of the material sometimes also contributes to off-task behavior." This shift in attention also carries the potential for a shift in task formulation as her task is not just to get students on-task, but to change something in the environment, in this case, the material.

Katherine not only experiences frame clashes between her assumptions and her data, but also between her data and what she reads in the literature. While the literature suggests that students will be engaged if they are interested and if content has real-life application, Katherine discovers that, "student responses about what makes them engaged are different from what the literature says leads to engagement." This frame clash seems particularly impactful for Katherine as she also has, "certain expectations about [what] s*hould be*

engaging for students." The frame clash she experiences between the literature and student responses prompts her to recognize her own expectations and see the frame clash as a possible explanation for why she, "still felt a lack of engagement in the room, even when [she] taught using lessons and activities [she] believed were engaging." This double frame clash of sorts shifts Katherine's attention from looking for the factors the literature says, or she believes, will lead to engagement to looking for (and possibly acting on) the factors that students say lead to engagement.

From this analysis, frame clashes seem to have the biggest impact on a candidate's trajectory of attention, problem formulation and task formulation when candidates have some assumptions but are open to having these assumptions disrupted. Sean has strong, generalized assumptions about students and how groups might work in a classroom that the frame clashes were unable to disrupt in a way that would lead to a change in his attention. Kari did not appear to have many assumptions about students, and therefore did not appear to have many frame clashes. Melissa had her assumptions disrupted temporarily, but ultimately, the pull of these assumptions outweighed any impact a frame clash might have had. Frame clashes were most impactful for Ivan and Katherine as they had some assumptions about students, but allowed what they saw in their inquiry to disrupt these assumptions and broaden their attention to things their assumptions caused them to miss or misconstrue.

Cognition, Environment, and Ecology

Candidates seem to direct their attention to either student cognition, the environment in which students are acting, or the ecology of the environment (that is, the ways in which environmental conditions work together to impact action). Cognition in this case refers to

what candidates see about student thinking *and* behavior. While behavior might not sound like cognition, candidates who attend to cognitive explanations of action treat behavior as an expression of cognitive activity rather than as a response to (and participation in) an environment. A cognitive approach basically says that something in a student's head (their motivation, home life, etc.) makes them act in a particular way. The environment in this case refers to the people tasks, physical space, and other contextual conditions that exist in an educational encounter. Ecology, then, refers to the way in which multiple environmental conditions work together in mutually constitutive relationships.

Whether candidates attend to cognition, environment, or ecology matters for whether and how their attention shifts. It also matters significantly for their problem formulation and task formulation. When candidates attend to student cognition and formulate problems as ones of student cognition, these problem formulations then call for task formulations that are directed toward changing student cognition or behavior directly. This is different from explaining student behavior as a response to the environment or ecology of an educational encounter. In this approach, candidates formulate problems that are situated in particular context (task, relationships, peers, content, physical space etc – there is an infinite list here.) and look at these environmental factors or the relationships amongst them to understand student action. This calls forth a task formulation that changes the environmental conditions in which student behavior exists.

Sean, a cognitive approach. As previously mentioned, Sean primarily directs his attention toward student cognition. He formulates problems as issues of individual student cognition, tasks as changing student behavior, and even his methods of inquiry are aimed at investigating student cognition. As Sean investigates how group roles might affect the ways

in which students work "efficiently and effectively" in groups, he begins to, "wonder what roles represent students that think highly of themselves in the class." This clearly reflects attention on student cognition. Here, Sean formulates a problem not as one of the environment, but as one of student cognition – how students think about themselves. An environmental problem formulation might look like Sean wondering about how the roles are structured or defined for students, or what these roles require from students. Instead, he wonders about how students' choice of roles reflects what they think about themselves.

This cognitive problem formulation calls forth what we might call a cognitive method of inquiry, or a way to further explore student cognition. In this case, Sean conducts interviews in order to, "address students' subconscious feelings, their metacognitive ability, and their awareness about the future." In his own words, Sean states that he is trying to get inside students' heads to figure out the problems in his classroom. His problem formulation does not lie in what might be happening in the environment, but what is happening inside students' heads. Therefore, his task formulation is, among other things, to get inside their heads.

From these interviews, Sean uncovers, "that self-worth does have a part in how students participate during group activities, and in particular what role they take on during these activities." Again, Sean's attention remains directed to cognitive explanations of student behavior. This leads him to cognitive task formulations. From his discovery about students' self worth, Sean describes his task formulation: "To promote the best collaboration in groups, students need to each take on the roles that they are the most comfortable with, and to not force students into roles that they do not desire." His task is to change, or at very least manage, student cognition. It even appears that he does not formulate the task as one

for him to do, but one for the students to do (they need to take on roles they are comfortable with). There is nothing apparent in this task formulation about changing the environment in which students are taking on these roles.

When Sean moves from looking at interviews to student survey results (also a cognitive method of inquiry), he finds that students do not select the roles he anticipated they might. Sean assumes that students with higher grades will take on public, leadership roles, while students with lower grades will take on less public roles. However, student surveys show that this is not the case. Though this frame clash could offer an opportunity for Sean to direct his attention toward environmental or ecological explanations for what is going on, he instead continues to situate his explanations in student cognition. He writes, "It could be that students may consider any participation on their part an example of leadership." Sean could look at a host of other factors – what the roles demand of students, how the roles were introduced, if the roles were actually public or not – to explain student behavior. Instead, he explains it by how he thinks students might be thinking about the group roles.

At the end of his inquiry, Sean does give some indication that he might also attend to the environment. He writes,

> Ultimately, I believe that it comes down to the social environment within a classroom. Since social self-worth is generally more influential than academic self-worth, a classroom environment where all students feel that they are part of the class community will result in the best learning.

Even though he mentions the environment of the classroom, he still seems to be formulating problems of cognition (self-worth), rather than problems of the environment. In order to

claim that there was a shift in Sean's attention away from cognition and toward the environment, there would need to be evidence of how he might explore the environment.

Melissa, between cognition and the environment. Melissa attention seems to vacillate between student cognition and the environment. Early in her inquiry, when she sees that Javier does well on visual response and constructed response questions, she explains this difference cognitively. She concludes, "it occurred to me that it is possible that Javier may learn better visually, and may be better able to show me what he knows in a visual way." Melissa explains that Javier's performance on the test is due to him learning better visually, a cognitive explanation for student action. While this is certainly a possible explanation, it does not take into account any attention to the environment. Melissa might also attend to how the test questions are structured, if there is a difference in what they are asking, where on the test they appear, and innumerable other possibilities that don't have anything to do with the test questions or even the test.

Melissa's attention shifts in the first chapter to also looking at the environment. She takes a deeper look at the test and realizes, "the test allowed students to only understand the algorithmic side and did not reward students for also understanding the conceptual side." This realization formulates the problem not as one of student cognition, but as one of the test (an environmental condition). This leads her to begin to formulate tasks that require changing the environment, such as, "checking for understanding of one concept in more than one way."

Melissa's third inquiry chapter exemplifies the ways in which her attention vacillates between student cognition and the environment. This chapter is about positive and negative classroom environments, suggesting that her attention will be directed toward environmental

factors. While it is to some degree, she also seems to attend to student cognition to explain the environment. For example, she sees in one positive classroom environment, that "students felt totally comfortable saying things out loud and asking relevant questions without raising their hands." There is an entanglement between cognition and environment here. While she is looking to understand what makes a positive environment, she sees that students, "felt comfortable," which is likely a product of the environment.

In a second example, Melissa sees that Latino/a students are not participating as much as White students, which leads her to believe, "that while this classroom environment appeared positive for many students, it was most likely negative for some students in the room." She sees student behavior as an indicator of a negative environment, but does not further investigate what about this environment leads to that student behavior. Both of these examples expose the gravitational pull toward explanations of student cognition, even when a candidate is looking at an environment. (See the description of Kari's attention below for a way that a candidate might investigate an environment without attending to student cognition.)

In both chapters of her inquiry, Melissa's attention begins to orient toward the environment as she sees that there are some environmental factors that explain student cognition. With her attention primarily directed toward student cognition, however, Melissa misses two key elements that might dramatically change her problem formulation and task formulation and bring about a reconceptualization of the educational encounter. First, Melissa misses a more thorough exploration of the multiple environmental factors that might impact students. It seems she can sometimes see one or two, but is far from seeing much of what an environment has to offer. Second, Melissa misses (and this is likely due to her first

miss) the ecology of the environment, or the ways in which environmental factors are held in mutually constitutive relationships. She does not see the ways in which these relationships, not just the environmental factors themselves, might impact students.

Ivan, attending to the environment and seeing some of the ecology. As mentioned earlier, my analysis of Ivan's work is somewhat prejudiced by my role as his M.Ed. facilitator. While the same could be true for all candidates in this study, conversations with Ivan stick out the most in my memory, perhaps because his M.Ed. report indicates such a shift from the conversations I remember having with him, though those shifts are not as evident in his reporting.

In Ivan's first chapter, his attention seems primarily directed toward the environment. Through fine-grained analysis of dialogue and action in a short (less than one minute) segment of video, he attends to the ways in which one action or interaction can impact future actions. For example, he finds that his, "reposed question directly led to the next event of 'Student Helping Student.'" He also sees that, "although student-student help may be delivered discreetly, a strong reaction can make it public very quickly," and, "varying reactions to help." In these examples, Ivan's attention is at first only directed to environmental factors that might impact problem formulation. As he further examines his dense records of practice, he also attends to the ecology of the environment, seeing how his reposing of the question, help, the "high-stakes" nature of the moment, discreetness, the reaction to help, and multiple other environmental factors are held in relationship.

Like Sean, Ivan's attention impacts the records he analyzes for his inquiry. While Sean's attention was directed toward student cognition and he analyzed records of student cognition like interviews and surveys, Ivan's attention is directed toward the environment,

and he analyzes records of the environment, like its tasks, interactions, and demands. In one example, Ivan situates his problem formulation in the environment when he realizes, "that the original task that [he] gave to students was semi-collaborative; they were encouraged to work together for productivity, but they did not necessarily need each other to do so." This indicates that Ivan is formulating the problem as one of task (an environmental factor), rather than student cognition. In a second example, at the end of his first chapter, Ivan analyzes what might be considered a low-stakes environment to see how this environmental condition might impact how students help each other. Again, Ivan is formulating problems of student action that are situated in the environment.

Katherine, attention that is situated in the environment. Katherine begins her inquiry stating that intends to focus on environments, rather than student cognition. She writes, "rather than blaming [students] as 'the problem,' I see the importance of considering additional factors, especially those related to the teacher, the lesson or the environment." Katherine indicates that she is searching for problem formulations that are situated in the environment, not in student cognition.

Katherine's multiple frame clashes also lead her to more deeply explore the environment of the educational encounter. While she comes to her inquiry with ideas about what might engage students (choice, identity, and real world application), she discovers, "there was much more to consider and look for" in the environment, including the task, student social situations, and her role in student learning. Her attention at this point, seems directed toward each of these discrete environmental factors, not how they work together in an ecology.

Katherine's attention is also directed toward environmental factors when she looks at a video and sees that the way she introduces a task might impact student engagement. She also begins to, "consider additional factors that may be influencing [student] behavior, which led to deeper, more specific questions about the situation." Again, her attention is directed toward the environment as she investigates the "situation," rather than students. Her questions following this statement primarily center on the task – one factor of the environment.

Toward the end of her inquiry, Katherine starts to develop an ecological attention when she begins to wonder how these environmental factors might relate to one another. She asks, "If students' willingness to engage is based on their peers' involvement, what does that tell me about the design of my lessons or classroom? Here, she sees that social factors (peers' involvement), tasks (lesson design), and physical space (classroom) could all work together in an ecological problem formulation. Katherine seems to situate her task formulation in not just the environment – she doesn't suggest changing just one or two factors of the environment – but situates her task in the ecology of the educational encounter. This task asks of her to design an ecology of social interaction, task, and physical space that will engage students.

Kari, inquiry about the ecology of educational encounters. The very nature of Kari's inquiry question about human connections in a classroom seems to lend itself toward an ecological orientation. Her attention is already directed toward relationships, in this case, relationships amongst students, and between students and the teacher. Early in her inquiry, Kari explains that she attends to the, "settings and conditions that occurred within each context of my listed observations by looking at the classroom environment, the time and the

location, the activity and/or lesson." This seems to indicate that she is not focused on just one environmental factor, but on the relationships among multiple factors.

One example of her ecological attention is the relationship Kari looks for between "positive and active discussion" and "academic content." If Kari's attention had been limited to environmental factors alone, she might have seen that positive and active discussion can impact connections in the classroom. Her attention is further broadened, though, to the ecological ways in which positive and active discussion and connections can work in relationship with academic content.

Unlike the other candidates, Kari actually seems to recognize the function and possibly the impact of her own ecological orientation. She describes looking for "patterns" in conversations, and sees through her analysis that, "the environment, relationships, and social interactions are all connected to form the *ecology* [emphasis added] of the individual's development." Kari goes beyond seeing the ways in which environmental conditions can impact student action, to seeing and attending to the ways in which environmental conditions work together to not just impact actions in one context, but also can, "impact learning and development in another setting." In this description, Kari seems to attend not only to the ecology of an educational encounter, but also to the ecology of a student's personhood, by recognizing the ways in which the conditions of a singular educational encounter might work together to impact a person's actions across educational encounters.

Ideas About Inquiry

Candidates ideas about both the nature of what inquiry is and how it should be done seem to impact both how and where they direct their attention and if their attention shifts. Candidates approach the M.Ed. inquiry with varying ideas about what inquiry research is.

Some treat the inquiry as a way to "prove" a hypothesis, while others take a more open-ended approach of exploration. Their ideas about inquiry also seem to shape the methods that the candidates employ for their inquiries. The more a candidate seems to be trying to "prove" a hypothesis, the more they tend to use more quantitative methods. This means that they also generally attend to things in their classroom that can be quantified. Candidates who see inquiry as more exploratory tend to use more qualitative methods. This means that their attention is already more open to classroom phenomena beyond what can be quantified.

Only Sean and Kari clearly expressed their ideas about inquiry. It should not be a surprise from their trajectories and the above analysis that Sean set out to prove a hypothesis, while Kari took an exploratory approach. Sean had a more rigid approach to his inquiry, in that he only saw the things he set out tow see, while Kari had a more fluid approach to her inquiry, in that the things she saw determined what she saw next. Sean's inquiry seemed to take a pre-determined path, while Kari's path of inquiry developed as she investigated.

Sean. Sean talks early on about his "predictions" for what students will do. He writes, "My predictions were that, generally, the groups would stay in their assigned stations, with a bit of discussion between nearby students." These predictions suggest that he is employing a scientific method – form a hypothesis, and prove it or disprove it through experimentation. His predictions also seem to narrow what he sees to only the things that might prove his predictions were accurate. In order to investigate his predictions, Sean uses quantitative methods both to collect records of practice for his inquiry, and to analyze his data.

To collect records of practice, Sean writes about observing student interactions. This could be a qualitative method, leading to qualitative analysis, but instead, he records

interactions in pre-determined categories. He writes, "I came to the idea that I could record what kinds of interactions took place, and how often, on a class seating chart. This would allow me to quantitatively see how often interactions took place." Sean recognizes his use of quantitative methods and seems to see them as beneficial to his inquiry. In his third chapter, Sean uses surveys that ask students to respond on a Likert-scale. This is another quantitative method of data collection that will lead to quantitative analysis.

Sean's methods of analysis follow his methods of data collection. He counts student responses, quantifying them into pre-determined categories. For example, he writes, "There were a total of fourteen interactions between friends, six of which ended up in productive collaboration." Sean effectively narrow what there is to see in the data to what can be counted.

Finally, Sean makes a concluding statement that seems to reflect his approach to inquiry. He writes, "My original guiding question of what does self-worth look like was finally answered. If a student has a strong sense of self-worth in a class, they will be very outgoing either academically or socially." This statement reduces the complexities of student self worth to being outgoing academically or socially. Likely, Sean's data and analysis of the data did not allow him to broaden his attention to much more beyond this conclusion.

Kari. Kari has a much different approach to her inquiry than Sean did. She does not seem to approach her inquiry with many pre-determined ideas, as I discussed in the "Assumptions" section, and therefore is not seem to be trying to "prove" anything. Kari's data collection and methods of analysis are exploratory and open opportunities for her to see more. She even writes that she, "knew that the inquiry and analysis would be difficult, but I continuously reminded myself that my inquiry must be based on what feels authentic, even if

it is abstract, in order to help me better understand students." Kari recognizes that her topic of inquiry (student connections) calls for complex data collection and analysis that will not necessarily be quantifiable.

Kari's dense records of practice include videos and observations that include an ecological accounting of what is taking place in an educational encounter. Though she does use a survey at one point, it is composed of open-ended response questions, and she states that it is to, "guide the next steps of [her] inquiry." Kari's methods of analysis also take a qualitative approach. She writes about how she, "transcribed conversations and looked for relationships within dialogue." This method of analysis indicates that she is not examining the data *for* something in particular, but is instead looking *at* what the data might show her. This method of analysis broadens Kari's attention to seeing more than just one pre-determined thing.

My analysis of these two candidates' methods of inquiry exposes to me the relationship between candidates' problem formulations and methods of inquiry. Sean, who formulates presented problems also uses presented methods of inquiry. The presented problems he formulates come with presented ways to investigate them. Kari, who formulates discovered problems, uses discovered methods of inquiry. Kari's method of inquiry is not pre-determined, rather it is discovered as she goes.

CHAPTER 8

Discussion, Findings, and Implications

This dissertation revealed several findings that may hold implications for how we might conduct teacher education. Through analysis of attention, problem formulation, and task formulation, it is clear that candidates intend to act based on what they attend to. If teacher educators want to impact the ways in which candidates act, or intend to act, in classrooms, they must begin with educating candidates' attention.

A Summary of the Findings of this Study

The first chapter of this dissertation explored the various types of inquiry questions a teacher candidate might ask and discovered that these questions are related to what a candidate sees, i.e., a candidate's *attention*. Though there appeared to be four types of possible question orientations – solution-oriented, values-oriented, explanation-oriented, and vision-oriented – I found that there were really only two question orientations that the candidates had in practice: solution-oriented and vision-oriented. Additionally, I discovered that the questions they asked had the ability to either *narrow* or *broaden* their field of attention in several key ways.

From the data in the first chapter, attention can be *narrowed* or *broadened* through what is taken into a candidate's field of vision as they attend to something. When a candidate's attention broadens, the candidate appears more likely to consider multiple factors in the environment, including the immediate interactional environment, and how such factors might work in relationship to one another. *Broadening* questions open a candidate's attention to *more* – more complexity, more possibility, more options – more of what is happening and might happen in an educational encounter. Broadening questions work to

expand a candidate's attention in three primary ways: 1) seeing phenomena in complex relationships; 2) seeing more possibilities for student or teacher action; and/or 3) seeing a more complete view of the environment of the educational encounter. Unlike *narrowing* questions, which work to reduce a candidate's vision to discrete individuals, temporally and spatially-bound instances, or simple relationships, *broadening* questions open a candidate's field of vision to see phenomena as dynamic and situated within complex, unfolding, ongoing relationships. This broadening enables candidates to take a more "ecological" view of what might at first appear to be an isolatable, easily interpretable discrete individual or instance. By seeing more ecologically, candidates might become better able to see relationships amongst phenomena and imagine more possibilities for student learning and their role in that learning.

When a candidate's attention is *narrowed*, an observed phenomenon is, for all intents and purposes, extracted from its environment. Narrowed attention isolates a person or action from its larger ecology. Narrowing questions work to reduce a candidate's attention in three primary ways: 1) isolating observed phenomena as discrete, independent, and/or temporally and spatially bounded; 2) constricting conceptions of the teacher's role or actions the teacher might take; 3) seeing student cognition without an accounting of the environment of an educational encounter. In this sense, narrowing is not the same as *focusing*. Focusing brings one factor *of* the environment to the forefront of one's vision for concentrated study, without excluding the presence and perception of the rest of the environment. In fact, focusing can actually lead to broadened attention by making visible the relationship between a single phenomenon and its larger environment. Narrowing, however, can limit one's attention as it makes the rest of the environment unavailable to be seen. While both focusing and

narrowing reduce the complexities of an environment, narrowed attention excises extracts? one factor *from* the environment in a such a way as to render the rest of the environment invisible, effectively missing, and therefore not available for consideration or interpretation.

The findings of chapter five showed that teacher candidates' attention can be narrowed or broadened by the type of inquiry questions they ask. A candidate's attention makes things available to be seen or not, by calling forth something for closer inspection. Solution-oriented questions tend to narrow a candidate's attention to only making available how the solution might work in the classroom, while vision-oriented questions tend to broaden a candidate's attention by making available more of what is taking place in an educational encounter. If we want teacher candidates to see and account for the real complexities of any educational encounter, we, as teacher educators must attend to the ways in which we are training our candidates' attention.

As we saw in the five case studies, a candidate's attention matters for the ways in which they will formulate the problems of teaching and their tasks as teachers. *Problem formulation* describes the way in which candidates formulate what needs to change in a given situation. The narrower a candidate's attention is, the more likely they are to formulate "presented," (REF?) solution-oriented problems; conversely, the broader a candidate's attention is, the more likely they are to formulate discovered, vision-oriented problems. Presented, solution-oriented problems are given to teachers with known task formulations that are more defined, more constrained, and less open to other problem formulations. We saw how presented, solution-oriented problems worked to define Sean's (and to some extent, Melissa's) problem formulation, tasks, and future attention in narrowed ways. While there was much more that Sean could have seen about group work (the complexities of

relationships among students, the relationships between students and the task, what effective group work looks like, what he means by effective, or even broader to consider when group work happens or should happen, to name a few), he formulated his problem as one of "efficient" and "effective" group work, in a way that excluded other phenomena in the educational encounter from his vision. Once Sean formulated this solution-oriented problem, it gave him certain things to attend to at the exclusion of others. Without these other things to attend to, they remained unavailable to him for problem formulation. His task then became narrowly formulated by his problem – make sure that students are working in their groups and that groups are composed of the right combination of students that will work. This gives Sean a more certain (if not less accurate), vision of teaching. The group work problem presented to him showed him the way things are and the way things "should" be in a manner that is visible, isolable, and less complicated.

"Discovered," vision-oriented problems generally seem to have a larger gap between what is currently happening and what a candidate wants to have happen. Discovered problems require one's attention to be continually redirected to the problem situation to see what is actually happening. In chapter six, we saw how Kari (and also Katherine and Ivan) formulated discovered, vision-oriented problems that continually broadened her attention to seeing more in the educational encounter. As Kari formulated the problem of connections in her classroom, she formulated her task as finding out what connections look like in a classroom. This task led her to new problem formulations as she attended to more phenomena in the educational encounter. For example, she discovered that connections among students often already existed. Rather than making new connections in her class, her new problem was to find the connections that existed so that her task could be not to impinge

upon those existing connections. Her task formulation for this discovered problem is more ambiguous, more open, and more contingent on what else she sees and what students do, as there is much more that can exist in the gap between the actual and the desired. Discovered problem formulations and their accompanying task formulations reflect a vision of teaching that is accurately uncertain.

As we can see in the cases of these five candidates in chapters six and seven, there is a mutually constitutive relationship between a teacher's attention and problem formulation. The problems available for candidates to formulate are contingent on what they see and attend to, and the way they formulate problems directs their attention. If a person's attention does not include some object or phenomenon, it is not available to be formulated as all or part of a problem. Once a problem has been formulated, it gives a person things to see and attend to – either new things or existing things. These case studies indicate a candidate's attention as the starting point for his or her problem and task formulations. Simply put, if a candidate does not see something, he or she is not able to formulate it as a problem or change his or her task. One object of teacher education, then, must be candidates' attention to the broad complexities of educational encounters.

There are several key factors that can impact attention, as discussed in chapter seven, but the most impactful seems to be the "frame clashes" that a candidate experiences when looking at dense records of practice that contain more information than was originally sought. These "dense" records, particularly video, provide candidates with opportunities to see more than they initially saw in the moment of teaching. The more that is available to be seen in a dense record, the more opportunities that candidates have to see more than they initially saw and experience a frame clash. Katherine serves as a great example for how

these frame clashes seem lead to problem and task reformulation. Through looking at dense records of practice, Katherine experiences multiple frame clashes, such as when she discovers that students had never gotten on task to begin with. This leads her to reformulate her problem from students being off task to what counts as off task. This also changes her task formulation from getting students on task to investigating what students are up to in deeper ways than just the relationship of their behavior to one present task. This shift in her attention, problem formulation and task formulation came from looking closely and slowly at a video.

A teacher's attention to the complexities of the environment of educational encounters, problem formulations that account for multiple conditions in the environments of those encounters, and task formulations that seek to change the environments of educational encounters holds the potential for students to have better learning experiences in schools. But, it all starts with attention – a teacher cannot act on what she does not see. A teacher with broader attention sees not only students in more complete ways, but sees the environments in which these students act in more complete ways. And, hopefully creates better environments for their learning.

Implications of the Findings for a Candidate's Teaching Practice

Though the findings of this study are specific to the context of what teacher candidates are doing in an M.Ed. inquiry, they can have implications for a candidate's future teaching practice. The M.Ed. serves as an opportunity to disrupt old habits of attention that readily formulate presented problems, while also offering a place for candidates to develop and practice new habits of attention that they might carry with them into their teaching careers. The M.Ed. functions to do this through slow and close looking at dense records of

practice that have the potential to create frame clashes, broadening a candidate's attention, and opening possibilities for new problem formulations and task formulations.

The importance of close, slow looking. The work that candidates do in their M.Ed. first has the potential to impact their teaching practice by teaching them how to look closely and slowly at students and their learning. Through their inquiries, candidates engage with dense records of practice, such as video, that make available to them things to be seen that are not always available to be seen in the moment of an educational encounter. These dense records allow candidates to suspend the temporal urgency for action that is often present during typical classroom teaching and slowly take a more complete look at the complexities in an educational encounter. By looking closely and slowly, candidates can see more of what is taking place than they initially saw during the moment of teaching.

Seeing more of what is taking place in an educational encounter is important, but it does not always lead to a change in teaching practice. Sean and Monica, for instance, both saw more, but what they saw did not change their actions in the classroom. Sean and Monica saw more that mattered for the inquiries – they were able to further their research from what they were seeing – but not more that mattered to change what they did as teachers. Their attention was continually directed to solving the presented, practical problems of teaching. And, as they acted to solve these problems, their attention was continually directed back to the same place. Their attention shaped their actions, and their actions recursively directed their attention.

While the M.Ed. gives candidates a chance to become better teacher researchers through providing practice and training for looking closely and slowly, more importantly, it gives them an opportunity to practice seeing in ways that afford them new actions. Through

looking at dense records of practice, Ivan, Katherine, and Kari saw more that afforded them new possibilities for action. For instance, Kari's attention to students' existing connections led her to seek ways to not interrupt the connections that were already there, rather than trying to create connections for students. This new possibility for action was afforded by Kari's close attention to the educational encounter and the discovery of new problems. When a candidate's attention is directed toward discovering new problems, the discovery of new problems affords them new actions and new places for their attention.

Though it is beyond the scope of this project to say with any certainty how the close, slow looking required by the M.Ed. makes a difference for student outcomes, it can be said that it gives candidates something more to look at than typical quantitative measures of student success. While examinations of student outcomes often look to student test scores or behavior, M.Ed. candidates look at students in more complete and complex ways that consider not just student performance, but the environments in which students act. This has powerful implications for candidates' actions. Rather than seeing students as "behavior problems" or "under achieving," the M.Ed. directs candidates' attention to better see the environments in which students are behaving and achieving. This brings about the possibility of a shift in a candidate's actions from changing students to changing the environments in which these students are acting.

The findings from this study on attention brought about by close and slow looking builds on the literature on teacher noticing. While the literature on teacher noticing describes the ways in which teachers frame what is taking place in a classroom based on cognitive interpretations and tacit understandings, this study indicates that teachers frame what is taking place in a classroom through attention to and participation in the ongoing action and

interaction amongst the participants. This ongoing action and interaction continually provides candidates with things to attend to (or notice). If Shoenfeld's (2011) assertion that teachers, "act on what they notice" (p. 230) is true, then changing the ways in which candidates attend to educational encounters has powerful implications for their actions. Seeing more through looking closely and slowly at dense records of practice has the potential to change what candidates do in educational encounters, as we see in the cases of Ivan, Katherine, and Kari.

The importance of frame clashes. The close, slow looking that a candidate does as part of the M.Ed. seems to matter most for a candidate's actions in the classroom when a candidate sees more, leading to a frame clash. Frame clashes then lead to newly discovered problem formulations. When a candidate looks closely and slowly, they have the opportunity to see things that they initially did not, and, possibly that they did not even imagine could be. When a candidate sees something other than what s/he initially assumed was happening in an educational encounter, it creates a frame clash (Agar, 1994) that exposes the distance between the assumed happenings and the actual happenings in an educational encounter. This distance calls forth a reformulation of the problem situation, as the candidate must reframe what is taking place.

Katherine's inquiry demonstrated the importance of frame clashes for helping candidates formulate newly discovered problems. Frame clashes often reveal that the presented problems of teaching are not accurate representations of what is taking place in a particular educational encounter. When a candidate looks at a dense record, s/he has an opportunity to see something other than the presented problems of teaching. The frame clash

that is caused by this new seeing exposes new problems for the candidate to discover and new tasks for them to formulate.

Frame clashes hold the potential to change candidates' actions by providing them with opportunities to see new possibilities for action through the new problems they formulate. When a candidate experiences a frame clash, it broadens their attention and problem formulation beyond what is presented to them through the culture of teaching and schooling, opening limitless possibilities for action. Candidates see new things in the distance between what is currently happening and what they want to have happen, which calls forth new ways of acting. When a candidate's attention and problem formulation is narrowed, they only see the immediate, practical problems. The distance between what is happening and what should be happening is small, as candidates only see the problem in relationship to its solution. Their actions are limited to solving the practical problems of teaching, because they are not able to act on what they do not see. They cannot act in new ways when they do not see new things to act on. When a frame clash broadens a candidate's attention, they discover new problems to formulate and new tasks to carry out.

Limitations of the M.Ed. in Changing a Candidate's Attention and Potential Practice

While the M.Ed. offers great potential to change a candidate's attention and practice, there are some limitations that can impact changes that a candidate might experience. First, candidates who complete the M.Ed. at PPU are in an intense, fast-paced teacher credentialing program. They are on school sites all day and then take classes in the evening. This often does not allow them adequate time to do the slow looking that can lead to a frame clash. The transformative work of the M.Ed. takes time – time to look closely and slowly, time to unearth and change one's deeply ingrained habits, time to replace the apprenticeship of

observation with new ways of seeing and acting. Some candidates need more time in order for their attention and practice to be transformed.

Secondly, notions about teaching and the pressure to solve the practical problems of teaching can impact change in a candidate's attention and actions. Monica's and Sean's inquiries were both shaped by practical teaching problems that they expressed a need to solve. Their idea about teaching, as indicated by their problem formulations, was that teaching meant solving these problems. These pressing, practical problems narrowed their attention and limited their possibilities for action.

Finally, a candidate's M.Ed. can be impacted by his or her ideas about inquiry. Some candidates seem to come to the M.Ed. with the idea that inquiry is about proving a hypothesis, and that data needs to be quantitative. Sean's inquiry was driven by this idea. This also limits what candidates see and the ways that their attention might impact future actions.

Contributions to the Literature and Implications for Teacher Education

This study adds to existing literature on teacher action by offering an alternative ontological stance. While much of the literature situates the origins of teacher action in cognition (as explained by literature on teacher beliefs, decision making, meaning making, and even teacher noticing), this study moves toward an explanation for teacher action that is constructed by an ongoing framing and reframing through participation in educational encounters. This study draws on problem formulation literature and applies it to teaching to help explain the ways in which teachers formulate what there is for them to do educational encounters. This study also builds on recent literature on teacher noticing by situating noticing, or rather attention, as contextual and interactional, rather than cognitive.

This possible interactional location for the origins of teacher action provides new possibilities for teacher education. The findings of this study reveal that a teacher candidate's attention is the starting place for action in a classroom. A teacher cannot act on what she does not see. While this study does not demonstrate a direct correlation between teacher attention and teacher action, it does explore the ways in which attention leads to transformative possibilities for action through frame clashes brought on by the slow and close looking at dense records of practice. Through frame clashes, candidates are exposed to newly discovered problem formulations that carry with them new task formulations and new ways of acting in educational encounters. All of this possibility for change in a teacher's practice begins with their attention. Thus, the object of teacher education must be to educate candidates' attention by teaching them how to look closely and slowly at learning environments as the starting place for formulating their tasks as teachers.

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