Examining the Role of Epistemic Cognition in Teacher Learning and Facilitation of Inquiry Dialogue

Sirine Mabrouk-Hattab

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EXAMINING THE ROLE OF EPISTEMIC COGNITION IN TEACHER LEARNING AND FACILITATION OF INQUIRY DIALOGUE

A DISSERTATION

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by
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EXAMINING THE ROLE OF EPISTEMIC COGNITION IN TEACHER LEARNING AND
FACILITATION OF INQUIRY DIALOGUE

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ABSTRACT

EXAMINING THE ROLE OF EPISTEMIC COGNITION IN TEACHER LEARNING AND FACILITATION OF INQUIRY DIALOGUE

By Sirine Mabrouk-Hattab

In this study, I investigated how a fifth-grade teacher engaged in epistemic cognition when he learned and facilitated inquiry dialogue. Inquiry dialogue is a type of talk in which participants use argumentation to search for the most reasonable answer to a contestable question. It has been suggested to represent the normative dialogue type to enhance students’ reasoning, as it is most aligned with the standards and practice of rigorous argumentation. Despite its importance, researchers have shown that it has not been widely implemented in classrooms and this is partly due to teachers’ epistemic cognition. Given the significance of inquiry dialogue, I sought to understand how teachers’ epistemic cognition informed the learning and facilitation of inquiry dialogue. I used Fives and colleagues (2016; 2017) Epistemic Cognition in Learning and Teaching Framework, Kuhn’s (1991) Developmental Model, and Reznitskaya and colleagues (2015, 2017) Argumentation Rating Tool to frame my work and understand how the different components of epistemic cognition interact with each other during teacher learning and facilitating inquiry dialogue in their classrooms. To conduct my research, I used previously collected data, focusing on one fifth grade art teacher, Eric. My data comprised classroom discussions, study group meetings, focus group interviews, coaching sessions, and reflective judgment interview. I conducted a case study analysis to provide a detailed and rich description of the phenomenon under investigation. I analyzed my data using the thematic analysis method with recursive emergent coding. My results indicated that Eric’s thinking about the dimensions of knowledge were inconsistent throughout the professional development phase.
suggesting that epistemic cognition is a complex process, which is domain, context, and task
bound. In addition to the complexity, results suggest that the relationship between epistemic
cognition and practice is not linear.

*Keywords:* epistemic cognition, argumentation, inquiry dialogue, argumentation rating
tool, dialogic teaching.
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DEDICATION

This dissertation is dedicated to my amazing, loving, and supportive family: My husband Mehdy, my daughter Fatma, and my son Selim. I love you very much and I hope I make you proud each and every single day.
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Chapter One: Introduction

Argumentation: A Life and Academic Skill

Argumentation is an important life and academic skill that plays a key role in democratic societies (Halpern, 1998; Kuhn & Crowell, 2011; Kuhn & Dean, 2004). It underlies people’s capacity to think critically, draw appropriate conclusions, and rationally evaluate information given to them. In addition to its importance in our daily activities, researchers have argued that argumentation is needed in different academic fields (Reznitskaya et al., 2001; Ryu & Sandoval, 2012). Indeed, engaging in argumentation helps to advance argumentative writing (Applebee, Langer, Nystrand, & Gamoran, 2003; Chinn, O'Donnell, & Jinks, 2000; Reznitskaya et al., 2001; Zohar & Nemet, 2002), develop content knowledge (Scheuer, Loll, Pinkwart, & McLaren, 2010; Zwiers & Crawford, 2011), and enhance motivation to learn from peer interactions (Chinn et al., 2000).

van Eemeren and Grootendorst (1992) defined argumentation as “a verbal, social and rational activity aimed at convincing a reasonable critic of the acceptability of a standpoint by putting forward a constellation of propositions justifying or refuting the proposition expressed in the standpoint” (p.1). While arguments are a key component in one’s professional and personal life (Rigotti & Greco Morasso, 2009; Schiappa & Nordin, 2013), it has been suggested that people are unlikely to consistently make compelling ones (Schiappa & Nordin, 2013). This is because argumentation is complex, multifaceted, and requires social and intellectual skills (Duschl, 2007; Schiappa & Nordin, 2013). Schiappa and Nordin (2013) noted that argumentation skills were best enhanced when individuals study and practice them. This is aligned with the latest Common Core Standards, which have highlighted the significance of argumentation and
stated that the readiness for college and professional life depends on the students’ ability to effectively read and write arguments (Common Core Standards, 2014).

**Inquiry Dialogue: Definition and Significance**

Scholars have suggested that argumentation skills are best supported during a particular type of talk called “inquiry dialogue” (Gregory, 2006, 2007; Reznitskaya & Gregory, 2013). Walton (1998) identified six types of dialogues: negotiation, persuasion, information-seeking, deliberation, eristic, and inquiry dialogue. He has argued that each dialogue has specific purposes. In inquiry dialogue, participants try to collectively reach the truth or the most reasonable conclusion. This is different from persuasion dialogue, in which participants aim to convince their opponents to agree with their position, or negotiation dialogue, in which people with different aims and needs seek to reach an agreement through making concessions (Walton, 1998). As such, inquiry dialogue has been suggested to represent the normative dialogue type to enhance students’ reasoning, as it is most aligned with the standards and practice of rigorous argumentation (Gregory, 2006; Wilkinson et al., 2017).

Classroom discussions that share features with inquiry dialogue have been examined in a significant number of empirical studies (Dong, Anderson, Li, & Kim, 2008; Reznitskaya, Anderson, Dong, Li, & Kim, 2007; Reznitskaya, Anderson, & Kuo, 2007). During these discussions, students work together to find an answer to a contestable question (Dong et al., 2008; Reznitskaya, Anderson, Dong, et al., 2007; Reznitskaya, Anderson, & Kuo, 2007). They search for evidence to support their standpoints and challenge other people’s positions. During inquiry dialogue, the roles of teachers and students shift. Students become more responsible for constructing knowledge, managing their discussions, and evaluating each other’s reasoning (Reznitskaya & Gregory, 2013). Teachers, on the other hand, help their students evaluate their
peers’ opinions, ask clarifying questions, and encourage students to challenge each other’s thinking (Reznitskaya & Gregory, 2013; Reznitskaya & Wilkinson, 2017).

Empirical evidence has suggested that discussions that share features with inquiry dialogue can help students improve reasoning (Kuhn & Udell, 2003; Mercer, Wegerif, & Dawes, 1999), enhance argumentative writing (Applebee et al., 2003; Chinn et al., 2000; Reznitskaya et al., 2001; Zohar & Nemet, 2002), as well as acquire better understanding of subject-matter knowledge (Duschl & Osborne, 2002; Gregory & Laverty, 2009). For example, in their study, Reznitskaya et al. (2001) showed that students who engaged in “collaborative reasoning,” a discussion-based method that has common features with inquiry dialogue and whose aims are to help students improve argumentation skills, wrote essays with more arguments, counterarguments, and evidence from the text than those who did not participate in “collaborative reasoning” discussions. Along similar lines, Rojas-Drummond and Mercer (2003) compared different groups of Mexican teachers and their students. They found that students who participated in classroom discussions that shared features with inquiry dialogue were more successful at comprehending and producing argumentative texts than those who did not participate in such practices. They concluded that traditional approach to discussions, where teachers ask basic questions to test their students’ knowledge, was less effective than interactions in which teachers asked questions to guide the development of students’ deep understanding.

Scarcity of Discussions Featuring Inquiry Dialogue

Despite the importance of productive classroom discussions, they are rare in today’s classrooms (Applebee et al., 2003; Murphy, Soter, Wilkinson, Hennessey, & Alexander, 2009; Nystrand, 1997; Nystrand, Wu, Gamoran, Zeiser, & Long, 2003; Smith, Hardman, Wall, & Mroz, 2004). Researchers have shown that in most classrooms, interactions followed a recitation
pattern, consisting of teachers asking questions, students answering these questions, and finally teachers evaluating students’ answers (Applebee et al., 2003; Nystrand, 1997; Nystrand et al., 2003). Teachers, in these classrooms, did most of the talking and students, most of the time, work individually (Applebee et al., 2003). For instance, when observing eighth and ninth grade English classrooms, Nystrand et al. (2003) found that the teachers asked most of the questions and that the average length of interactive class discussions was less than fifteen seconds. They also reported that the goal of the lessons was to recall and display what was already known instead of engaging students in collaborative co-construction of meaning.

The fact that recitation pattern still widely exists in classrooms (Applebee et al., 2003; Nystrand et al., 2003) shows that teachers are not successful at changing their methods of teaching (Juzwik, Sherry, Caughlan, Heintz, & Borsheim-Black, 2012; Nguyen, Anderson, Waggoner, & Rowel, 2007). For example, Juzwik et al. (2012) noted that teachers had limited approaches to structuring classroom interactions and that, most of the times, teachers used methods that were familiar to them. Practitioners’ lack of pedagogical knowledge is due to several factors. While some researchers argued that the number of pre-service programs providing future teachers with multiple strategies on how to effectively use classroom talk was limited (Grossman et al., 2000; Newell et al., 2011), others attributed this problem to the lack of professional development opportunities (Garet, Porter, Desimone, Birman, & Yoon, 2001; Hiebert, 1999). Thus, more research is needed to inform teacher educators on how to successfully design professional development aimed at enhancing dialogic-based instruction.

Today, there is a consensus about particular characteristics of successful professional development that helps teachers deepen their content knowledge and develop their teaching practices (Battey et al., 2013; Desimone, Smith, & Phillips, 2013; Garet et al., 2001). These
characteristics include the focus on the content (Birman, Desimone, Porter, & Garet, 2000; Ingvarson, Meiers, & Beavis, 2005), active learning (Birman et al., 2000; Garet et al., 2001), collective participation (Ingvarson et al., 2005; Lieberman & Pointer-Mace, 2008), program coherence and sufficient time (Desimone et al., 2013). Although there is a broad agreement on the importance of these characteristics, they often seem insufficient to change teachers’ practices (Garet et al., 2001; Hiebert, 1999). Moreover, researchers have posited that, while these characteristics commonly appear in several professional development programs, there is little direct evidence that they account for better teaching (Garet et al., 2001; Hiebert, 1999), and more specifically better discourse practices (Pimentel & McNeill, 2013). As a consequence, questions about how teachers can be supported on their professional journeys to change their discourse practices remain largely unanswered.

Moreover, ineffective pre-service programs and professional development opportunities are not the only reasons that hinder the implementation of classroom discussions. Recent research suggests that the struggles teachers encounter when using dialogue-based instruction may be due, at least in part, to their beliefs that are misaligned with this practice (Alvermann & Hayes, 1989; Bråten & Strømsø, 2006; Pimentel & McNeill, 2013). In fact, numerous empirical studies and theoretical accounts claim that teachers’ beliefs heavily affect their practices (Fives & Buehl, 2012; Macnab & Payne, 2003; Nespor, 1987; Pajares, 1992; Richardson, 1996; Thompson, 1992). Thompson (1992) argued that in order “to understand teaching from teachers’ perspectives we have to understand the beliefs with which they define their work” (p. 129). Richardson (1996) also suggested that the study of belief was needed in teacher education because beliefs “drive classroom actions and influence the teacher change process” (p. 102). For example, in their case study, Nguyen et al. (2007) collaborated with a fourth grade teacher to
implement “collaborative reasoning” discussions in her classroom over a three-month period. The authors reported that the instructor had difficulty shifting her practice to become more dialogic because she was concerned with the right interpretation of the story and allowed few opportunities for students to notice the misinterpretations on their own. Although, the teacher was coached and guided, these difficulties were still persistent throughout the study. Similarly, Yerrick, Parke, and Nugent (1997) showed that science teachers were unsuccessful at adopting more dialogic approach when teaching their subject matter despite their participation in a two-week seminar. In their study, Yerrick et al. (1997) noted that science teachers perceived themselves as the sole knowledge providers, considered interactions as a waste of time, and ascertained that students got off track easily when they engaged in classroom discussions. The authors reported that teacher beliefs about the nature of science and the acquisition of scientific knowledge heavily affected their teaching and learning practices. In other words, teachers’ epistemic cognition played an important role in both their learning and their teaching strategies.

A large body of research has suggested that teachers’ epistemic cognition affects their interactions with students, instructional choices, approaches to professional development, and assumptions about how students learn and develop over time (Bondy et al., 2007; Howard, McGee, & Schwartz, 2000). Research on epistemic cognition offers an insight for understanding teachers’ practices such as choice of pedagogical approaches, curriculum, and assessment methods (Lunn, Walker, & Mascadri, 2016; Strømsø & Bråten, 2011; Yadav, Herron, & Samarapungavan, 2011), as well as their engagement in professional development opportunities (Wilkinson et al., 2017).
Research Question and Organization of the Study

In this study, I seek to understand how epistemic cognition informs teacher learning and facilitation of inquiry dialogue. My research question is: How do teachers engage in epistemic cognition when they learn and facilitate inquiry dialogue?

The remainder of the document is divided into six chapters. In Chapter two, I examined the construct of epistemic cognition and reviewed the three waves of research that have shaped the field of epistemic cognition. In Chapter three, I proposed the Integrated Model for Learning and Facilitating Inquiry Dialogue to gather further insight into the construct of epistemic cognition as it relates to learning and facilitating inquiry dialogue. The model might help me to understand how teachers engage in epistemic cognition, as well as allow me to determine if their level of epistemic cognition shapes the learning and facilitation of inquiry dialogue. Chapter four is about the methodology I chose in order to conduct my study. Since I conducted a secondary analysis of previously collected data, I started by describing the in-depth, longitudinal study conducted by Reznitskaya and colleagues’ (2015; 2017), whose goal was to design a professional development program to help elementary school teachers learn and facilitate inquiry dialogue. I then described the data I chose to use in my proposed study (i.e. participant and data sources) as well as the analytical procedures for the proposed study. In addition, I discussed its validity and trustworthiness including: credibility, transferability, dependability, and confirmability, as well as my own positionality. In Chapter five, I reported my findings from the analysis of the Reflective Judgment Interviews, and the analysis of the coaching sessions, the focus group meetings, the study group meetings, and the classroom discussions transcripts. Chapter six is my discussion chapter, in which I discussed the relevance of my findings in relation to inquiry
dialogue and epistemic cognition. Lastly, I identified the study implications and provided my final reflection to conclude my thesis.

Chapter Two: Theory and Research on Epistemic Cognition

Defining the Terms

The fact that epistemic cognition has been studied under many fields within psychology and education has resulted in a myriad of definitions in the literature (Hofer, 2016). Researchers often used terms such as epistemological beliefs (Schommer-Aikins, 2004), epistemological theories (Hofer & Pintrich, 1997), reflective judgment (King & Kitchener, 1994), epistemological reflection (Baxter Magolda, 2001), and more recently epistemic cognition (Buehl & Fives, 2016; Chinn, Buckland, & Samarapungavan, 2011; Greene, Azevedo, & Torney-Purta, 2008). Even though the purpose of this paper is not the full examination of all these conceptualizations, a brief review of how they developed is necessary to sketch the differences existing in the field of epistemic cognition and to convey a clearer explanation of the construct.

The terms personal epistemology, personal theories, and epistemological beliefs have been, to a large extent, used interchangeably (Maggioni & Parkinson, 2008). They refer to the set of individual beliefs about knowledge and knowing (Hofer & Pintrich, 1997; Pintrich, 2002). Several researchers have advocated to limit the content of the construct by including only beliefs about knowledge and the process of knowing (Hofer & Pintrich, 1997; Sandoval, 2005 ). They have argued that, even though beliefs about teaching, learning, and intelligence are important and are related to epistemological beliefs, it is necessary to delimit the content of the construct in order to gain a deep understanding of its function and structure (Hofer & Pintrich, 1997). The debate among researchers was not only about the content of the construct, but also about the
EPISTEMIC COGNITION AND INQUIRY DIALOGUE

terminology used to define and describe it (Kitchener, 2002). Kitchener (2002) argued that researchers should be precise about the use of the terminology and pointed out that “epistemological” and “epistemic” should not be used interchangeably. She explains that the term “episteme” refers to knowledge, and thus epistemic beliefs refer to people’s beliefs about knowledge. As explained in Murphy, Alexander, Greene, and Hennessey’s (2012) article epistemic beliefs are used to look at “the dimensions” of knowledge such as the certainty, the structure, and the justification of knowledge. Epistemological beliefs, on the other hand, refer to the “theory of knowledge” (Kitchener, 2002). This is to say that epistemological beliefs are beliefs about the study of knowledge, or the field of epistemology (Kitchener, 2002; Murphy et al., 2012). Consequently, if researchers were to follow Kitchener’s conceptualization of the construct, then they would use the term epistemic beliefs because it is a more accurate representation of what they have been investigating so far (Kitchener, 2002; Murphy et al., 2012).

More recently, researchers such as Buehl and Fives (2016) Chinn et al. (2011), Hofer (2016), Moshman (2013) suggested the use of the term “epistemic cognition”. Buehl and Fives (2016) defined epistemic cognition as “the processes individuals engage in while thinking about, developing, using, or mentally manipulating knowledge” (p.248). As such, it refers to what people do when they reflect on and think about knowledge (Maggioni & Parkinson, 2008).

Given the numerous definitions of the construct, I chose to use the term “epistemic cognition” as it is best suited to explore the cognitive processes that teachers engage in while considering the nature and justification of knowledge for both learning to teach and teaching praxis. Further, epistemic cognition is used as an overarching term that encompasses the previously mentioned constructs. I believe it is most helpful for understanding how teachers
think about, develop, and use their knowledge and processes of knowing when they learn and facilitate inquiry dialogue.

The different conceptualizations that have pervaded the field of epistemic cognition have been associated with different research traditions (Hofer, 2016). Hofer (2016) categorized these traditions into three “waves” of research on epistemology in education: a) the developmental models of epistemic cognition, b) multidimensional and domain-specific models, and, c) process models of epistemic cognition. In the next sections, I examine these three waves of research and look at their contributions to the field of epistemic cognition.

First Wave: The Developmental Models

The developmental models of epistemic cognition is a research tradition that spanned over five decades and was led by Perry (1970), starting in the early 1960-ies. Within this wave, researchers have looked at how epistemic cognition develops over time depending on environmental and educational settings (Baxter Magolda, 2001; Belenky, Clinchy, Goldberger, & Tarule, 1986; King & Kitchener, 1994; Kuhn, 1991; Perry, 1970).

In this section, I describe the different developmental models that emerged within this wave of research. These models include: (1) Perry’s Scheme of Intellectual and Ethical Development, (2) Belenky et al.’s Studies on Women’s Way of Knowing, (3) Baxter Magolda’s Epistemological Reflection Model, (4) King and Kitchener’s Reflective Judgment Model, and (5) Kuhn’s Argumentative Thinking Model. A synthesis of these frameworks is also provided to look at the similarities and differences among them.

Perry’s scheme of intellectual and ethical development. Perry (1970) based his work on a series of longitudinal qualitative studies with Harvard students. The studies comprised 109 students who were mostly males. Perry conducted his research using Check List of Educational
Values (CLEV). His interviews were open-ended, partially structured, and contained broad questions (Hofer & Pintrich, 1997). After analyzing the interviews, he created a scheme of Intellectual and Ethical Development that described how college students make meaning of their experiences (Hofer & Pintrich, 1997; Perry, 1970). His scheme delineated nine positions that were grouped into four categorizations: Dualism, Multiplicity, Relativism, and Commitment to Relativism (Knefelkamp & Slepitza, 1978; Moore, 1994, 2002; Perry, 1970).

The dualist level consists of position 1 and position 2. In position 1 there is an absolute and unquestioned view of truth. People who are in this position do not tolerate any alternative perspectives. In position 2, some beliefs and perspectives become acknowledged but they are considered wrong. There are only right and wrong positions. At the dualist level, authorities such as God, teachers, and parents are thought to be the only sources of knowledge (Hofer & Pintrich, 1997; Perry, 1970).

Once individuals start to realize that knowledge could be uncertain and that authorities may not have all the right answers, individuals are said to move to the multiplicity level. Position 3 is characterized by the acknowledgment of uncertainty. People in this position believe that there are three categories: right, wrong, and uncertain. They also believe that the unknown knowledge will be at some point discovered and will belong to the right or wrong category. In position 4, individual start to recognize that in some cases truth cannot be achieved and knowledge is not certain. In other words, there will always be some sort of knowledge that cannot be categorized as either right or wrong. Thus, all opinions are accepted, equally valued, and should not be judged (Perry, 1970).

The shift from multiplicity level to relativism level is the most important move in Perry’s scheme (Hofer & Pintrich, 1997). The relativist level, which includes position 5, represents a
fundamental movement of individual’s beliefs from perceiving the world as essentially dualistic to perceiving it as essentially relativistic, where context plays a significant role in one’s construction of knowledge (Hofer & Pintrich, 1997; Perry, 1970). Even though this shift happens from dualist level to multiplist level (i.e., people start to move away from a dichotomous view of the world), the main difference between position 5 and position 4 is that in position 5 the individual becomes aware of his or her role as an active meaning maker.

Finally, comes the Commitment to Relativism Stage, which includes positions 6, 7, 8, and 9. Compared to the previous stages, there is an ethical and emotional commitment. At this stage, knowledge is still relative and tentative; yet, individuals can take positions, make choices, and commit themselves to values and relationships. To do so, individuals use ethical commitment and personal experiences (Hofer & Pintrich, 1997; Moore, 2002; Perry, 1970). There has been little work done on these final stages, partly because undergraduate students rarely reach post-contextual-relativistic thinking (Moore, 2002).

**Studies on women’s ways of knowing.** Perry’s work has been critiqued by scholars, mainly because it focused on elite male students from Harvard University. This fact has spurred many researchers to extend this work and include different populations (Belenky et al., 1986). Belenky et al. (1986) expressed their interest in studying women’s ways of knowing and learning. They used interview questions in relation to gender, moral decisions, and relationships. They interviewed 135 women from a variety of contexts and educational settings. After analyzing the data from the interviews, they created a five-stage developmental model. The stages include: silence, received knowledge, subjective knowledge, procedural knowledge, and constructed knowledge.

**Silence.** In this stage, women perceived themselves as voiceless, mindless, and
oppressed. In their interviews with the researchers, women reported that they were silenced by authorities, who were considered the only sources of knowledge. They were hesitant of expressing themselves or questioning the knowledge and decisions made by authorities. Some women adopted the silence stage to be safe because they were afraid of speaking in front of authorities. There is no equivalent of this stage in Perry’s model (Belenky et al., 1986).

**Received knowledge.** At this level individuals perceive knowledge to be either right or wrong (Belenky et al., 1986; Hofer & Pintrich, 1997). Women who adhere to this stage do not consider themselves to be active makers of meaning (Belenky et al., 1986; Hofer & Pintrich, 1997). They have little confidence in their own voices so they regard receiving, retaining, and returning the knowledge delivered by authorities as learning. The received knowledge stage is similar to Perry’s dualism stage where ambiguity and uncertainty are not tolerated.

**Subjective knowledge.** At this level, women start to hear their inner voices and see themselves as generators of knowledge. They perceive truth as intuitive and personally constructed (Belenky et al., 1986). They start to distrust logic and consider experience to be the most valuable source of knowledge. Even though women at this stage believe that intuition is the main source of knowledge, they are still convinced that there are right or wrong answers and tend to reject opinions that conflict with their own. This is a feature of Perry’s dualist level where every position is either right or wrong.

**Procedural knowledge.** This stage reflects the recognition of the existence and legitimacy of multiple sources of knowledge. Procedural knowers focus on evaluating knowledge by applying objective and systematic methods of analysis (Belenky et al., 1986; Hofer & Pintrich, 1997). Two categories of knowers fall under procedural knowledge: *separate knowing* and *connected knowing*. 
Separate knowers disagree with the idea that everyone is right, they believe that everyone, including themselves, might be wrong. They also exclude feelings and beliefs from their judgment when evaluating knowledge and base it on critical thinking. Connected knowers, on the other hand, value other people’s opinions and ideas and seek to understand them by trying to share the experience that led them to the forming of their knowledge (Belenky et al., 1986; Hofer & Pintrich, 1997).

**Constructed knowledge.** Women at this level do not have a fixed mindset about knowledge. They believe that it may change depending on the context and the experience. For them knowledge is "a constant process of construction, deconstruction and reconstruction" (Love & Gurthie, 1999).

**Epistemological reflection model.** In an attempt to address the concerns raised by Belenky et al. (1986) regarding women’s role and gender dimensions, Baxter Magolda (1992) created a gender-inclusive model. In her epistemological reflection model, Baxter Magolda (1992) identified gender related patterns across different stages. She conducted a five-year longitudinal study with 51 men and 50 women through their college years (Baxter Magolda, 1992). Continuing on the same line of epistemological development and basing her data analysis on grounded theory, Baxter Magolda (1992) proposed a model that contained four perspectives. These perspectives included: absolute knowing, transitional knowing, independent knowing, and contextual knowing. Hofer and Pintrich (1997) reported that Baxter Magolda (1992) model was aligned with Perry’s (1970) scheme and Belenky et al.’s (1986) perspectives. In fact, absolute knowers in all three models view knowledge as certain and believe that authorities hold the truth (Hofer & Pintrich, 1997). At this stage, learners’ main focus is on acquiring knowledge from authorities and being able to reproduce it. Paradox and uncertainty are inconceivable. As the
term *transitional knowing* suggests, individuals at this level start to accept the fact that knowledge may not be absolute and certain. Individuals start to think critically and seek to understand knowledge in order to make sound judgment about it. Then, comes the *independent knowing* stage. At this level individuals begin to perceive themselves as possible makers of meaning. They think that their opinions are valued and start to develop their own beliefs and stances. They also accept the existence of different opinions and beliefs and start to critically question and challenge them. In *contextual knowing* stage, individuals realize that knowledge is constructed and that they need to use rigorous reasons to support their claims (Baxter Magolda, 1992; Hofer & Pintrich, 1997). As its name indicates, in contextual knowing individuals’ context plays an important role in the development and evaluation of knowledge. In other words, knowledge exists in a context and is judged on reasons and evidence within the context.

**Reflective judgment model.** Yet, another example of epistemological development model is the *reflective judgment model* created by King and Kitchener (1994). They were interested in investigating the epistemological assumptions and the reasoning processes of older adolescents and adults specifically when dealing with ill-structured problems (Hofer & Pintrich, 1997; King & Kitchener, 1994). Participants discussed topics such as the objectivity of news reporting, the safety of chemical additives in food, the safety of nuclear energy, and the building of the pyramids (King & Kitchener, 1994). They were asked to justify their answers by responding to six follow-up questions. King and Kitchener (1994) generated a model of the development of reasoning skills with different developmental stages. The reflective judgment model includes seven stages. These stages are grouped into three types of thinking: pre-reflective thinking, quasi-reflective thinking, and reflective thinking.

*The pre-reflective thinking* includes the first three stages. In this phase, individuals hold
the dichotomous view of knowledge as right or wrong. Knowledge is concrete and is justified through authority figures. The quasi-reflective thinking phase, which includes stages four and five, is characterized by the idea that knowledge is subjective and contextual. Beliefs are justified through reasons and evidence, but these reasons are idiosyncratic because they are chosen based on the individual’s established beliefs. The last two stages constitute the reflective thinking where knowledge is constructed from a variety of sources and beliefs are justified by comparing opinions, reasons, and evidence from different perspectives. Individuals at this stage view knowledge as the result of rigorous and reasonable inquiry where reasons and evidence are thoroughly examined and interpretations are logically explained. King and Kitchener’s main focus was on the view of knowledge and the process of justification (Hofer & Pintrich, 1997). Their main focus shifted from looking at the different stages of the development of epistemic cognition to looking at the processes of thinking (Hofer & Pintrich, 1997).

**Argumentative thinking model.** Similar to King and Kitchener’s framework, Kuhn (1991) developed a model to better understand argumentation practices (Hofer & Pintrich, 1997; Kuhn, 1991). Her studies offered further insights on the development of epistemic cognition. She suggested a model with three levels: absolutist, multiplist, and evaluatist. The absolutist level is very similar to the dualism level of Perry’s (1970) scheme and Belenky et al.’s (1986) received knowledge stage. Individuals at this level view knowledge as certain, absolute, and generated from authorities (Kuhn, 1991; Kuhn & Weinstock, 2002). The multiplicity level is parallel to the subjective knowledge level in Belenky et al.’s (1986) model. In this level, individuals believe that all opinions are equally valid (Kuhn & Weinstock, 2002).

Synthesizing the different epistemological models has shown that there is a recurrent theme across the literature. Indeed, the authors of all five epistemological developmental models
have theorized that beliefs shift from a dualistic view of knowledge where it is seen as right or wrong to more advanced stages where individuals challenge and evaluate knowledge (Baxter Magolda, 1992; Belenky et al., 1986; King & Kitchener, 1994; Kuhn, 1991; Perry, 1970).

The developmental models of epistemic cognition, however, differed in many other aspects, such as the population studied, the methodologies used, and the duration and the focus of research (Hofer & Pintrich, 1997). For example, Perry (1970) studied elite white male students from Harvard, whereas Belenky et al. (1986) focused on women. Baxter Magolda (1992), on the other hand, attempted to have a more inclusive model, in which men and women were evenly represented. Another distinction among these five models is that Perry (1970), Belenky et al. (1986), Baxter Magolda (1992) focused on the developmental and structural sequence of epistemic cognition, whereas King and Kitchener (1994) and Kuhn (1991) focused on the assumptions that underlie thinking processes (Hofer & Pintrich, 1997). Despite these differences, all frameworks presented somewhat parallel positions reflecting the development of epistemic cognition. That is, most scholars proposed frameworks that depict the movement from dualistic viewpoint to a more evaluative perspective (Hofer & Pintrich, 1997; Moore, 2002).

The first wave of research has advanced the field of epistemic cognition in three different ways. First, researchers have addressed for the first time a new construct that seemed to play a significant role in the teaching and the learning processes (Hofer & Pintrich, 1997). Second, this tradition generated different developmental models of epistemic cognition that helped understand the evolution of individuals’ epistemic cognition (Hofer & Pintrich, 1997). Finally, this wave laid the ground for the following waves of research to inform teacher education programs about the relationship existing between epistemic cognition and teaching practices (Hofer, 2016; Lunn et al., 2016). Despite the significant role of the first research tradition, scholars have critiqued it...
for not acknowledging the multidimensional and domain specific aspects of epistemic cognition (Buehl, Alexander, & Murphy, 2002; Schommer, 1990). For example, even though researchers such as King and Kitchener (1994) described the source of knowledge and the justification of knowledge as two main dimensions to determine the developmental stage, most of them assumed that these dimensions develop in a synchronic, consistent way (Hofer, 2016). People’s epistemic cognition was assumed to develop holistically from an absolutist level to a more evaluative position; hence, the second wave of research has emerged to challenge these views of epistemic cognition.

**Second Wave: Domain-General versus Domain Specific Models**

For several decades, researchers and theorists have debated the general versus specific nature of epistemic cognition (Muis, Bendixen, & Haerle, 2006). As mentioned earlier, researchers from the first wave have assumed that people’s epistemic cognition is domain-general, meaning that it is the same across all domains and that it advances through a fixed trajectory (Baxter Magolda, 1992; Perry, 1970). For example, if people are at the absolutist level in mathematics, they are assumed to be at the same stance in other subjects, such as history or English. On the other hand, scholars have challenged domain-generality and argued for domain-specificity, suggesting that people’s epistemic cognition depends on the discipline under consideration (Buehl et al., 2002; Donald, 1990). For instance, if people perceive knowledge in mathematics as certain and unchanged, they may not necessarily hold the same beliefs about other disciplines, such as history or literature.

Currently, there is another trend of research on epistemic cognition that reconciles both perspectives. Within this trend, scholars argue that epistemic cognition is too complex to be categorized as either domain specific or domain general. They further argue that epistemic
cognition depends on both domains and contexts, therefore, the binary categorization (i.e. domain-specific vs. domain general) is an oversimplification of the construct (Buehl & Alexander, 2001). This has led researchers to propose unified models that integrate dimensional, developmental and contextual elements (Buehl et al., 2002; Hofer, 2016; Muis et al., 2006).

The nature of epistemic cognition in different contexts has been empirically investigated by researchers (Buehl & Alexander, 2001; Donald, 1990; Hofer, 2000; Muis et al., 2006). For instance, Donald (1990) examined validation processes and truth criteria that six university professors used in their disciplines. She showed that the frequency of the use of empirical evidences such as experiments to test the truth and the reproducibility of a given phenomenon differed depending on the domains. For instance, professors in the natural science were more likely to use empirical evidence; professors in humanities, on the other hand, were least likely to use this criterion. Based on these findings, Donald (1990) reported that the justification of knowledge was domain-specific. She concluded that professors in different disciplines used different processes to determine how beliefs became justified knowledge.

A related area of research that has emerged simultaneously with the studies of domain-specificity is the multidimensional conceptualization of epistemic cognition (Schommer, 1990). Schommer (1990) hypothesized that epistemic cognition was a complex system, composed of five relatively independent dimensions. These dimensions include: source, structure, and justification of knowledge, quick learning, and innate ability, develop at different rates and may be inconsistent with each other. For example, individuals may believe that even though knowledge is certain and unchanged, it can also be complex and evolving (Schommer & Walker, 1995). These beliefs can be classified as naïve or sophisticated (Buehl et al., 2002; Hofer, 2000). For instance, within the dimension of the source of knowledge, a naïve belief would be that
knowledge is generated by authorities and comes from one source, while more sophisticated beliefs would be that knowledge is constructed and it comes from multiple sources.

Several studies were conducted to explain multidimensionality across different domains (Buehl et al., 2002; Donald, 1990; Jehng, Johnson, & Anderson, 1993; Schommer, 1990; Schommer & Walker, 1995). For example, Jehng et al. (1993) investigated the relationship of 386 students’ epistemological beliefs and area of specialization. They categorized the participants into two groups: the first group was composed of social sciences or humanities and art students (i.e. soft fields) and the second group was composed of students majoring in business and engineering (i.e. hard fields). Jehng et al. (1993) found that students who majored in soft fields believed that knowledge was uncertain. They also viewed that learning was not orderly and relied more on their reasoning ability than the group in the hard field. In addition, the authors concluded that students’ educational level played a role in how they viewed knowledge. In fact, graduate students were more likely to believe that knowledge was often uncertain, was best acquired from independent reasoning, and that learning was not usually an orderly process compared to undergraduate students. The findings of this study opened doors to more research on the role of context in developing epistemic cognition.

Researchers not only examined multidimensionality across domains (Hofer, 2000; Schommer, 1990), but also within the same domain (Bråten, Strømsø, & Samuelstuen, 2008; Donald, 1990). For example, when investigating the validation processes of six university professors, Donald (1990) showed that social science professors who considered their discipline to be pure relied on empirical evidence and on deductive thinking. However, professors who perceived their discipline to be applied only used empirical evidence. This is to say that, even
within the same domains, beliefs might differ depending on individuals’ perceptions of these domains.

The ongoing debates about the nature of epistemic cognition (i.e. whether it is domain-general or domain-specific), as well as its multidimensionality, are perhaps partly due to the lack of a clear definition of what is meant by academic domain knowledge (Muis et al., 2006). Following Alexander’s (1992) conceptualization of domain knowledge Muis et al. (2006) defined domain knowledge as “a body of knowledge that individuals possess about a specific field of study” (p.10). In their conceptualization of academic knowledge, Muis et al. (2006) have argued that knowledge can be “paradigmatic” or “hard” (e.g. physics and biology), or “not paradigmatic” or “soft” (e.g. humanities, education, p.10). This distinction is based on the nature of the problems. In paradigmatic domains, problems are well-structured with agreed-upon solutions derived from tested theories and algorithm procedures (Buehl & Alexander, 2001). Conversely, non-paradigmatic domains are based on ill-structured problems. In this case, methodologies and content are thought to be idiosyncratic and solutions are developed through a more heuristic approach (Muis et al., 2006).

Academic domains also differ in terms of their practical applications. For example, subjects that focus on theoretical development, such as mathematics, are considered “pure”. On the other hand, subjects that emphasized the practicality of knowledge, such as biology, are considered “applied” (Muis et al., 2006). These categorizations of domains are necessary because they influence the methodologies of research, the interpretation of the data, and the conclusions of the studies (Buehl & Alexander, 2001).

The new conceptualization of epistemic cognition within the second wave of research has led scholars to create new measures to fully capture the complexity of epistemic cognition
An example of the new measures is Schommer’s Epistemological Questionnaire (SEQ). SEQ was considered one of the major contributions of the second wave and was widely used by researchers (Buehl et al., 2002; Hofer & Pintrich, 1997). This is because it allowed researchers to test the existence of the proposed dimensions, to measure the different constructs of the epistemic cognition, and to administer it to larger groups of people (Buehl et al., 2002; Hofer & Pintrich, 1997). In addition, a new line of inquiry has emerged to investigate the relationship between epistemic cognition and other educational constructs, such as text comprehension (Schommer, 1990) and strategy use (Schommer, Crouse, & Rhodes, 1992). For example, Schommer (1990) studied the relationship between epistemic cognition and comprehension of texts. Specifically, Schommer (1990) wanted to investigate the relationship between epistemic cognition and the types of conclusions written by the students. Eighty-six first year college students were asked to read passages from psychology and science. The psychology passage contained four integrated theories about the topic of aggression, and the science passage contained different views on the consummation of the vitamin B-6. The texts did not have conclusions and the participants in this study were required to write appropriate conclusions to the texts they read. Students were also asked to rate their confidence in comprehending texts and to report the number of classes they had previously taken in psychology and science. This allowed Schommer (1990) to investigate whether prior knowledge affected comprehension. One conclusion from this study was that students with naïve beliefs about knowledge (i.e., those who believed that knowledge consisted of isolated facts) seemed to ignore the complexity of the text and drew simple conclusions that were aligned with their prior beliefs. On the other hand, those who held sophisticated beliefs drew open-ended conclusions, highlighting the uncertainty and the evolving nature of knowledge (Schommer,
Despite her big contribution in advancing the line of inquiry in epistemic cognition, Schommer’s measurement work has been criticized. For instance, Reznitskaya and Gregory (2013) claimed that Schommer’s Epistemological Questionnaire (SEQ) does not capture the complexity of the construct of epistemic cognition. They argued that the short, de-contextualized statements used in Schommer’s questionnaire were too simplistic to account for more nuanced aspects of epistemic cognition. Furthermore, it has been shown that SEQ did not accurately measure all the five dimensions hypothesized by Schommer (Buehl et al., 2002; Hofer, 2000).

Another finding was that not all five dimensions belonged to the epistemic cognition system (Hofer & Pintrich, 1997). These critiques have resulted in the development of new, more fine-grained approaches to measuring epistemic cognition, such as Hofer’s Discipline-Focused Epistemological Beliefs Questionnaire (DFBQ) and Buehl and colleagues’ Domain-Specific Beliefs Questionnaire (DSBQ).

To conclude, researchers within the second wave have offered new insights on how to advance the field of epistemic cognition. First, they addressed domain specificity and domain generality of epistemic cognition (Buehl et al., 2002). As a result, many researchers agreed that epistemic cognition had domain-specific components (Donald, 1990; Jehng et al., 1993; Schommer, 1990; Schommer & Walker, 1995). The overall consensus now is that epistemic cognition can be both domain specific and domain general (Muis et al., 2006). Finally, the use of quantitative measurement tools not only allowed researchers to conduct more studies with larger groups of people, but also produced a new line of inquiry exploring the relationships between epistemic cognition and other constructs (Buehl et al., 2002). Yet, despite their numerous contributions to the field of epistemic cognition, neither developmental models nor domain-
specific models have addressed the processes of engagement in epistemic cognition. The third wave is focusing on this shortcoming and it has significant implications for teaching and learning.

Third Wave: Process Models of Epistemic Cognition

Epistemic cognition research has continued to expand within the third wave offering new models, new measurement tools, and new methods of analysis (Hofer, 2016). Researchers such as Chinn et al. (2011) and Greene et al. (2008) drew insights from other disciplines, including philosophy and psychology, to provide a clearer definition of the construct and to help build unified models that account for the process of engagement in epistemic cognition.

One of the most influential models that was created within this wave of research is Chinn et al.’s (2011) framework. Building their framework on Hofer and Pintrich’s (1997) model and using ideas from philosophy and psychology in their formulation of epistemic cognition, Chinn et al. (2011) created a multidimensional framework that contains five constructs: a) epistemic aims and values, b) structure of knowledge, c) source and justification of knowledge, d) epistemic virtues and vices, and e) reliable and unreliable processes for achieving epistemic aims. In their framework, Chinn et al. (2011) emphasized the role of context in the development of epistemic cognition. Additionally, they claimed that their framework could be used to explore the developmental trajectory of the five constructs, and to investigate the learners’ processes for knowledge acquisition.

Since its development, several researchers have worked with Chinn and colleagues’ (2011; 2014) models to further explore the relationship between epistemic cognition and educational and philosophical constructs. For instance, Bråten, Muis, and Reznitskaya (2017) proposed that Chinn’s model helps to explain the connections between argumentation, used as a
reliable process, and deep understanding. Similarly, Lee, Goldman, Levine, and Magliano (2016) used Chinn et al.’s model as an explanatory tool to understand the complexity of epistemic cognition when it comes to reasoning and arguing about literary texts. Yet, another useful model based on Chinn and colleagues’ (2011; 2014) framework is the Epistemic Cognition for Learning and Teaching framework developed by Fives and colleagues’ framework (2016). The authors expanded Chinn et al.’s model by explicating the connections existing between the components of epistemic cognition and by situating it within the teaching profession. They also distinguished between the role of epistemic cognition in teachers’ learning process and in their teaching practice.

The existence of new models within the third wave of research (Buehl & Fives, 2016; Chinn et al., 2011; Greene et al., 2008) revealed some limitations in the current measurement tools (Chinn et al., 2011; Schraw & Olafson, 2008). Indeed, researchers such as Chinn et al. (2011), DeBacker, Crowson, Beesley, Thoma, and Nita (2008), and Schraw and Olafson (2008) suggested that the current tools failed to accurately measure the important components of epistemic cognition. Therefore, new approaches to measurement have been developed to assess epistemic cognition. These approaches include think aloud protocols (Ferguson, Bråten, & Strømsø, 2012), classroom observations (Hofer, 2004), and the use of mixed methods (Bromme, Pieschl, & Stahl, 2010).

In short, the field of epistemic cognition has undergone major changes since the works of Perry in the 1950s. In the previous sections, I described how each wave of research has enriched the field of epistemic cognition. It was within the first wave of research that the construct of epistemic cognition was introduced and explored (Hofer, 2016). Different, yet largely overlapping, developmental models described the different stages of epistemic cognition.
Researchers also created the first tools to assess the development of epistemic cognition. Then came the second wave to challenge some of the shortcomings of the first wave. Researchers within the second wave discussed the domain generality and domain specificity, as well as the multidimensionality of epistemic cognition. This new conceptualization has led to the creation of new measurement tools and opened doors to additional lines of inquiry, such as relating epistemic cognition to other variables, including text comprehension and use of strategies (Buehl et al., 2002; Schommer, 1990). However, neither the first wave, nor the second wave has investigated people’s engagement in epistemic cognition. Hence, a new wave has emerged. Researchers from the third wave integrated ideas from other disciplines, such as philosophy and psychology, to further refine the concept of epistemic cognition and to create models to explain how people engage in epistemic cognition. They also attempted to capture the complex and nuanced nature of epistemic cognition and created new measurement tools to accurately assess the different components.

**Chapter Three: Integrated Framework for Learning and Facilitating Inquiry Dialogue**

My goal in this chapter is to integrate three different frameworks: 1) the Argumentative Rating Tool, an assessment framework, developed by Reznitskaya and Wilkinson (2017), 2) Kuhn’s (1991) model of argumentative thinking, and 3) Fives and colleagues’ (2016) frameworks of epistemic cognition in teaching and learning. I believe the integrated model will help me address my research question: to examine how teachers engage in epistemic cognition when they learn and facilitate inquiry dialogue in their classrooms, and to analyze whether the level of epistemic cognition informs teacher learning and facilitation of inquiry dialogue.

Fives and colleagues’ (2016) conceptualization of epistemic cognition in learning and
teaching is most relevant to my work because it is situated within the teaching profession. Furthermore, in their framework, Fives and colleagues’ (2016) explained the relationship existing between the components of epistemic cognition by clarifying how these components interact with each other. As described in the next section, I mostly focused on four components of Fives and colleagues’ (2016) *epistemic aims for self and learners, consideration and evaluation of epistemic matters, reliable processes, and teachers’ self-system.*

Along with Fives and colleagues’ (2016), I also used Kuhn’s (1991) developmental model to analyze the levels of teachers’ epistemic cognitions as they learned and facilitated inquiry dialogue. This model is well-suited for the context of learning and teaching argumentation through inquiry dialogue as it explicitly focuses on how individuals argue about ill-structured problems (Kuhn, 1991). Kuhn’s (1991) developmental model helped me shed light on whether or not holding evaluativist epistemic cognition was necessary to successfully learn and facilitate inquiry dialogue.

The last framework I used is the Argumentation Rating Tool (ART) developed by Reznitskaya and Wilkinson (2017). The ART presents a detailed description of normative argumentation processes aligned with the goals of inquiry dialogue. This tool helped me explore the complexity of the criteria, practices, and talk moves used by teachers who learn to facilitate argumentation during inquiry dialogue.

In the next section, I provide a description of the three frameworks that I used to inform the development of the new integrated framework for the learning and teaching argumentation during inquiry dialogue. When presenting the three different frameworks, I chose to start with the ART because it represents focal components of the new integrated framework. Then, I describe Kuhn’s developmental model because it captures one of the several influences that are
part of the teachers’ self-system. Finally, comes Fives and colleagues’ framework because it embodies the other frameworks. After describing the three frameworks, I explain how the new integrated model helped me in my endeavor to understand how teachers engage in epistemic cognition when learning and facilitating argumentation during inquiry dialogue.

**Framework One: The Argumentation Rating Tool**

After engaging in extensive research on argumentation, logic reasoning, and critical thinking, Reznitskaya and Wilkinson (2017) designed and assessment framework called the Argumentation Rating Tool (ART) to help teachers and researchers evaluate the quality of teachers’ facilitation of inquiry dialogue and students’ argumentation during inquiry dialogue. The researchers started by identifying four criteria that address high quality argumentation: 1) considering multiple perspectives, 2) having clarity in language and structure of arguments, 3) providing acceptable reasons and evidence, and 4) making logical connections between positions, reasons, and evidence. Next, researchers have also identified discourse practices that are connected to each criterion. For example, Table 1 shows four discourses practices in relation to the second criterion of clarity.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarity</td>
<td>1. Clarifying meaning</td>
</tr>
<tr>
<td></td>
<td>2. Connecting Ideas</td>
</tr>
<tr>
<td></td>
<td>3. Labeling moves and parts of an argument</td>
</tr>
<tr>
<td></td>
<td>4. Tracking the line of inquiry</td>
</tr>
</tbody>
</table>

In addition, researchers exemplified each practice with characteristic “talk moves”. The
term talk moves refer to statements that teachers and students can make to perform various functions in the context of inquiry dialogue (Resnick, Michaels, & O'Connor, 2010). Michaels and O’Connor (2015) defined talk moves as “moves that seemed to take the conversation from recitation to reasoning opening up the conversation, helping students listen carefully to one another, and supporting them as they built on and critiqued the ideas and arguments of their peers” (p. 335). As such, the effective implementation of inquiry dialogue relies on the effective use of the talk moves. Knowing the importance of talk moves, Reznitskaya and Wilkinson (2017) identified a set of talk moves for each practice in the Argumentation Rating Tool. For instance, to clarify meanings, a teacher may say something like “I hear you saying ... is that what you mean?” or “Are you saying that...?” Table 2 shows some talk moves related to the practice of connecting ideas.

Table 2

<table>
<thead>
<tr>
<th>Practice</th>
<th>Talk Moves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecting Ideas</td>
<td>1. Which part are you agreeing with?</td>
</tr>
<tr>
<td></td>
<td>2. Martin, do you want to respond to Kim?</td>
</tr>
<tr>
<td></td>
<td>3. How does this relate to what William said?</td>
</tr>
<tr>
<td></td>
<td>4. How is this example relevant to what Marina said earlier about…?</td>
</tr>
</tbody>
</table>

To sum up, the ART was developed to help teachers enhance their facilitation of inquiry dialogue and improve students’ argumentation process. It contains four criteria which are each connected to specific practices. In order to achieve these practices and ensure rigorous argumentation, teachers and students are requested to use effective talk moves.
Framework Two: Kuhn’s Developmental Model

Kuhn (1991) developed a model to better understand argumentation practices. Her studies offered further insights on the development of epistemic cognition. She suggested a model with three levels: *absolutist, multiplist, and evaluatist*.

At the absolutist level, knowledge is generated by authorities, hence it is certain and absolute. Knowledge is right or wrong and is not to be questioned, or challenged. Consequently, there is no reason for an individual at the absolutist level to engage in sustained intellectual inquiry because there is no space for reasoned argumentation (Kuhn, 1991).

Whereas people at the absolutist level believe that knowledge is binary and can only exist as “right” or “wrong,” people at the multiplist level acknowledge that several versions of “right” knowledge can exist concurrently. On this level, since all knowledge is equally valid and valued, any evaluation of knowledge as better, more certain, or more accurate is unnecessary (Kuhn, 1991).

Like people at the multiplist level, people at the evaluatist level acknowledge that multiple versions of knowledge can exist, but people at the evaluatist level do not consider all knowledge to be equally valid. At the evaluatist level, people weigh different knowledge and recognize the existence of “better” answers and “more certain” conclusions. As opposed to viewing knowledge as fixed and definitive, people at the evaluatist level see knowledge as evolving and requiring continuous inquiry, research, and interrogation (Kuhn, 1991).

In the context of argumentation, teachers at the absolutist level align their ideas and positions with those of authorities, and it is improbable that they accept positions that differ from theirs. On the other hand, teachers who are at the multiplist level, may be unable to engage in inquiry dialogue because their beliefs about the value and the legitimacy of different opinions
may contradict with the practices of rigorous argumentation. Therefore, teachers at the evaluatist level, are thought to be successful at inquiry dialogue because they undertake greater observation, examination, and analysis of an issue (Kuhn, 1991; Reznitskaya & Wilkinson, 2017). Since the level of epistemic cognition influences one’s engagement in argumentation practices, for this reason, I argue that Kuhn’s developmental model could be part of the teacher’s self-system that I describe in the next section.

**Framework Three: Fives and Colleagues’ Framework for Epistemic Cognition in Learning and Teaching**

**Epistemic aims.** Drawing on Chinn et al.’s (2011; 2014), Buehl and Fives (2016) defined epistemic aims as the knowledge related goals toward which all activities are directed. Teachers may have epistemic aims for themselves and for their learners. In the context of inquiry dialogue, an example of teachers’ epistemic aim for their learners would be to help students understand, formulate, and evaluate arguments. At the same time, teachers may have epistemic aims for themselves such as gaining knowledge about facilitating inquiry dialogue. In order to achieve those epistemic aims, teachers consider, weigh, and evaluate the different dimensions of knowledge (Buehl & Fives, 2016).

**Consideration and evaluation of epistemic matters.** The dimensions of epistemic cognition include: a) source of knowledge, b) structure of knowledge, c) certainty of knowledge, and d) justification of knowledge.

**Source of knowledge.** In the case of learning and teaching inquiry dialogue, teachers should know that they cannot blindly rely on the information presented to them. They need to evaluate the trustworthiness of their sources of information. In order to do so, they need to thoroughly examine the content, check the expertise, agendas, and affiliations of the authors. For
example, in my study, when asked about nuclear energy, Eric, a fifth-grade teacher, said that he relied on specific websites to check the accuracy of a claim. He added that he would not believe all the published news especially if the topic was controversial and would only focus on the news that comes from some sources that he thought were more objective and less agenda-driven.

In addition to evaluating the sources of knowledge, teachers are encouraged to consider different sources of knowledge to support knowledge claims (Bromme, Kienhues, & Stahl, 2008; Chinn et al., 2011). For example, it is recommended that teachers base their knowledge on personal experiences: the books they read, the professional development they have attended, and the other teachers and colleagues they have been interacting with on a daily basis. Moving to the context of inquiry dialogue, it is important for teachers to be able to perceive the value of integrating multiple sources of knowledge (Kuhn, 1991). Kuhn (1991) further argued that teachers at the absolutist level, who assume that knowledge comes from a single source, might be unaware of the value of other people’s perspectives and are unlikely to engage in reasoned argumentation. To elaborate on Kuhn’s (1991), I would expect that teachers at the absolutist level might not consider students’ personal experiences as a potential source of knowledge simply because for absolutists knowledge only comes from authorities, such as teachers and scientists. On the other hand, individuals at the multiplist level who believe that everyone is free to generate knowledge in any way they want (i.e. basing it on their own tastes and desires) have little motivation to engage their students in testing the accuracy of different ideas through reasoned argumentation (Kuhn, 1991). As Reznitskaya and Gregory (2013) have argued, individuals who are at the evalutatist level might be more successful at learning and facilitating inquiry dialogue. Reznitskaya and Gregory (2013) have also suggested that teachers need to expand their sources of knowledge to include evidence from multiple, often competing sources.
**Structure of knowledge.** According to Chinn et al. (2011) the structure of knowledge refers to whether people perceive knowledge as simple (i.e. composed of isolated facts) or complex (i.e. constructed, and sometimes ambiguous). During inquiry dialogue, holding a complex view of knowledge is important. For example, a teacher who believes that knowledge is comprised of one concept or one idea would not seek to engage her students in argumentation. On the other hand, if the teacher holds a belief that knowledge is constructed, complex, and integrated, then the teacher might be willing to engage her students in inquiry dialogue by encouraging them to look at different positions, sources, and reasons, and integrate them together.

**Certainty of knowledge.** The third component of epistemic cognition comprises the certainty of knowledge, which refers to the way people perceive knowledge as fixed and certain versus tentative and evolving (Buehl & Fives, 2016; Hofer & Pintrich, 1997). When learning and teaching inquiry dialogue, teachers at the absolutist level will be unlikely to question the certainty of their knowledge as they believe that knowledge is fixed and that there is no need to doubt it or build on it (Kuhn, 1991). Researchers have shown that teachers sometimes find it difficult to perceive knowledge as evolving and tentative; thus, making it hard for them to engage in reasoned argumentation (Duschl & Osborne, 2002; Yerrick et al., 1997). On the other hand, teachers who adhere to the multiplist level may be less critical about inconsistencies and misconceptions when learning about or implementing inquiry dialogue. They might be interested in engaging students in group discussions, but only to have students share individual perspectives, rather than critically evaluate them. Reznitskaya and Gregory (2013) have argued that individuals at the evaluatist level who believe that knowledge is tentative and uncertain, and who continually seek to build on and critique other people’s ideas, are more likely to be effective
learners and facilitators of inquiry dialogue.

_Justification of knowledge._ This dimension refers to the mechanisms people use to evaluate a given claim (Buehl & Fives, 2016; Chinn et al., 2011). Chinn et al. (2011) defined the justification of knowledge as the people’s reasons for their beliefs (i.e. how people decide whether a claim is true or not). During inquiry dialogue, a person’s goal is to reach the most reasonable answer, and to do so they need to justify their opinions and support them with strong evidence. They need to scrutinize where the information comes from, how the knowledge is structured and constructed, and what strategies have been used. As an example, let’s consider Emma, a fifth grade teacher. Emma and her students read a short text where a football player had a concussion. He continued to play and, as a result, he was seriously injured. Next, Emma gathered her students in a group to discuss a question of who was responsible for the player’s injury. One of the students, whom I will call student George, claimed that it was the coach’s fault. He justified his position by arguing that coaches receive medical training before they start coaching. The medical training allows them to distinguish between serious and less serious injuries and as such helps coaches to take decision whether or not their players should continue the game. He elaborated his answer by stating that coaches were like doctors and they possessed scientific knowledge. For George, science helps make sound decisions. Differently, another student, whom I will call Jenny disagreed with George and said that it was the parents’ fault. She argued that a mom should know when her kids were not feeling well. After listening to both students, Emma intervened in the discussion and addressed the rest of the class: “So here we have two arguments, George thinks it is the coach’s fault because he is like a doctor and he possesses scientific knowledge. On the other hand, Jenny said that it was the parents because they should know when their kids are not feeling well. Does anyone want to respond to this?
Science or feelings?” Emma, then addressed Jenny: “Jenny, can you read to me the passage where it says that the parents were attending the game? Do we know for sure that the parents were there?” What Emma did in this instance was questioning her students’ answers to push for further explanation and justification. At the end of the discussion, the class decided in favor of George’s answer. They rejected the reasons presented by Jenny because they could not justify for sure whether the parents were present. They also argued that feelings were not always accurate and sometimes we don’t make sound decisions based on just our feelings. In this scenario, Emma did not just listen to her students’ positions and arguments. She helped her class evaluate the knowledge that came from their peers. She guided their thinking by clarifying the knowledge claim and asking questions. Her goal was to test reasons, rather than to accept them.

**Reliable processes.** Buehl and Fives (2016) discussed reliable and unreliable processes for constructing knowledge. Building Chinn and colleagues’ (2011; 2014), Buehl and Fives (2016) defined reliable processes as strategies that individuals use to achieve knowledge or any other epistemic aims. In the context of inquiry dialogue, the Argumentation Rating Tool (ART) described previously is used as the reliable processes.

Going back to the example of Emma and her class, and using the ART tool to evaluate her facilitation practice, we notice that Emma’s intervention in the conversation was successful because she met most of the criteria in ART. First, Emma used talk moves to clarify the two different positions and she explained the two positions to the rest of the class by distinguishing between science and feelings. Here we can argue that she addressed the clarity criterion. Then, she used different talk moves to articulate the reasons for each claim and evaluated the evidence. For instance, when Jenny claimed that the parents were responsible for the player’s injury, Emma asked for evidence that shows that the parents were present. From this example, we can
argue that Emma believes that a reliable process to achieve her students’ epistemic aims is to evaluate different points of view, asking for clarification and justification. She also seemed to think that basing knowledge on just gut feelings is an unreliable process to reach the most reasonable answer. In this way, Emma is more likely to use reasoned argumentation as her reliable process. Thus, teachers who use reasoned argumentation as their reliable process are more likely to achieve the epistemic aims of inquiry dialogue (Bråten et al., 2017).

**Teacher’s self-system.** According to Fives et al. (2017) the teacher’s self-system has four elements that influence epistemic cognition: prior knowledge and experience, epistemic ideals, epistemic vices and virtues, and epistemic values. For the purpose of my study, I will be alerted to these influences as I analyze my data. For example, in the context of learning and facilitating inquiry dialogue, teachers’ prior beliefs, experiences, and knowledge influence their epistemic cognition. A teacher is unlikely to use inquiry dialogue in her classroom if she believes that she might lose control over her students during classroom discussions. It may be that her self-efficacy for classroom management impedes her learning and practice of inquiry dialogue.

In another example, let’s consider a novice teacher, John, who places great importance on standardized testing. If John does not believe that inquiry dialogue can improve his students’ performance on standardized tests, then he might not be interested in learning how to use this type of talk. In contrast, if John believes that helping students engage in deep thinking is more important than focusing on rote memorization to prepare students for standardized tests, then these ideals are said to promote John’s learning and facilitation of inquiry dialogue in his classroom.

**Epistemically informed praxis.** The term epistemically informed praxis is understood to mean “the enactment of instructional decisions informed by the process of epistemic cognition
engaged in to assist others in achieving specific epistemic aims” (Buehl & Fives, 2016, p. 260). Simply put, epistemically informed praxis represents the decision taken by the teachers after they engage in epistemic cognition. Epistemically informed praxis in the context of inquiry dialogue ranged from simple, discrete comments on students’ discussions to more complex decisions such as trying new strategies or spending more time on challenging practices.


Below is a graphic of the new representation of the integrated framework of epistemic cognition for learning and facilitating inquiry dialogue.

**Figure 1.** The Integrated Framework of Epistemic Cognition for Learning and Facilitating Inquiry Dialogue.

Building on Fives and colleagues’ (2016) framework, I argue that the teachers’ tasks guide their engagement in epistemic cognition; thus, defining them (i.e., learning or facilitating
argumentation during inquiry dialogue) is essential to shed light on the different components of epistemic cognition.

In order to engage in epistemic cognition, teachers set epistemic aims for their students or themselves. In the context of inquiry dialogue, an example of an epistemic aim would be helping students to improve their argumentation skills and reach the most reasonable answer. To reach the epistemic aims, teachers use the ART practices and talk moves as the reliable processes to consider the dimensions of knowledge. The process of epistemic cognition is influenced by teacher’s self-system. As I explained in the previous section, I argue that the level of epistemic cognition affects and guides the argumentation processes; therefore, I consider Kuhn’s (1991) model to be part of teacher’s self-system in the context of inquiry dialogue.

Chapter Four: Methodology

Overview

The data sources for my research come from a previous project conducted by Reznitskaya and colleagues (2015; 2017). In the next sections I 1) review the original 3-year study, 2) focus on Year 3 because I used data from this year, 3) describe my current study: the participants, the data sources and the data analysis, and 4) address my positionality as a researcher, the limitations of the study, and the timeline for the project.

Original Study: Previously Collected Data

Reznitskaya and colleagues (2015; 2017) conducted the original study, which was a three-year project to design a professional development program. Their goal was to help elementary school teachers learn and facilitate inquiry dialogue to foster the development of students’ argument skills. In year 1 and year 2, the researchers used a single group pretest-posttest design. The project involved three different stages: pretest stage, professional
development stage, and posttest stage. In the pretest stage, researchers videotaped classroom discussions to collect baseline information for the teachers’ practice, they surveyed participants to get background information, and administered King and Kitchener’s (1994) Reflective Judgment Interview to evaluate teachers’ views about knowledge. Then, researchers implemented the professional development, which consisted of study group meetings, classroom observations, and focus group meetings in year 1. In year 2, full day workshops were also conducted, in addition to the activities used in year 1. Finally, during the posttest stage, the researchers administered the alternate version of King and Kitchener’s Reflective Judgment Interview (the alternate version of the Reflective Judgment Interview contained items that probed the same constructs as the original version) and videotaped two discussions in each classroom (Reznitskaya & Wilkinson, 2015; Wilkinson et al., 2017).

**Year 3.** In year 3, researchers used a pretest-posttest experimental design (Wilkinson et al., 2017). Twenty-six fifth grade language arts teachers from Ohio and New Jersey participated in the study. Fourteen out of the twenty-six teachers were randomly assigned to the experimental group (those who participated in the professional development program). Similar to years 1 and 2, the program in year 3 comprised three phases, the pretest phase, the professional development phase, and the posttest phase. In the pretest phase, teachers in both groups were videotaped while conducting classroom discussions in order to collect data on how teachers typically interact with their students. Next, researchers administered King and Kitchener’s (1994) Reflective Judgment Interview to assess teachers’ views about knowledge. They also administered the Gates-MacGinitie Reading Comprehension Test to students to measure their reading abilities. In the professional development phase, teachers in the experimental group participated in two full day workshops, six study group meetings, six individual coaching sessions, and three focus group
meetings. Teachers were also asked to conduct discussions at least once a month. All of the focus
groups, study groups, workshops, and classroom discussions were audio-taped and videotaped, however, the coaching sessions were only audio-taped. During the post-test stage, researchers assessed teachers’ views about knowledge after completion of professional development using the alternate form of the Reflective Judgment Interview by King and Kitchener (1994). They also asked teachers to conduct two classroom discussions. Lastly, they administered the alternate version of the Gates-MacGinitie Test, as well as writing argument, reading argument, and speaking argument tasks to students.

**Present Study**

I used a qualitative study design to examine the following question: How do teachers engage in epistemic cognition when they learn and facilitate inquiry dialogue? According to Keegan (2011) qualitative methodology lends itself well to explore “why”, “how”, and “what” questions. Qualitative methodology is also well suited for investigating complex phenomena in their natural contexts (Stake 1995; Yin, 2016). It results in a rich and holistic understanding of a particular phenomenon (Merriam, 2009). Specifically, I selected a case study design to provide a detailed and rich description of the phenomenon under investigation (Merriam, 2009; Yin, 2016). Given the complexity and dynamic nature of investigating teachers’ epistemic cognition, a case study design is the methodology that best suits my endeavor.

**Participant**

My case study drew on the data from a fifth-grade teacher, Eric (pseudonym), who participated in the third year of professional development described above. This teacher demonstrated the highest quality of discussion facilitation after he participated in the professional development, which was measured using the Argumentation Rating Tool (ART), discussed in
Chapter 3. This study was guided by an initial hypothesis that in order for teachers to be successful at engaging students in reasoned argumentation, they need to develop epistemic cognition that is aligned with the practices of inquiry dialogue (Kuhn, 1991). I anticipated being able to see how the more successful teacher engages in the different processes of epistemic cognition when facilitating and learning inquiry dialogue.

**Data Sources**

Table 3 below provides an overview of the data sources I used for my study and includes the description and purpose of each data source. Data sources include classroom discussions, focus group interviews, study group meetings, coaching sessions, and King and Kitchener’s (1994) Reflective Judgment Interview.

Table 3

*Purpose and Description of Data Sources*

<table>
<thead>
<tr>
<th>Data Sources</th>
<th>Description</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom discussions</td>
<td>9 classroom discussions were videotaped approximately every month for each teacher</td>
<td>Included to help me investigate how teacher’s epistemic cognition shapes his practice of inquiry dialogue</td>
</tr>
<tr>
<td>Study Group Meetings</td>
<td>6 study group meetings contained mini lessons, group activities, and analysis of videos of classroom discussions</td>
<td>Included to help me investigate how teachers’ epistemic cognition shapes their learning of inquiry dialogue</td>
</tr>
</tbody>
</table>
Focus Group Interviews | 3 Semi-structured interviews of approximately 60 minutes conducted during focus groups meetings | Included to examine the role of teachers’ self-system, which is an important component of teachers’ epistemic cognition, when learning and facilitating inquiry dialogue and to share their challenges and successes

Coaching Sessions | 6 coaching sessions audio-taped for each teacher, (average length of each session is 25 minutes depending on the needs of the teachers) | Included to see how teachers engage in epistemic cognition when they reflect on and evaluate their practice.

Reflective Judgment Interviews | 2 Reflective Judgment interviews conducted each interview lasted approximately 45 minutes | Included to assess teachers’ views about knowledge.

**Classroom discussions.** Because the focus of my study is on gaining a better understanding of how teachers’ epistemic cognition shapes the facilitation of inquiry dialogue, observing teachers in their classrooms is of utmost significance. I decided to include classroom discussions as one of my data sources because they allowed me to view the teachers and their teaching practices in a naturalistic setting, as well as to obtain a direct encounter with the phenomena under study (Merriam, 2009). I included nine classroom observations. Two of them are the ones that were video-recorded at the pre-test stage, two are the ones that were recorded at the posttest stage, and the remaining observations occurred when teachers were engaged in the professional development.
**Study group meetings.** I decided to include study group meetings in my research because they were different from classroom discussions. While classroom discussions allowed me to gain a better understanding of how teachers facilitated inquiry dialogue, study group meetings helped me understand how teachers learned inquiry dialogue. In the course of the professional development phase, researchers conducted biweekly study group meetings that lasted approximately two hours each. These meetings were meant to build bridges between the theories that drive inquiry dialogue and the actual practices. At the beginning of each study group, teachers shared the successes as well as the challenges they faced when they facilitated inquiry dialogue with their students. For example, teachers talked about their difficulty inviting shy students to take part in the discussion, the lack of time to conduct more discussions using inquiry dialogue due to the pressure of preparing students for standardized tests, the benefits of using small groups, or the different strategies used to engage everyone in the conversations.

After sharing their experiences, teachers analyzed video clips from their own discussions. These video clips, chosen by the research team, usually depicted good examples of facilitation of inquiry dialogue. They were used not only to acknowledge the successful practices of the participants but also to enhance their application of effective “talk moves” (Michaels & O’Connor, 2015). Toward the end of the study group meeting, teachers, with the help of the researchers participated in co-planning a lesson around inquiry dialogue. During co-planning, the participants, read a text suitable for fifth grade students, developed the big question (the controversial question that was central to the story and that framed the inquiry) and discussed it, while one member of the research team facilitated the discussion. These co-planning activities were important because they presented an opportunity for teachers to take part in inquiry dialogue using argumentation criteria and practices described in the ART. When teachers
finished discussing the story, they reflected on the quality of their argumentation and the practices of the facilitators.

**Focus groups interviews.** I used the three semi-structured interviews, each approximately 60-90 minutes that were conducted during focus group meetings. The goal of these interviews was for teachers to describe their thoughts and reactions in relation to learning how to facilitate inquiry dialogue. Sample questions included, “What are some of the things we did that really helped you in learning about conducting classroom discussions to promote argumentation?” and “Can you describe a particular experience or episode that changed the way you think about teaching and learning?” The focus-group interviews were an additional opportunity for teachers to share thoughts about their experiences as learners and as facilitators of inquiry dialogue. I included these interviews because they allowed me to delve more into teachers’ beliefs and epistemic cognition about teaching and learning inquiry dialogue.

**Coaching sessions.** Each teacher received six individual coaching sessions during which they met with an expert discourse coach. The purpose of these coaching sessions was to help teachers engage in systematic reflection on their own facilitation of inquiry dialogue based on the analysis of teacher’s previously videotaped discussion. Before meeting with the teacher to discuss the video clip, the coach watched the video to get a general sense of the discussion. He or she would typically rate the discussion using the ART and highlight effective facilitation moves made by the teacher to prompt a discussion and to give constructive feedback to the teacher. During the coaching sessions, the coach and the teacher sat together and watched the video. They talked about the quality of argumentation using the ART and compared their ratings of the discussion on different criteria. It is important to emphasize that the analysis of teacher facilitation during coaching was directly related to the quality of students’ argumentation. For
example, if a student A wrongly paraphrased student B and the teacher did not interfere, the
teacher and the coach would reflect on ways to address this weakness in students’ arguments.
They also talked about the effective practices and talk moves that happened in the discussions
and those that needed to be done or improved. For example, during coaching sessions, the coach
would provide positive feedback to the teacher on how he or she clarified or summarized a
student’s claim so that everyone in the room was able to follow the discussion. He or she could
also point to some areas for improvement, such as missed opportunities to address problems with
students’ argumentation. At the end of the coaching sessions, the coach and the teacher set goals
for the next discussion, such as helping students clarify and summarize their peers’ statements, or
using text evidence. The teacher would then work toward achieving these goals. When they met
for the next coaching session, both the coach and the teacher paid attention to the goals set and
discussed the teacher’s progress. Thus, coaching sessions were tailored to meet teachers’ specific
needs. Because each teacher had different needs, the coaching session might differ from one
teacher to another and the coach would be prepared to address teachers’ concerns. Yet, all
coaches followed the same principles outlined in the coaching protocol developed by the
researchers. The coaching sessions were helpful for me because they permitted to look at the
dissonance and accordance between what happens in the study groups and what happens in the
classrooms. They also helped me to understand how teacher viewed their own facilitation and
offer ways to assess changes in teachers’ epistemic cognition as they reflect on their practice.

**Epistemological beliefs interviews.** Researchers used the Reflective Judgment
Interview (RJI) developed by King and Kitchener (1994) to evaluate teachers’ views about
knowledge. They administered the RJI to the participants at the pre and posttest phases to track
the development, if any, of teacher’s epistemic cognition. The RJI is a semi-structured interview
designed to elicit data to provide a description of the subject’s epistemic beliefs (i.e., fundamental beliefs about knowledge and how it is acquired). The interview was administered individually and took about forty-five minutes to complete. The RJI consists of four ill-structured problems and a set of follow-up questions (King & Kitchener, 1994; Mines, 1982). During each interview session, teachers were presented with two ill-structured problems, such as the safety of nuclear power and the building of the pyramids. The interviewer read two dilemmas, while the teachers followed along on an identical written copy. After the problem was read, the interviewer asked probing questions. Examples of questions include: *what do you think about these statements?*, *on what do you base your point of view?*, *how is it possible that people have such different views about the subject?*. The participants’ answers were audio taped and transcribed.

Even though teachers’ epistemic cognitions were scored using King and Kitchener’s (1994) Reflective Judgment Interviews, for my study, I was hoping to develop a more nuanced understanding of teachers’ epistemic cognition by re-examining teachers’ responses to the reflective judgment interview using qualitative methods of data analysis.

**Data Analysis**

**Summary of Codes Used**

To analyze my data, I used thematic analysis with recursive emergent coding (Braun & Clarke, 2006). Thematic analysis is used to identify, analyze, and report patterns within a data set (Braun & Clarke, 2006). Because it is not specific to a particular theoretical framework, thematic analysis is flexible and can be used within different theoretical frameworks (Braun & Clarke, 2006). In particular, my analysis was driven by the relevant literature, the research questions I was trying to answer, and the theoretical frameworks I was using.
I used the integrated framework described in detail in Chapter 3 to inform my coding. Briefly, this framework consists of three frameworks: The first is Kuhn’s developmental model (1991, 1999). I used this model to assess the development of teachers’ epistemic cognition as they participated in the professional development. The second framework is Fives and colleagues’ (2016) model of epistemic cognition in teaching and learning. I chose this model to allow for a deeper insight into how teachers engage in epistemic cognition when learning and facilitating inquiry dialogue. Finally, the Argumentation Rating Tool (ART) developed by Reznitskaya and Wilkinson (2017) was used to understand how teachers use the different practices promoted by the professional development and described in the ART to facilitate and learn inquiry dialogue. The ART was also used to capture the complexity of argumentation practices.

The codes I generated are organized in the six tables shown below. Tables 4a, 4b, and 4c describe the codes from Kuhn’s developmental model and are used to code the pretest and posttest RJIs. Tables 4a and 4b include the codes “source of knowledge.” The code source of knowledge pertains to individuals’ conception of where knowledge originates. Having “source of knowledge” as a code was essential to my analysis for two reasons. The first reason is that the construct “source of knowledge” is considered as one of the main components of teachers’ epistemic cognition by Fives and colleagues’ (2016). It allowed me to look at how teachers evaluated their sources of knowledge and how they questioned these sources when they facilitated inquiry dialogue. Secondly, this code guided my decisions about Eric’s developmental patterns in relation to Kuhn’s (1991, 1999) model.

In Table 4a, the first column represents my codes. A code is the descriptive name given to represent a single idea (Saldaña, 2016). For example, when Eric mentioned “his parents” as his sources of knowledge, I assigned the code “parents as a source of knowledge” to that piece of
information. Once I generated all my codes, I looked at the relationships existing between the different codes and grouped them into categories. For instance, I grouped the codes “parents”, “culture”, and “upbringing” into a category that I called “non-research based” source of knowledge.

I ended up having two categories related to the sources of knowledge: research-based sources of knowledge and non-research based sources of knowledge. These categories helped me to decide about Eric’s level of epistemic cognition. Finally, I summarized my categories into larger overarching themes. In Tables 4-a and 4-b my big theme is the “evaluation and consideration of the sources of knowledge.” Figure 2 represents the “bottom up” process of my analysis where the lowest level consists of my codes, the next level represents the categories, and the higher level represents the themes.

**Figure 2.** Bottom- Up Process of Data Analysis

<table>
<thead>
<tr>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
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<tr>
<td>Category</td>
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<tr>
<td>Category</td>
</tr>
<tr>
<td>Code</td>
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<td>Code</td>
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<tr>
<td>Code</td>
</tr>
<tr>
<td>Code</td>
</tr>
</tbody>
</table>
Table 4a

*Codes Related to Non-Research Based Sources of Knowledge Generated from Kuhn’s (1991, 1999) Developmental Model*

<table>
<thead>
<tr>
<th>Codes : Sources of Knowledge</th>
<th>Definition</th>
<th>Examples</th>
<th>Categories</th>
<th>Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents Community Upbringing Culture</td>
<td>Sources of knowledge pertains to individuals’ conceptions of where a knowledge originates.</td>
<td>I think culture. I think where you were brought up, the different culture within your house, but also within your community changes your vision on a lot of different things</td>
<td>Evaluation and Consideration of Sources of Knowledge</td>
<td>Non-Research Based Sources of Knowledge (Fives &amp; Colleagues, 2016; 2017)</td>
</tr>
<tr>
<td>Personal Construction of Knowledge: One’s Opinions, One’s Beliefs (Kuhn, 1991)</td>
<td></td>
<td>I definitely think that everyone is able to have their own opinion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Experts (Kuhn’s Codes)</td>
<td></td>
<td>I think I would have to talk to people in the field and I definitely have to talk to people who’ve not just worked in the field, but also people who’ve lived near them or in that area</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4b summarizes the “research-based” sources of knowledge that Eric used to argue about ill-structured problems. Research-based sources of knowledge represent the origins of information that come from for experts, and researchers in the field.

### Table 4b

*Codes Related to Research-Based Sources of Knowledge Generated from Kuhn’s (1991, 1999) Developmental Model*

<table>
<thead>
<tr>
<th>Codes Sources of Knowledge</th>
<th>Examples</th>
<th>Categories</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experts (Kuhn’s Code, 1991)</td>
<td>I don't have full education or knowledge on food, but if someone who does tell me don't eat something then I'll probably be more likely to listen.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School-Learning Experiences</td>
<td>I just think that makes the most sense for what we're taught at school</td>
<td></td>
<td>Evaluation and Consideration of Sources of Knowledge (Fives &amp; Colleagues, 2016; 2017)</td>
</tr>
<tr>
<td>Disciplinary Knowledge</td>
<td>I think it depends more on your background and what knowledge you have on the mathematical development of humans and the development of tools</td>
<td>Research-Based Sources of Knowledge</td>
<td></td>
</tr>
</tbody>
</table>
The second construct of epistemic cognition that I tried to capture was the certainty of knowledge. The certainty of knowledge refers to whether knowledge is perceived as certain and unchanging or tentative and evolving (Buehl & Fives, 2016). This construct was important because it reflected the progression of Eric’s epistemic cognition. As explained in Chapter 3, Kuhn, Cheney, and Weinstock (2000) argued that at the absolutist level, knowledge is perceived as certain and unchanging. At the multiplist level individuals embrace the beliefs that knowledge is uncertain and all opinions are equally correct. The evaluatist level is about reconciling the uncertainty of knowledge and the evaluation of knowledge, meaning that some opinions might be better than others since they are supported by better reasons and evidence (Kuhn et al., 2000). Based in these distinctions, I created codes related to the certainty of knowledge in Table 4c. One code was about the existence or non-existence of right answers. This code helped me detect whether Eric was at the absolutist stage or at higher levels. For example, if Eric doesn’t acknowledge the legitimacy of different opinions and believes that knowledge is certain and unchanging, I would place him at the absolutist level. On the other hand, if he thinks that knowledge is evolving, then I would place him either on the multiplist level or the evaluatist level. For this reason, I created the codes “the existence of a better answer” and “the non-existence of better answers”. These codes capture the process of evaluation and consideration of knowledge. This code helped me refine my analysis of Eric’s development of epistemic cognition.
Table 4c

Codes Related to Certainty of Knowledge Generated from Kuhn’s (1991, 1999) Developmental Model

<table>
<thead>
<tr>
<th>Codes: Certainty of Knowledge</th>
<th>Examples</th>
<th>Categories</th>
<th>Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Existence or Non-Existence of Right Answers</td>
<td>I definitely think that everyone is able to have their own opinion. I think that is how you grow as an individual, being able to accept others for being different from you. And you know, a lot of them view a lot of things differently and it doesn't mean one is more right than the other, it just means that they have a look at, they have a different lens, they see it in a different way.</td>
<td>Certainty / Uncertainty of Knowledge</td>
<td>Evaluation and Consideration of Certainty of Knowledge (Fives &amp; Colleagues, 2016; 2017)</td>
</tr>
<tr>
<td>The Existence of Non-Existence of Better Answers</td>
<td>Well, I mean, it's always better to make smarter choices. And I think saying that some foods are unsafe, could lead to people making smarter choices and being more aware of</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
what they're putting into their bodies.

My Table 5 contained the codes that are related to the framework of epistemic cognition for learning and teaching. My process of looking at the teachers’ epistemic cognition was a top-down process, meaning that I used the themes and categories described in Fives and colleagues’ (2016) models and started generating the codes that fit into these categories and themes. The different themes in the epistemic cognition models for teaching and learning include: epistemic aims, consideration and evaluation of epistemic matters, reliable processes, teachers’ self-system, and epistemically informed praxis.

Fives and colleagues’ (2016) model has been considered important in explaining how teachers engage in epistemic cognition because it explained the dynamics between the different components of epistemic cognition and clarified how these components interact with each other. Fives and colleagues’ (2016) argued that in order for teachers to engage in epistemic cognition, they need to hold epistemic aims for themselves, their students or for both. To reach these epistemic aims, teachers evaluate and consider knowledge by looking at the source, structure, certainty and justification of knowledge. The evaluation and consideration of knowledge require teachers to choose reliable processes, which are the strategies used to effectively evaluate knowledge and reach the epistemic aims. After establishing epistemic aims and evaluating knowledge by using reliable processes, teachers make decisions about their practice. This is called epistemically informed praxis. The process of engaging in epistemic cognition, as described by Fives and colleagues, is affected by several factors such as: previous experience, vices, virtues, ideals, and values. They grouped these factors under “teacher self-system” umbrella (Fives et al., 2017). Fives et al., (2017) framework informed my study of to the
teacher’s learning and facilitation of inquiry dialogue. The codes, categories, and themes related to this framework are depicted in Table 5.

Table 5

**Codes Related to Fives and Colleagues’ Models (2016; 2017)**

<table>
<thead>
<tr>
<th>Codes</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epistemic Aim</td>
<td>Epistemic aims are the knowledge related goals toward which all activities are directed (Chinn et al, 2011).</td>
<td>Today we are focusing on two things: sharing responsibilities and connecting ideas.</td>
</tr>
<tr>
<td>Source of Knowledge</td>
<td>Sources of knowledge pertain to individuals’ conceptions of where knowledge originates.</td>
<td>Self - driving cars are safe, it is in the videos we watched and in the text, in both.</td>
</tr>
<tr>
<td>Structure of Knowledge</td>
<td>Structure of knowledge is about whether knowledge is perceived as discrete and simple or as integrated and complex.</td>
<td>I think this field is very wide because there's different levels of the field. You have historians, but historians encompass many different aspects. So I think there might be more modernized historians and ones that are more in the Egyptian era. So there are different levels and strains of this one area.</td>
</tr>
<tr>
<td>Certainty of Knowledge</td>
<td></td>
<td>We can’t discuss whether Kelly and Evelyn are friends</td>
</tr>
</tbody>
</table>
Certainty of knowledge is about whether knowledge is perceived as certain and unchanging or tentative and evolving.

<table>
<thead>
<tr>
<th>Justification of Knowledge</th>
<th>Justification of knowledge describes the strategies individuals use to justify knowledge through appeals to authority, personal justification, and the personal evaluation of evidence to determine whether or not knowledge requires revision.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No accidents have been reported, technology is safe, 90% of accidents are caused by humans, so I think they are safe yes.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reliable Processes</th>
<th>Reliable processes are strategies that individuals use to achieve knowledge or any other epistemic aims.</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the end of our discussion we are going to evaluate our practice. Do you all have your smiley faces? [Referring to ART for Kids].</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Epistemically Informed Praxis</th>
<th>Epistemically informed praxis is the result of epistemic cognition. It should reflect the identified epistemic aim (or a re-defined aim).</th>
</tr>
</thead>
<tbody>
<tr>
<td>I noticed that they keep saying I agree, I disagree, I agree, I disagree, without stating their reasons, so what I am going to focus on in our next discussion is giving reasons, that is my goal for the next discussion.</td>
<td></td>
</tr>
<tr>
<td>Previous Experience/ Knowledge</td>
<td>Previous experience/knowledge are teachers' existing knowledge of subject matter, curriculum, pedagogical practices, and students.</td>
</tr>
<tr>
<td>Epistemic Ideals</td>
<td>Epistemic ideals are the criteria or measure by which individuals assess the product of epistemic cognition.</td>
</tr>
<tr>
<td>Epistemic Values</td>
<td>Epistemic values refer to the importance (or not) of some knowledge.</td>
</tr>
<tr>
<td>Vices/ Virtues</td>
<td>Epistemic vices are habits of thinking/factors that may hinder effective epistemic cognition. Epistemic virtues: are habits of thinking/factors</td>
</tr>
</tbody>
</table>
that may facilitate effective epistemic cognition. students consists a vice in this case).

Table 6 displays the codes related to the third theoretical framework I used in my study which is the Argumentation Rating Tool developed by Reznitskaya and Wilkinson (2017). The ART represents the reliable processes that teachers use to achieve the epistemic aims of inquiry dialogue and help them improve the quality of their students’ argumentation skills as well as improve the quality of their facilitation of inquiry dialogue. It’s a rating scale consisting of four criteria that include: a) diversity of perspectives, b) clarity, c) acceptability of reasons, and evidence, and d) logical validity. Each criterion comprises certain practices that are useful to achieve them. Bråten et al. (2017) exemplified each practice with characteristic “talk moves”.

Table 6

*Codes Based on Argumentation Rating Tool developed by Reznitskaya and Colleagues (2017)*

<table>
<thead>
<tr>
<th>Codes</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centering on Contestable Questions</td>
<td>We are getting off a little bit of topic so let’s focus on our question.</td>
</tr>
<tr>
<td>Sharing Responsibilities</td>
<td>Noah, can you nominate the next person? Someone we haven’t heard from?</td>
</tr>
<tr>
<td>Discussing Alternatives</td>
<td>Nick: Noah, you said that 90% of accidents are caused by men, how about the 10%? Have you thought about Technology?</td>
</tr>
<tr>
<td>Clarifying Meaning</td>
<td>Do you mean that telling secrets is a sign of friendship? Is that what you mean?</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Connecting Ideas</td>
<td>How is your comment relevant to self-driving cars?</td>
</tr>
<tr>
<td>Labeling Reasoning Processes and Parts of an Argument</td>
<td>What’s your position? I am not sure is this your position or your reason.</td>
</tr>
<tr>
<td>Tracking the Line of Inquiry</td>
<td>Is this a new position or is it…? Let’s recapitulate, how many positions do we have now?</td>
</tr>
<tr>
<td>Evaluating Facts</td>
<td>We are assuming about the weather because nothing in the article we read has mentioned the weather. What do we know about the states where this has been tested?</td>
</tr>
<tr>
<td>Evaluating Values</td>
<td>Friendship is more important than winning in a contest, is that always true?</td>
</tr>
<tr>
<td>Articulating Reasons</td>
<td>Nick, I heard you say that weather might be an issue with self-driving cars, what makes you say that?</td>
</tr>
<tr>
<td>Evaluating Inferences</td>
<td>So you are making the assumption that if they have couple drinks they will definitely crash.</td>
</tr>
</tbody>
</table>

**Step in Data Analysis**
It is necessary to note that the whole process of analyzing the data was not linear and it required moving back and forth throughout the different phases of the analysis (Braun & Clarke, 2006; Ely, Vinz, Downing, & Anzul, 1997). I followed Braun and Clarke’s (2006) six analytic steps which I describe in the next section.

**Phase 1: familiarizing myself with my data.** This first step in data analysis is important because it represents the base of the whole process. During this phase, I made myself familiar with the depth and the breadth of the content of my data set. I repeatedly read all of the transcripts in an active way by searching for meaning, jotting down some ideas and some potential coding schemes, as well as starting to identify possible patterns.

**Phase 2: generating initial codes.** Once I finished reading all my data transcripts and generated some initial ideas, I started coding my data. To do so, I looked at ideas as my unit of analysis (Mayer, 1985). An idea could consist of a phrase, a sentence, or a paragraph as long as it captures the same meaning (MacQueen, McLellan-Lemal, Bartholow, & Milstein, 2008; Miles & Huberman, 1984). In other words, the code signals the presence of a piece of information (MacQueen et al., 2008). Therefore, I made sure that my codes were concise and clear about the phenomena they were describing. To do so, I kept in mind Boyatzis’ (1998) description of a good code. According to Boyatzis (1998) “A good code is one that captures the qualitative richness of the phenomenon” (p.1). In this phase, I also made sure that I was paying attention to as many potential codes as possible, and that I could code a piece of data using as many different codes as needed. In other words, the same idea unit could be coded more than once. Lastly, it was important to remind myself that my data was not void of contradiction and that I should not be ignoring the inconsistencies between and across my codes.
To code my data, I used NVivo qualitative data analysis software. It was helpful when I was assigning codes to idea units and combining them into themes. In addition, NVivo was useful when I was trying to find out the number of occurrences of some patterns. For instance, if I wanted to find out how many times my participants mentioned their cultures to be their primary source of knowledge, manual searching would take hours due to the large number of transcripts I had, while in NVivo it only would take few seconds.

Below is an example of how I coded an excerpt from Eric’s Reflective Judgment Interview that was administered in the pretest phase. In this short excerpt, Eric was asked whether or not he believed that there were right and wrong answers regarding the accuracy of the news. His answer was as follows: “I definitely think that everyone is able to have their own opinion. I think that is how you grow as an individual, being able to accept others for being different from you. Something I value and I stress in this room a lot. And you know, a lot of them view a lot of things differently and it doesn’t mean one is more right than the other, it just means that they have a look at, they have a different lens, they see it in a different way. So, I think it is definitely, it is one thing to, to think one is better than the other, but it shows more growth and maturity if you can accept those differences and understand both sides” (Eric, Pretest Interview, Dilemma 1).

Below I show how I divided Eric’s response into idea units using the codes described previously in Tables 4a, 4b, 4c, 5, and 6 to capture their meanings:

- *I definitely think that everyone is able to have their own opinion* [Code 1: The existence / non-existence of right answer, see Table 4c for description; Code 2: Uncertainty of Knowledge]

- *I think that is how you grow as an individual being able to accept others for being different from you* [Code: Upbringing as a source of
Knowledge or as a process to know something, see Table 4a for description]

- Something I value and I stress in this room a lot [Code: Value, See Table 5 for description]

- And you know, a lot of them view a lot of things differently and it doesn't mean one is more right than the other, it just means that they have a look at, they have a different lens, they see it in a different way. So, I think it is definitely, it is one thing to, to think one is better than the other, but it shows more growth and maturity if you can accept those differences and understand both sides [Code 1: The non-existence of a better answer, see Table 4c for description; Code 2: Uncertainty of knowledge]

- I definitely think that everyone is able to have their own opinion [Code: Uncertainty of knowledge, see Table 5 for description]

**Phase 3: searching for themes.** After I generated all the codes across my data set, I analyzed my codes and considered how similar and different they were from each other and how they could be grouped into categories. For instance, when Eric talked about historians and scientists as sources of knowledge in the following statement “I'm sure there are historians and scientists that can study the dirt and the types of substances that they used and figure it out” I initially coded “historians and scientists as sources of knowledge.” I coded his statement “I definitely think that everyone is able to have their own opinion” as “Personal construction of knowledge.” I later assigned each of these codes into one of the two categories I created, which I called “research-based sources of knowledge” and “non-research based sources of knowledge.” My two categories belonged to the theme that I named consideration and evaluation of the sources of knowledge described in Table 4a. Another example of this process came from my coding of the practices in the ART. The practices in the ART were my codes, the four criteria were my
categories, and the categories fall under the theme the “The use of ART as a reliable process to learn and facilitate inquiry dialogue” (see Table 6).

At this stage of the analysis, I grouped some codes into main themes or sub-themes, while I left other codes untouched. I saved all the miscellaneous codes in a separate file and kept going back to them as I was moving across the phases.

**Phase 4: reviewing the themes.** Having completed phase three, and having created my themes using the different codes and categories (e.g., epistemic aims, reliable processes, evaluation of epistemic aims, etc.), I started reviewing my themes. Braun and Clarke (2006) explained that this phase comprised two levels. Level one involves reading all the data extracts for each theme and making sure that the themes are coherent. For instance, after I finished coding Eric’s fifth coaching session, I read the transcript again and made sure that I saw coherent themes within the data extract. In other words, I looked whether the themes I created were related to each other and how together can help me answer my research question. Once I determined that my themes were coherent, I moved to level two of this process, which involved similar practices of reviewing the themes but this time across all my data sources because I needed to consider the validity of my themes across the data set and see whether my themes were evident in the data as a whole. For example, when I created the theme “ART as a reliable process” to investigate how teachers use the practices described in the ART as strategies to help students engage in inquiry dialogue, I looked across all the data sources (i.e., coaching sessions, study groups, videotaped classrooms, and focus groups) and checked how the theme was evident in these sources. The purpose of the second level was to 1) to ascertain whether the themes work in relation to the data set, and 2) to code any additional data within themes that have been missed
in earlier coding stages (Braun & Clarke, 2006). When I completed the refinement of my data, I used Fives and colleagues’ (2016) model to create thematic maps.

**Figure 3.** Thematic Map of Eric’s Evaluation and Consideration of Epistemic Matters

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**Phase 5: defining and naming themes.** I named, defined, and described each theme in reference to the extant literature. For each theme, I conducted and wrote a detailed analysis. This means that I did not just paraphrase the content of my data extracts, but I identified what was interesting and why. After I unearthed the “story” each theme revealed, I tried to understand how each “story” fitted into the broader overall analysis of the case. Once again, bearing in mind my research question and my theoretical frameworks, I also examined the relationship between the different themes, such as looking at how teachers’ epistemic ideals are aligned with their reliable processes. In another example of this relationship, I looked at how the teacher used the ART as a reliable process to reach his epistemic aims for himself and for his students. By the end of this phase, I had a full and concise description of my themes.

**Phase 6: producing the report.** This phase started when I had my themes fully described and analyzed. In order to increase the validity of my analysis, I provided a concise, coherent, and logical account of the meaning of the data within and across themes. When I wrote
my report, I included sufficient data extracts to demonstrate the prevalence of the theme. I did so by choosing several vivid examples that capture the argument I was making. I also questioned my interpretation of the data by considering alternative explanations. My extracts, which were easily identifiable as examples of my themes, were embedded within my analytic narrative. In addition, my analytic narrative was not just a description of the data; instead, it told a nuanced story of my data and made an argument for it in relation to my research question.

This final phase also included the construction of a vignette / individual case study. I looked at how the teacher participant in my study engaged in epistemic cognition when he learned and when he facilitated inquiry dialogue as a result of participating in professional development. I also explored how epistemic components discussed in the literature shaped his facilitation and learning of inquiry dialogue. Creating my vignette allowed me to delineate the factors that may have contributed to the outcomes of the case, to seek to understand why one classroom observation was different or the same as other, and to make sense of unique and miscellaneous findings (Khan & VanWynsberghe, 2008). In my microanalysis, I sought to identify whether or not there were shifts in my participant’s epistemic cognition after he participated in inquiry dialogue. I was also interested in finding out how his epistemic cognition affected his use of the practices in the ART, and the achievement of his epistemic goals. Finally, my microanalysis allowed me to make sense of the miscellaneous codes, to understand, refine, and develop concepts.

**Researcher’s Role and Positionality**

As I prepared to engage in this research, I was aware that my own interests, beliefs, and experiences might inform and shape every step of the process. As Herr and Anderson (2005) suggest, “the degree to which researchers position themselves as insiders or outsiders will
determine how they frame epistemological, methodological, and ethical issues in the dissertation” (p. 30). My experiences as a former teacher and educational activist in Tunisia have driven me to delve into the non-linearity and the complexity that characterize teaching and learning processes. This is because in Tunisia, teaching is seen primarily as a simple transmission of knowledge from teachers to students. Furthermore, teachers’ beliefs in general and teachers’ epistemic cognition in particular are almost never investigated.

As a doctoral fellow participating in the original study described in the previous section, I have developed close relationships with lead research members, one of whom is my advisor and mentor. I have also had the opportunity to interact formally and informally with the participants. However, despite the relationships I have developed with the researchers and exchanges I have had with the participants, I was not concerned about having imbalanced power relationships with the participants because I only held a “peripheral membership role” throughout the whole process.

Establishing Trustworthiness

Throughout the study, I remained vigilant of what Guba (1981) described as the standards of trustworthiness. Trustworthiness involves credibility, transferability, dependability, and confirmability.

Credibility. Credibility is about how transparent the research process is and how rich the data are (Denzin & Lincoln, 2000). Denzin and Lincoln (2000) also argued that the richness of the data is more important than the amount of the data. Richness of the data could be achieved by triangulating the sources of data. For this study, I used five different data sources: video/audio-taped classroom discussions, study group meetings, coaching sessions, focus group interviews, and epistemological interviews. In addition to the comprehensiveness of the data, using different
data sources helped me to detect and minimize the inadequacies found in one data source. Because the credibility of my study was of utmost importance, clarifying my positionality as a researcher, detailing the data-analytic process, as well as providing rich and generative data were the steps I took to increase credibility.

**Transferability.** According to Lincoln and Guba (1985), transferability refers to the ability to apply findings from one study to another similar context. To do this, researchers should provide sufficient details of the context of the study so that the readers can decide whether they can apply the findings of the study to similar contexts. To support transferability in this study, I provided an extensive description of the context of the professional development. I also provided a thick description of the phenomenon I was seeking to understand, which was the role played by epistemic cognition in the learning and facilitation of inquiry dialogue. Additionally, I described the analytic framework I was using throughout the process of the data analysis.

**Dependability.** Dependability is the ability to show that the findings of a study are consistent and can be replicable if the researcher follows the same general rules for data collection and analysis and if the research is conducted under similar conditions as in the original study (Strauss & Corbin, 1998). In order to increase the dependability of my study, I made sure that my theoretical perspective, my positionality as a researcher, my procedures for analyzing the data, and the context of the study were fully described. I also asked my critical friend to re-code 20% of the data to produce evidence of reliability in my coding.

**Confirmability.** Confirmability refers to how neutral and unbiased a researcher should be when conducting his/ her study. This means that the analysis of the data and the findings of the study should not be shaped by the motivation, bias, or interests of the researcher (Lincoln & Guba, 1985). To establish confirmability, I used different techniques. First, I relied on the
triangulation of my data sources: classroom discussions, study group meetings, focus group interviewees, coaching sessions, and epistemological interviews. I also looked at the phenomenon under investigation from three different theoretical perspectives, which are Fives and colleagues’ (2016) for Teachers’ Epistemic Cognition in Learning and Teaching, Kuhn’s (1991, 1999) Argumentative Thinking Model, and Reznitskaya and Wilkinson’s (2017) Argumentation Rating Tool. Patton (1999) described this technique as the triangulation of theoretical perspectives. Moreover, throughout the process, I was working with a critical friend, who is a fellow doctoral student. I also relied on critical feedback from my advisor and dissertation committee. Having multiple sources of critical feedback allowed me to improve the quality of data analysis, address my possible bias, interrogate my held beliefs, and raise my awareness to significant issues that I might have encountered during this process.

Chapter Five: Findings

My purpose in this chapter is 1) to delineate the development of Eric’s epistemic cognition throughout the professional development, 2) to analyze Eric’s evaluation and consideration of the dimensions of knowledge, 3) and to shed light on the role of the context and tasks when engaging in epistemic cognition. Therefore, I divided this chapter into two main sections. The first section describes the development of Eric’s epistemic cognition and focuses on the dimensions of knowledge. In the second section, I show how contexts and tasks influence the process of epistemic cognition.

Development of Eric’s Epistemic Cognition

Evaluation of Eric’s Epistemic Cognition: Reflective Judgment Interviews (RJIs)

As I described in Chapter Four, the research team administered pretest and posttest RJIs to evaluate teachers’ views about knowledge. Eric was presented with two dilemmas: in the pretest interview, he was asked to argue about the accuracy of the news and the safety of nuclear
energy, and in the posttest interview, he was asked to argue about the building of the pyramids and food safety. In my study, I analyzed the RJIs using the codes that I developed from Kuhn’s (1991) developmental model. My theory-driven analysis led to one emergent theme, which portrays changes in the dimensions of knowledge: the justification, the sources, structure, and the certainty of knowledge (see Tables 4a, 4b, 4c, and 5 for details).

Findings provided below suggest that Eric’s epistemic cognition did not evolve in a stage-like development; rather, the changes were complex and affected the dimensions of knowledge in different ways and to different degrees. As discussed in Chapter Two, this is consistent with a more recent perspective on epistemic cognition, suggesting a multi-dimensional and complex process of development that includes domain specific and domain general aspects of knowledge (Buehl & Alexander, 2001; Buehl et al., 2002; Muis et al., 2006). What follows is an account of how Eric’s consideration and evaluation of the justification, sources, structure, and certainty of knowledge have shifted during the professional development. I first describe Eric’s consideration and evaluation of the dimensions of knowledge in the pretest RJI, then, I describe his consideration and evaluation of the dimensions of knowledge in the posttest RJI. My concluding paragraph of this section is a comparison between the interviews to yield a picture of how Eric’s consideration and evaluation of the dimensions of knowledge have evolved after his participation in the professional development.

**Eric’s evaluation and consideration of the dimensions of knowledge in the pretest RJI.**

**First dilemma.** Throughout the data analysis phase, it was often difficult to distinguish between the different dimensions of knowledge as they appeared to be interwoven; therefore, their evaluation was complex, ambiguous, and non-linear. For example, in the first dilemma
about the accuracy of the news, the interviewer asked Eric whether he believed that the news reporters were biased or unbiased. Eric stated that the news reporters were biased and explained that he relied on his culture, upbringing, and family to form his knowledge.

Interviewer: And how did you come to hold that point of view [news reporters were biased]?

Eric: I guess this is just how I was brought up. My parents always taught me to not always believe what you see and to believe in what you believe. So, if someone writes something about you or about anything don’t change your viewpoint just because of that. You hold true to who you are and kind of work around it to accept what other people might think (pretest RJI, dilemma 1).

Three dimensions of knowledge emerged in this response. First, Eric talked about the justification of knowledge. Buehl and Fives (2016) defined justification of knowledge as “the mechanisms and standards individuals use in evaluating a particular claim” (p.254). Eric’s parents and his upbringing seemed to be the mechanisms he used to achieve and evaluate knowledge. His claim “This is just the way I was brought up. My parents always taught me to not always believe what you see and to believe in what you believe” could be interpreted in two different ways. The first interpretation could be formulated as such: “I know that the news reporters are biased because my parents told me not to believe in everything” and could hint that his parents might be the main authorities that he used to justify his knowledge. His use of the word “always”, twice in this sentence, might also imply that Eric relied on his personal experience and his parents to justify his knowledge not only when discussing the objectivity of the news reporters but also when arguing about other subjects. Using his parents’ and personal
experience as his main means to justify his knowledge made me lean toward placing Eric at the multiplist level in Kuhn’s (1991) developmental model. This is not to say that personal experiences should not be used to justify knowledge, rather it is about finding the right level of balance between personal experiences and research-based evidence when justifying knowledge as each source has its own limitations (Reznitskaya & Wilkinson, 2017).

The complexity and resemblance between the two dimensions - the justification by authority and the sources of knowledge - have led to an alternative interpretation of the same response. The sources of knowledge, as defined by Buehl and Fives (2016), refer to “individuals’ conception of where knowledge originates. Source can also be viewed as a precursor to the dimension of beliefs about justification for knowing.” (p.254). In fact, Eric’s response could also be analyzed as the use of non-research-based sources of knowledge (see Tables 4a and 4b for details). His response could be paraphrased as such: “I learned about the accuracy of the news from my upbringing and my parents.” In this case, his parents and upbringing became his sources of knowledge. When engaging in argumentation practices, a person is required to integrate different sources of knowledge and to evaluate them since it reflects an evaluatist epistemology (Kuhn et al., 2000; Reznitskaya & Gregory, 2013). More precisely, in the context of inquiry dialogue, it is preferable to use different sources of knowledge (i.e. anecdotes, personal experiences, scientific research) to support one’s position, but it is essential to engage in the evaluation of these sources (Reznitskaya & Wilkinson, 2017). A person at the evaluatist level, for example, would integrate different sources of knowledge, try to analyze them, and at the end, decide which source was the most accurate and contained the most reliable information. In this response, Eric seemed to be at the multiplist level because he just reported that his parents
and upbringing, which are non-research-based sources of knowledge, were his origins of information without questioning and challenging these sources.

The absence of the evaluation of sources of knowledge and the use of non-research-based sources to justify his position were not the only reasons that made me lean toward placing Eric at multiplist level. His beliefs about the certainty of knowledge are the third dimension that emerged from this response. Buehl and Fives (2016) argued that “the certainty of knowledge can be interpreted and presented in different ways. For instance, the focus can be on the extent to which one believes that knowledge is either absolute and finite, or tentative and continuing to evolve” (p.255). Eric stated that people should “stick to their beliefs, do not change, and hold true to who they are.” A probable explanation of this claim is that all positions carry the same value and are equally valid, which is a belief held by people at the multiplist level (Kuhn & Udell, 2003). Eric seemed to have little reason to value or engage in argumentation because he might embrace the idea that all beliefs are legitimate, could coexist and are not subject to judgment and evaluation. This might inhibit him from moving toward reaching the best possible answer.

It is important to clarify that the best possible answer in inquiry dialogue does not equate with certainty of knowledge. Indeed, Kuhn (1991) argued that holding knowledge with certainty is “a major weakness of the absolutist epistemology” (p.176). In this context, the best possible answer reflects the idea that positions could be compared and assessed, which is aligned with Kuhn’s (1991) description of the evaluatist level when she stated that evaluatist people believe that knowledge is evolving and uncertain but they understand that arguments “can be compared with one another and evaluated with respect to their relative adequacy or merit” (p.188). In the previous excerpt, Eric’s beliefs about the legitimacy of the coexistence of opinions might affect
his engagement in the justification of knowledge. Simply put, Eric’s beliefs about the certainty of knowledge may not avail him to reach the best possible conclusion.

His beliefs about the certainty of knowledge were also depicted when he answered questions about evaluating different positions such as: claiming that one position was right and the other was wrong, or that one position is better than another position. This is illustrated in the following excerpt.

Interviewer  Can you ever know that your position on this issue is correct?
Eric       Not really.
Interviewer  Why not?
Eric       Because you never really know. You might have a different perception of that person. But you never really know the actual answer” (pretest RJI, dilemma 1).

This response seemed to reflect his beliefs that knowledge was uncertain. Both people at the multiplist and the evaluatist levels deny the certainty of knowledge. As I explained previously, people at the evaluatist level are open to new perspectives and believe that the certainty of knowledge is unlikely to be achieved; yet they observe, examine, and analyze the new ideas in order to reduce the uncertainty of knowledge (Kuhn, 1991). Despite the fact that Eric acknowledged the existence of different perspectives, he did not evaluate them, which might lead to the multiplicity of knowledge.

During the first dilemma of the pretest RJI, Eric presented traits of multiplist epistemology by endorsing the idea that there were no right or wrong positions and that opinions were not subject to evaluation. The following excerpt is another illustration of how Eric justified his beliefs about the existence of correct answers.
Interviewer  When two people differ about matters such as this, is it the case that one opinion is right and one is wrong?

Eric   No. I definitely think that everyone is able to have their own opinion. I think this is how you grow as an individual, being able to accept others for being different from you. Something I stress in this room a lot. A lot of them view a lot of things differently and it doesn't mean one is more right than the other. It just means that they have a look at, they have a different lens, they see it in a different way. I think it shows more growth and maturity if you can accept those differences and understand both sides and still be comfortable with the side that you've chosen, or the side that you believe (pretest RJI, dilemma 1).

Eric seemed to hold a belief that opinions were not amenable to proof and that knowledge was subjective, which is recurrent in his answers. Not only did Eric acknowledge the possibility of having coexisting opinions and beliefs, he even complimented people’s attitude when they embraced different perspectives (e.g., *I think it shows more growth and maturity if you can accept those differences and understand both sides and still be comfortable with the side that you've chosen, or the side that you believe*). According to him, these people show signs of “growth and maturity”. Eric’s claim that there were no right or wrong answers and that opinions were freely held is parallel to Kuhn and Udell’s (2003) claim about people at the multiplist level. They contended that individuals at the multiplist level believed that knowledge was freely chosen and was not subject to evaluation or challenge, therefore it was uncertain (Kuhn & Udell, 2003). It is not clear from these excerpts whether Eric believed that truth could not be
approached or whether it was not necessary to reach the truth. But either option is a characteristic of people who are at multiplist level in Kuhn’s (1991) model.

As I mentioned in the introduction of this section, the analysis of the different dimensions of knowledge was challenging. Some dimensions seemed to be the precursors of other dimensions. For instance, if Eric considered his culture to be his main sources of knowledge, then the dimension of the sources of knowledge might affect his engagement in the justification of knowledge. This relationship between the sources of knowledge and the justification of knowledge could be detailed in the following example.

Interviewer: How is it possible that people have such different views about the subject [The bias of the news reporters]?

Eric: I think culture. I think where you were brought up, the different culture within your house, but also within your community changes your vision on a lot of different things. I've been in many different settings: urban, suburban, rural and just within those different areas you see how people's viewpoints change towards certain topics. So, I think definitely your upbringing and your culture really have huge impact on those viewpoints (pretest RJI, dilemma 1).

Here again, Eric mentioned that his culture, community, parents, and upbringing forged the formation of his knowledge. What is noticeable is that throughout the first dilemma in the pretest RJI, Eric did not mention any research-based sources. Probably, he did not provide research-based evidence because he thought that all sources could be reliable, acceptable, and carry the same value. Another explanation could be his unawareness of the existence of research that could be used to discuss controversial topics such as the accuracy of the news reporters.
In this example, Eric’s sources of knowledge might have influenced his justification of knowledge. Instead of justifying his knowledge basing it on scientific evidence and on inquiry, Eric seemed to heavily rely on authorities and on personal experiences to construct and evaluate his positions, which are not characteristics of people at the evaluatist level (Kuhn, 1991).

**Second dilemma.** Eric’s answers to the questions in the second dilemma of the pretest RJI varied slightly from the first one. In the following example, I analyze Eric’s thinking when asked about the safety of nuclear energy.

**Interviewer** What do you think about these statements [whether the nuclear energy is safe or unsafe?]

**Eric** I am a very on the fence type of person and that gets me in trouble sometimes because I tend to agree with both sides. I really think that there are good things about it but you also need to think about the effects that they can have on people living immediately near those plants. I think a lot of times researchers don’t necessarily take that into account where they are putting these plants and the effect they can have on their environment. Instead of thinking of them, they think of long term and how it’s affecting globally or nationally. Again, this is a culture and where you’re brought up that help you decide. Growing up in Jersey, more toward South Jersey, there’s nuclear plant, so having family down there you hear that side (pretest RJI, dilemma 2).

In this excerpt, Eric showed some complex thinking. He seemed not to be sure about his position. He was able to see the positive and the negative effects of both sides of the dilemma (e.g., *I really think that there are good things about it but you also need to think about the effects*...
that they can have on people living immediately near those plants.). Eric seemed to be uncertain about his position not because he believed that all positions carried the same value, rather his knowledge was uncertain due to the complexity of the topic.

In this example, Eric resumed to talk about his culture and upbringing as sources of knowledge. He also related the issue of nuclear energy to his own personal experience. Unlike the previous examples, in which he did not mention scientific research to justify his knowledge, in this response, Eric referred to the role of the researchers when forming his opinion about nuclear energy. Integrating different sources of knowledge might indicate that Eric showed some development in his thinking (Brazilai & Chinn, 2018; Reznitskaya & Wilkinson, 2017).

The integration of different sources of knowledge was also apparent in the following excerpt, in which Eric answered the question about making his decision regarding safety of nuclear energy.

Interviewer: How would you go about making a decision about this issue?

Eric: I think I would have to talk to people in the field. I definitely have to talk to people who are in field like working in nuclear energy plants and things like that. But I also need to talk to people who lived near them. I need to see what they are both thinking like where their thoughts are and a lot of research would be included to make sure. But luckily, I don’t live near one, so I don’t have to worry and I am a very go-with-the-flow type of person (pretest RJI, dilemma 2).

Eric’s thinking about the sources of knowledge seemed to oscillate between evaluatist and multiplist levels. The evaluatist traits appeared when Eric integrated non-research based in addition to research based sources of knowledge to reach completeness of knowledge. He
seemed to be aware of the limitations of each source and was trying to get different kinds of information to support his reasons and position.

Yet, two indications in his response made me think that his thinking about the sources of knowledge was shifting between the two levels. First, Eric seemed to attribute the same value and the same importance to experts’ and non-experts’ positions. He mentioned that he would not only base his position on research, but he also would ask people who were not in the field. He seemed to consider that all opinions were equally valid, which is a trait of the multiplist level in Kuhn’s (1991) model. Even though Eric mentioned that he would use different sources to construct his knowledge about the safety of nuclear energy, he did not explain what he would do with the data collected from non-experts. He just mentioned that he was interested in their thoughts, but he did not expand anything about why he was interested in their thoughts, what he would do after getting the non-experts’ opinions, and how he would use the data. Although Eric mentioned that he would listen to both experts and non-experts’ opinions on the matter, nowhere in his claims he asserted that he would compare and evaluate both opinions to make a sound decision about whether nuclear plants were safe or unsafe.

The second indication is the last part of the answer when he said that he was “a very go-with the-flow type of person”. This claim mirrored Eric’s disposition to accept the opinion of the majority of people without necessarily evaluating it, which as explained previously, is a multiplist trait (Kuhn, 1991; Kuhn & Udell, 2003).

Throughout the pretest RJI, Eric kept mentioning the role of beliefs as important sources of knowledge. For instance, when the interviewer asked him the question about holding right or wrong positions regarding the safety of nuclear power, he answered that there were no right or
wrong positions because beliefs were not subject to evaluation. This was identical to what he said in the first dilemma about the bias of news reporters.

Interviewer When people differ about matters such as this, is it the case that one opinion is right and one is wrong?

Eric No I don’t so. I think it is more of the point of their beliefs. Your beliefs are not necessarily right or wrong. It’s just what you feel (pretest RJI, dilemma 2).

In this response, Eric seemed to believe that it was unlikely to approach the truth because he based his position on subjective sources of knowledge such as beliefs and feelings. This response is parallel to the answers provided by the participants who fell under the multiplist level in Kuhn’s (1991) study.

Eric’s claims in the pretest RJI suggested that he was at the multiplist level in Kuhn’s (1991) developmental model. What I noticed is that Eric’s beliefs about the certainty of knowledge influenced his justification of knowledge. When arguing about both dilemmas, he considered knowledge to be uncertain because it was based on beliefs, feelings, and culture; therefore, it seemed that Eric did not have a reason to justify and evaluate his knowledge.

On the other hand, his beliefs about the sources of knowledge varied between the dilemmas as he started to mention researchers as potential sources of knowledge in the second one. This was probably due to the fact that beliefs are context and domain bound (Buehl et al., 2002).

Eric’s evaluation and consideration of the dimensions of knowledge during the posttest RJI.
First dilemma. In the posttest RJI, Eric started to express some shifts in his evaluation of the sources of knowledge. For example, when asked about his position regarding the building of the pyramids, Eric explained that the pyramids were built by ancient Egyptians and he based his position on his knowledge about mathematics and human development. He also talked about how humans developed tools over time and how the process of building the pyramids required trials.

Interviewer What do you think about these statements [whether the pyramids were built by aliens or ancient Egyptians]?

Eric I think there's evidence to support both claims. I think it depends on what type of background knowledge you have on this subject and what you believe in. I think it depends more on your background and what knowledge you have on the mathematical development of humans and the development of tools and what not (posttest RJI, dilemma 1).

In this statement, Eric integrated different sources of knowledge, which is encouraged in the context of argumentation generally (Brazilai & Chinn, 2018; Kuhn, 1991) and inquiry dialogue specifically (Reznitskaya & Gregory, 2013; Reznitskaya & Wilkinson, 2017).

Acknowledging different sources of knowledge is not new to Eric, it has already been observed and discussed in the pretest RJI, however, the difference between the pretest and the posttest RJIs lies in Eric’s evaluation and justification of the sources, as well as the use of research-based evidence such as mathematical knowledge, human development, and background knowledge to back up his claims.

Because Eric did not explicitly state who he believed was the builders of the pyramids, the interviewer asked him a follow up question.
Interviewer: Do you lean towards one of these positions being more or less reasonable than the other?

Eric: I lean towards the Ancient Egyptians being able to make them. Just for the fact that we've seen the similar tools that they used, or that they've claimed to use, evolve over time and they've had to evolve from somewhere. So, I think it does make sense that they did trial and error to figure out how to make these monuments (posttest RJI, dilemma 1).

Eric’s justification of knowledge in this response seemed to evolve from what has been reported in the pretest RJI. Here, Eric used scientific inquiry to justify his knowledge, which is a process done by people at the evaluatist level (Kuhn, 1991; Kuhn et al., 2000). In fact, Eric talked about “trial and errors” which are features of empirical research. It is worth noting that in this dilemma, Eric did not mention his parents or upbringing to be the mechanisms he used to form his knowledge, rather, he justified his knowledge with empirical evidence.

The fact that Eric started using empirical and scientific research to justify his knowledge made him come closer to the best possible answer. For instance, in the first dilemma of the posttest RJI, the interviewer asked Eric whether he thought that some positions could be better than others. Eric mentioned that certainty of knowledge could not be achieved but he hinted that people could come close to the best possible conclusion.

Interviewer: Can you ever know for sure that your position on this issue is correct?

Eric: I'm sure there are historians and scientists that can study the dirt and the type of substances that they used and figure it out. But at my level, I don't think I'll ever know what is right from wrong just based on what I kind of feel more to be true (posttest RJI, dilemma 1).
Three dimensions emerged in this response. The first one is the sources of knowledge. Eric attributed more value to the experts’ knowledge. He started to talk about the role of the researchers and experts and seemed to realize that sources carry different values. He started to think about the reliability and credibility of the sources of knowledge, which is a hint that Eric started transitioning from multiplist to evaluatist level (Kuhn, 1991).

The second dimension that appeared in this excerpt is the justification of knowledge. Eric’s response revealed his take on the fact that knowledge is constructed through inquiry and testing. In fact, when he said: “I’m sure there are historians and scientists that can study the dirt and the type of substances that they used and figure out”, he believed that researchers and scientists generated knowledge through empirical research. In this excerpt, his justification of knowledge reflected evaluatist characteristics.

The third dimension that emerged in this excerpt is the certainty of knowledge. In the pretest RJI, Eric believed that knowledge is uncertain because it comes from one’s beliefs, feelings, and contexts, which indicates multiplist level in Kuhn’s developmental model. However, attributing the uncertainty of knowledge to the complexity of knowledge and the diversity of sources and justification methods is a sign of evaluatist epistemology.

Eric’s beliefs about the certainty of knowledge seemed inconsistent. For instance, in the previous example, Eric said that if researchers conducted empirical studies, they might be able to reach a plausible answer (e.g. I'm sure there are historians and scientists that can study the dirt and the types of substances that they used and figure it out). Yet, when the interviewer asked him whether he thought that some answers could be better than others, Eric denied the existence of better answers.

Interviewer    Can you say that one opinion is in some way better than the other?
Eric  No, I just think it depends on what you believe in and again, with your level of knowledge on the subject matter (posttest RJI, dilemma 1).

In this turn, Eric claimed that one position could not be better than another position, which seems to contradict what he said before about the existence of correct answers. Eric’s claim raised the following question: How is it possible to have correct answers but impossible to have better answers?

This example also reflected Eric’s integration of different sources of knowledge, namely, beliefs and content knowledge to come to construct knowledge. He used scientific evidence and personal beliefs to justify his knowledge, which is an evaluatist stance (Reznitskaya & Gregory, 2013; Reznitskaya & Wilkinson, 2017).

The last question, in the first dilemma in the posttest RJI, mirrored Eric’s beliefs about the structure of knowledge. He attributed the lack of agreement among experts to the complexity of the structure of knowledge.

Interviewer  How is it possible that experts in the field disagree about this subject?

Eric  I think this field is very wide because there's different levels of the field. You have historians, but historians encompass many different aspects. So, I think there might be more modernized historians and ones that are more in the Egyptian era. There are different levels and strains of this one area. And I think that's where the difference in opinions probably stems from (posttest RJI, dilemma 1).

Beliefs about the structure of knowledge are typically discussed in terms of a continuum of believing that knowledge is simple (i.e. isolated and discrete) to believing that knowledge is complex (Buehl & Fives, 2016). In this response, Eric considered the field of history to be
complex and evolving, which led to the formation of complicated and divergent perspectives. Historians did not hold simple beliefs about the building of the pyramids, rather, their knowledge came from different disciplines and contexts. In this statement, I argue that Eric showed evaluatist traits since he implied that knowledge was not composed of discrete, simple facts.

To sum up, in the first dilemma of the posttest RJI, Eric’s beliefs about the sources, justification and the one example about the structure of knowledge seemed to start aligning with the evaluatist level in Kuhn and colleagues’ (1991; 2003) model. Yet, his beliefs about the certainty of knowledge seemed to sway between multiplist and evaluatist level.

**Second dilemma.** The first question in the second dilemma was about Eric’s position regarding the safety of food additives.

Interviewer  What do you think about these statements?

Eric I think it's very similar, where they both can be true and there's some evidence supporting both. But, I think as of late doctors and researchers are trying more and more to find a cure for cancer. And I think they just want to find an answer and they're just pointing at any type of chemical that could potentially lead to it. And I think sometimes it's that social scare, you want to scare people into thinking: "Let's live a healthier lifestyle". But, I think that they both can be true and it's definitely a topic that is brought up a lot.

Interviewer And do you lean to one side or the other?

Eric I lean towards the side that they're not as harmful as people, as some of the researchers make it out to be (posttest RJI, dilemma 2).
Eric seemed skeptical about experts as sources of knowledge: their desire to cure cancer made them exaggerate the relationship between food additives and different types of cancer. In this exchange, Eric did not take for granted experts’ opinions and engaged in the evaluation of their knowledge. He was also able to provide an alternative explanation of why experts suggested a relationship between cancer and food additives. According to Kuhn (1991) this is a characteristic of evaluatist level as Eric understood that experts’ positions could be evaluated with respect to their accuracy and trustworthiness.

In this dilemma about the safety of food additives, Eric challenged the experts’ position using competing factual evidence. He explained that the researchers were inaccurate when they reported the results of the studies. He believed that cancer was not caused by people consuming food additives. Instead, the issue was that people consumed these additives in huge quantity and without moderation. Challenging experts’ positions and providing alternative perspectives to their points of views is a feature of the evaluatist level. Similar analysis is portrayed in the following excerpt.

Interviewer: And on what do you base that point of view [Food additives are not harmful]?  
Eric: Just based on the fact that there hasn't been a drastic change in less cancer diagnosis or more, either way. And, there's so many different types of cancer. How do you pinpoint is it cancer in general? Is it a specific kind of cancer that the food causes you? Is it stomach cancer because that's where it's sitting? So to me it's just, I base it on, I don't think there's enough factual evidence to actually tell me, "yes if you eat this chicken, where they insert chemicals in, you will eventually get cancer" (posttest RJI,
When Eric said “I don't think there's enough factual evidence to actually tell me”, he appeared to mean that there was not enough research in the field of food safety to accurately report the correlation between chemicals and food safety. Here again, he challenged researchers’ positions, which might indicate that he actively engaged in the evaluation of the sources of knowledge.

Throughout the posttest RJI, Eric’s beliefs about the certainty of knowledge seemed to influence his position and reasons. It is interesting to see, once again, how Eric’s beliefs kept swaying back and forth between the likelihood and unlikelihood of knowing the truth. This might be because Eric was still transitioning from one level to another and the shift requires time. On the other hand, the context could also play a role in this inconsistency in Eric’s beliefs about the existence or non-existence of best possible answer. For example, when discussing the question about the existence of a better position, Eric seemed hesitant to affirm that one position was better than the other.

Interviewer  Can you say that one opinion is in some way better than the other?

Eric  I mean, it's always better to make smarter choices. And I think saying that some foods are unsafe could lead to people making smarter choices and being more aware of what they're putting into their bodies. But, at the same time, people should have the choice to live their lives the way they want to. So, I think with this question, I think this is one that is always going to be a topic (posttest RJI, dilemma 2).

Eric’s position was unclear in this response. He seemed to see both sides of the dilemma and argued for both. On the one hand, he believed that when people ate healthy food they made
smarter and better choices, on the other hand, he seemed to struggle with the idea of freedom when he said that “people should have the choice to live their lives the way they want to.” His response conveyed the meaning that sometimes healthier options contradicted with the freedom to choose. Therefore, it was difficult for him to explicitly state which position was better. Eric’s uncertainty about the answer seemed to stem from the convoluted relationship between ethics, freedom, and healthier choices. In fact, Eric affirmed that if researchers made people eat food that they think can cause cancer, which is unethical, only then could they answer the question about the safety of food additives.

Interviewer: Can you ever know for sure that your position on this issue is correct?

Eric: Not unless they actually do a study where people eat a certain type of food they think is cancer causing and over time they see that these people start to develop more cancer cells or whatnot. I think if they do a specific study geared towards food in general, I think then that would alleviate the question factor of what is true. But as of now, I think that would be unethical to do that to a group of people (posttest RJI, dilemma 2).

In this dilemma, the context seemed to inhibit individuals to reach the truth. Empirical research could be unethical; therefore, it should not be conducted. This led to experts’ divergence in their opinions and inability to justify their knowledge. The following example illustrates how Eric justified the disagreement among experts.

Interviewer: How is it possible that experts in the field disagree about this subject?

Eric: Because I don't think they're ever going to really know unless, like I said earlier, if they do a study where if they think this chicken has chemicals that lead to cancer, if they have a group eat this chicken every day or a
reasonable amount they say to eat over a couple of years and then they have another group that's not, comparing who gets sick first, I think that's the only way you can tell. And for right now, that's not ethical. I would think, they would probably use animals is my guess. But, you never really know because that's their stomachs digest things differently based on what type of animal they are. So, I just think it's one of those things where there might never be a more right answer, or an answer at all (posttest RJI, dilemma 2).

In this response, Eric talked about inquiry as a means to justify his knowledge, yet, research in this context could be unethical. Here, he engaged in the evaluation of the mechanisms to reach knowledge and started to eliminate some of the unreliable mechanisms. This practice is aligned with practices of argumentation during inquiry dialogue (Reznitskaya & Wilkinson, 2017). At the end of this response, Eric confirmed that “there might never be a more right answer, or an answer at all”, which reflects his beliefs about the certainty of knowledge. Even though, this response suggests that Eric might be at the multiplist stage, I argue that it is not the case and that Eric seemed to convey evaluatist features. Not knowing the truth is related to the difficulty to conduct ethical research. Eric did not seem to attribute the uncertainty of knowledge to the legitimacy of the different opinions. Rather he believed that the uncertainty of knowledge might be the result of the complexity of the context and the researchers’ inability to test their claims because of ethical considerations.

In the posttest RJI, I described the four dimensions of knowledge that emerged from Eric’s responses. Some dimensions were more prominent than others. From the analysis of the pretest and posttest RJIs, I noticed that dimensions of knowledge did not evolve in a stage-like
development. For example, there was only one instance in which Eric talked about the structure of knowledge and demonstrated some evaluatist traits. When Eric evaluated his sources of knowledge and the mechanisms to justify his knowledge he seemed to be at the evaluatist level. However, Eric’s beliefs about the certainty of knowledge seemed to shift between multiplist and evaluatist levels. As I mentioned earlier, this might be due to various factors such as: the domain specificity, context, and transitioning phase. These factors will be fully described in the Discussion Chapter.

The Engagement in Epistemic Cognition when Learning and Facilitating Inquiry Dialogue

Buehl and Fives (2016) argued that teachers hold “unique positions of being both learners and agents who play a role in the learning of others” (p.250). According to Buehl and Fives (2016) differentiating between learning and teaching tasks was essential when considering teachers’ epistemic cognition. In the context of inquiry dialogue, separating the learning and the teaching tasks was important because I noticed that Eric’s engagement in epistemic cognition and his use of the Argumentation Rating Tool (ART) varied depending on the task he was performing (i.e. learning or facilitating inquiry dialogue). In accordance with this observation, I had one section about Eric’s learning of inquiry dialogue and one section about his facilitation of inquiry dialogue.

**Eric’s engagement in epistemic cognition when learning inquiry dialogue.** In the following section, I provide a detailed analysis of the changes surrounding Eric’s beliefs about the dimensions of knowledge, namely source, justification, certainty, and structure when he learned inquiry dialogue.

**Evaluation and consideration of knowledge.** As its name indicates, the construct of evaluation and consideration of epistemic matters refers the evaluation of one’s knowledge when
attempting to achieve epistemic aims (Buehl & Fives, 2016). Eric had the opportunity to contemplate his knowledge and practices in different contexts such coaching sessions, study group meetings, and focus group interviews. In this section, I included examples that captured the process of epistemic cognition and tried, when possible, to present them in a chronological order to show the path of development of Eric’s epistemic cognition. For clarity purposes, I divided this section into three major parts. The first one regards the coaching sessions, the second one describes the study group meetings, and the last part covers examples from focus group interviews.

The dimensions of knowledge that emerged in the coaching sessions. In the coaching sessions, Eric openly reflected on and evaluated his practice when learning and facilitating inquiry dialogue. Thus, I was able to find hints that revealed his epistemic cognition process. For example, in the Coaching Session 2, Eric insisted on the importance of listening, taking turns, asking questions, and using silent moments to critically think about positions. This, to me, reflected his take on how knowledge should be constructed through testing and challenging, which refers to the dimension of the justification of knowledge. In other words, knowledge is constructed through inquiry.

Coach That was actually one of my critiques. There's repetition. Although they do a good job building on one another, but there is repetition. I know that you referenced eight ground rules on your board. Are any of those ground rules associated with how to speak?

Eric Yes. One of them is one person speaks at a time. And another one is the use silent moments to think. I really try to highlight those two because they go hand in hand. If you're not speaking at that time, you should use it
to develop your thoughts even further. To piggyback off of what someone else might say or post-question, discuss alternative views (coaching session 2).

Eric’s statement detailed his beliefs about the *justification of knowledge*. Valuing his students’ practices such as: “*piggybacking off of what someone else might say, asking questions, or discussing alternative views*” are traits of the evaluatist level and are aligned with practices of well-reasoned argumentation (Bråten et al., 2017; Reznitskaya & Wilkinson, 2017).

After listening to Eric expressing his anxiety regarding the lack of attentive listening among his students, the coach asked him how he would try to solve the problem.

Coach: What are your thoughts about how to get them to go more smoothly for them to listen to each other?

Eric: I feel like there are a few of them that are posing questions or challenging one another. But I feel like a lot of them are just giving a basic "I think that it was this person's responsibility" or “Kelly should…” that is flat. Instead of building off of that or questioning other people's thoughts. So I think if I talk to them, if maybe, we do a questioning type of lesson and talk to them about how everyone needs to develop some of the thoughts instead of just "I agree or disagree with you ” (coaching session 2).

Similar to his previous response, in this excerpt, Eric embraced the belief that students should challenge each other and discuss alternative positions in lieu of just stating them. His plan was to clarify that the argumentation practices were about connecting ideas and testing positions. This is aligned with the practices of inquiry dialogue and reflects evaluatist epistemology (Reznitskaya & Wilkinson, 2017).
Another instance showing Eric’s beliefs about *the justification of knowledge* occurred when he talked about his students’ unwillingness to listen to alternative perspectives.

Eric If it's someone who's not agreeing with them, they're not going listen.

Coach You can hold them accountable for that. "But how does that connect to what so and so said?" If you think they're completely ignoring that, call them out on it. Tell them. In a respect, obviously you wouldn't do it any other way. Just say if you see that's what they're doing, if they're ignoring everything else and going to that one thing, you can say "Wait a second. How does that fit in with the rest of this?"

Eric Right. I think that's where a lot of the repetition comes from. Because they're only listening to what they want to hear. So, when they hear something different, they're not questioning it. They're not attacking it a little bit to make those people think harder. They're just repeating what they said to say I still think this (coaching session 2).

Here, Eric’s beliefs about *the justification of knowledge* seemed to evolve toward the evaluatist level. As previously stated challenging, discussing alternatives, asking question are the rules of inquiry that match argumentation practices in inquiry dialogue (Reznitskaya & Wilkinson, 2017).

Another example related to *the justification of knowledge* is taken from Coaching Session 6. Eric seemed to appreciate the discussions with his students because they seemed to have grasped the basic practices of argumentation.

Coach This Mars discussion, how'd you feel about it? Anything in particular you want to discuss?
Eric I felt like it was okay. They come up with good ideas, they challenged each other a lot better this time. And they really challenged the specific parts, not just "I disagree with you" and whatnot. They picked what they disagreed with, and why. I feel like they are getting there. But in general, I think they're doing well with it. I've seen that their writing has gotten more like this, where they're able to rationalize, take their thoughts and put it into writing, and not just speaking (coaching session 6).

Two interesting ideas emerged from this excerpt. First, Eric noticed a change in his students’ construction of knowledge and he seemed to be pleased with it. His response was similar to the ones analyzed previously, in which, he stated that testing positions, justifying knowledge, and connecting ideas were all desired practices that lead to the construction of knowledge. Second, Eric stated that his students used argumentation practices not only in speaking but also in writing. Research has shown that individuals present aspects of development of epistemic cognition when they transfer practices from one domain to another (Chinn et al., 2011; Grotzer & Basca, 2003). Eric demonstrated such practices when he was helping his students use argumentation practices in speaking and writing.

Eric’s consideration and evaluation of the justification of knowledge was influenced by his beliefs about the certainty of knowledge. A glimpse into his beliefs about the dimension of certainty of knowledge is reported in the following exchange with the coach. In this exchange, Eric mentioned that his students considered the argumentation process to be a fight. They seemed to approach inquiry dialogue as a battle to be won with only one right answer.

Eric They're not always paying attention to their thoughts. As much as they all like one another and get along, they're very competitive and want to only be right. I think
that's what gets, I don't think it's anything with the program or with understanding, I think it's just their personalities. They want to fight to the death that they're right. They want everyone to agree with them.

Coach: With this pedagogical approach, it's really not about winning or losing.

Eric: Right. I think that's what a lot of them don't get. They hear this question where there's multiple answers to it. And they're so sports related, which is why they loved the article. But they're always like "Well who won? Who won?" It's not about winning. We just have different opinions as to what the right answer could be. That's something that they're having a really hard time grasping (coaching session 2).

In this statement, Eric talked about the winning mindset of his students and commented on that by saying “It's not about winning. We just have different opinions as to what the right answer could be”. Eric seemed to profess a high degree of uncertainty of knowledge because of the equality of beliefs. As I explained in the previous section, although individuals in both multiplist and evaluatist levels claim that knowledge is uncertain, it is important to note that this uncertainty has different origins in the two cases. In the multiplist case, knowledge is uncertain because different positions could coexist and could carry the same value, whereas, in the evaluatist level, people believe that knowledge is complex, evolving, and tentative, and that is why certainty is rarely achieved (Kuhn, 1991; Kuhn et al., 2000). Another difference between the two views is that people at the multiplist level do not engage in the evaluation of knowledge because they think it is unnecessary since all opinions are equally valued and valid. On the other hand, those who are at the evaluatist level constantly evaluate their knowledge and get rid of the weakest conclusions (Kuhn, 1991; Kuhn et al., 2000; Kuhn & Crowell, 2011). From this
example, I argue that Eric showed characteristics of multiplist level as he did not talk about the evaluation of knowledge. He claimed that people had different interpretations of what the right answer could be and he seemed to encourage his students to grasp the concept of simply accepting different positions (e.g. *We just have different opinions as to what the right answer could be. That's something that they're having a really hard time grasping*).

Chinn et al. (2011) argued that the degree of certainty of knowledge depends on how well knowledge is justified. This might be Eric’s case with his students. The lack of well justified answers such as empirical evidence, anecdotal evidence, and prior knowledge, might result in the uncertainty of knowledge. This means that if knowledge is not well justified, it would be difficult for the group to reach the most reasonable answer.

The following example from Coaching Session 2 is also an explanation of the close relationship between Eric’s beliefs about the certainty of knowledge and his justification of knowledge. His response suggested that he was still upholding some traits of the multiplist epistemology.

Eric

They get disappointed in themselves after. Not disappointed in the sense that they think it went terrible, but after this one, a few of them came up to me and said: "We're still not as good as we were for our first one". And I said: “I think you guys are just over thinking it too much. You're getting yourself wrapped up in trying to win and trying to have the better idea than somebody else, instead of just being who you are and thinking, using your own knowledge and creating an idea (coaching session 2).

Acknowledging that students should use and create their own knowledge without necessarily working towards the best idea is a feature of the multiplist level (Kuhn, 1991). It is
true that inquiry dialogue is not about having the correct answer; yet, one of the main aims is to collectively reach the most reasonable conclusion (Reznitskaya & Wilkinson, 2017). This is to say that some positions and reasons are better than others and as a group, the students work toward reaching this goal (Reznitskaya & Wilkinson, 2017; Wilkinson et al., 2017).

Consequently, using personal knowledge to create positions is just the first step of the process. These positions should be tested and then eliminated if there was not strong evidence to support them (Reznitskaya & Wilkinson, 2017).

In order to show how Eric’s beliefs about the certainty of knowledge started to develop and influence the process of justification of knowledge, I included the following example from Coaching Session 6.

Coach   So let’s talk about the move [ the coach refers to the talk moves that I described earlier in Chapter 3. What was going on that made you decide that?

Eric   I just felt like that was a really good point that somebody brought up that could be debated. I just felt like that was one of the better arguments that came up. I think a lot of the people on the other side didn't challenge that enough, and I felt like that was a good spot to revisit that, for a minute (coaching session 6).

In this excerpt, Eric’s beliefs about the certainty of knowledge seemed to start shifting slightly. The shift is expressed when Eric said: “I just felt like that was one of the better arguments that came up.” Here, Eric seemed to endorse the idea that some arguments could be better than others. The word “better” itself implied that Eric evaluated the student’s position, compared it to other positions in the classroom, and got closer to the most reasonable answer.
According to Kuhn and colleagues (1991, 1999; 2000; 2011) and to Reznitskaya and colleagues (2013; 2017), recognizing the existence of better answers is aligned with the practices of well-reasoned argumentation and it is a sign of evaluativist epistemology.

The third dimension that was apparent in the coaching sessions is the *sources of knowledge*. The following excerpt is an example of how Eric talked about encouraging students to use textual evidence.

Eric   We've been working really hard with having them use the text. I think most of them did extremely well with this one. Some of them didn't. We read the article first and I didn't tell them what the big question was or anything. I just said: “Highlight some things that you think are interesting or important to Zack's story”. And when I finally asked that big question, a lot of them were: "Oh, yes! I have this highlighted". They went to where they had something highlighted because it fit into exactly what they wanted to say. A lot of them don't know how to use the text. In our previous discussions, a lot of them just used their own personal experience.

Coach   Which is okay, by the way.

Eric   Right. I encourage that because it helps them connect with the reading better. But a lot of times, they have it right in front of them. Just open it and look at it, you'll sound a lot more intelligent and accurate if other people can look at it and see it too (coaching session 2).

In the context of argumentation, the use of different types of evidence, such as textual evidence, anecdotal evidence, or scientific evidence to support one’s position, is acceptable and
encouraged (Chinn et al., 2011; Kuhn, 1991; Reznitskaya & Gregory, 2013; Reznitskaya & Wilkinson, 2017); however, different sources of evidence need to be evaluated in relation to their credibility. For example, Reznitskaya and Wilkinson (2017) explained that the sources of textual or scientific evidence should be scrutinized because they might be unreliable and untrustworthy. Likewise, evidence from personal experience, should also be analyzed because their accuracy depends on the situations and the contexts. Kuhn (1991) argued that, even though evidence from personal experiences might be plausible, coherent, and serve the purpose of supporting one’s positions, it carries less value than research-based evidence. This is because personal experiences are hard to verify, are not based on methodical and transparent process, and, thus, could be unsound and defective. Being able to use and evaluate different sources of knowledge to generate conclusions is considered a characteristic of the evaluatist level.

This trait is reflected in Eric’s previous response since he seemed to understand the reason behind using personal experiences (e.g., to connect with the text), which is necessary for the students to connect emotionally and cognitively with the story and feel motivated to discuss it. Yet, he preferred textual evidence and considered it more powerful because it is accessible for anyone to see. In other words, he held text-based evidence in higher regard (e.g., you’ll sound a lot more intelligent and accurate if other people can look at it and see it too.)

Although, Eric leaned more toward using text evidence, I argue that he is still transitioning toward evaluatist level because he did not seem to evaluate the texts themselves. As I mentioned previously, Reznitskaya and Wilkinson (2017) have made it clear that it is necessary to engage in the evaluation of all sources of knowledge, including empirical studies, because some studies were poorly designed, not trustworthy, or nor relevant to the question being discussed.
To sum up, the examples I included in this section described three dimensions of knowledge: the justification, the certainty, and the sources of knowledge. Eric’s beliefs about the sources of knowledge seemed to align with those of people who are at Kuhn’s (1991) evaluatist level, or who are transitioning from multiplist to evaluatist levels. Eric’s beliefs about the certainty of knowledge, on the other hand, seemed to go back and forth between multiplist and evaluatist level and to influence the processes of the justification of knowledge.

The dimensions of knowledge that emerged in the study group meetings. Like the coaching sessions, study group meetings represented a learning opportunity for Eric to reflect on and improve his argumentation practices during inquiry dialogue. In this section, I also used a chronological order to portray the development of knowledge dimensions over time.

In Study Group 1, one of the struggles that teachers shared was that students challenged each other using inaccurate information. The following excerpt shows how Eric tackled this issue.

Eric   That happened in my class with the story of Kelly. They thought that Kelly and Evelyn were sworn enemies (group laughs). So I stepped in and said: “Wait, where are you getting this information from? This has nothing to do with, like we don't know that. Read it, just look” (study group 1).

“What Should Kelly Do?” is the title of the story that Eric discussed with his students. Table 7 on page 114 provides a summary of each story and the big question that was discussed.

In the remark above, Eric seemed to push his students to use textual evidence as their main sources of knowledge to support their position and challenge each other. Eric appeared to address the accuracy and acceptability of the information when he said “where are you getting this information from? Read it.” Reznitskaya and Wilkinson (2017) highlighted the importance of
this move, which is evaluating the sources of the information as well as its accuracy, because it is a feature of the evaluatist level.

Another example illustrating Eric’s evaluation of the sources of knowledge is taken from Study Group 2. In this excerpt, the teachers were deciding about the contestable question for the story that they could discuss with their students. The story was about a little boy in the coma (See Table 7 for details).

Eric: Well, I wrote down like as a question: Is there a difference between living in reality and living in dreams? Because what I took from the story is that he's obviously in a coma at first because it says he couldn't talk, but he could hear everything that goes around him. And studies have shown that even though you’re in a coma you can hear people that are around you (study group 2).

Here, when formulating his question, Eric used the information from the text and justified his question with textual evidence (e.g. Because what I took from the story is that he's obviously in a coma at first because it says he couldn't talk, but he could hear everything that goes around him.) Again, this might highlight Eric’s emphasis on using textual evidence. Not only did Eric use the information in the text when he formulated the big question, he also used other sources (i.e. studies) support his interpretation of the text. This means that Eric started to show evaluatist characteristics by checking the accuracy and acceptability of the information in the story and by using empirical sources.

I also think that this turn could address the justification of knowledge. When Eric talked about the big question, he used the empirical evidence to determine if the claim in the story was true, meaning that he used research to check the accuracy of the information and made sure that
both pieces of information match. When Eric stated: “And studies have shown that even though you’re in a coma you can hear people that are around you”, it indicated that the use of empirical evidence was his mechanism to justify his choice of the big question. Basing one’s justification of knowledge on scientific inquiry is one of the signs of evaluatist level (Kuhn, 1991; Kuhn & Crowell, 2011).

The different topics discussed during study group meetings such as: formulating the contestable questions, designing pre and post discussion activities, or choosing good texts depicted some of Eric’s beliefs about the dimensions of knowledge.

In Study Group 3, for example, the teachers talked about their practices and their use of the principles of inquiry dialogue when designing pre and post discussion activities. Having a pre discussion activity helps students to relate the text and incites their cognitive and emotional engagement with the story (Reznitskaya & Wilkinson, 2017). Post discussion activities, on the other hand, serve as a bridge “to transfer the argument skills and dispositions learned in the group to their individual efforts in speaking, listening, reading, and writing arguments” (Reznitskaya & Wilkinson, 2017, p.62).

In the following example, Eric talked about one of the post discussion activities he used with his students.

Researcher: For the post discussion, I guess the only key idea to take home, from all of this, is that it has to focus on arguments. Because the idea is that they have to transfer the knowledge that they’re acquiring in the group to individual performance. Because again, we want them to write better arguments, to read and comprehend arguments better. Give them some kind of individual assignment focused on the target text.
Eric I just want to add something. Last time, I said: “What you thought was the best argument? And what evidence was the best for you?” And it was really interesting when they did that. A lot of them took opposing views, which I kind of encouraged them to do, and even some of them went back into the text and found more evidence to help that person support their ideas. So, I really liked that because it got them thinking and it helped me know who was paying attention to what people might have been saying (study group 3).

In this example, Eric’s justification of knowledge was influenced by his beliefs about the certainty of knowledge. By asking his students the question: “What you thought was the best argument? And what evidence was the best for you?” Eric began to show that not all positions were equally valued. He appeared to understand that the arguments that were supported by credible evidence might be better and might carry more value. According to Kuhn (1991) comparing, weighing, and evaluating arguments lie at the heart of the evaluatist level of epistemic cognition.

Eric mentioned that he encouraged his students to think about alternative perspectives “A lot of them took opposing views, which I kind of encouraged them to do”. His attitude towards the construction of arguments displayed features of evaluatist stance. Indeed, taking opposing views requires his students to look at the counterarguments and counter examples and to find reasons and evidence that contradict with their own. Knowledge requires testing and challenging in order to be constructed. This reflects a belief that knowledge is complex, evolving, and highly integrated. Several researchers have reported that holding a belief that knowledge is complex is
associated with evaluatist stances of epistemic cognition (Chinn et al., 2011; Kuhn, 1991; Kuhn et al., 2000; Reznitskaya & Gregory, 2013; Schommer, 1993).

The dimension of the sources of knowledge was also apparent in this excerpt. Eric seemed to encourage his students to go back to the text and find more evidence to support their views (e.g., even some of them went back into the text and found more evidence to help that person support their ideas). Reznitskaya and Wilkinson (2017) explained that, during inquiry dialogue, students are encouraged to integrate different sources of knowledge to support their positions. This habit will help them evaluate the different sources and perceive the limitations of each one. Similarly, Kuhn (1991) acknowledged the legitimacy of using different sources to justify one’s positions; yet, she has argued that research-based sources are generally more trustworthy than anecdotal evidence and are aligned more with the evaluatist stage. Eric’s response suggested that he was demonstrating hints of evaluatist stage.

The following example, in which Eric described the pre-discussion and post discussion activities, is similar to the previous one.

Eric After we read the passage, I had them all go back and we were talking about author's message: the point of view that the author's trying to get across. So, I had them all go back and based on what the message the author was trying to say, I had them highlight things that they thought were important to support the author's message without even knowing what the big question was. So, a lot of them came to the carpet with really good things highlighted already, which then helped them build the houses [ refers to the metaphor used by researchers that I explained earlier: building arguments is like building houses] a lot more quickly. So that's
one thing that I really liked doing with them because a lot of times they
don't even use the stories that I give them. They’re just saying: “I think
this. And I say: “If this is in front of you, use it, that is why it's there.” So
that forced them to use textual evidence in addition to prior knowledge
and personal experiences. And post reading, what I… a post discussion
had them write, who, what view they thought was the best and give
reasons why that argument was the strongest (study group 4).

Eric seemed to follow the researchers’ recommendations when he chose his pre and post
discussion activities. This turn illustrates two dimensions of knowledge: the source and the
justification of knowledge. Both reflected that Eric’s epistemology started to align with the
evaluatist level in Kuhn’s model. As described earlier, his emphasis on integrating different
sources of knowledge (e.g., textual evidence and personal experience) is a features of evaluatist
level (Reznitskaya & Wilkinson, 2017). His response suggested that textual evidence was
important because it added credibility to the positions developed by the students and made them
more acceptable (e.g., “They’re just saying: “I think this.” And I say: “If this is in front of you,
use it, that is why it's there.”” However, he also considers the use of anecdotal evidence to be
complementary to the use of textual evidence, as in “So that forced them to use textual evidence
in addition to prior knowledge and personal experiences”. The integration of different sources of
knowledge is important because they may help the students see the strength and the limitations
of each type of sources (Reznitskaya & Wilkinson, 2017). In addition, to the integration of the
sources of knowledge, Eric encouraged his students to choose the strongest arguments and the
best reasons. This practice might indicate that he started to become aware of the existence of
better answers and push his students to develop well-justified positions
It seemed that Eric showed some changes in his thinking about the dimensions of knowledge. Yet, these changes were not consistent: sometimes he showed multiplist level and at other times he was at evaluatist level. For example, in Study Group 4, Eric talked about the value of using textual evidence because it is part of the Common Core standards and the standardized tests. Therefore, I could not determine whether Eric preferred textual evidence because he believed that it was more accurate than anecdotal evidence or whether because the school curriculum emphasized its use.

Researcher I liked when you said: “I just wanted to make sure you have evidence for why you think that.”

Eric Yes, because a lot of them assume a lot from the story. I REALLY try to get them to just using the text, and they can add their personal experience. But especially for the PARCC, they are looking for what you can provide them with what's given to you. They really need to focus on that.

Obviously, sharing your own personal knowledge helps and enhances that but in PARCC text evidence is more important (study group 4).

Here, Eric used the standardized testing (i.e., Partnership for Assessment of Readiness for College and Careers (PARCC) to justify the priority for his students to use textual evidence (e.g., “But especially for the PARCC and whatnot they are looking for what you can provide them with what's given to you”.) He used the PARCC as the authority to justify his knowledge.

This response made me also wonder whether Eric really believed that integrating different sources of knowledge, as he was advocating in the previous examples, was necessary to support one’ position, or whether he was just imitating the researchers’ practices and applying them in his facilitation of inquiry dialogue. In other words, it was unclear whether Eric’s change
of practice preceded his change of beliefs or vice versa. The relationship between beliefs and practice has been widely discussed in the literature (Buehl & Beck, 2015; Pajares, 1992; Richardson, 1996). I address this relationship in my discussion chapter.

The structure of knowledge was the dimension that emerged the least in the transcripts. Typically the structure of knowledge is discussed in terms of simplicity versus complexity of knowledge (Buehl & Fives, 2016). The next example, in which students discussed the rules of wearing uniforms in schools, offers a glance into Eric’s beliefs about the structure of knowledge.

Eric When I did my last discussion (Should Kids Have to Wear Uniforms to School?), my class wasn't all on one side, but gender wise, all the girls were: “Yes!” and all the boys were: “No!” So, I tried to make them see opposing views. Like in my eyes it was: why can't the girls see the boys’ point of view and vice versa? So, I tried to help them see the opposite side, and it started getting some of them to think opposite (study group 4).

I argue that this turn might be an example of Eric’s epistemic stances toward the structure of knowledge because he was trying to get to the nuanced meanings of the story and get beyond simplicity. He seemed to help his students think beyond the basic understanding of the idea that rules should always be followed. His beliefs about the structure of knowledge appeared to guide his process of constructing and evaluating knowledge. When Eric invited the students to consider opposing views, it seemed that he encouraged them to think of knowledge as complex and tentative, which is a trait of evaluatist level (Buehl & Fives, 2016; Chinn et al., 2011; Kuhn et al., 2000; Reznitskaya & Gregory, 2013).

Another example that revealed Eric’s thinking about the structure of knowledge and how it affected his choice of the big question is taken from Study Group 6. The teachers read a story
called “The Babysitter” and were trying to develop the big question for the story. One of the teachers suggested a question that according to Eric was not very contestable. Here is Eric’s opinion on the question that was suggested by his colleagues:

Eric I feel like any of the ones that talk about the babysitter alone aren’t very contestable because it’s very one-sided (study group 6).

Eric appeared to resist one-sided questions because they can’t be challenged and tested. A possible explanation is that he believed that knowledge was integrated and interconnected. It needed controversy and challenges to be constructed, which is an evaluatist stance (Chinn et al., 2011). Eric’s beliefs about the structure of knowledge might have guided his formulation of the big question as he wanted a complex question with multiple perspectives.

To sum up this section, I argue that Eric’s thinking about the dimensions of knowledge seemed to evolve, in general, towards evaluatist level; yet, this development is not continuous and some dimensions wavered between multiplist and evaluatist levels. I also noted that some dimensions were more apparent than others and that Eric’s beliefs about the certainty of knowledge seemed to guide his consideration of the justification of knowledge.

*The dimensions of knowledge that emerged in the focus group interviews.* The last data sources that I include in this section are the focus group interviews, in which the teachers shared their success as well as their challenges when learning and facilitating inquiry dialogue. For example, in Focus Group 2, Eric shared his struggles about making his students discuss and understand alternative perspectives.

Eric My students are having trouble letting go of their thoughts. They feel they have to stick to whatever they say and there is no change in it, even if someone just said something that makes sense, they're very stuck. So, I try
to reiterate to a lot of them: “It is not necessarily a right or wrong type of activity it is more of, we're working with one another to find what is the BEST answer and yours might not be the best and relinquishing that power is part of it. Like knowing that you may not have the best answers.”

They tend not to listen all the time to what people are saying. They just keep saying, “Well I think, I think, I think.” It’s been hard to get them away from that (focus group 2).

This example reflected how Eric’s epistemic stance about the certainty of knowledge (i.e. acknowledging that there are better answers than others) influenced his justification of knowledge. From Eric’s description, his students seemed unwilling to listen to people who do not share their ideas or positions (e.g., They tend not to listen all the time to what people are saying), and are incapable of changing their positions (e.g., My students are having trouble letting go of their thoughts.) Eric seemed unsatisfied with the fact that his students were initiating multiple positions but not giving up the weakest ones. He wanted his students to learn that inquiry dialogue was not about one student having the correct answer; rather it was about reaching the best answer as a group. He pushed them to change their positions if sufficient reasons and strong evidence arise from another student (e.g., we're working with one another to find what is the BEST answer and yours might not be the best and relinquishing that power is part of it.”) Eric’s response made me lean toward placing him at the evaluatist level because he conveyed the idea that positions should be scrutinized in order to move forward to the best answer. In the context of inquiry dialogue, the best answer should be generated collectively by the group not individually by a single student (Reznitskaya & Wilkinson, 2017) because it is the result of discussing alternatives and challenging each other’s positions.
The next example also comes from Focus Group 2 and it is about Eric’s talking about the sources of knowledge. In this example, the research team asked the teachers if they were interested in experimenting with peer coaching.

Researcher  We were thinking, or playing with the idea of peer coaching, which is having your partner teacher watch something with you and wanted to know what are your thoughts.

Eric   I don't know, I think it depends... I don't know, I think sometimes… I personally like coaching from someone who has done it for a while.

Researcher  Expert.

Eric   Actually, like, studied it and, you know, trained, instead of someone who has been trained along with you. I think you can always help one another. But I think the word coaching might be a little, peer coaching, a little too strong in that sense (focus group 2).

In this example, Eric expressed his desire to learn from an expert. He believed that his knowledge and practice would be better because it came from an expert in the field. Attributing higher value to experts’ knowledge is considered an evaluatist stance (Kuhn, 1991).

Another example comes from Focus Group 3, as Eric reflected on his experience as a learner of inquiry dialogue.

Interviewer  What is the most significant that you've learned from your experience this year? Have we learned anything?

Eric   I think being able to facilitate and not have all the students agree on the same thing. It was hard for me at first because I want them all to get to, what I was thinking of it more as "What's the right answer?" instead of
"What's the most reasonable answer?" So, to be able to let go of the right from wrong and have the disagreement with my students and that being okay. I mean that was something that enlightened me a little bit because we've done novels and we do the comprehension questions and there's the right questions where they get all the right answers. And so I think being able to have those debates, I've seen much more maturity in my students' thinking since September. So, I think I learned a lot about myself, about being able to let go, and have them guide their own learning, and not me having to be the one grilling them with different things (focus group 3).

This reflection occurred at the end of the professional development, in which Eric happened to summarize what he acquired during PD. Thinking about what the most reasonable answer was instead of what the right answer was is one of the highlights of Eric’s learning journey. This relates to his thinking about the four dimensions of knowledge and reflects hints of evaluatist stance. When Eric described his students’ success and maturity in engaging in the debates that feature inquiry dialogue, he probably implied that his students were better at challenging each other, considering alternatives, listening to each other, and using text evidence to justify their knowledge. All these practices implied evaluatist level as they aligned with argumentation practices in inquiry dialogue.

In this section, I described Eric’s epistemic cognition when he learned inquiry dialogue. I tried to depict the development of the different dimensions of knowledge. I found that the dimensions of knowledge did not evolve in a stage-like pattern, which is consistent with my analysis of the coaching sessions and study group meetings.
**Eric’s engagement in epistemic cognition when facilitating inquiry dialogue.**

As reported in Chapter Four, the research team videotaped ten classroom discussions that Eric had with his students. Classroom Discussions 1 and 2 were pre-test discussions based on the texts given by the researchers and videotaped before the professional development phase. Discussions 3 through 8 occurred during the professional development. Discussions 9 and 10 were post-test discussion, again using texts selected by the researchers. Table 7 describes the classroom discussions that Eric had during the professional development phase and post-test discussions. In this table, I include information about the classroom discussion number, title of the story, a short summary, and the big question discussed by Eric and his students.

**Table 7**

*Story Description*

<table>
<thead>
<tr>
<th>Classroom Discussion Number</th>
<th>Title of the Story</th>
<th>Summary</th>
<th>Big Question</th>
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<tbody>
<tr>
<td>Classroom Discussion 3</td>
<td>What Should Kelly Do?</td>
<td>The story is about two classmates, Evelyn and Kelly, who are going to participate in a contest held by the school. They are both talented painters, but Evelyn is more talented than Kelly. In the story, Evelyn gets distracted and leaves her painting outside. Evelyn will miss the deadline for submitting her painting. Plus, it starts to rain, so the painting might be</td>
<td>What should Kelly do?</td>
</tr>
</tbody>
</table>
ruined. Kelly notices that Evelyn’s painting standing outside, and she needs to decide whether she should tell Evelyn about it. The big question for this story was “What Should Kelly Do?”

<table>
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<tr>
<th>Classroom Discussion 4</th>
<th>Deadly Hits</th>
<th>Who is responsible for the safety of the players?</th>
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<tbody>
<tr>
<td></td>
<td>The story is about a football player who got injured on the field. Zack tackled a runner and as both players fell on the ground, Zack’s head smacked against the turf. Zack laid on his back for few minutes, then stood up and left the field. After spending 15 min on the bench with his teammates, he decided to join the game again. The coach did not prevent him from going back but at the end of the game, Zack suffered brain concussion and this has stopped his career and impacted his life.</td>
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<tr>
<th>Classroom Discussion 5</th>
<th>Victor</th>
<th>Who is Victor? and Is Victor real?</th>
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<tbody>
<tr>
<td></td>
<td>In the story, Cody, a twelve-year-old boy in a comatose state, talked about a man</td>
<td></td>
</tr>
</tbody>
</table>

Victor who accompanied him through his toughest and saddest moments in the hospitals. The story was not clear about whether Cody was hallucinating about the existence of Victor, or whether Victor was a real man.

Classroom Discussion 6
Self-Driving Cars
The text set describes the experience of having self-driving cars in three different states. It showed how people benefitted from them. It also addressed some of the drawbacks of having them on the roads.

Classroom Discussion 7
The Stolen Party
There are four main characters in the story: Senora Inez and her daughter Luciana, as well as the maid and her daughter Rosaura. Rosaura thought that she was Luciana’s friend and was invited to her birthday party. During the party, Senora Inez asked Rosaura for her help

Should self-driving cars be allowed on the roads?

Are Luciana and Rosaura friends?
in the kitchen and with the other kids at the party. At the end of the party, Senora Inez gave Rosaura money instead of a gift given to other children. Rosaura was treated differently than other kids.

Classroom Discussion 8

Mars 1 Mission

The text set consists of 3 texts, and it is about starting a new colony on Mars. People get intensive training for 8 years on how to survive on Mars. After the intensive training, they are sent to Mars to live there. One of the conditions of starting this colony is that it is a one-way trip, meaning once you agree to go and once you are chosen, there is no option for you to come back to earth.

Classroom Discussion 9

Fashion Police

The text set consists of 2 articles and it describes the pros and cons of having a dress code in school.

Is going to Mars worth taking the risk?

Should we have a dress code at school?
The story is about Roger, a boy who wanted to steal a woman’s purse. Instead of calling the police, the lady, called Ms. Luella Bates Washington Johnson, took him home, washed his face, made him dinner, and gave him ten dollars to buy the shoes he wanted.

Is Ms. Luella Bates Washington Johnson a good person?

In this section, I analyzed Eric’s interventions chronologically. The first dimension that I describe here is the justification of knowledge. In Classroom Discussion 3, Eric stated the main points that his students needed to focus on. His introduction reflected his evaluation of the justification of knowledge.

Eric

So quickly before we start our discussion let’s remind ourselves with the guidelines that we made the last time. We should be listening to the speaker. Whenever someone is talking you should be listening. One person speaks at a time. Do not raise your hand and listen and wait to respond. It is ok to disagree and ask why. Last time a lot of us were disagreeing and asking why and that was really good so keep that up this time. Speak in a clear voice so that everyone can hear you. Give reasons to explain our thinking. So make sure when you are saying something you explain it and you give your reason. Use silent moment to think and be aware of others in the group. So the question we’re going to be discussing
today is: What should Kelly do? (classroom discussion 3)

In this statement, Eric stressed the importance of challenging each other’s positions and asking questions. This conveyed his ideas that knowledge was constructed through testing, challenging, generating counterarguments, and articulating reasons. All these are practices described in the ART to promote students’ argumentation skills (Bråten et al., 2017; Reznitskaya & Wilkinson, 2017). Therefore, I argue that in his introduction to the discussion, Eric showed some characteristics of evaluatist level and his guidelines were aligned with the practices of well-reasoned argumentation.

During Classroom Discussion 3, as the students were generating positions, Eric intervened to clarify their claims and make sure that everyone in the class was following along. Toward the middle of the discussion, Eric paused to ‘track the line of inquiry’ which is a practice from the ART used to keep the students focused on the big question, remind them of the different positions, and help them eliminate the weakest ones to try to move towards the most reasonable answer (Reznitskaya & Wilkinson, 2017; Wilkinson et al., 2017).

Eric [pause 1] Ok so let’s take a time out for a second. Some things that I’ve heard going around people who think that Kelly should not tell Evelyn because she needs to be more responsible. That’s one thing. We have people who think she should tell Evelyn but not right away. She needs to wait a little bit to kind of prove a little bit of a point that you need to be more responsible but I still care about your painting. Then we have people who think she should tell Evelyn because she is only worried about how nice her painting is.

So those are the three main things I have heard. Who is thinking
something a little bit different? (classroom discussion 3).

In the previous excerpt, Eric did not seem to help the students to evaluate their positions. Rather, he invited them to simply generate more ideas. This made me argue that Eric was perceiving inquiry dialogue to be a space in which students share their arguments without scrutinizing them. As I have already explained in Chapter One, sharing positions without analyzing them might be accepted in some contexts such as: discussing personal or aesthetic reactions to the story or participating in warm up activities and icebreakers; yet, in the context of inquiry dialogue, developing positions represented just the initial step of the process. In inquiry dialogue, even though reaching certainty of knowledge might not be possible, students as a group should work together to get closer to reaching the truth. They are supposed to test positions, with the assumption that only the strongest ones survive the evaluation and elimination processes, which reflects an evaluatist epistemology. Instead, Eric’s interpretation of ‘tracking the line of inquiry’ practice in Discussion 3 seems to be more aligned with multiplist level of epistemic cognition.

A similar interpretation could apply to Eric’s second use of “tracking the line of inquiry” practice in Classroom Discussion 3:

Eric [ pause 2] So let’s pause for another second. Now we are still saying, we still have people who say “don’t tell her because it is not fair.” She is not following the rules and she would not be eligible anyway because part of the contest was following the rules. Then we still have people who say, “yes you should tell her,” but now we have reasons of “she is still winning because she doing the right thing and she might still win the best painting” (classroom discussion 3).
Here, I argue that Eric’s interpretation of “tracking the line of inquiry” practice reflected multiplist features because he simply summarized the positions without prompting students to engage in further analysis or examination.

Throughout the data sources, I noticed that Eric developed a pattern on how to track the line of inquiry: he simply summarized the different positions and reasons. For instance, what comes next is an example of how Eric paused in Classroom Discussion 4 to recapitulate all of his students’ positions and reasons about who was responsible for the safety of the players in a football game.

Eric    Ok let’s time out for a second and let’s review the things that we have talked about so far. So, we have some people who were saying that it’s the coach and the trainer sharing the responsibility. That it should be both of them to evaluate whether the player is safe to go back in the game. We have some other people who are thinking that it is the player’s fault because they know themselves and they know when they are not feeling well. Then we have some people who mentioned that it is the parents’ fault. Someone was saying that they might push too much, they might encourage their child too much to play through pain, and I gave the example of my mom earlier. And we have a bunch of people now who are thinking that it is everybody’s fault. Someone actually mentioned that the athlete should tell the coach, and the coach should talk to the trainer, and it is all of them who needed to communicate and figure out what is the safest thing to do. And there is someone just said it’s everybody’s fault because out of everybody there someone should be able to see that they are not ok,
whether it is the athletes themselves, the trainer, the coach or the parents
(classroom discussion 4)

The main purpose of having the “tracking of the line of inquiry” practice is to help the
students see the array of positions and reasons and work on eliminating less reasonable answers
(Reznitskaya & Wilkinson, 2017). In the previous example, Eric summarized the positions and
the reasons but did not prompt students to move to the evaluation phase that underlies the
evaluatist stance. Consequently, I argue that his thinking suggested that he was still at the
multiplist level.

All of the previous examples also suggested that when Eric’s thinking reflected multiplist
epistemology, his facilitation of inquiry dialogue does not align with the practices of rigorous
argumentation. In fact, Eric’s multiplist epistemology seemed to inhibit him from helping the
students move forward and eliminate the weakest positions.

The next example taken from Classroom Discussion 4 again suggests that Eric’s use of
the “tracking of the line of inquiry” reflects a multiplist level of epistemic cognition. Therefore,
his facilitation of inquiry dialogue did not align well with the practices of rigorous
argumentation, described in the ART. Despite the fact that Eric’s implementation of “tracking
the line of inquiry practice” suggested multiplist epistemology, Eric’s choice of the post
discussion activity, on the other hand reflected evaluatist level of epistemology.

Eric  Again, we have different people thinking different things. Some people think it is
the coach for many different reasons but a lot of people think that when they think
it is the coach. The coach shared this responsibility with the trainer and there are
some people who think that the coach shares the responsibility with the athlete.
Then we have some people who thought it was the parents. Some people thought
it was just the player. And some people who thought that it was everybody’s who is there, everyone should be involved to make sure they are safe. What I want you to do when I send your team back to your desks, what you are going to do is you’re going to identify the strongest or the best argument from our discussion that was not your own (classroom discussion 4).

Here again, Eric did not try to help his students assess the quality of positions during the discussion. He seemed to listen to all positions and accept them without encouraging his students to decide which ones should be kept and which ones should be questioned or discarded. Yet, his choice of the post discussion activity, which requires the students to test different positions, challenge them, and support them with reasons and evidence, suggests that he might be moving toward evaluatist level (e.g., identify the strongest or the best argument from our discussion that was not your own). The choice of post discussion activity is aligned with the practices of argumentation (Reznitskaya & Wilkinson, 2017). Alternatively, Eric may be simply using the writing task suggested by researchers. This seemed to align with what I reported earlier about the changes in beliefs and practice. This is to say that it is unclear from the data to conclude that Eric’s beliefs about the dimensions of knowledge have led to change in his practice.

Eric’s thinking about reaching the best possible answer with his students seemed inconsistent throughout the data sources, meaning that sometimes he had high degree of uncertainty about knowledge, reflecting a multiplist level, and at other times, he professed lesser degree of uncertainty of knowledge and seemed to be at the evaluatist level. For example, both the introduction and the conclusion of Classroom Discussion 5 indicate that Eric featured beliefs that shifted between multiplist and evaluatist epistemologies.
Eric: We’re also going to work on making sure that we are raising our hands and just not having conversations with our friend back and forth, back and forth. So those are the things we need to work on because that will help our discussion be a lot more successful and productive in terms of coming up with the best possible answer. And remember when [the coach] was here last time, we were talking like there were no really right or wrong.

We just want to come up with the best possible answer, and I said that it is ok if you change your mind, it is ok if you think what someone else has said is better than what you said. Compliment them and help other people see what they were talking about. So, our big question today is going to be: Who is Victor and is Victor real? (classroom discussion 5)

In this introduction, the way Eric explained the coexistence of multiples answers was different from his previous statements in the study group meetings and the coaching sessions. As a quick reminder, when learning how to facilitate inquiry dialogue, Eric talked about his stance regarding the equality of beliefs and positions. He seemed to embrace the idea that knowledge depended on feelings and culture; therefore, there is no such a thing as a better position. For example, in Coaching Session 2, Eric explained to the coach how he was trying to change his students winning mindset: “It’s not about winning. We just have different opinions as to what the right answer could be.” Eric did not seem to evaluate the different positions.

However in this excerpt, Eric made it explicit to his students that even though there were no right or wrong answers, the purpose of inquiry dialogue was to reach the best possible conclusions. Eric’s introduction might suggest that he believed that knowledge was uncertain because it was evolving and complex. For example, when he acknowledged that “there were no really right or
wrong answers, we just need to come up to the best possible answer as a group,” he did not seem to mean that positions were equally valid. On the contrary, he seemed to say that even though it was difficult to reach the truth, as a group we still could have better answers and stronger positions.

He also encouraged his students to think about other people’s perspectives and adhere to them if they believed that they had better arguments. Eric’s statement that “it is ok if you change your mind, it is ok if you think what someone else has said is better than what you said,” implied his thinking about knowledge as evolving and constructed through inquiry rules. In this statement, his thinking about the justification of knowledge is parallel to inquiry dialogue practices (Bråten et al., 2017; Reznitskaya & Wilkinson, 2017) and is more likely to lead to well-reasoned argumentation.

Let’s now consider Eric’s concluding remarks in Classroom Discussion 5 below:

Eric We are going to stop here. And I want you guys to think of this: I want you to choose someone else’s argument, someone else’s thoughts and ideas about whether Victor was real. Who you thought had the best evidence and the best argument that is not your own? Think about what you heard today. Some of the things we’ve heard related to “Victor is real” are: he might be God, he is the old man walking around the hallways at night, he got the empty box, Cody heard somebody talking to him. And some of the reasons for Victor was not real are: he [Cody] was imagining him [Victor] from the land above, Cody might have been in coma, it could have been a ghost and other things also. You need to think which was the best argument that somebody gave (classroom discussion 5).
Similar to the previous example, Eric’s choice of the post discussion activity (e.g., *You need to think which was the best argument that somebody gave*) could probably reflect evaluatist beliefs about the justification of knowledge. In this example, he appeared to believe that a well-justified reasoning could lead to better conclusions. This is similar to Chinn et al. (2011) suggestion, in which they claimed that the degree of certainty of knowledge depended on the quality of the justification of knowledge. Here, I argue that if Eric was not simply following the researchers’ recommendations on the writing tasks, his choice of the post discussion activities might reflect his evolving ideas about *the justification of knowledge*. In fact, asking students to choose the best argument that was not their own required them to recall counterarguments and weigh the reasons for each position. These practices are similar to the justification by inquiry and reflect evaluatist stage of epistemic cognition (Kuhn, 1991; Reznitskaya & Wilkinson, 2017).

Another example illustrating Eric’s epistemology is extracted from Classroom Discussion 8 about Mars colonization.

Eric Let’s pause for a second because I want to recap. The big question is: Is it worth the risk? And the people who were saying no were saying: “No it is not because we should wait longer for the cost to be down and technology to be able to bring people back if they don’t like it. We can’t trust the company that allows this Mars 1.” And yesterday we talked about the many different numbers they were throwing out and dates that were not consistent. It is not worth the risk because 2024 is too soon. It could be hard on your family. We don’t know enough about Mars. The quality of life won’t be the same. We don’t know the type of communication they are going to have with people running the program. It is not worth the risk.
because of the bad storms and we don’t know necessarily everything about their environment. And it is a one-way ticket. People who think it is worth the risk: we have some people saying, “We went to the moon and that was unknown, and since then technology has advanced, so why not taking the lead?” People signed up and should know what the risk is, so it should be worth it. Someone also said it is worth to send the first 4 people and learn from there, and what we can change to make it better the next time. It is worth the risk because people will be trained for 8 years. Earth won’t last forever. These people may have dreamt of going there, so why crashing their hopes and dreams if they want to go there? Certain scientists believe that once there was life on Mars, so it is worth the risk to see if that is true and if you are going to die on earth, why not to go to Mars if it is your dream to go there? (classroom discussion 8).

In this discussion, Eric simply recapitulated the different positions without moving to the next step, assessment. Summarizing the content of the discussion is a legitimate practice in inquiry dialogue to clarify meaning. However, the teachers are encouraged not only to summarize the content, but also to guide the students to push the discussion forward. This could be done by helping them consider the strength and the weakness of each argument. For example, in Coaching Session 5, the coach complimented Eric’s interventions when he clarified the meaning for his students’ statements, but he also asked him to help his students reach the most reasonable answer. Clarifying meaning was not sufficient for students to engage in strong argumentation practices. Here is an example of the coach’s suggestion for Eric regarding Discussion 8.
Coach  I like the interventions that you're making, but a lot of your paraphrase here is about the content of what they say. I think adding a few times where you say what they're doing… You can say something like: “So, what are we going to do? We decided that secrets are acceptable, or are they not?” And if they say no, wipe them off the table. I think just a little bit more of that (coaching session 5).

Here, the coach is acknowledging Eric’s successful practice of paraphrasing his students’ answers and explaining that simply summarizing these answers might not be enough to reach the most reasonable answer. He suggested that Eric should engage in the evaluation of his students’ answers after paraphrasing them. Eric’s recurrent lack of the evaluation of positions suggested that he was still showing some characteristics of multiplist level.

Eric’s interventions during class discussions suggest two main ideas. First, he might have started to perceive that there were better conclusions and that some people might have better reasons and evidence to support their positions than others; yet, he did not know how to engage students in the assessment of the different positions. In this case it could be argued that his beliefs about the dimensions of knowledge started to change but the change was not yet reflected in his practice.

The alternative explanation is that since the post-discussion activities were proposed by the research team in one of the study group meetings, Eric might just be replicating what the research team had encouraged teachers to do. In other words, his choice of post-discussion activity might not be the result of his evaluation of the dimensions of knowledge; rather it was a simple application of what he learned in one of the study groups. Therefore, it is impossible for me to conclude whether his thinking reflected an evaluatist level.
From Classroom Discussion 10, I chose the following excerpt that illustrates Eric’s thinking about the practice of working towards more reasonable answers. Below, Eric explained to his students how they would try to reach the most reasonable answer as a group.

Eric

In the past two days, we read the story “Thank you M’am”. Today, we are going to talk about the big question to kind of come to an answer. **Today, I really want to focus on, all of us trying to reach a group answer at the end.**

A lot of times, we have our discussions and we tend to stay on one side. **This time I want us to focus on seeing the opposite side to really come to the group answer, as what is the most reasonable answer for the big question** (classroom discussion 10).

Eric’s response mirrored his consideration of the justification of knowledge. He seemed to underline the necessity to reach a group answer (e.g., *Today, I really want to focus on, all of us trying to reach a group answer at the end.*) and to highlight the openness to alternative perspectives (e.g. *This time I want us to focus on seeing the opposite side*) and agreement among the group members on the best conclusion (e.g. *to really come to the group answer as what is the most reasonable answer for the big question.*) This statement probably reflects Eric’s thinking that positions could not carry the same value. It may be an indication that he is in the transitioning phase from multiplist to evaluatist.

The remaining of this section is dedicated to the analysis of Eric’s consideration of the sources of knowledge. Throughout the professional development, Eric’s seemed successful at checking the credibility and accuracy of the sources of information. My analysis of the coaching sessions, study group meetings, and focus group interviews showed that he was moving toward evaluatist level. This seems to be also the case in the classroom discussions. For instance, in the
Classroom Discussion 3, David, one of the students, believed that Kelly should not tell Evelyn about the painting. He supported his position by saying that Kelly should make her family proud and that family is more important than friends.

David: I am saying she should not tell Evelyn, no offense to all my friends, but I’d rather make my family proud first before helping my friends. Family first, friends last.

Eric: That’s the first time this [family] is coming up. So, David can you tell us where you’re getting this information about her family? Just read the sentence so people know where you are getting the information from (classroom discussion 3).

In this exchange, Eric asked David about his sources of knowledge. He seemed to check the accuracy of the information provided. Eric’s intervention offered the impression that he valued textual evidence over anecdotal evidence. When he said: “Just read the sentence so people know where you are getting the information from,” he implied that using textual evidence would add credibility to David’s position. Eric’s thinking about the sources of knowledge in this excerpt is similar to his thinking about them when he was facilitating other discussions: he seemed to have often favored textual and empirical evidence over personal anecdotes, as shown in the next exchange between him and Myriam, one of the students in his class.

Myriam: I think she should tell because by the time the rain is getting heavier may be Evelyn will look at the window and she will see her painting.

Eric: But do we know that the rain is getting heavier? So be careful with what you are assuming (classroom discussion 3).
Here, Myriam was assuming that the rain would get heavier, so Eric intervened to draw her attention that what she was saying was not supported by evidence from the text, which reflects an evaluatist stance.

The next example also illustrates Eric’s evaluation of the sources of knowledge and his preference for textual evidence.

Shannon: I agree with what Nolla said about the quality of the painting. Maybe, she is being modest. So, at times, when I make something good, and someone tells me: “It is really good!” I say: “No, it is not.”.

Eric: How do we know that this is true? What made you think that? You are just connecting from your own personal experience, but it is not in the text (classroom discussion 3).

There is an emphasis on the textual evidence in this statement. Eric did not reject Shannon’s anecdotal evidence, but he questioned its credibility, which is a feature of the evaluatist stage (Kuhn, 1991). Eric seemed to encourage his students to always use textual evidence in addition to their personal experiences. He has shared with the research team that using textual evidence was a sign of intelligence. For instance, in Coaching Session 2 Eric noted: “I tell my students use the text, it is in front of you and it makes you look smart; Coaching Session 2.”

Conversely, his preference of textual evidence could also reflect simplistic interpretation that textual evidence is always better than any other evidence. As explained earlier, integrating different sources of knowledge is encouraged in the context of argumentation as it adds credibility and accuracy (Reznitskaya & Wilkinson, 2017).
In another example from Classroom Discussion 3, a student was assuming that Evelyn and Kelly were strangers, rather than friends.

Griffin  I have two things to say. It says here that in a few minutes the painting in the rain will be ruined. Even if she does not tell the girl, the girl still has enough time to submit her painting. And, Mike, what you said before that the mom might be more proud of her for helping someone, the mom might not know Evelyn because they never know if they are friends or not. When I grow up and I have kids I want my kids to help this random stranger.

Class  But they are not random strangers.

Griffin  But they are not friends.

Class  We don’t know.

Eric  I think you might be assuming a little too much. I think you are jumping a little to conclusion saying they are not friends. Do we know that they are not friends? Is this in the text? We don’t know (classroom discussion 3).

The preceding example suggested that Eric continued to privilege text information, as it is accessible and could be verified by the students. His statement “I think you might be assuming a little too much” is a forceful intervention that directly rejects students’ interpretation of the story and is not aligned with the principles of inquiry dialogue.

Similarly, in Classroom Discussion 4, Nicholas, a student in the class and a football player, explained that coaches could tell whether a player had concussion or not by using a flashlight. Eric intervened in the discussion and asked Nicholas if coaches carried flashlights in the field. He also requested him to use the text for evidence to support his claim.

Nicholas  It is not a visible concussion, actually. The football teacher was
explaining the symptoms. But if you have a flashlight and if you shine it on someone’s eyes and their pupils shortened, then they don’t have a concussion. But if their pupils stayed the same, then they have a concussion.

Eric Does your football coach carry a flashlight?

Nicholas Most of them have iPhones.

Eric Since you are bringing up the symptoms, let’s turn to that last page where it says “The symptoms of a concussion.” So, look at this and read it.

We’re going to take a time out for a second. So, Nicholas you said that you could not tell when you have a concussion. Other people can look at you and know based on the symptoms that they show us what can people see? [Nicholas is reading from the text]. Ok good, I just want to make sure that it is clear for everyone (classroom discussion 4).

In this exchange, Eric once again demonstrated characteristics of evaluatist level by integrating different sources of knowledge. He asked Nicholas to back up his personal experience by evidence from the text (i.e., Nicholas’ personal experience and previous knowledge and textual evidence.) The sources seemed to complement each other and added completeness and credibility to the position. Yet, I argue that he was still only moving toward evaluatist level because he still did not question the acceptability of the evidence in the text.

Eric appeared to become aware that integrating different sources of knowledge and evaluating these sources are necessary steps in inquiry dialogue. This is exemplified in the next excerpt from Classroom Discussion 7.

Eric So what do we know from the text about Rosaura and Luciana? Were they
friends? Because I know some of you, in this class, might have friends that your parents did not really like them. What do we think about that?

(classroom discussion 7).

In this story, the students were trying to figure out whether the two girls, Luciana and Rosaura, were friends. Here, Eric intervened to help them answer the question. He first directed their attention to what was in the text (e.g. What do we need from the text about Rosaura and Luciana?"), then he asked them to use their personal experiences to help them connect with the story (e.g. in this class, you might have friends that your parents did not really like them. What do we think about that?). The integration of different sources of knowledge was highly encouraged by researchers during argumentation (Chinn et al., 2011; Reznitskaya & Gregory, 2013; Reznitskaya & Wilkinson, 2017) for two main reasons. First, it adds validity and credibility to a given position. Second, each source has its own limitations and having different sources helps to overcome these limitations (Reznitskaya & Wilkinson, 2017).

I noticed that Eric’s beliefs about the sources of knowledge followed a developmental path. The examples discussed above have shown that he was either at the evaluatist level or at the transitioning phase moving from multiplist to evaluatist stance.

The next example about Eric’s beliefs about the sources of knowledge is taken from Classroom Discussion 6.

Eric Ok, let’s stop assuming that whenever you are drunk you get in a car accident. We have much more information than just that. I think, like I said, we are getting way too much into choices and ethics on what people should and should not do with their personal choices. The question is: Should self-driving cars be allowed on the roads? Most of you have three
plus pages of pros and cons that you got from these articles and only one of them was about drinking, so look and let’s get off that (classroom discussion 6).

Here, Eric made a distinction between information from the text and ethical choices when he said: “we are getting way too much into choices and ethics on what people should and should not do with their personal choices.” He asked the students to use the notes they took from the text to support their positions (e.g. Most of you have three plus pages of pros and cons that you got from these articles and only one of them was about drinking, so look and let’s get off that.) In this excerpt, Eric wanted his students to stick to the information in the text and discuss only what can be supported by evidence from the text. This implied that he still might not be able to understand the benefits of using personal experiences and to detect the limitations of strictly relying on texts. This is another indication that he still did not reach the evaluatist level.

Similarly, in Classroom Discussion 8, Eric used the text to challenge the information provided by a student.

Jeff We know nothing about Mars, basically, except that it is red.

Eric Are you basing your answer on what you know? From the text we know more than that (classroom discussion 8).

This claim again highlights Eric’s value of textual evidence. Still, I argue that he is only evolving toward the evaluatist level because he did not seem to evaluate the information presented in the stories.

I conclude this section about the sources of knowledge with one last example from Classroom Discussion 9.

Eric We read two different articles. One was titled, “Fashion Police,” and the
other was the five essential pros and cons for dress codes. So today we are going to have a discussion about: “Should students have the right to wear what they want in schools?” and I want to focus on two things today. I want to focus on making sure we are supporting our ideas with evidence from the articles. And I also want to make sure that we are sharing the responsibilities, we are going to get people involved that have been somewhat quiet throughout all of our discussions (classroom discussion 9).

In this excerpt, Eric reiterated that textual evidence was the most important source of knowledge, however, he did not evaluate the acceptability of the information in the texts. For this reason, I argue that he was still transitioning from multiplist to evaluatist stage.

In this section, I reported on Eric’s epistemic cognition development related to three dimensions of knowledge, namely: the justification, the certainty, and the sources of knowledge. My findings in this section were consistent with the results I reported in the two previous sections. I noticed that Eric presented inconsistency in the development of the dimensions of knowledge. The findings also suggest that Eric’s beliefs about the “certainty of knowledge” influenced his evaluation and consideration of the justification, sources, and structure of knowledge. A detailed interpretation of Eric’s development of the dimensions of knowledge is provided in the Discussion Chapter.

**The Role of Tasks and Context in Epistemic Cognition**

My analysis of the data led to another important theme, which is the role of the context and tasks when engaging in epistemic cognition. In the first part of the section, I analyze how the tasks of learning and facilitating inquiry dialogue have influenced the constructs of epistemic
cognition namely epistemic aims, reliable processes, teacher self-system, and epistemically informed praxis. In the second part of this section, I analyze the role of the context in the process of epistemic cognition.

**The Role of Tasks**

The analysis of the data showed that the constructs of epistemic cognition were influenced by the tasks of learning and facilitation of inquiry dialogue. In other words, the constructs of epistemic cognition when Eric learned inquiry dialogue were different from the constructs that emerged when he facilitated inquiry dialogue. In the following section, I describe the constructs of epistemic cognition (i.e., epistemic aims, reliable processes, teacher’s self-system, and epistemically informed praxis) when Eric learned and facilitated inquiry dialogue.

**The constructs of epistemic cognition when learning inquiry dialogue.**

**Epistemic aims.** Drawing on Chinn and colleagues’ (2011; 2014), Buehl and Fives (2016) defined epistemic aims as the knowledge related goals toward which all activities are directed. They also argued that teachers may have epistemic aims for themselves and for their students. In the context of PD and research study in the use of inquiry dialogue, the goals for the teachers were set by researchers. They included learning about the criteria of inquiry dialogue, the set of facilitation practices that are connected to each criterion, and the effective talk moves that go with each practice. These epistemic aims were listed in the ART, which was fully described in Chapter 3.

Despite the fact that the aims were first developed by the researchers, Eric’s interest in achieving them was tangible in my data set. During the different phases of the professional development, he never missed any meeting, constantly asked questions, sought clarifications,
worked with his colleagues to find engaging texts for his students, and discussed new strategies. To achieve these aims, Eric used reliable processes, which are the focus of the next section.

**Reliable processes.** Building on Chinn and colleagues’ (2011; 2014) work, Buehl and Fives (2016) defined reliable processes as strategies that individuals use to achieve epistemic aims. In the context of inquiry dialogue, the facilitation practices and related talk moves described in the ART are used as reliable processes by the teacher to reach the epistemic aims. As I described in Chapter 3, the use of well-reasoned arguments is the reliable process to help the teachers learn how to facilitate inquiry dialogue (Bråten et al., 2017).

Since inquiry dialogue was a new pedagogical approach for Eric, he mostly implemented the tools that the research team introduced during the professional development. The next example, which was taken from the Coaching Session 1, describes Eric’s use and appreciation of the ART to effectively learn about inquiry dialogue.

Eric But they're enjoying it, they love it [“it” refers to inquiry dialogue].
Coach I was pretty impressed that they went for that long. It's good.
Eric Of course. They know how to do this.
Coach Absolutely! Cool. Any questions?
Eric No, I don’t think so. I have all my stuff in here, so as long as I have this [Eric was talking about the binder that contains ART and ART for kids]
Coach The magic binder. Cool! (coaching session 1).

In his response, Eric clearly stated that ART and ART for Kids, which I described in Chapter 3, were the main tools that he used to learn about the moves, the criteria, and the practices of argumentation. In the first Focus Group Interview, he further described how he adapted the ART to meet his needs as a learner and a facilitator of inquiry dialogue.
Eric  The one thing that I thought was helpful: the printout that you gave us with all the prompting questions that we should ask. I made a smaller copy on a piece of paper, and then put a note section on it. I sat with that, with a clipboard, and I took notes on it, and I had it there with me for when they asked a certain question. It really helped. I found that having it smaller and then with a note section as I was writing down what they were saying, I thought of questions to ask them. So, like the top half was the exact same chart.

Researcher  This one? [holds up the same a one-page summary version of ART]

Eric  YeS. I made that one really small and then I had a blank section for me to draw the houses [Drawing houses is a metaphor used by the research team to “convey the idea that building an argument is like building a house: the position is the roof of the house and the reasons serve as supporting brick (Reznitskaya & Wilkinson, 2017)] and make notes and what not. And so, as I was writing down what they were saying, I was looking for things to prompt them further. And I think it helps seeing it right there, whereas the first few times I was winging it (focus group 1).

The epistemic aims that Eric had for himself as well as the reliable processes he used to achieve his aims were defined and developed by the research team. In my data sources, I was not able to detect any aims or reliable processes other than the ones proposed to him. It is unclear from the data whether Eric adopted the reliable processes because they were given to him by the research team or whether he believed that these reliable processes could eventually lead to rigorous argumentation practices and better knowledge. Thus, I could not conclude whether the
use of the Argumentation Rating Tool is a sign of epistemic cognition development. His use of the reliable processes helped me see some changes in his practice, however, this is not the focus of my study. The next construct I describe is the epistemically informed praxis.

**Epistemically informed praxis.** Epistemically informed praxis is the end product of the engagement in epistemic cognition. Eric seemed to rely on the coach’s suggestions on what to do with the students. Unfortunately, I did not find any instance, in which Eric talked about his decisions after he engaged in epistemic cognition.

**The constructs of epistemic cognition when facilitating inquiry dialogue.**

**Eric’s epistemic aims for his students.** Eric’s main goal for his students was to develop their argumentation skills by acquiring the practices described in the ART. The ART presents a detailed description of normative argumentation processes aligned with the goals of inquiry dialogue. Here are some examples of Eric’s epistemic aims for his students that I extracted from his classroom discussions.

In every classroom discussion, Eric stated his aim for the students. The first example is taken from Classroom Discussion 4 and the epistemic aim is *challenging each other*.

Eric Also one thing I want to focus on is make sure *you are challenging one another. Don’t just state what you’re feeling, challenge, ask questions.* If you don’t agree with something someone said or if you are not sure ask them something. If I hear Noah say something and I am questioning it instead of me saying what I feel look at Noah and say Noah I have a question for you or *I am going to challenge you on something you just said* (classroom discussion 4).

The next example is about *articulating reasons* as the main aim of the discussion.
Eric So today I want to focus on a different couple of things for our discussion. The one thing that I really want us to try to focus on today is *articulating reasons*. Giving reasons for saying what you are saying. Don’t just say your opinion state reasons why you believe that. We have a lot of pros and cons that we talked about yesterday with this idea so I want you guys to focus on that (classroom discussion 8).

In this introduction of the Discussion 8, Eric explicitly stated the focus of the discussion and explained to his students that he expected them to “give reasons and explain why these reasons were chosen”, which is a practice of argumentation detailed in the ART.

The last example is about *evaluating facts and sharing responsibilities* and is extracted from Classroom discussion 9.

Eric We read two different articles. One was titled fashion police and the other was the five essential pros and cons for dress codes. So today we are going to have a discussion about: Should students have the right to wear what they want in schools? and I want to focus on two things today. *I want to focus on making sure we are supporting our ideas with evidence from the articles.* And I also want to make sure that we are *sharing the responsibilities*, we are going to get people involved that have been somewhat quiet throughout all of our discussions (classroom discussion 9).

The practice of sharing responsibilities in the context of inquiry dialogue is believed to enhance argumentation practices (Reznitskaya & Gregory, 2013; Reznitskaya & Wilkinson, 2017). According to Reznitskaya and Wilkinson (2017), when students share responsibilities
with the teacher they become responsible for their classroom management, they engage in the construction of knowledge through testing and challenging positions, generating arguments and counterarguments, and may reach the best answer together.

Throughout the professional development, I did not encounter instances, in which Eric had epistemic aims different from the ones set by the researchers. Therefore, I could not confirm whether his choice of epistemic aims reflected his level of epistemic cognition or it was a mere application of the researchers’ suggestions.

*Reliable processes.* Having analyzed the construct of epistemic aims, I move now to discuss the component of “the reliable processes” that Eric used achieve his epistemic aims and evaluate knowledge.

Chinn et al. (2014) defined the reliable processes as: “the processes by which knowledge and other epistemic products are reliably produced” (p.426). As I explained earlier in Chapter 3, the reliable processes in the context of inquiry dialogue were presented by researchers as discourse practices and illustrated with related talk moves in the ART (see Chapter 3 for details). The practices reflected an evaluatist stance to ensure that teachers and students engaged in well-reasoned argumentation. From my analysis of the classroom discussions, it seemed that Eric internalized the discourse practices and related talk moves described in the ART and applied them when he was facilitating inquiry dialogue. I noticed that during most of his interventions, Eric used similar language and followed the same patterns of the talk moves described in the ART; however, it is not clear whether Eric was simply imitating the moves suggested by researchers or whether he was thinking about his reliable processes in relation to his epistemic aims.
In the following Table 8, I report some of Eric’s interventions during classroom discussions and the talk moves described in the ART to show how Eric’s moves were parallel to and aligned with the talk moves illustrated in the ART.

Table 8

*The Alignment of Eric’s Talk Moves with the ART Talk Moves.*

<table>
<thead>
<tr>
<th>Practice in the ART</th>
<th>Examples of Eric’s Talk Moves</th>
<th>Examples of Talk Moves from the ART</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centering on Contestable Questions</td>
<td>1. So the question we’re going to be discussing today is: What should Kelly do?</td>
<td>• Today our big question is …</td>
</tr>
<tr>
<td></td>
<td>2. So the big question is: who’s responsible for the safety of the players?</td>
<td>• What are some big questions we can ask about the story?</td>
</tr>
<tr>
<td></td>
<td>3. So our big question today is going to be: Who is Victor and is Victor real?</td>
<td></td>
</tr>
<tr>
<td>Sharing Responsibilities</td>
<td>1. Who wants to share next?</td>
<td>• You can nominate the next person, Emily.</td>
</tr>
<tr>
<td></td>
<td>2. Can you nominate the next person?</td>
<td>• How should we address the problem with interrupting each other?</td>
</tr>
<tr>
<td>Discussing Alternatives</td>
<td>1. Does anyone agree or disagree with William on what he said?</td>
<td>• Which part are you disagreeing with?</td>
</tr>
</tbody>
</table>
2. Most of you have three plus pages of pros and cons that you got from these articles and only one of them was about drinking, so look and let’s get off that?"

- Is this the only explanation?
- We have a number of examples already can anyone offer a counterexample?

Clarifying Meaning

1. What I hear you saying is she should not tell Evelyn to teach her a lesson, right?

- I hear you saying… Is that what you mean?
- So are you saying that…?

2. You are going against what Nicholas said about the parents, and you are saying it should be the athlete that is responsible for his own safety. Is that right?

- Joe, is that what you mean?

Connecting Ideas

1. What are you disagreeing with about Charlotte’s statement? What did Charlotte say that you are disagreeing with?

- I don’t see how your example supports Ana’s position. Can you explain more?
- How does this relate to what William said?
- Which part are you agreeing with?

2. So how does this relate to the question “Is it worth the risk?”

3. How does this relate to “Was Ms. Jones a good person?”
### Labeling Reasoning

**Processes and Parts of an Argument**

1. So, you are challenging David’s idea that family is first?
2. You both think she should not tell her, but you are disagreeing on your reasons why.

- Is this the reason for or against?
- Rumi is now challenging your reasons.
- So, should I put this example next to Tyson’s reasons?

### Tracking the Line of Inquiry

1. Ok, let’s time out for a second and let’s review the things that we have talked about so far.
2. Let’s pause for a second because I want recap, so let’s recap.

- Where are we now? Let’s retrace what has been said so far?
- How many different positions on our big questions have emerged so far?

### Evaluating Facts

1. That’s the first time this is coming up. So, David, can you tell us where you’re getting this information about her family?
2. But do we know that the rain is getting heavier? So, be careful with what you are assuming.

- How do we know this?
- Is this true? Do we know this for a fact?
- Where is this information coming from? Is this a good source?
3. Since you are bringing up the symptoms, let’s turn to that last page where it says, “the symptoms of a concussion.” So, look at this and read it. We’re going take a time out for a second.

 Evaluating Values

1. So should these dress codes be applied to everybody? Should we always have a dress code?

   • Do we always have to follow this rule?

   • Does this rule always work? Does it work for everyone or only for some?

 Articulating Reasons

1. And what is making you think that?

   • What is your reason for saying that?

   • Can you explain why you disagree?

 Evaluating Inferences

1. I think you might be assuming a little too much. I think you are jumping a little to conclusion. Do we know that they are not friends?

2. So are you saying that anybody you tell a secret to is your friend?

   • What is the link between that and your position?

   • Are you assuming that?

   • Do you think we’re jumping to conclusions here?
All of Eric’s talk moves reflected an evaluatist stance since they were analogous to the talk moves proposed by the research team. However, it is difficult to claim that his beliefs about knowledge have reached the evaluatist stage. It is more likely that he was applying what he learned in the context of facilitation. This might have led to the change in practice before the change in beliefs, which I discuss more in the Discussion Chapter.

**Teachers’ self-system.** Teachers’ self-system, as described by Buehl and Fives (2016) refers to the influences that might affect the epistemic cognition. Buehl and Fives (2016) identified the most relevant influences as: prior knowledge and experiences, vices and virtues, and epistemic ideals. They also acknowledged that teacher’s self-system may include other influences. In my findings, I argue that Eric’s motivation, his beliefs about his students, and his epistemic cognition level may be part of his self-system.

**Motivation.** Students’ motivation seemed to drive Eric’s practice of facilitation of inquiry dialogue. He showed appreciation that his students were motivated and willing to have discussions.

Eric  
I usually dedicate my Friday English language arts block to this [inquiry dialogue]. Then I pull it into a writing piece involving our discussion, so I can make it work that way.

Researcher  
That’s great!

Eric  
And they actually look forward to it, so they think it’s something special to do on Fridays, which makes it easier because they are more excited about it, willing to do it (focus group 2). The same idea emerged in the Study Group 1.

Eric  
My kids feel very excited to be a part of it and to have that type of
discussion where I told them that every Friday we’re going to have one.

But, so now on Fridays we really look forward to doing that, so I have it set in my schedule that that’s what we do on Fridays (study group 1).

Eric seemed to constantly think about his students and what motivates them. This was evidenced in his choice of the stories. In study group 2, when discussing the story of Victor, which was about the 12-year-old- boy who was in the coma, Eric seemed to not like the story because he thought it might be difficult and sad for his students to read and discuss.

Eric I personally thought it was a little bit difficult, it would be difficult for them [the students] too...And I think some of them might be a little bit sad upon reading it… It is kind of like, is the box half empty or half full? It’s either going home with the box full of toys or going somewhere else in a box. That what I was thinking this box was similar to a coffin, that is, like, terrible (study group 2).

In Focus Group 3, the research team was asking the teachers how to improve the program and sought feedback on the genres of the story. Eric thought that it would be nice to have both genres and explained that his students needed to reconnect with fiction stories. He also mentioned that his students enjoyed discussing fiction and non-fiction stories.

In Focus Group 3, Eric also mentioned how it was important for him to motivate his students to participate in the discussion. The importance of student motivation has been discussed by researchers in the field of epistemic cognition (Chen & Barger, 2016; Chinn & Rinehart, 2016). Chen and Barger (2016) have contended that “as the field has expanded from conceptualizing a set of personally held beliefs about knowledge to a broad spectrum of cognitive processes related to knowledge seeking, motivation has implicitly been folded into the
framework of epistemic cognition” (p.249). This quote supports my reported findings that epistemic cognition is influenced by several factors and motivation is one of them.

**Eric’s beliefs about his students.** Eric’s beliefs about his students surfaced as a component of his self-system. Throughout the program, Eric often commented on the age of his students when evaluating the quality of their talk. The following are two examples of Eric’s beliefs about his students.

Researcher: We're a little bit above [the Common Core standards], pushing them a little bit...

Eric: Yeah, so even though, like at sometimes I am thinking, like, they [students] are too young for this [engaging in inquiry dialogue], I think it is something that will stick with them more than just reading a book. It is more like life skills, how to hold a conversation, how to rationally think and argue with somebody (focus group 2).

Eric: One thing that I'm still really struggling with them [students], and it's not just with the argument discussions, it's everything in general, is taking turns talking. They're really not grasping that concept, and it's not terrible. I think it's just them being 10 and 11 and just being so excited and wanting to share (coaching session 2).

In both examples, Eric reflected on the age of his students: he thought they were too young to engage in rigorous argumentation. His beliefs about his students might have affected some of his practices. For instance, from the videotaped discussions, Eric never asked his students to come up with the big questions, track the line of inquiry with the focus on evaluating ideas, or evaluate values. More investigation is needed here, but one probable explanation is that
Eric’s beliefs about his students (i.e. their age, their developmental level, their role in the class) might have influenced his epistemic cognition when learning and facilitating inquiry dialogue.

**Epistemically informed praxis.** The final construct of engaging in epistemic cognition is the epistemically informed praxis. When reflecting on his practices, Eric knew what practices he needed to implement and focus on. Also, in the study group meetings, with the help of the research team, the teachers decided about the new practices that students needed to learn. For example, in Coaching Session 1, after reflecting on his practice, Eric stated his next actions for the coming discussions.

Eric  
I think they're still getting used to the whole terminology and knowing. That's why I try to say challenge, connect. They know what connections are, but more so text to text not in discussions like these. So I will try to get them used to the terminology so they can start using it (coaching session 1).

In this example, Eric seemed to be aware of his students’ challenges and was trying to come up with some actions.

In summary, the analysis of this section revealed that when Eric learned inquiry dialogue he did not explicitly talk about his epistemic aims, reliable processes, self-system, and epistemically informed praxis. On the other hand, when he facilitated inquiry dialogue, he stated the epistemic aims for his students, used the talk moves described in the ART as his reliable processes, reflected on his self-system, and mentioned few examples of his epistemically informed praxis.

**The Role of the Context**
One of the important findings that emerged from my data analysis was the role of the context when Eric facilitated inquiry dialogue. For instance, I noticed that when Eric discussed fiction stories or controversial topics, he seemed to use his beliefs, feelings, and anecdotal evidence to justify his knowledge, whereas when arguing about scientific issues or discussing non-fiction stories, he mostly used research-based evidence to justify his answers.

For example, when Eric was arguing about the accuracy of the news in the pretest RJI, he stated that the news reporters were biased and he relied on his culture, upbringing, and family to form his knowledge. The following excerpt is an illustration of his beliefs about the sources of knowledge when discussing such topics.

Interviewer: And how did you come to hold that point of view [news reporters were biased]?

Eric: I guess this is just how I was brought up. My parents always taught me to not always believe what you see and to believe in what you believe. So, if someone writes something about you or about anything don’t change your viewpoint just because of that. You hold true to who you are and kind of work around it to accept what other people might think (pretest RJI, dilemma 1).

In this response, Eric justified his answer using non-empirical sources of knowledge. His parents and his upbringing seemed to be the mechanisms and the main sources that he used to construct his knowledge about the accuracy of the news reporters.

Few turns later the interviewer asked Eric what evidence he used to make his claim.

Interviewer: And how did you come to hold that point of view?

Eric: I guess, as I have gotten older, I see facial reactions of the people who are
talking about what is going on or covering only the certain sides of the stories and it really makes you see that they're leaning heavily towards one side” (pretest RJI, dilemma 1).

Both excerpts showed that when he talked about the bias of the news reporters, Eric used non-empirical sources of knowledge to justify his answers.

The following example is also taken from Eric’s answers about the news reporting. The interviewer asked him about the reasons that caused people to hold different opinions.

Interviewer How is it possible that people have such different views about the subject [The bias of the news reporters]?

Eric I think culture. I think where you were brought up, the different culture within your house, but also within your community changes your vision on a lot of different things. I've been in many different settings: urban, suburban, rural and just within those different areas you see how people's viewpoints change towards certain topics. So, I think definitely your upbringing and your culture really have huge impact on those viewpoints (pretest RJI, dilemma 1).

Here again, Eric mentioned that his culture, community, parents, and upbringing influenced his formation of knowledge. What is noticeable is that throughout the first dilemma in the pretest RJI, Eric did not mention any research-based sources. I thoroughly discussed this point in the previous section when I analyzed Eric’s development of epistemic cognition.

Conversely, when Eric answered questions about scientific subjects, such as nuclear energy, the building of the pyramids, or food additives, Eric mentioned the role of experts and research in making decisions and justifying knowledge. What comes next is a brief reminder of
Eric’s thinking when arguing about scientific topics. The first example is from Eric’s discussion about the safety of food additives.

Interviewer  What do you think about the statements [whether food additives were harmful or not]?

Eric    I think they both can be true and there's some evidence supporting both. But, I think as of late, doctors and researchers are trying more and more to find a cure for cancer (posttest RJI, dilemma 2).

The next example is about his beliefs on the building of the pyramids.

Interviewer  What do you think about these statements [whether the pyramids were built by aliens or ancient Egyptians]?

Eric    I think there's evidence to support both claims. I think it depends on what type of background knowledge you have on this subject and what you believe in. I think it depends more on your background and what knowledge you have on the mathematical development of humans and the development of tools and what not (posttest RJI, dilemma 1).

These two examples show that Eric leaned toward using empirical evidence when discussing scientific texts. For example, he mentioned mathematical knowledge, content knowledge, and empirical research.

The context not only affected Eric’s use of the sources of knowledge when he answered questions about the dilemmas but also his evaluation of the justification of knowledge during classroom discussions and PD. This was depicted in the way he asked questions about the accuracy and acceptability of information. When Eric facilitated or learned about fiction stories, he asked questions such as: How do you know? Are you assuming this? Is this always true? For
example, in Study Group 1, one of the struggles that teachers shared was the use of inaccurate information by the students when supporting their positions. Eric’s comment below showed how he reacted to this issue with the students:

   Eric   That happened in my class with Kelly. They thought that Kelly and Evelyn were sworn enemies (group laughs). So, I stepped in and said:
          “Wait, where are you getting this information from? We don't know that. Read it, just look” (study group 1).

   In this remark, Eric seemed to realize that his students were forming their positions as personal impressions devoid of any grounding in evidence. He asked prompting questions (e.g. where are you getting this information from?) to address the accuracy and acceptability of the information.

   Another example showing Eric’s questions when he facilitated fiction stories is taken from Classroom Discussion 7 “The Stolen Party”, when the students had to decide whether the characters were friends or not.

   Student I have to disagree with Nicholas, Ashley and Madison that they aren’t friends because I think they are. I do some of these things with my friends. I understand that Rosaura’s mom is Luciana’s mom’s maid but they were there with each other every day after school. It even says on page 1 at the bottom “Every afternoon she used to go to Luciana’s house and they would finish their homework while Rosario’s mom did the cleaning, they had their tea in the kitchen and they tell each other secrets.” That means that they are friends and they trust each other.

   Eric So are you saying that anybody you tell a secret to is your friend?
Are you assuming that? (classroom discussion 7).

Few exchanges later, the students were still struggling with how to define the relationship between the two girls. So, Eric intervened to help them use their anecdotal evidence in addition to the information in the text to come up with an answer.

Eric So what do we know from the text about Rosaura and Luciana? Were they friends? Because I know some of you, in this class, might have friends that your parents did not really like them. What do we think about that? (classroom discussion 7).

In these two examples, there is an emphasis on using personal experience in addition to textual evidence when backing up claims. For instance, Eric encouraged the students to think about how their own parents perceive their friends.

In his discussions of fiction stories and debates about controversial topics, Eric asked questions to incent students to argue about them such as: Are you assuming that? Is this in the text?” Although his main goal is to help the students evaluate values and discuss them, Eric did not seem to effectively perform this practice. On a couple of occasions, the students worded brief answers to respond to the teacher’s questions. What follows is an example of Eric’s questions in Discussion 10 (see Table 7 for details). The class had to interpret the character’s actions and make a judgment whether Ms. Johnson was a good person.

Student I think she is generous. I disagree with the people that said that she is not nice. She has worked hard for the money, why would she give it to him if the was a bad person?

Eric So you are saying good people are nice people. Did he use the word nice? Was she always nice?
In this excerpt, Eric’s intervention appeared ineffective as he probably did not know how to reflect on value statements when discussing fiction stories. His questions did not allow him to successfully engage his students to further develop their ideas and evaluate value statements.

The final extract I include in this section is from Classroom Discussion 3, in which the students discussed the concepts of fairness, responsibility, and friendship (see Table 7 for more details). In this example, the student introduced new information to support his position, so Eric interfered to make sure that the other students were following along.

David   I am saying she should not tell Evelyn because…no offense to all my friends, but I’d rather make my family proud first before helping my friends. Family first, friends last.

Eric   That’s the first time this [family] is coming up. So, David can you tell us [where you’re getting this information] about her family? Just read the sentence so people know where you are getting the information from (classroom discussion 3).

“Where are you getting this information?” was a recurrent question that Eric used to check the acceptability statements. After he found about the sources of information, Eric did not seem to
help his students engage in the evaluation of the sources of knowledge to check the accuracy and
truthfulness of the information.

Throughout his classroom discussions, Eric seemed not to distinguish between facts and value statements which might have affected his interventions. In other words, when arguing about value statements that occurred mostly in the fiction stories and in the pretest reflective judgment interview Eric seemed to consider them as factual statements and ask questions such: “Are you assuming that? Is this always true? How do we know?” Although these questions were mainly used to help students consider their thoughts and ideas, they seemed ineffective in the context of fiction and controversial stories.

My analysis of Eric’s statements when discussing non-fiction stories revealed some hints of shift in his thinking about knowledge. For example, when asked about his position regarding the building of the pyramids, Eric explained that the pyramids were built by ancient Egyptians and he based his position on his knowledge about mathematics and human development. He also talked about how humans developed tools over time and how the process of building the pyramids required trials.

Interviewer What do you think about these statements [ whether the pyramids were built by aliens or ancient Egyptians?

Eric I think there's evidence to support both claims. I think it depends what type of background knowledge you have on this subject and what you believe in. I think it depends more on your background and what knowledge you have on the mathematical development of humans and the development of tools and what not (posttest RJI, dilemma 1).
In this statement, Eric used research-based sources such as mathematical knowledge, human development, and background knowledge on the subject to back up his claims.

Since Eric did not explicitly state who he believed were the builders of the pyramids, the interviewer asked him a follow up question.

**Interviewer**  Do you lean towards one of these being more or less reasonable than the other?

**Eric**  I lean towards the Ancient Egyptians being able to make them. Just for the fact that we've seen the similar tools that they used, or that they've claimed to use, evolve over time and they've had to evolve from somewhere. So, I think it does make sense that they did trial and error to figure out how to make these monuments (posttest RJI, dilemma 1).

Here, Eric used the principles of inquiry such as: challenging, testing, and discussing alternatives when he discussed scientific topics.

Another example illustrating Eric’s use of empirical evidence in the context of scientific topics is taken from his answer about food additive in the posttest interview:

**Interviewer**  And on what do you base that point of view [ Food additives are not harmful]?

**Eric**  Just based on the fact that there hasn't been a drastic change in less cancer diagnosis or more, either way. And, there's so many different types of cancer. How do you pinpoint is it cancer in general? Is it a specific kind of cancer that the food causes you? Is it stomach cancer because that's where it's sitting? So to me it's just, I base it on, **I don't think there's enough factual evidence to actually tell me, "yes if you eat this chicken**
where they insert chemicals in, you will eventually get cancer” (posttest RJI, dilemma 2).

Here again, Eric mentioned facts, and research to support his position.

Not only did Eric use empirical evidence during the reflective judgment interviews, he also did so when he discussed non-fiction texts with his students during classroom discussions. For instance when I reported my findings about the development of Eric’s epistemic cognition, I included examples from discussions about Self-Driving Cars, Colonizing Mars, or Deadly Hit and highlighted how Eric used research-based sources to support positions and give reasons and urged his students to base their knowledge on the information from the text.

Another difference between fiction and non-fiction stories in Eric’s facilitation of inquiry dialogue emerged when he asked questions to prompt his students thinking. For instance, when facilitating the discussion about self-driving cars, which is a non-fiction story (see Table 7 for details), the students kept mentioning drinking as the main reason for not allowing self-driving cars. They were assuming that when people drink alcohol they would necessarily get in a car accident. After listening to several turns about the causal relationship between drinking and accidents, Eric intervened:

Eric: Ok let’s stop assuming that whenever you are drunk you get in a car accident. We have much more information than just that. I think, like I said, we are getting way to into choices and ethics on what people should and should not do with their personal choices. The question is: Should self-driving cars be allowed on the roads? Most of you have three plus pages of pros and cons that you got from these articles and only one of them was about drinking, so look and let’s get off that (classroom discussion 6).
In fiction stories, Eric usually asked questions such as: “Are you assuming that? How do you know that?” to incite his students’ thinking. However, in this discussion, Eric explicitly told his students to stop making up facts (e.g. Ok let’s stop assuming that whenever you are drunk you get in a car accident). This intervention implied that students’ answers should be grounded in evidence from the text and not in their mere assumptions (e.g. Most of you have three plus pages of pros and cons that you got from these articles and only one of them was about drinking, so look and let’s get off that). It seems that with non-fiction stories, Eric asked more precise questions to check the accuracy of anecdotal evidence. This was evident in Classroom Discussion 4 about Zack, when Nicholas, one of the students talked about his own experience with injuries, Eric asked him to go back to the text and check whether the information he was presenting matched the evidence in the text or not.

Nicholas  It is not a visible concussion, actually. The football teacher was explaining the symptoms. But if you have a flashlight and if you shine it on someone’s eyes and their pupils shortened, then they don’t have a concussion. But if their pupils stayed the same, then they have a concussion.

Eric  Does your football coach carry a flashlight?

Nicholas  Most of them have iPhones.

Eric  Since you are bringing up the symptoms, let’s turn to that last page where it says “The symptoms of a concussion.” So, look at this and read it. We’re going to take a time out for a second. So, Nicholas you said that you could not tell when you have a concussion. Other people can look at you and know based on the symptoms that they show us what can people
see? [Nicholas is reading from the text]. Ok good, **I just want to make sure** that it is clear for everyone (classroom discussion)

In this statement, Eric acknowledged Nicholas’ anecdotes but made him realize that anecdotes might not be enough to support a claim. So, he asked him to match information from his personal experience with the information in the text.

The final example is from Discussion 8, when a student claimed that people do not know anything about Mars.

Jeff    We know nothing about Mars, basically, except that it is red.

Eric    Are you basing your answer on what you know? From the text we know more than that (classroom discussion 8).

Eric implied that Jeff’s answer was not well-supported and lacked evidence. He explained to him that he could not build his position on the little information he had and that he needed to dig deeper in the text to find more about the planet.

The context and the tasks appeared to play a role in the process of epistemic cognition. When Eric discussed fiction texts, his justification of knowledge was based on his beliefs, feelings and anecdotal evidence. However, when arguing about scientific texts such as colonizing Mars or banning sugary drinks, Eric justified his knowledge using the principles of inquiry. I also noticed that when discussing fiction stories Eric’s questions were slightly different from non-fiction stories. In fictions stories, he asked questions such as: How do you know? Are you assuming this? Is this always true? But with non-fiction stories, in addition to the previous questions, he also asked questions to focus on the accuracy of the evidence such as: This evidence is from your personal experience, is this enough to claim that? Can you find similar evidence in the text? Can we find more evidence? These findings suggested the context and the
task made Eric evaluate evidence in a new way (i.e. what evidence is good evidence, or what evidence is enough?)

Summary of the findings

In Chapter Five, I reported my findings regarding Eric’s engagement in epistemic cognition when he learned and facilitated inquiry dialogue. The results showed that 1) The development of epistemic cognition was inconsistent, meaning that sometimes his evaluation and consideration of epistemic matters reflected multiplist features and other times, reflected evaluatist epistemology, 2) the beliefs about the certainty of knowledge seemed to influence Eric’s evaluation of the sources and justification of knowledge, 3) and finally, the context and the tasks influence the process of epistemic cognition. In the final chapter, I discuss my findings in relation to what has been reported previously in the field of epistemic cognition. I also offer some implications that might advance the field.

Chapter Six: Discussion, Implication, and Limitations

The purpose of this study was 1) to explore the components of epistemic cognition that emerged when Eric learned and facilitated inquiry dialogue, 2) to investigate how he engaged in epistemic cognition during inquiry dialogue, and 3) to understand the capacity of the new integrated framework as a descriptive and analytic framework to shed light on the cycle of epistemic cognition in the context of inquiry dialogue. This study was guided by the following research question: How do teachers engage in epistemic cognition when they learn and facilitate inquiry dialogue?

To explore this research question, I used qualitative case study methodology to analyze my data. Data sources included King and Kitchener’s (1994) reflective judgment interviews, coaching sessions, study group meetings, focus group interviews, and classroom discussions.
The results suggest that Eric’s epistemic cognition was influenced by the task he was performing. Furthermore, his thinking about the dimensions of knowledge was inconsistent throughout the professional development, suggesting that the beliefs system is complex multidimensional, and domain-specific. This chapter is divided into three parts. In the first part, I discuss the findings of the study and synthesize them in relation to the existing literature. In the second part, I suggest several implications of the study to better understand the constructs of epistemic cognition. Finally, I discuss the limitations of my study.

Discussion

Epistemic inconsistency. Within my data sources, Eric’s beliefs about the dimensions of knowledge were erratic and could be considered indicative of different developmental levels. For example, as reported in the previous chapter, part of Eric’s beliefs about the sources of knowledge and the justification of knowledge were aligned with multiplist level and part of them were aligned with evaluatist level. Yet, neither level clearly characterized Eric’s developmental pattern. Hence, this finding suggests that epistemic beliefs may be viewed as a complex system. It may be the case that consistency of the development of epistemic beliefs varies across domains, a hypothesis that has already been suggested by prior studies such as Maggioni, Alexander, and VanSledright (2004), Kuhn et al. (2000), and Kuhn and Weinstock (2002). For example, in their study, Kuhn and Weinstock (2002) looked at how the objective and subjective dimensions of knowing develop and attain “mature epistemological understanding” across various domains. The study was conducted with seven groups of children, adolescents, and adults varying in age, education, and life experience. Fifteen items were used to assess the epistemological understanding of the different groups. Kuhn and Weinstock (2002) argued that the development of the epistemological understanding depended on the domain. In fact, when
making judgment about social truth or physical truth, the participants showed characteristics that were more consistent with a given level than when they discussed aesthetic or value truth.

Several researchers also addressed the epistemic inconsistency in the developmental literature. For example, when reporting their findings on the reflective judgment interviews, King and Kitchener mentioned that they found some degree of epistemic inconsistency among their participants. They noted that: “variability of stage reasoning (that is evidence of reasoning that is characteristic of more than one stage at a time) was the norm” (p.45). Kitchener (2002) further compared the development to the movement of waves, which spread and change shape across different stages. Hence, they argued that “characterizing individuals as being “in” or “at” a single stage is clearly erroneous and should be avoided” (p.45). My findings support the existence of epistemic inconsistency especially when Eric was at the transitional phase.

**The development of epistemic cognition.** As discussed before, Eric showed inconsistency when he evaluated epistemic dimensions. For example, his evaluation of the sources of knowledge was more aligned with the evaluatist level in Kuhn’s model than his certainty of knowledge. One possible explanation could be related to the domain specificity or domain-generality of beliefs (Buehl et al., 2002).

Another explanation could be related to Eric being in transitioning phase. Throughout the professional development, there were hints in Eric’s thinking suggesting that he was transitioning from multiplist to evaluatist level. For example, in the pretest RJI, Eric’s evaluation of the sources of knowledge indicated multiplist characteristics. However, his thinking about the sources of knowledge started to shift and change throughout the professional development to show at times multiplist traits and at other times evaluatist traits.

As seen in the literature on conceptual change, massive restructure of beliefs about
knowledge is rare (Chinn & Brewer, 1993; Kuhn et al., 2000). In their study, Chinn and Brewer (1993) presented their students with information on quantum mechanics that contradicted with their existing beliefs about the physical world. They reported that even though the students seemed to understand the new information presented to them, they resisted and struggled to change their existing beliefs regarding quantum mechanics. This finding might be similar to Eric’s case. For example, though he knew that the main epistemic aim of inquiry dialogue was reaching the most reasonable answer, he was still asking his students to generate more ideas and did not seem to help them evaluate their positions so they could eliminate some positions that are not well supported by reasons and evidence. Instead of abandoning or modifying his existing beliefs about the legitimacy of the coexistence of different positions, he actually maintained his old ideas.

Changing beliefs has been a subject of broad and current interest among researchers because it is complicated and multifaceted (Fives & Buehl, 2012; Richardson, 1996). Overall teachers’ beliefs are hard to change (Pajares, 1992; Woolfolk-Hoy, Davis, & Pape, 2006). Building off the works of other philosophers and psychologists, Pajares (1992) argued that beliefs change depended on the strength, centrality, and the newness of the belief. This is to say that some beliefs are held with stronger conviction and are more central than others. The newer the belief is, the more vulnerable it is to change (Fives & Buehl, 2012; Pajares, 1992). Green (1971) pictured a circle where beliefs held with the strongest conviction were in the center of the circle. As one moves away from the core circle toward the perimeter, his or her beliefs become less strong and more likely to be discussed or changed.

This was consistent with my reported findings. As a teacher, Eric had some existing epistemic stances and beliefs that have influenced his learning and facilitation of inquiry
dialogue. The stronger the epistemic stances and beliefs were, the harder for him it was to adapt them to match the new practices of argumentation. For example, the beliefs he held about the non-existence of right or wrong answers might have inhibited his facilitation when attempting to help his students to summarize, evaluate, and narrow the number of their positions, eliminating those that did not withstand the scrutiny of the group. He probably either struggled with this practice of argumentation or considered it unnecessary. Two explanations might fit here. One the one hand, his beliefs about the legitimacy of different positions might not foster an awareness of the existence of better conclusions. Therefore, his beliefs about the equality of different opinions might have affected his practice because they convey the idea that there is no need or way that can help individuals to evaluate different arguments. On the other hand, an alternative explanation might be that Eric has neither fully understood nor learned to apply core argumentation criteria and practices that have to do with evaluating and eliminating arguments (e.g., tracking the line of inquiry). Unfortunately, a second round of data collection is needed to test these explanations.

Researchers have also been aware that beliefs are part of one’s identity (Cardelle-Elawar & Nevin, 2003; McCutcheon, 1992; Pajares, 1992) and changing them might be considered a threat to one’s identity (Woolfolk-Hoy et al., 2006). For example, Gregoire (2003) emphasized the idea that when dealing with beliefs change, it is crucial to understand how the endorsement of the new beliefs or the modification of existing ones threaten or align with teachers’ identity. In my study, Eric constantly talked about himself as “an open-minded person”, who can “go with the flow”, “accepting all different opinions and attributing the same value to all of them.” Perhaps, asking his students to push back some of the weakest arguments might be a challenge
for Eric. In other words, modifying some of his values and adapting his personality to the new context of inquiry dialogue might be hard and might require a longer period of time.

The inconsistency in the development of Eric’s epistemic cognition might also align with King and Kitchener’s (2004) claim that people at the quasi-reflective level struggle to distinguish between better opinions and better people. Eric might have learned that one opinion might be better than another opinion if it is supported by reasons and evidence. Yet, he was still adjusting himself to the fact that evaluating knowledge does not mean judging people who believe in that knowledge. Indeed, in both dilemmas in the posttest interview, he leaned toward one position, justified it with research-based evidence, and provided some counter-evidence to explain why he rejected the second opinion. However, he did not explicitly declare that one position was better than the other. He might be at the transitional phase, in which he was still adjusting himself to the new concepts he learned and to the new identity he was forming as a result of the professional development. Perhaps, Eric’s desire to be a supportive and caring teacher, whose students express themselves freely in his class without having their ideas assessed or rejected, slowed the process of his transitioning.

**The role of contexts and tasks.** The analyses of Eric’s responses in the Reflective Judgment Interviews (RJIs) as well as his statements during professional development meeting and in classroom discussions provide insights about how the context and the task influenced Eric’s engagement in epistemic cognition. The role of the context and the task is not new in the field of epistemic cognition (Buehl & Alexander, 2001; Buehl et al., 2002; Buehl & Fives, 2016). For example, when discussing the different dilemmas in the RJIs, Eric’s reflection on how knowledge may be constructed seemed to depend on the context. In thinking about the bias of the news reporters, he justified his beliefs using his parents and his community as his main
sources of knowledge; while in thinking about food safety and historical knowledge, Eric believed that knowledge was highly structured and research-based.

In addition to the context, the nature of the task, or whether Eric was learning the practices of argumentation or facilitating them, affected his epistemic cognition. For example, when learning inquiry dialogue, Eric’s self-system did not seem to come into play. In other words, I did not detect any instances where he talked about influences on his epistemic cognition. However, when he was facilitating inquiry dialogue, his beliefs about his students, motivation, and ideals suggested that his self-system affected his practice. This is aligned with Fives and colleagues’ (2016) claim about the necessity to distinguish between the learning and the teaching tasks.

The relationship between epistemic cognition and motivation. Not only did the context influence Eric’s engagement in epistemic cognition but it also increased his interests in learning about and facilitating inquiry. Eric’s remarks, which he shared with the research team about how beneficial this experience has been for him and for his students, illustrated his motivation about learning and facilitation of inquiry dialogue. Eric also seemed enthusiastic about inquiry dialogue because it was aligned with the Common Core Standards and his beliefs about encouraging the students to be critical thinkers. This finding probably supports Chen and Barger (2016) idea about the relationship between motivation and epistemic cognition. Building on motivation theories, Chen and Barger (2016) argued that when people have goals, they initiate tasks and continue to engage in them in order to achieve their goals. Simply put, motivation drives our actions and behaviors. Chen and Barger (2016) acknowledged that “Thinking about knowledge is not merely a “cold” cognitive process, but a “hot” process that involves affective and motivational components” (p.13). Consistent with the literature, the results of this study
suggested that Eric was motivated to actively take part in the professional development because he started to see positive outcomes such as: engagement in better argumentation practices, improvement in writing and reading skills, improvement in their abilities to think critically, and better classroom management. These positive outcomes might be the motivational factors that pushed Eric to engage in the learning and facilitation of inquiry dialogue.

**The relationship between epistemic cognition and the learning and facilitation of inquiry dialogue.** In my findings section, I described how Eric’s epistemic cognition has become more aligned with goals and practices of inquiry dialogue. In this specific context, alignment means growth and development. In fact, researchers on argumentation and inquiry dialogue have argued that evaluatist stage is best aligned with the practices of inquiry dialogue and rigorous argumentation (Kuhn, 1991; Reznitskaya & Gregory, 2013). However, from my data, I was unable to determine which growth came first. In other words, I could not distinguish whether Eric’s epistemic cognition has led to the mastering of the practices of inquiry dialogue, or, alternatively, whether the practice of facilitating inquiry dialogue has affected Eric’s development of epistemic cognition. This finding about the relationship between beliefs and practice is consistent with what has long been posited by researchers on the field (Buehl & Beck, 2015; Nespor, 1987; Pajares, 1992; Richardson, 1996). Richardson (1996) stated that the order of belief change and practice change is not clear and certain and that the process of teacher change may start with either belief change or practice change. Similarly, Fullan (2000) argued that change in beliefs and change in practices are reciprocal and ongoing.

**The relationship among the components of epistemic cognition.** My findings provided few insights on the relationship between the different constructs of epistemic cognition. Of concern, are instances when the constructs of epistemic cognition mismatch with each other
resulting in the inhibition of the engagement of epistemic cognition. For example, in two classroom-discussions, Eric’s main epistemic aim was to help students come together as a group to move towards the best possible answer. He explicitly mentioned that to reach this aim, students should engage in attentive listening, share responsibilities, challenge each other, and discuss alternatives. He also mentioned that he wanted them to use textual evidence to support their positions. In this epistemic cognition cycle, Eric seemed to have an epistemic aim for his students, which is to reach the most reasonable answer. To do so, he would engage in the justification of knowledge through inquiry, meaning that, students should agree or disagree with a given position, challenge it, provide an alternative perspective, support it, etc. Students also need to use silent moments, attentive listening, and turn taking to build on what other students have said. These strategies might be their non-epistemic reliable processes to reach their epistemic goal. However, in both classroom discussions, the class did not reach best argument as a group. First, the students did not seem to be able to wait patiently for their turns. They appeared to have their hands up frequently, even when one of them was sharing his /her positions. In coaching session, 2 Eric shared his concerns with the coach: “They don’t listen, they just want to say what they have to say, and this is where the repetition comes from.” Eric’s statement implied that the non-epistemic reliable process that could lead to the epistemic aim was not effectively used by his students when they constructed their knowledge during classroom discussions. Another missing element was the evaluation of the process of knowledge construction. In my study, I did not look closely at Eric’s practice of inquiry dialogue, as I was focused on his interventions to depict his engagement in epistemic cognition. Even though Eric seemed to embrace the beliefs that it was crucial to use inquiry to justify knowledge, his engagement in the evaluation of knowledge during classroom discussion was inconsistent and
rare. The rare occurrences of evaluation and consideration of the dimension of knowledge might have inhibited the achievement of epistemic goal of facilitating and learning inquiry dialogue.

The misalignment among the constructs of epistemic cognition is also illustrated by Eric’s resistance to use the reliable processes suggested by the research team such as: small group discussions and the building of the “argument houses.” The argument house, as explained in the previous chapter, is a metaphor referring to the process of building arguments, with position being the roof of the house supported by reasons and evidence, which represent the foundations or the bricks of the house. These strategies were proposed by the research team to help teachers reach their aims and evaluate the positions by using reasoned argumentation. Eric’s beliefs about conducting small group discussions or evaluating arguments made him resist the implementation of the reliable processes recommended by researchers. In this case Eric’s self-system (e.g., his beliefs about ineffectiveness of small group arrangement) influenced his choice of the reliable process (not using small-group discussions with his students) which led only to a partial success in achieving the epistemic aims (i.e. learning and facilitating the practices of argumentation). This could be similar to what Brazilai and Chinn (2018) referred to as cognitive engagement in epistemic performance. According to Brazilai and Chinn (2018) the engagement in epistemic performance refers to the process of “selecting valuable products to aim for; appropriately applying epistemic ideals to evaluate, create, and communicate diverse epistemic products; and performing evaluative, creative, and communicative processes that can result in reliable achievement of epistemic aims” (367).

**Implications**

**Implications for Practice**
**Explicit attention to epistemic cognition.** If we expect that teachers engage in epistemic cognition when learning and facilitating inquiry dialogue, then it is important to raise their awareness of the practices of inquiry dialogue, and their awareness about the engagement of epistemic cognition. Researchers have argued that it is important to uncover and acknowledge teachers’ epistemic beliefs as a first step toward the change process (Richardson, 1996; Thompson, 1992). Theoretical accounts and empirical studies have also posited that “changes in teachers' practices are unlikely to result from presenting, examining, or discussing research studies alone” (Thompson, 1992). Simply drawing attention to teachers’ epistemic cognition will not guarantee the change. In fact, teachers should be presented with opportunities, in which they question and challenge their epistemic beliefs (Woolfolk-Hoy et al., 2006). They need to have non-threatening, non-coercive opportunities, during which they can examine and reconcile their new ideas with the exciting ones (Woolfolk-Hoy et al., 2006). This is why Reznitskaya and Colleagues (2017) designed the professional development to not simply lecture teachers about the practices of inquiry dialogue; rather the professional development relied on a variety of activities. In fact, it is crucial to present teachers with tasks and activities that are compatible with argumentation practices to help them align their epistemic cognition with evaluativist stances. This seemed to be Eric’s experience with inquiry dialogue. He mentioned several times in the coaching sessions, study group meetings, and focus group interviews that he enjoyed being part of the program and that he learned a lot of things. He also claimed that he saw changes in his practices, in his thinking about his teaching as a whole, and in his students’ performances.

**On-going professional development and explicit awareness of the construct.** The extensive body of literature has demonstrated that time matters when it comes to beliefs change (Fives & Buehl, 2012). This is because beliefs might be strongly held for a long time, and to
change them, teachers should engage in multiple opportunities to reconcile the old beliefs with the new ones (Green, 1971; Pajares, 1992; Woolfolk-Hoy et al., 2006). Since it is unlikely that professional learning experiences will center solely on the role of teachers’ epistemic cognition, thus, making epistemic cognition explicit should be appropriately and meaningfully incorporated into professional learning content.

Interventions aiming at fostering epistemic change within teachers need to address prior ideas that may hinder epistemic development and to provide convincing alternative ways of thinking about their practices. Failure to do so might result in teachers either resisting the new ideas or espousing conflicting ideas. For example, Eric talked about finding the best answer but he kept encouraging his students to initiate new positions without helping them with the evaluation process.

**Inquiry dialogue as in other disciplinary contexts.** Although the purpose of my study was not to investigate teachers’ practice, it seemed that Eric used the principles of inquiry dialogue in other subject matters such as: social studies, science, and mathematics. This might have implications for practice in general and professional development in particular. If classroom discussion is being used by teachers to answer big questions in multiple subject matters using argumentation practices, then inquiry dialogue should be adopted as a normative frame for learning and facilitation of argumentation practices (Gregory, 2007; Walton, 1998).

**Implications for Further Research**

**Defining the term epistemic cognition.** Despite the fact that research on epistemic cognition has spanned over three decades (Hofer, 2016; Hofer & Pintrich, 1997), there is still confusion on how the term epistemic cognition is used (Hofer & Pintrich, 1997). One of the
challenges I faced when I conducted my study was the lack of a consistent definition of the term “epistemic cognition.” It was used interchangeably with other terms such as epistemological beliefs, epistemic beliefs, epistemological theories, and personal epistemology (Hofer, 2016). Also, because the construct of epistemic cognition is influenced by many fields, such as philosophy, education, and psychology, there is a variety of terms to describe various dimensions of epistemic cognition. For example, the dimension of “certainty of knowledge” seemed to overlap with the concept of “stability of knowledge” and sometimes “truth,” which is a philosophical concept. More consistent definitions could reduce the confusion existing in the field.

**Accurate measurement tools.** Similar to other findings in the developmental literature, my results showed that the development of epistemic cognition is complex, inconsistent, and, at least partially, domain-specific. Even though there are some attempts to account for this inconsistency by highlighting the domain specificity and domain generality of beliefs (Buehl et al., 2002; Kuhn et al., 2000; Kuhn & Weinstock, 2002), the question of how to measure these differences and to capture the complexity of the beliefs system remains unanswered.

**Careful examination of the relationship between the components of epistemic cognition.** My data has revealed that the possible misalignment between the constructs of epistemic cognition might have affected the process of epistemic cognition. For example, Eric’s self-system (epistemic stances and values) might have influenced his choices of the reliable processes and affected his evaluation and consideration of his students’ knowledge. This was apparent, for instance, when he talked about aligning the practices of inquiry dialogue with the goals of the standardized tests. In fact, in Study Group Four, Eric highlighted the importance of using textual evidence to support positions, which was one of the standards assessed by
standardized tests. Even though, the research team insisted on explaining the advantages of integrating different sources of knowledge, Eric, kept pushing for the use of textual evidence over anecdotal experiences because of the requirements of the standardized testing. His epistemic ideals and pragmatic considerations might have inhibited him, in some instances, from seeing the limitations of only using textual evidence. Hence, more research is needed to seek deeper understanding of the relationship between the constructs of epistemic cognition and the effects of their misalignment. For example, if a teacher sets a goal for his students, he needs to carefully choose the reliable processes that would help him successfully achieve his goal. He also needs to evaluate his knowledge bearing in mind the external influences that might affect his thinking about his knowledge and his epistemically informed praxis. If one of these constructs is missing, or if it did not serve the purpose it should be serving, or if it is misused or misinterpreted, do people still achieve the epistemic aims? In other words, even though teachers try to engage in epistemic cognition, if they don’t have a clear understanding of how each construct works, and how the constructs are related, it is not guaranteed that they will effectively engage in epistemic cognition.

Implications for Theory

The results of my study suggest that the relationship between epistemic cognition and the learning and practices of inquiry dialogue is complex. For example, in the RJs Eric demonstrated the characteristics of a multiplist level of epistemic cognition, yet his interventions during the learning and facilitating of inquiry dialogue suggested that his thinking was inconsistent and shifted between multiplist and evaluatist level. In addition to the role of the domain and the context, Eric’s level of epistemic cognition might have affected his thinking about the dimensions of knowledge. Therefore, in the context of inquiry dialogue, and when
using the integrated framework, I argue that the level of epistemic cognition should be added to the list of the influences that fall under the teachers’ self-system. This is because if teachers are not at the evaluatist level, they are unlikely to adopt the recommended practices of inquiry dialogue (Braten et al. 2017).

Another suggestion is related to the construct of the evaluation and consideration of epistemic matters. It seemed from my data analysis that the dimensions of the certainty of knowledge and of the structure of knowledge can act as epistemic stances or epistemic beliefs that guided the evaluation of knowledge. Eric did not seem to engage in epistemic cognition to find out whether knowledge was evolving or determined. He seemed to hold beliefs about the certainty of knowledge and these beliefs influenced his epistemic cognition. The same interpretation applies to the structure of knowledge. If a teacher believes that knowledge is complex and integrated, then his beliefs about the structure of knowledge would affect his evaluation and construction of knowledge. Therefore, I argue that in inquiry dialogue the certainty and structure of knowledge belonged to Eric’s self-system. More research is needed to determine whether these dimensions should be part of the teachers’ self-system as influencers on epistemic cognition or whether they should be kept as dimensions of knowledge that require evaluation and consideration.

**Figure 4.** The Modified Integrated Framework of Epistemic Cognition for Learning and Facilitating Inquiry Dialogue.
Limitations

Several researchers have argued that the traditional concept of generalizability in qualitative research is neither important, nor relevant in relation to the objectives of the research (Kitto, Chesters, & Grbich, 2008; Schoefield, 2002). In the same vein, Stake (1995) posited that it was not possible to generalize findings from qualitative research due to the small number of the participants. Instead, Stake (1995) suggested the concept of “naturalistic generalizability”, which enables the transfer of results from one study for the interpretation of similar situations. Hence, the goal of this research is not to directly generalize the findings to other populations and settings, but to offer burgeoning insights on how to look at epistemic cognition when teachers learn and facilitate inquiry dialogue.

Another limitation of this study is the use of a secondary data set. Even though, secondary data has many advantages, such as accelerating the pace of the research, re-analyzing and re-interpreting the data, as well as testing new ideas, theories, and methods of research design (Doolan & Froelicher, 2009), researchers should be aware of the limitations that they may
encounter (Heaton, 2008). For example, researchers are not able to conduct follow-up interviews and member checking with the participants. In some cases, they cannot collect further data due to confidentiality reasons (e.g. the identities of the participants are removed from the dataset to remain anonymous (Heaton, 2008). Consequently, the role of the researcher in this case is to carefully reflect, examine, and critically evaluate these data in order to overcome these limitations.

Moreover, despite the fact that epistemic cognition has long been studied (Buehl & Fives, 2016; Hofer, 2016) the lack of a clear definition makes the construct complex to study and may not allow for replication of the study even if steps are followed precisely. If some researchers decided to do the same study in another context, following the same exact steps does not guarantee the same findings. Yet, despite these limitations, I hope that this study holds promise for providing new understanding of the complexity of teachers’ epistemic cognition while learning and facilitating inquiry dialogue.

Finally, as a non-native speaker of English, I struggled when I addressed abstract concepts and this might have affected the quality of my work in general. However, being a non-native speaker comes with many advantages I was able to read research on epistemic cognition in French and Arabic, which has informed and enriched my literature review.
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