Epistemology and Prospective Content-Area Teacher Candidates:

Preparing for Teaching Adolescent Literacy

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Dedication

Reading is messy meaning-making that draws upon the rich cognitive resources of human brains. Books and texts cannot be reduced to simple formulaic algorithms. Books are messy. Beginning in my childhood, when my parents gave me books as presents, I collected books. As a young man, I filled my college dorm rooms with them, and they collected dust and took up too much space until I had to send them home. I spent my college allowance sending books around the U.S., and I never stopped shaping a collection of ideas and texts. Apartment after apartment and home after home – each place was the sensory and physical chaos of boxing and unpacking and shelving and un-shelving hundreds of books. Not much has changed, as my own family can testify.

Messy, perhaps, but also suggestive to me of the way we make meaning out of a complex world. We can tell our life stories through our literacy generally, and our libraries, specifically. For me, each book I read, each book I collect, is a piece of a larger narrative that is my journey for understanding. I like to think of understanding as a collection of chaotically juxtaposed ideas and images, and my books are my handhold on this messy system of relationships. The places where one book touches another are real to me, as are the spaces between books, the incomplete spaces where one text falls short of meeting another. Reading is the never-ending quest to make these connections happen in rich patterns of meaning.

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I dedicate this dissertation to my mother, Dee Johnson, and my father, Bill Johnson. They too loved books, and while their lives were physically tidy, they knew

that ideas were complex, even messy. Their nightstands and coffee tables held an array

of books, the *New Yorker,* student papers, and historical artifacts. Dusting was always

an encounter with texts and ideas. They supported me through years of reading and

school, even when the choice to follow the path of literacy meant hardship and the road

less-travelled. I miss them. My reading and my pursuit of a doctorate are in homage to

their lives.

Abstract

Research into student epistemology provides us with descriptions of learners as they encounter academic challenges. Content-area teachers approach the problem of teaching adolescent literacy with particular attitudes toward learning, knowledge, and texts, and these beliefs affect their effectiveness as future literacy teachers. This project investigated content-area pre-service teachers' beliefs about knowledge, learning, and texts, adding to the literature about teacher-candidate epistemology and content-area literacy teaching. The study utilized mixed methods: content-area teacher candidates were surveyed in the first stage of the research study, and a sample of these candidates were interviewed in the second stage of the study. Research findings included the development of a new inventory for learner epistemology measurement. This epistemology of reading inventory offers researchers and educators a measure of learners' beliefs about reading, texts, and comprehension. Study results offer a salient description of teacher candidates' epistemological traits as they approach the problem of teaching content-area reading and literacy to adolescents.

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Chapter 1: Introduction

Introduction to the Problem

In his book on the hermeneutics of reading, Iser (1978) makes an argument for the complexity of the process of reading comprehension. Reading is not a simple process of information received from a printed page. It is integrative, interactive, and highly dependent on the prior knowledge of the reader:

> [T]he reader's own disposition will never disappear totally; it will tend instead to form the background to and a frame of reference for the act of grasping and comprehending. If it [the reader] were to disappear totally, we should simply forget all the experiences that we are bringing into play as we read – experiences which are responsible for the many different ways in which people fulfill the reader's role set out by the text. (Iser, 1978, p. 37)

Learners' dispositions affect how they read and make meaning from texts. Learners have models of mind, or schemas, which characterize how they represent and make sense of knowledge. Those university students who plan to become teachers are no different. They too come to their study of education with beliefs about knowledge, the process of learning, and the way that reading functions within learning. As they approach the challenge of teaching, these teacher candidates are also approaching the challenges of literacy, including the challenge of promoting reading comprehension for all learners, and promoting this comprehension within a specific content-area of study.

This research project considers the relationship between student beliefs about reading and the demands of teaching literacy. In the experience of this researcher, content-area candidates display at least some ambivalence and uncertainty when asked to approach the challenges of literacy, including the teaching of reading. While some students relish the chance to learn about reading pedagogy, others express frustration that it isn't connected enough to their content areas. Beliefs about knowledge are critical to educators' understanding of child development and student learning, but they are also critical to our thinking about the education of those students who will become teachers. Prospective teachers often cite their love of a subject area, or their desire to teach a particular content-area, as a reason for their decision to become a teacher. Successful literacy educators must assess the source and nature of student motivation and engagement with academic discourse -- how motivated a learner is to make sense of a new text can depend on discourse specific or socio-cultural factors that include prior knowledge, including the prior knowledge salient to a particular academic discipline, or content-area. This challenge obviously includes a dynamic set of variables independent of the prospective teacher's love of his or her content-area. Students who have not chosen language arts fields of study often don't see the relevance of reading to their content-areas, and in a refrain known to all content-area reading instructors in teacher education, they challenge the very concept of reading across the curriculum.

This project will utilize a cognitive science approach that emphasizes the concept of epistemology in learners. Epistemology is defined here as the study of knowledge and knowing. By extension, such epistemology discussions may also

include the study of how humans learn. While epistemology is also a topic in philosophy, the main use of the term here will refer to learners' conceptions about knowledge, where knowledge comes from, and how learners come to know things about the world. In the case of this project, epistemological phenomena will exist in at least two dimensions. First, university students will have particular beliefs about knowledge and learning. Second, PreK-12 learners, or students in classrooms *to be taught*, will also exhibit particular beliefs about knowledge and learning.

The PreK-12 experiences of prospective teacher candidates with learning to read will affect how they approach becoming teachers. So will the individual narratives that constitute those learners' respective learning narratives. All of those experiences, and all of the understandings that teacher candidates have about knowledge, learning, and reading, will be part of the epistemology they exhibit as they study in teacher education programs. Understanding the epistemological views of novice teachers is crucial to our development of pedagogy for teacher education generally (White, 2000). Such understandings should also play a vital role in understanding how secondary content-area teachers can better encourage and develop literacy with their adolescent students. Teacher candidates who prepare for content-area teaching, whether in science, mathematics, social studies, or another discipline, will face the challenge of teaching texts and literacy *without* the mindset and skills that we might see in teacher candidates who have chosen the language arts, literature, and writing as an undergraduate focus (Jehng, et al., 1993; McKenna and Robinson, 2006).

The language arts and the discourse of literacy are not the first choice of content-area prospective teachers. Because pre-service content-area teachers are approaching literacy as a relatively unknown problem and skill domain, they face what King and Kitchener (2004) call an "ill-structured problem" that will challenge their ability to be effective literacy teachers. Indeed, some literature suggests that university coursework has the effect of driving some students back into their most rigid epistemic beliefs, a crucial finding for teacher preparation programs (Cole, Goetz & Willson, 2000).

Given the epistemological and domain-based assumptions within their content areas, pre-service teachers may hold models of learning that do not embrace the richness and complexity of literacy acquisition. As King & Kitchener argue, the ability to engage in reflective thinking cannot be understood without considering the cognitive characteristics (especially, the epistemic assumptions) of the developing person" (1994, p. 18). These attitudes affect their willingness to motivate adolescent readers, challenge disciplinary assumptions about text, and uncover the problems of distinctive discourses (Brownlee, 2003; Gee, 2001; Pintrich, 2002). Successful literacy educators must assess the source and nature of student motivation and engagement with academic discourse -- how motivated a learner is to make sense of a new text can depend on discourse specific or socio-cultural factors that include prior knowledge. Gardner (1991) argues that the intellectual assumptions of a discipline may be implicit, and readers will not recognize the relevant prior knowledge within an academic domain. The implicit skills for an expert (the teacher, for example) may be completely hidden for novice readers within a

particular domain or discourse. The flexibility and sophistication of teacher-candidate epistemology is likely a valid predictor of their willingness to engage in difficult work with competing or parallel discourses which adolescent readers must navigate (Gee, 2001; King & Kitchener, 1994; King and Kitchener, 2004; Perry, 1970).

How learners and teachers understand and value text is crucial to their epistemological viewpoint. Often these understandings are part of an autobiographical narrative, a sense of how texts work in school, and beliefs about their own self-efficacy with reading (Dweck & London, 2004). These are all factors that can help us to understand their capacity for literacy teaching. Schraw and Bruning argue that epistemology may be evinced in student attitudes toward text, a phenomena they call "epistemology of text" (1996, p. 290). Epistemology of text is the sub-genre of inquiry within the broader topic of student epistemology, and it offers educators tools for thinking about readers' processing of text, comprehension of text, and meta-cognitive awareness of the role text plays in their understanding of the world (Schommer, 1990). Theorists about readers' responses to text (Beach, 1994; Rosenblatt, 1978; Schraw & Bruning, 1996) describe readers as tending toward transmission understandings of text, on one hand, or transactional understandings of text-based-learning, on the other hand. Transmission theory resembles "folk-theory of-mind' (Bereiter, 2002; King & Kitchener, 2004; Lakoff & Johnson, 1999), as it depends upon the reader understanding text as information to be deposited into the brain.

Transactional text epistemology postulates reciprocity between the reader and the text, and an increased focus on the reader construction of meaning (Vygotsky, 1978,

in McDevitt & Ormrod, 2007; Rosenblatt, 1978; Schraw & Bruning, 1996). Wolf (2007) argues that text-based literacy is a socio-cognitive construction with both neurology and social constructs as foundation. Bruner (1993) rejects transmission models of cognition, offering instead that learning is a function of human narrative-making as a form of epistemology. Cunningham and Fitzgerald (1996) show epistemology as a foundation for different varieties of pedagogy in reading instruction, including teacher orientation toward transmission versus transaction. Lapp, et al. (2008) summarize the contributions of cognitive theory to content-area literacy concerns with student theory-of-mind. Preparing teacher-candidates to embrace literacy education will require us to understand better how models of reading epistemology influence their own notions of how brains construct meaning from texts.

Background of the Problem

Interest in how learners make sense of knowledge is a timeless question. In the last century, epistemological inquiry in educational psychology has largely taken one of two tracks. First, behavioral psychology largely closed itself to epistemic inquiry. Learning and knowledge were observable phenomena only – and mental constructs were mostly ignored. Bruner (2004) reminds us that in the 1920's, E.L. Thorndike popularized the practice and repetition mode of teaching for modern educators. In this method, students would learn content by rote, "as you would were you memorizing non-sense syllables" (2004, p. 17). The practice dates largely from the twenty-five years between 1875 and 1900, when associationist psychologists sought to reduce learning to elemental associative correspondences between the empirical world and

knowledge in the brain. In this period, learning exercises frequently became lengthy lists of words to be associated (Bruner, 2004, p. 15) In this model, knowledge is largely information, and it is learned by association, memorization, or rote instrumental routine. As Gee (1990) reminds us, this model was a powerful force in education, and persists today, even as new models have become available to students of language, learning, and education.

The Cognitive Revolution brought down learning theory (behaviorism) in the 1960's (Bruner, 2004; Gardner, 1985). Models from computer science, brain science, and evolutionary psychology offered a picture of brains creating and storing knowledge in patterns, schemas, or narratives (Bereiter, 2002; Pinker, 2002; Searle, 1992). Within this model, language was understood as a generative and creative construct, not a rote skill (Chomsky, 1959). Still, the model of associationist cognition persists and plays a central role in educational practice and policy. For a decade now, many K-6 schools have been influenced by particular pedagogies of literacy associated with the report of the National Reading Panel, the authorization of No Child Left Behind legislation, and calls for school reform. One of the most prevalent curricular projects was the widespread utilization of Reading First, which emphasized a variety of skills as central to reading development. Many anecdotal reports about the scripted instruction for phonics advocated by Reading First policy are explicit in describing the learning and memorizing of nonsense syllables (Garan, 2002). This process, which evokes the associationist project of almost a century ago, is defended by the claim that it functions to promote phonemic awareness and anticipating the skills of decoding,

Rich models of the mind, and of the development of literacy, are vastly

preferable to the reductionist models currently being forced on schools. Wolf (2007)

acknowledges that learning and "knowing what's in a word" helps you read better, but

it is not separate from the affective and social realities of engaging with language. Lee

(1997) argues:

> This approach to conceptualizing knowledge and learning differs
>
> dramatically from traditional accounts that take learning to be a matter of
>
> accumulating discrete items of knowledge – as though knowledge comes
>
> in concrete pieces that can be sorted, counted, stored in mental boxes or
>
> filing cabinets, valued or audited in quantitative terms....or even given by
>
> one person to another. (in Beck & Olah, 2001, p. 99)

In recent years, both national and state policy about literacy standards and

assessment have served to "raise the bar" on reading instruction. Allington argues that

adolescent literacy has become a pressing political and professional concern because of

perceived stagnation in reading comprehension among secondary learners (in Beers, et

al., 2008). Allington cites two studies that point to a problem in adolescent literacy:

> First, on the NAEP (National Center for Educational Statistics, 2006)
>
> neither eighth – nor twelfth-grade reading outcomes have improved since
>
> 1971 (though fourth –grade outcomes have shown modest improvements
>
> from 1971 to 2002). Second, on the Program for International
>
> Assessment – PISA -- (NCES, 2002), U.S fifteen year-olds performed at
>
> the international average, with better performance on narrative text

reading than on informational text reading...(cited in Beers, et al., 2008, p. 273).

These statistics suggest that American educators are struggling to teach reading comprehension to adolescents, and particularly so in courses driven by expository or informational content, such as the content-area courses typical of secondary curricula. In response to this problem, practicing educators --whether classroom teachers, administrators, or teacher educators --have been urged to teach literacy "across the curriculum," or alternately, to "teach reading across the curriculum." To illustrate this point – a search of the Amazon.com website yielded 139 texts for the phrase "literacy across the disciplines," and 239 books for the search phrase "reading across the content areas. This emphasis on across the curriculum instruction of literacy has not been lost on policymakers. In the state of Minnesota, the legislature has passed specific statutory language governing content-area teacher preparation to teach reading. Additionally, at the time of this writing, numerous publications and public forums have called attention to the skills and dispositions of future teachers, and the need for teacher education programs to better prepare teacher candidates is always at the center of this discourse (Duncan, 2010; Green, 2010; Ravitch, 2010). These attitudes toward the preparation of teachers have made education schools into high stakes settings for meeting numerous standards. Meeting these standards through effective curriculum and teacher education pedagogy has made the challenge of understanding students' beliefs and knowledge about texts even more pressing. At present, there is a gap in the literature of

epistemology because there has been little investigation of teacher epistemology and its ramifications for teaching literacy to adolescents in content-area courses.

Statement of the Problem:

Not enough is known about the beliefs and attitudes that characterize future teachers' epistemology and understanding of learning from texts.

Purpose of the Study:

This study will seek to learn more about the beliefs and attitudes about knowledge and learning from text that future teachers exhibit.

Research Question:

The following research questions will provide a foundation to both the survey instrument and the interviews of content-area candidates:

Main Question:

What beliefs and attitudes about learning from text do future teachers hold?

Sub-questions:

1) What beliefs about the nature of learning and knowledge do these beginning teachers hold?

2) What value or role do these teachers place on learning from text, and what value or role do these prospective teachers place on their future students' learning from text?

3) What will a measure of future teachers' attitudes toward text look like, and how will it correlate with existing measures of learners epistemological beliefs?

Methodology

The researcher proposed a two-stage, mixed methods design for this project (Creswell, 1994). This plan allowed the researcher to triangulate between different data and phenomena, offering "snapshots" of epistemic views and reflective thinking (King & Kitchener, 2004; Thomas, 1994). A first stage in this plan provided a quantitative description of a significant sample of undergraduate content-area teacher candidates. Subsequent to the survey, a second stage of semi-structured interviews used qualitative inquiry to pursue thick description of the narratives and beliefs of candidates who aspire to teach in particular subject areas.

The researcher employed a quantitative design to survey pre-service teachers (N=75) who are in their undergraduate sequence of preparation for teacher licensure in a content-area (math, social studies, art, music, health, science, and foreign languages). Most of these candidates will be in the first semesters of their collegiate experience, and they will be taking a foundation of education course required of all education majors *before* program admission.

The researcher designed a two-part survey instrument. First, it examined the construct of epistemological beliefs as described by Schommer (1990, 1994, 1998, Schommer, et al., 2000; Jehng, et al., 1993). This model posits Fixed Ability, Simple Knowledge, Quick Learning, and Certain Knowledge as critical to student epistemology. Secondly, the survey posed questions to subjects related to their epistemology of text, including their beliefs about the omniscience of textual authority, the importance of text to learning, and the process of acquiring comprehension of text

(Schraw & Bruning, 1996). Data analysis allowed a normative description of epistemological beliefs of content-area pre-service teachers, which is a contribution to the field of teacher preparation.

A sample of participants (N= 15) was engaged in a secondary level of analysis through semi-structured interviews. Subsequent to the interviews, data was coded and analyzed. After this initial analysis, data was analyzed in the context of the quantitative sample for perspectives on typical epistemological beliefs, the range and stability of these beliefs, and the consequences for teacher-candidates' attitudes toward texts. A typology of beliefs and attitudes within several core themes resulted.

Definition of Terms

Aesthetic Reading: According to Rosenblatt, reading that is for the purpose of appreciation, creativity, or emotional response. The focus is on the process, or what happens during the reading (1978).

Behaviorism: The psychological school of thought that argues for objective observation of learning. In it, psychologists must study stimuli and responses as evidence of learning in organisms (Ormrod, 2004).

Cognitive Theory: Gardner (1985) defines cognitive science as "the contemporary, empirically-based effort to answer long-standing epistemological questions – particularly those concerned with the nature of knowledge, its components, its sources, its development, and its deployment. Gardner emphasizes the role of three components in cognitive theory: 1) an emphasis on mental representations; 2) the use of computing as a metaphor for human knowledge-making; 3) the absence of affective or social

factors in cognitive descriptions (1985, p. 6). Presently, many cognitive theorists depart from condition three as described by Gardner; they see cognition as inextricably interwoven with affective/emotional experience (Damasio, 1994, Zull, 2002).

Content-Area Literacy: "[T]he ability to use reading and writing for the acquisition of new content in a given discipline" (McKenna & Robinson, 1990, in McKenna & Robinson, 2006, p. 8).

Content-Area Teachers: Those teachers who seek or hold licenses in discipline specific fields. In Minnesota, those fields include: Music, Art, Social Studies, Earth Science, Life Science, Physical Science, Mathematics, Health, and Physical Education. In Minnesota, such licensure areas are 5-12, while Art, Music, and Physical Education are K-12 licensure area (Minnesota Department of Education, 2010). In Minnesota, secondary teachers are also prepared in the content-area of Communication Arts and Literature. Those candidates are not part of this study, given their specific training in literacy, and given the discourse of content-area instruction, which is usually understood to exclude traditional language arts instruction.

Efferent Reading: Reading in which the concern is what is "carried away" by the reader, as in extracting information (Rosenblatt, 1978).

Epistemology: In traditional philosophical usage, epistemology is the study of knowledge, the nature and scope of knowledge, and the reliability of claims to knowledge (Hamlyn, 1972). Educators, educational psychologists, and cognitive theorists refer to epistemology in learners, or the beliefs about knowledge and learning that characterize learners (Hofer & Pintrich, 2004; Ormrod, 2004).

Epistemology of Text: Beliefs and attitudes about how knowledge and meaning are conveyed by text, and how readers know and learn from text (Schraw & Bruning, 1996).

Epistemological Beliefs: Ormrod (2004) describes epistemological beliefs as "ideas about what "knowledge" and "learning" are. Ormrod offers that related terms that convey similar meanings include: personal epistemology, intuitive epistemology, epistemic cognition, ways of knowing, and meta-knowing.

Pre-Service Teachers: Undergraduate, graduate, or post-baccalaureate higher education students who seek a teaching license, but who have not become practicing teachers with a state license.

Pre-K-12 Learners: Designating the learners and experiences typical of American public education, inclusive of all developmental experiences from birth to the conclusion of high school.

Social Cognitive Theory: "Social Cognitive theory focuses on how people learn from one another, encompassing such concepts as observational learning, imitation, and modeling (Ormrod, 2004, p. 124.)

Transaction: Beliefs that meaning is constructed by a transaction between the author, reader, and text (Rosenblatt, 1978; Schraw & Bruning, 1996). According to Rosenblatt, this belief has its origin in terminology developed by John Dewey and Arthur Bentley, terminology that has been adapted to descriptions of the reading process (Rosenblatt, 1978, p. 16).

Transmission: Beliefs that meaning is transmitted from the author and/or text to the reader (Schraw & Bruning, 1996).

The Study: Assumptions and Limitations

The problem of pre-service teacher epistemology is complex, but several facets of it can be captured by utilizing research questions and research paradigms to examine a particular facet of student epistemology. As Kuhn (1962) argues, paradigms are critical models about how best to think about domains of knowledge, but it is also the case that paradigms may overlap, compete, or conflict. Epistemological inquiry is such a paradigm, existing as it does within the field of educational psychology and cognition. It is continually being tested, refined, and altered. This project represents an attempt to investigate a part of the epistemological field, but makes no claims to inform all epistemological inquiry. Of course, there are challenges and limitations in the field of student epistemology. Thinking about how students and teachers construct knowledge is good practice and sound educational psychology (Vygotsky, 1997), and it is likely the case that particular discourses evoke and demand particular epistemologies, or ways of being literate within that discourse. Gee (2001) describes the highly situational and social discourses by which we learn different literacies, and enlightened thinking about teaching and learning might well keep this in mind as the model of a dynamic, shifting, and highly contextualized dialogue between teachers and learners through which notions of knowledge are constructed (Bakhtin, 1981). Reducing student epistemology to a mechanistic model is not advisable, as minds and learners are dynamic and complex; indeed, Schommer (1994) demonstrates that epistemic domains and

orientations may shift over time and within learners, both as learners acquire new knowledge, and as they encounter different domains of knowledge requiring distinct cognitive challenges; i.e., solving math word problems as opposed to writing a laboratory report. Epistemological researchers are wise to use a variety of methodologies, with careful attention to 'goodness of fit,' and awareness of the potential for misuse of reductionist data. As Kozol (2005) argues, "Enlightened practices, when carried out on a large scale, and not reflectively, "do run the risk of being ossified" (p. 330). Using the model of student epistemology should not be over-extended or reduced to particulars that are no longer characteristic of the larger phenomena, contexts, or the diversity of individual experience. Cognition and 'ways of knowing' are not reducible to a level commensurate with purely quantitative research models, even as some will attempt to do so. This caution will guide this researcher's pursuit of new knowledge about how teacher candidates demonstrate and learn the epistemologies that will affect their future teaching.

The researcher believes that both quantitative and qualitative inquiry can inform epistemological research. There is value in learning about a significant number of prospective teachers in a university setting, and there is also value in learning from them via interviews, where they have opportunities to share unique experiences, narratives, and understandings. This is good practice, as it is sensitive both to large trends and to individual difference. Authorities on research methodology argue that matching questions to methodology requires sensitivity, reflection, and awareness of

research paradigms (Blaikie, 2000, Creswell, 2003, Creswell, 2007, Fitzpatrick,

Sanders, & Worthen, 2003).

Significance of the Study

University students who plan to become teachers often choose an area of content

in which to acquire expertise. This is particularly true of teachers who propose to teach

secondary students, defined here as learners in grades 5-12. In choosing a content-area,

prospective teachers begin a particular apprenticeship in the knowledge assumptions of

disciplinary study. Within content areas, such as science, mathematics, art, or social

studies, students acquire and develop epistemological and domain-based assumptions

that may reflect the realities of knowledge within their area of study. These

assumptions shape students' attitudes toward learning, including learning from the

reading of texts. Pre-service teachers may or may not hold models of learning sufficient

to embrace the richness and complexity of reading comprehension. How learners and

teachers understand and value text is crucial to their epistemological viewpoint, and can

help us to understand their capacity for literacy teaching.

A systematic survey of pre-service teacher candidates offers insight into the

practical implications of their beliefs about knowledge and learning and the relationship

of textual learning to their epistemology. Teacher candidates, who represent the

perspectives and experiences of content-area expertise, teacher preparation, and

professionalism, will play a role in promoting text-based literacy practices.

Interviewing these candidates about their learning (and teaching) experiences, their

beliefs about knowledge, and their understanding of learners' minds, can have

significant import for constructing curricula and pedagogy for secondary content-area reading courses. The researcher will seek to elicit student responses representing views of learning, knowledge and texts, as well as the narrative describing their acquisition of a personal epistemology of text. Findings will have implications for teaching of literacy methods to content-area teacher candidates, and to teacher preparation programs generally, which must wrestle with the reality of teacher candidates' beliefs about knowledge and learning.

Summary of Chapter

As Iser argued, readers must construct for themselves the meaning of texts (1978). Texts are not mere agents of transfer, whereby information is transmitted to readers – the transmission model of learning. This phenomenon suggests how important readers' dispositions and beliefs about knowledge and texts are to their own construction or meaning. Continued work in epistemological theory and research will play a vital role in our pedagogy for content-area teacher candidates whose future work will be critical to adolescent literacy. This researcher is interested in the epistemological positions and the epistemic development of those university students who plan to teach in PreK-12 schools. These university students, who we might call "pre-service" teachers, display the phenomena described by the researchers who have worked in the last several decades to build the field of epistemology within educational psychology.

Human diversity suggests that some candidates for the teaching profession are naive, some will think critically and reflect deeply, some are committed to "certain

knowledge," and some believe learning is a simple process. Of course, other possible

epistemic positions exist. This epistemic diversity is intriguing in itself, but it must also

be coupled with other factors with further epistemological implications. First, the

middle and high school learners who will be the students "to be taught," will also have

epistemic identities; undoubtedly, these learners will vary as well in their epistemic

sophistication and development. Second, subject matter (or content-area) will affect

description of student epistemology; for example domains of knowledge may be more

or less ambiguous, whether in science, mathematics, the social studies, or literature.

Pre-service teachers must be prepared to navigate the complexity of how best to help

students understand and master content while taking on the vital challenge of promoting

and developing literacy for their students. This is a task that will place significant

demands on future teachers, and this project proposes to describe a sample of those

teacher candidates who are about to begin this challenging journey.

Chapter 2: Literature Review

Overview of Epistemology and Learning

This chapter will review the field of epistemology as it relates to teachers and learners and the process of teaching literacy in content-area curricula. This survey of the salient literature concerning student epistemology will consider five areas of inquiry:

1) A consideration of epistemology as a construct for examining learners' beliefs about knowledge and learning.

2) Epistemology and the preparation of teachers.

3) Epistemology and texts.

4) Epistemology, literacy practice, and policy

5) Implications of epistemological research literature for the research question that interests this researcher.

In the sections that follow, each of the aforementioned approaches to the problem of epistemology and reading of texts receives more detailed consideration.

Foundations

The philosophical foundations of epistemology can help us understand the concepts of mind, knowledge, inquiry, language and thought. In Western education, philosophical inquiry into epistemology has defined the nature and range of educational practice, and also shaped the way that philosophers, scientists, and researchers into learning have framed the problems of knowledge, learning, and language.

Historically, epistemology is the branch of classical philosophy that includes systematic thinking about how humans "know," and "what knowledge is." This part of epistemology is a field entirely unto itself, but it is also of specific interest to researchers who are considering how knowledge is constructed within scholarly disciplines or content-areas. Buehl and Alexander remind us that Plato summarized knowledge as consisting of truth, belief, and justification (2001). How we wrestle with this triad might be said to be our epistemological position. Of course, such positions vary according to individuals, and also across time, as philosophies, scientific developments, and orientations toward knowledge and learning shift. Kant argued that knowledge might be *a priori,* occurring before our experience, or *a posteriori,* following from our experience; such a distinction sets up the crucial parameter that knowledge may be filtered by our *a posteriori* orientation (Buehl & Alexander, 2001).

Since Plato and Socrates, who described knowledge in idealized, formal, and deductive terms, and Aristotle, who moved epistemology toward a Realist position based on sensory and empirical investigation, conceptions of epistemology have been challenged, revised, and at times, revisited. In the last century, radical revisions to the idealistic project in epistemology occurred, particularly as thinkers emphasized the psychological nature of knowing, and the construction of knowing through schooling (Buehl & Alexander, 2001). This epistemological orientation is central to the Pragmatism, as exemplified by the work of Peirce in semiotics, James in psychology, and Dewey and Whitehead in education (Ford, 2007; Menand, 2001; Buehl &

Alexander, 2001). At the center of this approach to epistemology is the problem of how learners understand the nature of knowledge and learning.

The Cognitive Model

Contemporary researchers who address student epistemology use a model based on Piaget and Bruner, among others. It is commonly described as a cognitive science model of understanding (Gardner, 1985; Bruner, 2004; Flavell, 1992) This model has an emphasis on schema formation, where learners have models or archetypes of knowledge and learning in their minds, and these models in turn influence how these learners encounter, acquire, and assimilate new knowledge. The question that concerns these researchers is how to describe the ways that learners categorize, schematize, or comprehend new and challenging subjects. These theories of mind, attitudes toward knowledge, reading, and texts, represent student epistemological perspectives (Jehng, J.J., Johnson, S., & Anderson, R., 1993; Schommer, 1998).

Epistemological inquiry in educational psychology has been an attempt to describe the kinds of models of knowledge and learning characteristic of cognition in learners. As Elkind (1979) reminds us, adults are inclined to understand cognition opaquely, as an externalization of our own mental processes. Researchers investigating student epistemology strive for a recounting of the phenomena observed in learners, including their belief in the certainty of knowledge, the omniscience of authority, learning process, innate ability, and quick learning (Boyes & Chandler, 1992; Jehng, et al, 1993; Schommer, 1990, 1994, 1998; Schommer-Aikins, M., Mau, W., Brookhart, S., & Hutter, R., 2000).

Bruner cites Krech as emphasizing that human learning "is hypothesis driven, not just passive registration" (p. 18). Zull (2001) develops a model of student instruction that is based on holistic models of the brain and cognition, models that call the senses, emotions, reflection, and action into play. Instead of being anti-scientific, these holistic models are actually based on brain biology. In all cases they suggest the complexity and diversity of knowledge construction, and resist attempts to reduce learning to mere skills or information retrieval (Bereiter 2002).

Social Construction of Cognition

While disciplinary or domain factors can affect how learners approach knowledge, models of human learning, including the way that we think about reading, are also subject to the philosophical, political, and socio-cultural realities of a historical period. In American curricular and pedagogic thought, the influences of Dewey's socio-cultural model, and his influence on twentieth century progressive philosophy of mind, is one strand of epistemology within the American school context. Bruner and others might be said to be inheritors of the Vygotskian theory of learning as inevitably mediated through social interaction (Doll, 1993, p. 119). This notion of a richly interactive and connectionist model is central to the arguments of Vygotsky and Bakhtin, who place an emphasis on the role of cultural teaching via the tools of mentoring, modeling, and generic structures, all in concert with the epigenetic content of the human brain. Bandura (1971) argued that the social interfaces that offer models of behavior are critical to human learning, including models predicated on verbal and pictorial representations. Luria (1976) built on the work of Vygotsky

by showing that human higher cognitive activities are socio-cultural in nature. In

Luria's terms, perception is a complex cognitive activity, and a process mediated by

social interaction (1976). Wertsch (1991) offers a contemporary theory of cognition as

a set of tools that functions only with the complementary component of social and

cultural conventions in place. Changeux (2002) and Dehaene (2009) offer pictures of

the genetic human brain functioning in a dynamic balancing act with socio-cultural

and environmental factors constantly coming into play. Even today's psycholinguistic

model of human learning, as exemplified by the reverse-engineering psycholinguistics

discussions of Pinker (1993; 1997; 2005), argues against the antiquated notion of the

human 'blank slate' as repository for merely mechanical learning.

Models of mind in any age are often linked to innovations in science and

technology, as Searle (1984) argues in Hirstein (2001). The metaphor of the digital

computer is ripe for exploitation as a model for information processing (Searle, 1984).

For Searle, there is a risk in reducing human minds to 'following procedures,' and not

the meaning of rules (1984, p. 47). Yatvin et al. (2003) argue that reading can be

defined in a number of ways, and that there are risks and limitations to defining

reading solely in terms of specific mechanical skills; i.e., a mechanical or syntax-

based model of the reading (2003). Bruner (2004) states: "You cannot strip learning

of its content, nor study it in a 'neutral' context. It is always situated, always related

to some ongoing enterprise" (p. 20). In Bruner's view, learning is not mechanistic,

and not merely rule-based, as is the case in much of the literacy model advocated by

contemporary policy at the federal level (Allington, 2002; Edelsky, 2006; Garan,

2002). How we envision the functions of mind is indeed often a phenomenon based on contemporary metaphors; in at least some cases, the simplification inherent in metaphors may limit our capacity to understand complex cognitive function.

Piaget (1971) warns that positivism in the name of science can have the effect of excluding our understanding of consciousness. In the context of language acquisition and reading, this caution is extended to the practice of reading. Piaget emphasizes that semiotic function – the reading of signs – is crucial to representation and meaning (1971). For Piaget, reductionist thinking about cognitive function is a negation of higher forms of intelligence. Therefore, a theory of reading that reduces human interaction with text to mechanical skills might be understood in these terms as a faulty model. Pinker, the linguist who in some ways represents a twentieth century recapitulation of the associative project, is careful to show how vital context, intention, and meaning are to understanding language: "Cognitive neuroscientists must get the whole person to behave, and any bit of language behaviour must recruit many abilities at once: words, grammar, meaning and knowledge, intentions to speak or believe what is spoken..." (1997, p. 548).

Arendt (1978) argues that mechanistic or rule-based prescriptions for thinking become a kind of "non-thinking," which effectively limits the potential of people to see individual human experience, the particulars that make us unique, and the responsibilities that call upon us to think not merely of efficiency for the sake of the whole, or idealism that would deny the real experience of individuals. Like other existential theorists of the twentieth century, Arendt warns us that models of thought

that reduce education to "rules and procedures" will inevitably undercut what it means to be fully human.

Cognition in Academic Settings

Since Perry (1970) epistemological inquiry has often focused on the phenomena found in academic settings. One could characterize learner epistemology as a fundamental problem in all of education, as it includes learner beliefs about the nature of knowledge *and* the processes by which we come to accept knowledge. An analysis of learners' responses to questions about epistemic beliefs may suggest how theories of mind are operating as they engage in learning (Greene, 1994). These theories of mind are crucial to learners' motivation, self-efficacy, and conceptions of knowledge (Ormrod, 2004). In this theoretical model, how schooling affects learners is a central question; academic knowledge is a particular form of epistemology that is central to curricular and pedagogical questions (Buehl & Alexander, 2001). It may still be important to consider academic knowledge beliefs as a separate discourse (Gee, 2001). Additionally how learners think about knowledge in school may be separate from their general knowledge beliefs (Buehl & Alexander, 2001; Schommer, 1990; Gee, 2001). As we study epistemology, we should remember that real world activities – including those in school settings—also place cognitive demands on learners. These are also an important place to tease out the nature of epistemological beliefs (Kuhn and Weinstock, 2002). We must also pay close attention to the domain or discipline specific factors that shape the kind of knowledge and thinking that characterizes learning within a particular field of endeavor (Gardner, 1991, 2000; Gee, 2001; John-Steiner, 1997).

If the cognitive revolution in learning theory tells us that learners have models of mind, or schemas, then these schemas must operate in particular ways that characterize knowledge of a subject area, or discipline. Here, epistemological inquiry as practiced by cognitive science becomes a useful tool for investigating, testing, and describing the domains of knowledge and understanding that characterize different fields of knowledge. Within content areas, such as science, mathematics, art, or social studies, students may acquire and develop epistemological and domain-based assumptions that shape their attitudes toward learning, including learning from the reading of texts. These attitudes are likely to affect the willingness of prospective teachers to motivate adolescent readers, challenge disciplinary assumptions about text, and uncover the problems of distinctive discourses (Brownlee, et al., 2003; Gee, 2001; Pintrich, 2002).

Contemporary Perspectives on Epistemology

Contemporary research into student epistemology, and the phenomena associated with learner's ways of knowing within the academic realm, is often dated from the research of Perry (1968, 1970). Buehl and Alexander cite Perry's important role as a catalyst to research which countered his claims, or alternatively, sought to refine his conceptual model (2001). In what is perhaps a seminal study in the field, Perry (1970) interviewed 1500 college students and constructed a model of student intellectual and moral development that exhibits stage typology.

Perry developed a scheme to describe college learner epistemological development in moral and intellectual terms. Importantly, he found that relatively few

college students reach the higher stages of developmental trajectory, or "developing

commitments" (1970). Table 1. depicts Perry's scheme in broad terms. The general

developmental progression is portrayed as moving from naïve to sophisticated, with

black-and-white beliefs among more naïve learners, and complex, nuanced beliefs held

by more sophisticated learners. Perry noted that relatively few collegiate learners

advance to commitments of knowledge; instead, most stay with forms of dualism, or do

not leave the stage of rigid dualism.

Table 1

Perry's Developmental Scheme in a Simple Schematic

Main Line of Development

The Modifying of Dualism	The Realizing of Relativism	Evolution of Commitments

Note. Adapted from Perry (1970).

As Perry suggested in his conclusion, his findings have particular import for

grouping, design of curriculum, and teaching instruction in late adolescent settings such

as high school and college. Of particular note is Perry's finding that many academic

challenges have the effect of driving learners into retreat; that is, if learners do not have

adequate epistemological beliefs to address new intellectual challenges, they retreat to

earlier positions in the developmental scheme (1970, p. 210). Perry wrote of the

challenges of intellectual maturity for a learner facing change:

> At each step the student senses his option of taking up new
>
> responsibilities or of pulling out in retreat or alienation…..At this
>
> advanced moment of maturity, he would seem to require not less support
>
> but more – and of a particular kind. He needs not only models to
>
> emulate, but the experience of community with them (p. 215).

Perry's scheme merges Piagetian stage theory and socio-cognitive theory in a powerful model that reminds us how fragile and context dependent epistemological development is, even for those learners who are on the verge of adulthood.

Schommer (1990) assessed student epistemological beliefs through the administration of a survey instrument, and student comprehension results were analyzed for correlation with epistemic beliefs. Several significant relationships were found, suggesting the possibility of predicting student comprehension of text as a variable dependent on the epistemic beliefs held, and including the notion that epistemology is likely a set of interrelated domains, rather than fixed stages. Schommer's work over three decades offers one paradigm of quantitative inquiry into student epistemology. Schommer has sought to increase the construct validity of the epistemological domains research through constant revision of her survey instrument, and she has sought to increase the reliability of measurement through experimental studies, descriptive studies, and longitudinal measurement. It is noteworthy that her commitment to increasing construct validity, instrument reliability, and statistical power, has resulted in several dozen studies using quantitative methodology.

In 1994, Schommer summarized work in learner epistemology as belonging to one of two camps. On one hand, some researchers are primarily interested in the learning challenges inherent to a particular discipline; these researchers tend to define epistemology in unidimensional terms (p. 294). Other researchers focus on the development and nature of intellectual growth; Schommer cites Perry (1968, 1970), Kitchener and King (1981), and Belenky, Clinchy, Goldberger, and Tarule (1986) as central to this project. Within the context of summing up what had been done in epistemological belief research, Schommer (1990) hypothesized five beliefs about the nature of knowledge. Schommer explains that these domains relate to student learning in multiple ways. They engage in persistent, gradual learning if they have a high belief in gradual process. They take control of learning if they believe that learning is not merely innate. They see knowledge as highly connective and integrated if they hold sophisticated beliefs about the organization of knowledge. They believe that knowledge is changing and evolving if they are inclined to doubt the certainty of all knowledge. Finally, they view knowledge as constructed if they resist mere reliance on authority for knowledge. Schommer and Walker (1995) tested college students for consistency of epistemological beliefs across domains, using activities in math and social studies. Their two experiment design suggested that students' beliefs about knowledge are more or less consistent across domains, but students may adjust beliefs about knowledge in order to address tasks within a particular domain. Those five beliefs are outlined in Table 2.

Table 2

Schommer's (1990) Hypothesized Epistemological Dimensions

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1. Source of knowledge: From knowledge handed down by an omniscient authority to knowledge reasoned out through objective and subjective means.

2. Certainty of knowledge: From knowledge is absolute to knowledge is constantly evolving.

3. Organization of knowledge: From knowledge is compartmentalized to knowledge is highly integrated and interwoven.

4. Control of learning: From learning is genetically predetermined to learning is acquired through experience.

5. Speed of learning: From learning is quick or not-at-all to learning is a gradual process.

Note. Adapted from Schommer (1990).

Recent research which addresses student epistemology is part of an emerging scholarship which includes both quantitative and qualitative designs (DeBacker, et al., 2008). Jehng et al. conducted similar research employing an adaptation of Schommer's instrument, and found that students in the humanities were more likely to have flexible epistemologies than students in the hard sciences (1993). Schraw and Bruning (1996) administered a Reader Beliefs Questionnaire to 154 undergraduates and subsequently

evaluated their reading of a challenging text. Factor analysis suggested important correlations between student epistemology of text as an independent variable and reader response as the dependent variable. Cano (2005) conducted an experimental design including 1500 Spanish secondary students. Pre-test and post-test assessments of epistemic beliefs across a two-year secondary curriculum suggested that epistemic beliefs change over time, and also correlate with student academic performance. Ravindran et al. (2005) used surveys of student epistemic beliefs in a teacher training program to predict the subsequent student engagement with difficult cognitive tasks. Results suggest that the variable of pre-service teacher beliefs is a strong predictor of candidate engagement with cognitive demands. Cole, et al. (2008) evaluated the epistemic beliefs of under-prepared university students. They subjected the population ($N = 101$) to university training for academically "at risk" students, and measured changes in epistemic beliefs after exposure to university coursework. Student epistemology changed in some cases, and also influenced subsequent university performance. Kawasaki et al. (2004) conducted a field study by observing student epistemologies of scientific knowledge during instruction about object density and flotation. Student written comments, contributions to classroom discussions, and problem-solving discussions were recorded and analyzed to create a picture of epistemology acquisition within science. White (2000) used case studies and candidate interviews to survey prospective teachers in an effort to learn about teacher candidate epistemology, including the readiness of future teachers to tackle ambiguous student-to-teacher interactions and teacher decision-making.

Epistemology and the Preparation of Teachers

The flexibility and sophistication of teacher-candidate epistemology is likely a valid predictor of their willingness to engage in difficult work with competing or parallel discourses which adolescent readers must navigate (Perry, 1968; Gee, 2001; King and Kitchener, 2004). How teacher preparation programs, curricula, and instruction approach this problem is an important question for consideration. Increasingly, civic, political, and educational leaders are calling for greater effectiveness in teacher education programs. Clearly, those educators who prepare teachers are being asked to reconsider their own thinking about effective teaching and learning. As Bain (2004) argues, [best teachers] can use that ability to think about their own thinking -- what we call "meta-cognition" -- and their understanding of the "discipline qua discipline" to grasp how other people might learn" (p. 25). Rose (2010) argues eloquently for the particular habits of mind that make for an effective, inspirational, and challenging teacher. The willingness of learners to engage in problematizing strategies that lead to genuine inquiry is a recommended practice for improving pedagogy (Wiggins & McTighe, 2005; Wilhelm, 2007). Buehl and Fives (2009) found that individuals tended to confuse the knowledge necessary to become a teacher with the knowledge necessary to work in a classroom:

> We found it interesting that they confused the requirements and preparation needed to become a teacher with the actual knowledge needed to facilitate classroom instruction. Perhaps this reflects a larger problem -- that pre-service and practicing teachers do not recognize or

value the specific knowledge that is unique and needed within the

teaching profession (2009, p. 398)

Such findings about the need for epistemic reflection among teachers are important;

indeed, professionally reflective practice is critical. Some evidence even suggests that

ineffective university coursework had the effect of driving some college students back

into their most rigid epistemic beliefs, a crucial finding for teacher preparation

programs (Buehl & Fives, 2009; Cole, et al., 2008; Kagan, 1992).

If prospective educators subscribe to "folk theory" of mind (Bereiter, 2002;

Lakoff & Johnson, 2003; Pinker, 1994, 2002), they may see knowledge and information

as data to be transmitted to learners. The literature suggests that many learners have

rudimentary, naïve, or "folk notions;" of learning. These learners understand knowledge

in ways that deter dynamic literacy instruction; i.e., the brain as a container for

knowledge, the idea that all brains are pretty much the same, or knowledge comes

arbitrarily from authorities (Bereiter, 2002; Lakoff & Johnson,1999; Perry, 1970).

These learners may not engage in active, transactional practices of literacy.

Consequently, their professional practices of literacy instruction may be weak, and their

expertise in a content area may reinforce this tendency. Expert knowledge about a

content-area may be viewed as a substitute or proxy for explicit instruction that

promotes understanding (Daniels & Zemelman; Wiggins & McTighe, 2006; Wilhelm

2007). This has implications for the instruction in literacy for adolescents in secondary

settings. Describing and measuring this potential phenomenon in teacher candidates will

help teacher-educators prepare them for literacy instruction.

Adolescent literacy demands comprehension work involving prior knowledge, posing a pedagogical problem beyond teaching the initial skills of decoding and phonological awareness. Struggling adolescent readers may have these skills, but often have few skills or strategies for the meta-cognitive work of comprehension. Their superficial understanding of text is akin to the transmission model of reading described by Schraw and Bruning (1996). The literature suggests that many learners have these rudimentary, naïve, or "folk notions;' of learning, particularly at earlier stages of their intellectual development, which is often characterized by a passive orientation to authorities, or alternatively, a sense that all knowledge is relatively the same. In Perry's scheme of moral and intellectual development (1970), many students (particularly in the first years of college) utilized authority-driven schemes of knowledge. In this scheme, the learner is a passive recipient of knowledge, whether it comes from authorities, or any of a number of relatively equivalent sources. This phenomenon has implications for the instruction in literacy for adolescents in secondary settings. Failure to commit to an active and constructivist model of understanding may compromise literacy instruction. Describing and measuring this potential phenomenon in teacher candidates will help teacher-educators prepare future teachers for literacy instruction.

Schommer (1994) argues that her work has taught her several things that she would apply directly to the teaching of pre-service teachers in order to facilitate more complex and nuanced beliefs about knowledge. First, teach in a way "[T]hat communicates learning as an active, personal construction of knowledge" (p. 311). Second, communicate that learning is a "struggle, and that this struggle generates

emotion" (p. 311). Schommer argues that emotion is central to the promotion of sophisticated construction of knowledge. Her interview subjects have commonly told her "That teachers should show that they care" (p. 312). Emotion (caring) indicates relationship and connections – between people, between ideas, between systems of knowledge. Knowledge is not simple and transmissive when connected to emotion. Secondly, teaching should be done in a way "[T]hat conveys learning as seeing the connections among ideas and that these connections are always evolving in nature" (p. 312). Thus, sophisticated epistemology is not merely domains or measures of knowledge models; instead, it is the interconnectedness of ideas, emotion, and construction of understanding.

Epistemology and Content-Area Teacher Preparation

We should pay close attention to the domain or discipline specific factors that shape the kind of knowledge and thinking that characterizes learning within a particular field of endeavor (Gardner, 1991, 2000; John-Steiner, 1997). Teacher candidates who prepare for content-area teaching, whether in science, mathematics, social studies, or another discipline, will face the challenge of teaching texts and literacy after a culturally mediated set of "apprenticeships with parents, mentors, and distant teachers," all of which contribute to a particular epistemological world view (John-Steiner, 1997). By definition, many of these learners will approach the challenge of teaching from text *without* the mindset and skills that we might see in teacher candidates who have chosen the language arts, literature, and writing as an undergraduate focus. That is, epistemologies may differ from content-area to content area, as disciplinary and

discourse assumptions differ (Hofer, 2002; Jehng, et al, 1993; McKenna & Robinson, 2006; Kawasaki, K. & Herrenkohl, L., 2004). As students become more expert in a content-area, they will naturally believe in their own ability to solve intellectual problems. However, the challenges of literacy may be more "ill-structured" than other problems, and facile problem-solving may fall short of critical thinking for effective pedagogy (King & Kitchener, 1994).

How university teacher preparation curricula and instruction approach this problem is an important question for consideration. Professionally reflective practice is critical to teacher education programs, in that it models the dispositions needed for learning within the complex system of a classroom (Brookfield, 1992). King and Kitchener cite a powerful summary of this challenge:

> In the final analysis, the real challenge of college, for students and
> faculty members alike, is empowering individuals to know that the world
> is far more complex than it first appears, and that they must take
> responsibility and from which they may not flee by disclaiming expertise
> (Association of American Colleges, 1991, pp 16-17, in King &
> Kitchener, 1994).

As noted earlier, college coursework can actually undermine student development of sophisticated epistemology, even if only temporarily (Cole, et al., 2000; Perry, 1970). Of course, teacher education programs hope for better. As Brownlee et al. argue, the goal of teacher education programs should be "[T]o help students to be more meta-

metacognitive and focus explicitly on their epistemological beliefs in order to promote

such belief change" (2003).

Successful literacy educators must assess the source and nature of student

motivation and engagement with academic discourse -- how motivated a learner is to

make sense of a new text can depend on discourse specific or socio-cultural factors that

include prior knowledge. Gardner (1991) argues that the intellectual assumptions of a

discipline may often be implicit, and readers will not see or know the relevant prior

knowledge within an academic domain. The implicit skills for an expert (the teacher,

for example) may be completely hidden for novice readers within a particular domain or

discourse. Gee (2001) shows how students must be initiated into the texts of secondary

discourses, as they come to unfamiliar discourse with different implicit assumptions

about text. Some challenges do not have simple or single solutions. They are "ill-

defined," and actually, they typify school settings (King, 1983). Shanahan and

Shanahan (2008) argue that disciplinary literacy is actually a complex set of different

skills, and that many content-area literacy curricula underestimate the cognitive and

discipline specific demands of teaching reading comprehension within specific content

areas. Shanahan and Shanahan's (2008) findings underscore the need for "[More

sophisticated but less generalizable skills and routines" (p. 45). Students will likely

need to change epistemological beliefs to acquire mastery of teaching content-area

reading comprehension. Without skills to think about their teaching, and skills to

develop their practice, these problems will challenge prospective teachers' trajectory

toward becoming effective teachers (Brownlee, et al., 2001). The flexibility and

sophistication of teacher-candidate epistemology is likely a valid predictor of their

willingness to engage in difficult work with competing or parallel discourses which

adolescent readers must navigate (Gee, 2001; King and Kitchener, 2004; Perry, 1970).

Secondary content-area teachers, who are a specific sub-set of teachers, can

serve as role models and mentors in processes that encourage and develop literacy with

their adolescent students. Teachers exhibit the characteristic ways of understanding

knowledge and thought within their discipline, just as all expert practitioners do (John-

Steiner, 1997). Wertsch (1991) refers to this as socially mediated thought, wherein the

social norms of disciplinary thought become the language of cognition. That is,

epistemologies may differ from content-area to content area, as disciplinary and

discourse assumptions differ (Hofer, 2002; Jehng, et al, 1993; Kawasaki & Herrenkohl,

2004; McKenna & Robinson, 2006). When practitioners in a discipline (that is not the

language arts) serve as role models for reading and writing, and when they function to

shape students' reading comprehension practices, they are engaging in the best sort of

cognitive behaviorism (Bandura, 1971.) Allington argues that teacher talk sets up the

modeling of inquiry driven instruction, rather than teacher as "[G]iver of information, as

in the traditional transmission classroom" (2007, p. 285). Content-area teachers will

need sophisticated epistemic beliefs and reflective judgment to meet the pedagogical

challenge of interactive and inquiry driven practices (Jehng, et al., 1993; King and

Kitchener, 2004).

Epistemology and Texts

Theory about reading offers multiple approaches to finding meaning and knowledge from reading printed matter. The research question at the center of this inquiry demands a consideration of the varieties and modes of professional practice that teachers utilize as they work with texts, readers, and the subject matter of academic settings. If introducing more learners to greater literacy is a desirable goal, those research findings about "better practices" and epistemological dispositions toward text are crucial to understanding how best to prepare teacher candidates to teach reading effectively in all subject areas. Student attitudes toward text may be understood as "implicit models," which have a direct relation to reader motivation to read, ask questions, and construct sophisticated understandings of text (Schraw & Bruning, 2000, p. 281). Indeed, as King and Kitchener stress, how an individual understands the part of himself that is a learner is critical to his own judgment processes in approaching intellectual problems (1994).

Theorists about readers' responses to text (Beach, 1994; Rosenblatt, 1978; Schraw & Bruning, 1996) describe readers as tending toward transmission understandings of text, on one hand, or transactional understandings of text-based-learning, on the other hand. Transmission theory resembles "folk-theory of-mind' (Bereiter, 2002; King & Kitchener, 2004; Lakoff & Johnson, 1999), as it depends upon the reader understanding text as information to be deposited into the brain. Gee (2001) argues that human language is not limited to conveying information. He writes: "[W]ords and grammar are not primarily about giving and getting information but are

rather, about giving and getting different perspectives on experience" (2001, p. 716).

This model of language suggests highly interactive and situated literacy, not mere

transmission of text.

Transactional text epistemology postulates reciprocity between the reader and

the text, and an increased focus on the reader's construction of meaning (Rosenblatt,

1978; Schraw & Bruning, 1996, 2000; Vygotsky, 1978, in McDevitt and Ormrod,

2007). Rosenblatt (1978) argued that reading must be understood as an aesthetic

process (including creativity, a transaction, and imagination), and not merely as efferent

practice, performed according to rules and information-retrieval. Wolf (2007) argues

that text-based literacy is a socio-cognitive construction with both neurology and social

constructs as foundation. Bruner (1991) rejects transmission models of cognition,

offering instead that learning is a function of human narrative-making as a form of

epistemology. Cunningham and Fitzgerald (1996) show epistemology as a foundation

for different varieties of pedagogy in reading instruction, including teacher orientation

toward transmission versus transaction. Schommer points out that for naïve learners,

"[L]earning to read means memorizing words" (1994, p. 304). They also believe that

reading comprehension is a quick process yielding certain information (1994, p. 304).

Snow (2002) argues for instructor sensitivity to awareness of the simultaneous process

of "extracting" and "constructing" that readers bring to the act of reading (as cited in

Robinson & McKenna, 2008, p. 67). Ideally, readers learn ways to use prior

knowledge, a relevant, meaningful text, and new understandings gained from that text,

to create an integrated system of new knowledge. Ivey and Fisher (2008) argue that

part of the relevant work of incorporating prior knowledge theory in instruction is

choice of texts that connect to students' actual sense of the world. As Atwell (2007)

argues, reading is a personal art, and choice and relevance are critical to adolescent

motivation to read. Teachers must know a great deal about books, and have

sophisticated insight as to book choices, if they are to be successful in promoting

classroom reading (Atwell, 2007). Content-area teachers have often avoided this path

of intense reading in their own academic choices; consequently, they will need

sophisticated epistemic beliefs and reflective judgment to meet this pedagogical

challenge (Bain, 2004, Beach, 1994, Jehng, et al., 1993; King and Kitchener, 2004). As

Hofer (2002) argues, the epistemological assumptions of specific disciplines will

contribute to these dispositional characteristics in our learners who are prospective

teachers.

Prior Knowledge Theory and Reading Texts

The literature has suggested that many learners have rudimentary, naïve, or folk

notions of learning. These learners understand knowledge in ways that deter dynamic

literacy instruction; i.e., the brain as a container for knowledge, the idea that all brains

are pretty much the same, or knowledge comes arbitrarily from authorities (Bain, 2004;

Bereiter, 2002; Lakoff & Johnson, 1999; Perry, 1970).

A reader's readiness to tackle the work of comprehension is dependent on prior

knowledge, and will predict the reader's ability to organize and systematically store

knowledge, a vital factor in recall. We have mental representations of the world which

we activate to tell what's going to happen next. The more such representations that we

have, and the more flexibility we have in manipulating those representations, the more success we will have in accommodating new understandings, or making successful inferences. Promoting adolescent literacy demands comprehension work involving prior knowledge, posing a problem beyond the initial skills of decoding and phonological awareness, which are the characteristic challenges for elementary school learners, but not necessarily adolescent readers. All reading is a matter of making sense of new text in terms of what we already know about the world, and about the ways that texts relate to our prior knowledge. Bruner cites Krech as emphasizing that human learning "is hypothesis driven, not just passive registration" (2004, p. 18). Promoting adolescent literacy cannot be mere coverage of content-area topics; instead, it must be built on active questioning and testing, the hypothesis-driven activity that is at the core of knowledge construction.

This is consistent with the prior knowledge reading research of Pressley, who is deeply interested in empirical investigation of student questioning and hypothesizing about text. Questions and hypothesis-making strategies are also crucial to the integration of prior knowledge in reading comprehension. Pressley (1992) has been instrumental in attempting a comprehensive research project into the relationship of prior-knowledge to strategies of questioning by student readers and teachers. He states: "Generating answers to thought-provoking questions may promote learning by activating relevant prior knowledge" (1992, p. 101, Pressley, 2006). Pressley argues that how much questions help learning is a function of how consistent questions are with prior knowledge and new material to be read and learned (1992, p. 102, Pressley,

2006). In his review of empirical work in this area, Pressley notes that questions that are answered with elaborated and justified answers do a better job of improving learning from text. This is consistent with theory --- the more readers fully integrate their answers about text with what they already know about the world, the deeper the learning result we might expect to see.

Skilled secondary classroom teachers can alleviate this prior knowledge "trap" by successfully invoking, and explicitly teaching, the skills or strategies that connect readers' prior knowledge to the implicit demands of a new text (Alexander & Jetton, 2000; Johnston, et al., 2001). Pressley et al. stress how often post-reading strategies emphasize superficial aspects of learning, and do not force students to do the "deep processing" that relates prior knowledge to new learning (1992, p. 92) "What a reader knows prior to approaching a text is a key factor in whether that reader will be able to understand and transform the concepts found in text to new crystallized knowledge or learning" (Grisham & Wolsey, 2008, p. 388). Such practice creates scaffolding from readers' own knowledge to *knowledge to be learned*, a pedagogical aim consistent with Vygotskyan theory (1978) and the work of Bruner (1991). Teacher preparation programs must have tools to assess candidate readiness to do this, as prospective teachers with transmission theories of text cannot help learners engage actively with reading comprehension.

The educators who will develop reading comprehension in struggling adolescent readers will need sophisticated views of knowledge and texts. In a 2002 review of reading comprehension research, Snow, et al. argue for instructor sensitivity to the

factors that combine to create text comprehension specifically, and understanding,

generally: "Appropriate instruction will foster reading comprehension, which is defined

two ways – the comprehension of the text under current consideration and

comprehension capacities more generally" (as cited in McKenna and Robinson, p. 67).

This comprehension work -- the business of asking questions, sorting patterns, and

adjusting schemas – all involving prior knowledge --probably represents a reading stage

beyond the skill set of decoding and phonological awareness. McKenna and Robinson

write that according to Paris and colleagues, "…[A] certain threshold of decoding and

memory would need to be exceeded before strategies such as skimming, rereading,

using context, planning, paraphrasing, and summarizing could 'play [a significant role

in children's reading comprehension'" (as cited in McKenna and Robinson, 2008, p.

74). This is analogous with research into the notion of cognitive load; that is, readers

who are juggling the work of word-sound correspondence or decoding will have

relatively few cognitive resources left for deep processing of comprehension tasks.

Readers who have these skills, but who have few skills or strategies for the cognitive

work of comprehension, will tend to have superficial understandings. This is akin to the

transmission model of reading described by Schraw and Bruning (1996).

　　　　Ideally, readers learn ways to use prior knowledge, a relevant and meaningful

text, and new understandings that they gain from that text, to create an integrated

system of new knowledge. Ivey and Fisher argue that in this sense, part of the relevant

work of incorporating prior knowledge theory in instruction is choice of texts that

connect to students' actual sense of the world: "If we want students to comprehend

what they read, we must begin by letting them experience texts that make sense to them" (p. 101, as cited in McKenna and Robinson, 2008).

The conventions of print, as well as the assumptions of socio-cultural discourse, represent additional ways readers rely upon prior knowledge to negotiate texts. According to the Rand Reading Study Group, the physical or organizational elements of a text have a large impact on readers' success with negotiating the text with comprehension (2002, in McKenna and Robinson, 2008). Anderson cites Armbruster (1984) in reminding us that writers must consider the prior knowledge of their readers as they determine the focus of a text intended for a particular audience. In this respect, decisions about audience by writers, and decisions about text selection by teachers, include a critical element of prior knowledge assessment. For teachers, using pre-reading strategies such as the K-W-L chart designed by Ogle (as cited in Allen, 2004) or the anticipation guides advocated by Beers (2003) are ways of establishing the appropriate match between readers and texts. Some texts may be considered more or less "considerate" in terms of prior knowledge; for instance, an "inconsiderate" text may fail to account for the real interests, skills, or knowledge schemata of readers (Armbruster, 1984, as cited in Alexander & Jetton, 2000, p. 289). Effective teachers plan for the appropriate level of skill-building and scaffolding for their learners. They understand that instruction with texts will necessitate a constellation of skills and scaffolding. Among these are consideration of the physical features of the text, which can include feature of genre, manuscript format, technical vocabulary, and graphic representation.

In the case of a specific discipline such as science, prior knowledge might make all the difference in students' ability to organize and synthesize text. In science, background knowledge is vital, as science courses often demand of students that they "…survey an entire field of knowledge" (Santa, et al., 2008, p. 240). It is crucial that teachers in technical fields such as science invoke strategies that help students utilize prior knowledge, so that the demanding informational content of courses is not lost on uncomprehending readers.

One hope of teacher educators is that all teachers might approach the task of subject area comprehension with great sensitivity to the role that reading comprehension plays in facilitating understanding within that discipline. Models of such teaching for understanding utilizing reading comprehension strategies have historically been rare, but today they have become a more common part of teacher preparation discourse. Table 3 depicts the questions posed by Santa et al.(2008), questions that all teachers of science reading might well utilize.

Table 3

Teachers of Science Utilizing Questions for Reading Comprehension

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1. How can I help students figure out what they know or don't know about a topic?

2. How can I help students assess the accuracy of their background knowledge?

3. What knowledge do my students need before they read? Or what misconceptions need to change before students read?

4. What do I want students to focus on during the assignment?

Note. Adapted from Santa, et al., in Lapp (2008, p. 240).

Specific prior knowledge strategies such as textual conventions, organizational schemata, and active questioning are all related to an overarching theme in comprehension instruction. All effective instruction with prior knowledge in mind is a matter of making reader knowledge explicit. Cunningham and Shagoury (2005) identify specific strategies for improving reading comprehension that relate strongly to prior knowledge theory. Instructional plans should afford opportunities for *making connections between the texts and the readers' lives.* Students and teachers should frequently engage in *Asking Questions* to transact with the text in meaningful ways. Students need explicit instruction in *Determining Importance*, which may be understood as an active process of relating prior knowledge to what is important to acquire as new

knowledge. Finally, like Smith (2004) Cunningham and Shagoury (2005) emphasize

the importance of *Inferring*, or making a connection between what is known and what is

likely to happen next in the text. Deep comprehension may be understood as *Synthesis,*

or using what is known by a reader prior to reading and extending it to a new

comprehensive understanding (as cited in McKenna & Robinson, 2008, p. 96).

Lapp, et. al. (2008) summarize the contributions of cognitive theory to content-

area literacy concerns with student theory-of-mind. Skilled secondary classroom

teachers can alleviate this prior knowledge "trap" by successfully invoking, and

explicitly teaching, the skills or strategies that connect readers' prior knowledge to the

implicit demands of a new text (Alexander & Jetton, 2000; Johnston, et al., 2001). Such

practice creates scaffolding from readers' own knowledge to *knowledge to be learned*, a

pedagogical aim consistent with Vygotskian theory (1978) and the work of Bruner

(1991). Teacher preparation programs must have tools to assess candidate readiness to

do this, as prospective teachers with transmission theories of text cannot help learners

engage actively with reading comprehension.

Learners who are acquiring domain-specific knowledge based on the

assumptions of their discipline may develop what Hofer calls "impediments to learning"

(Hofer, 2002, p. 11). This makes sense given the overarching importance of prior

knowledge in any cognitive enterprise, including reading. A reader's readiness to tackle

comprehension depends on prior knowledge, and will predict the reader's ability to

organize and systematically store knowledge, a vital factor in recall; Daniels and

Zemelman state the challenge in this way: "If we understand that reading is not just

'receiving a message,' but actively building upon prior knowledge using staged,

strategic thinking, then we will teach differently" (2004, p. 31).

Prior knowledge theory is among best practices for teachers (Daniels &

Zemelman, 2004) but it also represents good science in the context of what we now

understand about the human brain, the evolution of language, and the ways we are

probably "wired" to learn. Pinker, the psycholinguist who has revolutionized interest in

the evolution of language and the brain, is careful to show how vital context, intention,

and meaning are to understanding language: "Cognitive neuroscientists must get the

whole person to behave, and any bit of language behaviour must recruit many abilities

at once: words, grammar, meaning and knowledge, intentions to speak or believe what

is spoken…." (1997, p. 548). Brain-based cognitive models need not be mechanical.

As Chomsky (1959) argued nearly fifty years ago, human language use is rarely just

functional adherence to rules. More recently, Damasio (1994) argues that the

biological basis of our brains makes us incredibly complex and fragile. We are living

organisms, Damasio reminds us, and as such, we are not mere-rule followers (1994).

Epistemology, Literacy Practice, & Policy

Models of reading should not be mechanical, nor should the policies and

curricula that serve to encourage literacy. As Iser (1978) states it: "Reading is not a

direct' internalization', because it is not a one way process, and our concern will be to

find means of describing the reading process as a dynamic interaction between text and

reader" (p. 107). Barton (2007) argues that the public discourse of literacy has often

involved the metaphor of literacy skills, an understanding and set of definitions that has a bias toward mechanistic thought and measurement:

> The idea of skills derives from psychology and its use was originally unrelated to language and reading. Today the skills metaphor is applied to reading and many forms of learning, and it fits in well with general cultural moves toward measuring and monitoring human activities. Briefly, when applied to reading, it is an autonomous view of literacy; that reading is a set of skills which can be broken into parts and taught and tested. (p. 161)

Today's teachers in training are the products of a particular socio-cultural discourse of learning, one that reflects this mechanistic and measurement metaphor for literacy processes. In this milieu, the contemporary political context of educational emphases on literacy, standardized assessment, and accountability have created a generation of potential teachers most of whom have only recently left the environment of secondary high stakes testing. In turn, they will constitute the next generation of teachers – those who will implement the culture and discourse of accountability and assessment for future learners.

In this environment of accountability and measurement, and in contrast to the constructivist inclinations of many researchers into prior knowledge and reading comprehension, some reading researchers are confident that the instrumental, rote skills models of explicit phonics instruction are what work at elementary levels. For these practitioners, all reading instruction must be explicit and guided, downplaying

comprehension strategies in favor of "specific guidance" Williams (2006, p. 139).

Williams' structural and instrumental model of instruction might be understood as an

example of 'Reading First' pedagogy, which in 2001 became the official reading policy

of the U.S. Department of Education, so of course it is very relevant to practicing

teachers. Only future research will be able to show whether or not this emphasis on

teacher-directed instruction will improve literacy, given its caveats about independent

reading and student-generated interactions with texts.

Significant voices in the literacy field argue that skills based paradigms should

shape and influence literacy pedagogy generally. Williams (2006) is confident that the

quantitative models of explicit phonics instruction are what work. She argues that

elementary level instruction must be explicit and guided. It should downplay

comprehension strategies in favor of 'specific guidance' (p. 139). Her focus is on skill

development as a kind of true reading pedagogy. Only future research will be able to

show whether or not this emphasis on directed, scripted, and mechanical instruction will

improve student reading K-12. In the meantime, actual practitioners report that schools

under Reading First grant programs have reduced or prohibited promotion of student

silent and/or independent reading (Garan, 2002; Kersten & Pardo, 2007).

Yatvin, et al. (2003) suggest that the effects of 'Reading First' curricular

programming may actually prove detrimental to better student learning: "Indeed, the

rigid use of a commercial reading program may crowd out silent reading, literature,

writing, and discussion from the curriculum, with harmful effects on children's literacy

development" (2003, p. 30). For Wolf, reading is a dynamic of development and

environmental factors (2007). Research must ascertain whether recent emphases on "Reading First" curricula, and on subsequent high stakes literacy testing, have had an epistemic effect on the next generation of learners who will become teachers.

Actual reading might also improve literacy, despite the caveats about independent reading within the NRP report (Atwell, 2007). Edmondson and Shannon (2002) argue that students can learn to read and improve their reading by having time in the school day to read a book (p. 454). Wolf (2007) also suggests the richness of effective literacy development:

> The amount of time the child spends listening to parents and other loved ones read continues to be one of the best predictors of later reading. As they listen to stories of Babar, Toad, and Curious George and say 'good night moon' every evening, children gradually learn that the mysterious notations on the page make words, words make stories, stories teach us all manner of things that make up the known universe. (2007, p. 221)

Pinker, whose rules-based models of cognition would seem to inveigh against this holistic vision of literacy, offers language that is congruent to Wolf's philosophy of reading for meaning: "The goal of education should be to provide students with new cognitive tools for grasping the world" (p. 29). Stahl (1998) argues against the pure 'theory' of whole language advocates, but makes the following case for balanced, and even eclectic, approaches:

> [A]n effective teacher of reading has to understand how reading develops, in all of its manifestations. This involves deeper

understanding of the development of automatic word recognition, comprehension, and motivation and appreciation and a skill in weaving these various goals into a coherent program. (p. 61)

Allington (2005) reiterates this point of view from the perspective of a reading pedagogy specialist who has actively protested the pedagogy of rules based programs such as Reading First: "Good teaching, effective teaching, is not just about using whatever science says 'usually' works best. It is all about finding out what works best for the individual child and group of children in front of you" (2005, p. 462). Rich models of the mind, and of the development of literacy through the active engagement with altering and building knowledge, are vastly preferable because they emphasize the constructive nature of knowledge. Gee (2001) argues:

The container / conveyor metaphor is (Lakoff and Johnson 2003; Reddy, 1979) is, as we shall see, a fallacious view of meaning. It gives rise to idioms like "I catch your meaning," "I can't grasp what you are saying," "I've got it," "Let me put the matter in plain terms," "I can't put it into words," and a great many more. So, it is easy for us to accept the suggestion of our grammar and see teaching languages as a form of mental transference of neatly wrapped little packages (drills, grammar lessons, vocabulary lists) along a conveyor belt from teacher to student. (p. 96)

This view of learning leads to the fossilizing of practices into what Gee (2001) calls "frozen theories," or what Kozol (2005) labels "ossification."

The National Reading Panel Report and 'Reading First' policy operate from a particular discourse within the scientific and education communities. As Gee (2006) argues, language can be used in ways that "enact specific social activities and social identities" (p.1). The discourse associated with the NRP and Reading First values science, scientific research, evidence, and accountability in particular ways that are often associated with conservative politics, back-to-basics rhetoric, and standards-based curricular reform. It recruits language in ways that further these political and educational agendas (Gee, 2006). Erickson (2005) argues that the work of the NRP manipulates a particular version of science: "In contemporary (high modernist) parlance 'science' connotes rigor and certainty --- it provides a warrant for true beliefs, a ground for master narratives" (p.5). Erickson denotes this as scientism, rather than science (2005). In science, there is room for doubt, uncertainty, and new questions. In scientism, answers are confirmed and unyielding, and not subject to new questions. Scientism is sometimes defined in terms of scientific positivism; i.e., the philosophical conviction that scientific progress is inevitable and inexorable over time. Cunningham (2002) discusses this epistemological question in terms of the NRP agenda and research methodology, arguing that the "NRP clearly holds s verificationist philosophy of science (as cited in Allington, 2002, p. 55).

Cunningham continues by describing the philosophical epistemology characterizing the work of this influential body of experts:

> Like all positivism, the Panel's work reveals a desire for certainty and
> a willingness to engage in reductionism to achieve it. All positivists

have been antirealists (Cunningham & Fitzgerald, 1996), apparently

because they are uncomfortable with the wide and never-closing gap

between our knowledge and our questions (Searle, 1995). Their

strategy has been to increase their comfort by reducing the questions

one is permitted to ask, and reducing the ways one is permitted to

answer them. (as cited in Allington, 2002, p. 56)

Bruner's assertions about pedagogy and cognition contradict assumptions

implicit in 'Reading First' model of learning: "Concentrate on how children master

their native language and you arrive at a very different conception of learning than had

you researched how undergraduates memorize nonsense syllables" (2004, p. 13).

Repetitive tasks of the type common to 'Reading First' preferred curricula are

typical of behaviorists' conception of human learning, a largely outmoded version of

human nature (Bruner, 2004; Searle, 1984). This return to the fifties and sixties

pedagogy of behavioristic reinforcement implicates contemporary educators in a new

pedagogical commitment to "kill and drill." The mechanistic and rote processes by

which K-3 literacy is to be developed within Reading First curricula seem antithetical to

this view of socially mediated cognition. The Reading First model of tightly scripted

instruction, mechanical manipulation of language, and rote learning of lists of words is

perhaps an oversimplification of the scientific approach to mind, given that researchers

into cognition and reading offer a more constructed notion of human learning, one more

amenable to prior knowledge theory. Pinker (1997) is an advocate of phonics

instruction, and a psycholinguist whose rules-based models of cognition help to define

our understanding of language and brains today. This vision would seem to fly in the face of holistic visions of literacy, yet Pinker also comes down on the side of a more integrated approach to reading, one that offers language that is congruent with a prior knowledge theory: "The goal of education should be to provide students with new cognitive tools for grasping the world" (1997, p. 29).

Implications

Learners who are acquiring domain-specific knowledge may develop "impediments to learning" based on the assumptions of their discipline (Hofer, 2002, p. 11). This makes sense given the overarching importance of prior knowledge in any cognitive enterprise, including reading. A reader's readiness to tackle comprehension depends on prior knowledge, and will predict the reader's ability to organize and systematically store knowledge, a vital factor in recall; Daniels and Zemelman state the challenge in this way: "If we understand that reading is not just 'receiving a message,' but actively building upon prior knowledge using staged, strategic thinking, then we will teach differently (2004, p. 31).

Snow (2002) argues for instructor sensitivity to awareness of the simultaneous process of "extracting" and "constructing" that readers bring to the act of reading (in Robinson & McKenna, p. 67). Ideally, readers learn ways to use prior knowledge, a relevant, meaningful text, and new understandings gained from that text, to create an integrated system of new knowledge. Prospective teachers will need the orientation of active, engaged, and life-long readers. As Gee argues, the conflicts of various discourses, whether mainstream, academic, or marginalized, "…are an integral part of

the language teacher's job" (2001, p. 114). Teaching well is often a challenge of creating appropriate foci for student attention (Gee, 2001; Schmoker, 2010). Content-area teachers will need sophisticated epistemic beliefs and reflective judgment to meet this pedagogical challenge (Bain, 2004, Beach, 1994, Jehng, et al., 1993; King and Kitchener, 2004). As Hofer (2002) argues, the epistemological assumptions of specific disciplines will contribute to these dispositional characteristics in our learners who are prospective teachers.

Preparing teacher-candidates to embrace literacy education will require us to understand better how models of reading epistemology influence their own notions of how brains construct meaning from texts. Teacher candidates, who represent the perspectives and experiences of content-area expertise, teacher preparation, and professionalism, will play a role in promoting text-based literacy practices. As Iser argued, readers do not approach texts as 'black boxes' receiving inputs according to a transmission model of learning (1978). Indeed, reading is a dynamic transactional process very dependent upon the epistemology that readers bring to the task of comprehending texts. For future teachers of literacy to be successful in confronting the challenges of student reading comprehension, they will need the kinds of beliefs, prior knowledge, and skills that sophisticated readers employ. Continued work in epistemological theory and research will play a vital role in our pedagogy for content-area teacher candidates whose future work will be critical to adolescent literacy.

At present, there is a gap in the literature of epistemology because there has been little investigation of teacher epistemology and its ramifications for teaching

literacy to adolescents in content-area courses. Investigating and describing teacher candidate learning (and teaching) experiences, beliefs about knowledge, and understandings of learners' minds, can have significant import for constructing curricula and pedagogy for secondary content-area reading courses. Research that elicits student responses about their views of learning, knowledge, and texts, is invaluable. Additionally, individual narratives that describe teacher candidate acquisition of a personal epistemology of text will add to our understanding of teaching literacy. Findings will have implications for teaching of literacy methods to content-area teacher candidates, and to teacher preparation programs generally, which must wrestle with the reality of teacher candidates' beliefs about knowledge and learning.

Chapter Three: Methodology

Introduction

This chapter begins with an overview of the research question and design proposed by the researcher. The rest of this chapter will consider two major concerns that are germane to research into student epistemology. First, the researcher will describe research approaches typical of the field of learner epistemology, considering research inquiry into epistemology from the qualitative and quantitative research designs. Second, the chapter will propose and describe a research design suitable for a robust investigation of pre-service teacher candidates' beliefs about knowledge, learning. The researcher will argue for a particular mixed methods approach to the problem posed by this project.

As suggested in Chapter One, this project will pursue a multi-stage and mixed methods design in an attempt to elicit valuable data and descriptions of teacher candidate epistemology (Creswell, 1994; Glesne, 2006; Hubbard & Power, 1999). As argued in Chapter One, not enough is known about the beliefs and attitudes that characterize future teachers' epistemology and understanding of learning from texts. Consequently, this study will seek to learn more about the beliefs and attitudes about knowledge and learning from text that future teachers exhibit. Inquiry will begin with the formulation of several research questions, which have been refined to include two major topics of inquiry.

The following research questions provide guideposts for the gathering of data in this research project. The main question is stated here: What beliefs and attitudes about learning from text do future teachers hold? Secondary, or sub-questions follow: 1) What beliefs about the nature of learning and knowledge do these beginning teachers hold? 2) What value or role do these teachers place on learning from text, and what value or role do these prospective teachers place on their future students' learning from text? 3) What will a measure of future teachers' attitudes toward text look like, and how will it correlate with existing measures of learners' epistemological beliefs?

Research Methodology in the Literature of Epistemology Research

In retrospect, it seems evident that the field of epistemology, and the consideration of learner cognition generally, has been advanced by the confluence of a variety of methodological approaches, both longitudinally through several decades of research, and contextually, as different researchers have tackled this problem in discrete and distinct ways. That it has taken multiple methods for researchers to gain useful perspectives on student epistemology should not surprise us. The problem of pre-service teacher epistemology is complex, but several facets of it can be captured by utilizing research questions and research paradigms to examine particular facets of student epistemology. As Kuhn (1962) argues, paradigms are critical models about how best to think about domains of knowledge, but it is also the case that paradigms may overlap, compete, or conflict. Likewise, authorities on research methodology argue that matching questions to methodology requires sensitivity, reflection, and awareness of research paradigms (Blaikie, 2000, Creswell, 2003, 2007, Fitzpatrick, Sanders, &

Worthen, 2003). Denzin and Lincoln (1998) summarize the value of multiple perspectives in methodology: "…[t]he use of multiple methods, or triangulation, reflects an attempt to secure an in-depth understanding of the phenomenon in question" (p. 4).

Student epistemology is at once a concrete phenomenon and a complex abstraction. In this sense there is a spectrum of knowledge about learner epistemology. On one end of the spectrum, educators recognize the evidence of learners' theories of mind, whatever the field or discipline. We know when students grasp new understandings, and we also recognize when students have naïve or simplistic epistemological positions vis a vis our curricular material or knowledge about the world. On the other end of the spectrum, investigating learners' beliefs about knowledge and learning is inquiry into the phenomena of mind and thought. Philosophy, psychology, neuroscience, and cognitive science are all engaged in the daunting task of teasing out the truths of this problem, which is obviously complex, abstract at times, and multiplicitous. The research challenge in student epistemology is created by this complexity and variability of epistemic phenomena. Quite simply, investigating epistemology is investigating the complexity of human thought, so approaches to the field have been varied in methodology and orientation.

As indicated in Chapter Two, there is a wide selection of empirical data about student epistemology. Researchers have surveyed students about their conceptions of knowledge and learning. They have conducted empirical studies examining the effects of particular instructional interventions on student epistemology. Through interviews, they have gathered the stories of learners as they have the lived experiences of acquiring

an education and knowledge. Firsthand access to this data is limited; it is largely

proprietarily the data of specific researchers, and raw data are not available in forms

that another researcher can access without permission. Some exceptions exist, however.

Some researchers have used the literature of the field to conduct tests of the reliability

of constructs used by other researchers. For example, several studies in the field use the

instruments devised by others to test the validity of constructs. Schommer's (1990,

1998) Epistemological Beliefs Inventory has been analyzed and deconstructed by a

number of researchers, including some who have used Schommer's correlative and

factorial findings as data for further analysis. This researcher will use an adaptation of

Schommer's instrument created by Jehng (1993) and Jacobsen & Jehng, 1999) in one

portion of the research design. Others have used the secondary data from the field as an

independent variable, using the existing instruments such Schommer's survey (1990,

1998), King and Kitchener's Reflective Judgment Model (1994), to conduct research on

new dependent variables.

Another research line stems from Baxter-Magolda (1994), King (2000) and

King and Kitchener (2004) all of whom pursued the topic of gender and epistemology,

using Perry (1970) as a starting point. To a great extent, the interview protocol proposed

for this project draws upon this essentially ethnographic tradition with an empirical

bent, in which concepts or variables associated with learner epistemology are tested via

survey or interview.

Research Questions, Concepts, and Operations:

Research with a qualitative bent might frame the task of describing learner epistemology in terms of concept generation, concept mapping, and identification of typologies. The notion of operationalizing questions is central to quantitative research, but it makes sense generally as researchers ask any question about the minds of learners. Making questions operational – framing them so as to test assumptions about epistemology -- suggests rigorous effort in identifying central epistemic concerns.

In considering student epistemology, researchers have pursued several areas of inquiry, defining the problems and topics of epistemology in various ways. First, some researchers (Baxter-Magolda, 1994; Perry, 1970; Schommer, 1990, 1994, 1998) are interested in the chronology of epistemological beliefs – these researchers employ cross-sectional studies of student beliefs, with an emphasis on the variation in beliefs as a variable dependent upon age or year in schooling. In this model, researchers follow epistemological beliefs over time, and use this longitudinal data to postulate *stage theories* of student epistemology.

Second, some researchers create domain models of epistemology, and structure surveys or interviews to establish *typologies of epistemology* in learners. Schommer (1990, 1994, 1998; Schraw & Bruning, 1996, 1999) among others have worked within this paradigm. These domains or typologies are often subsequently used as independent variables, and academic tasks such as comprehension, success in problem solving, flexibility of thinking, or academic achievement are offered as dependent variables.

Third, some researchers have used the variable of *academic discipline* (domain, content knowledge, or subject area expertise) as an independent variable, and pose epistemological beliefs as a dependent variable. These researchers (Jehng, et al., 1993; Beach, 1994; White, 2000) pose questions that inquire about the effects of student preparation, prior knowledge, and training in a field, and the epistemological beliefs those students hold. Some studies of this type use correlational statistical analysis; i.e., researchers look for correlative relationships between subjects studied and the kinds of beliefs that students hold. For example, a researcher may want to find out how many students studying science in a middle school actually acquire sophisticated beliefs about the way that scientific knowledge works. Jehng, et al. (1993) investigated the relationship between "hard science" students and "soft studies" humanities students and the types of epistemological beliefs these groups of students held.

Qualitative Designs:

Others use more qualitative approaches, using case studies or ethnography to describe the phenomena of learner epistemology. The first major line of inquiry in learner epistemology utilized such qualitative methodology. The field of epistemological inquiry might be said to date from Perry (1968) who pursued an ethnographic study of college students four decades ago. This work offers a kind of gold-standard for possible qualitative inquiry into the phenomenon of student epistemology. Perry interviewed 1500 college students and constructed a model of student intellectual and moral development that exhibits stage typology. This longitudinal study sought to capture twin phenomena: First, the qualities and nature of

student beliefs about the nature of knowledge and learning during their college experience; and second, any developmental changes in student epistemology over the course of the college years. This model lends itself to a particular question that fits well with the challenging process of teacher education, and one that matches effectively with phenomenological inquiry.

Kawasaki, et al. (2004) conducted a field study by observing student epistemologies of scientific knowledge during instruction about object density and flotation. Student written comments, contributions to classroom discussions, and problem-solving discussions were recorded and analyzed to create a picture of epistemology acquisition within science. White (2000) used case studies and candidate interviews to survey teacher candidate epistemology and readiness to tackle ambiguous student-to-teacher interactions and teacher decision-making.

Quantitative Designs:

The second and more recent strand of epistemic inquiry follows a quantitative research paradigm. Schommer's (1990, 1994, 1995, 1998, 2000) work over three decades offers one paradigm of quantitative inquiry into student epistemology. Schommer has sought to increase the construct validity of the epistemological domains research through constant revision of her survey instrument, and she has sought to increase the reliability of measurement through experimental studies, descriptive studies, and longitudinal measurement. It is noteworthy that her commitment to increasing construct validity, instrument reliability, and statistical power, has resulted in several dozen studies using quantitative methodology.

Schommer (1990) assessed student epistemological beliefs through the administration of a survey instrument to assess students' beliefs, and subsequently, through the administration of a reading task. In this quasi-experimental design, student comprehension results were analyzed for correlation with epistemic beliefs. Several significant relationships were found, including the possibility that belief in quick learning correlates with poor comprehension, and the possibility that beliefs in absolute knowledge correlate with faulty comprehension of challenging texts. This study suggested the possibility of predicting student comprehension of text as a variable dependent on the epistemic beliefs held, including Schommer's argument that epistemology is likely a set of interrelated domains, rather than fixed stages. Jehng, et al. (1993) conducted similar research with an adaptation of Schommer's instrument, and found that students in the humanities were more likely to have flexible epistemologies than students in the hard sciences. Schraw and Bruning (1996) administered a Reader Beliefs Questionnaire to 154 undergraduates and subsequently used a scoring protocol and independent scorers to evaluate student comprehension of challenging texts. Factor analysis suggested important correlations between student epistemology of text as an independent variable and reader response as the dependent variable.   One important weakness might be noted within these empirical designs; notably, few controls if any were in place to describe or isolate prior knowledge as a factor in reading comprehension.

Cano (2005) conducted an experimental design including 1500 Spanish secondary students. Pre-test and post-test assessments of epistemic beliefs across a two-

year secondary curriculum suggested that epistemic beliefs change over time, and also correlate with student academic performance. DeBacker &Crowson (2006) proposed a hypothesis that epistemic beliefs of students would be related strongly to student 'need for closure,' or resolution of ambiguous problems. Ravindran, et al. (2000) used surveys of student epistemic beliefs in a teacher training program to predict the subsequent student engagement with difficult cognitive tasks. Results suggest that the variable of pre-service teacher beliefs is a strong predictor of candidate engagement with cognitive demands. Cole and Goetz (2008, unpublished manuscript) evaluated the epistemic beliefs of under-prepared university students. They subjected the population ($N = 101$) to university training for academically "at risk" students, and measured changes in epistemic beliefs after exposure to university coursework. Student epistemology changed in some cases, and also influenced subsequent university performance. This literature suggests that university coursework had the effect of driving some students back into their most rigid epistemic beliefs, a crucial finding for teacher preparation programs.

Research Design

The researcher proposed a two-stage, mixed methods design for this project (Creswell, 1994). This plan allowed the researcher to triangulate between different data and phenomena, offering "snapshots" of epistemic views and reflective thinking (King & Kitchener, 2004; Thomas, 1994). Several researchers describe the challenge of matching research paradigms to research questions with the metaphor of the bricoleur (Denzin & Lincoln, 1998; Kincheloe, 2001). Denzin and Lincoln describe this

approach to inquiry this way: "The *bricoleur* produces a *bricolage,* that is, a pieced-together, close-knit of practices that provides solutions to a problem in a concrete situation" (p.3).

For this project, formal research began with the formulation of questions, an outline of the proposed design, and submission of a proposal to the University of Minnesota Internal Review Board for project approval. Student participants were asked to review the project proposal and review a consent form (Appendix D).

A first stage in this plan provided a quantitative description of a significant sample of undergraduate content-area teacher candidates. The researcher surveyed pre-service teachers (N=75) who are beginning their undergraduate sequence of preparation for teacher licensure in a content-area (math, social studies, art, music, health, science, and foreign languages). A survey gave the researcher the opportunity to learn more about their theories-of-mind and their attitudes toward learning from text. A survey allowed the researcher to collect data about epistemological beliefs, attitudes toward text, and demographic and contextual variables for a sample of education candidates. The survey methodology offered the prospect of descriptive statistics, which were the researcher's focus in this descriptive project.

The primary instrument for the quantitative portion of this study was the Epistemological Beliefs Instrument (Jehng, et al., 1993; Jacobsen & Jehng, 1999. Initially, this instrument was an adapted version of Schommer's Epistemological Beliefs Questionnaire (1990).

The Jehng (1993) instrument examines the construct of epistemological beliefs as described by Schommer (1990, 1994, 1998, Schommer, et al., 2000; Jehng, et al., 1993). This model posits a) certainty of knowledge; b) omniscient authority; c) orderly process; d) innate ability; and e) quick learning as critical to student epistemology. In this metric, theories of mind and learning may be described as existing on a spectrum from naïve to sophisticated beliefs. Naïve beliefs are characterized by views that learning is a rigid experience, authorities are omniscient, learning is innate (quick), and knowledge is certain (stable) (Schommer, 1990; Jehng, et al., 1993). Through a series of questions asked via a Likert Scale instrument, the questionnaire sought to capture and describe the domains of epistemology as posited by Schommer (1990; 1994) and Schommer & Walker (1995). Appendix A displays the entire Jehng Instrument. In this project, survey results were scored by a protocol that uses composite scales to arrive at a score in each of five domains for survey takers. This instrument was particularly well-suited to this research question, as it uses a factor structure and scoring protocol amenable to adding text-based items as additional factors.

Sophisticated beliefs suggest the flexibility and transformative nature of learning, the primacy of independent learning, the gradual process of knowledge acquisition, and the tentative nature of knowledge about the world. Similarly, learners may hold naïve, transitional, or transactional views of learning from texts. They may see texts as simple sources of authority or information (transmission), or alternatively, as the medium through which individuals explore meaning and construct understanding (transactional). Of course, students may hold theories of mind and attitudes toward

learning that represent combinations or intermediate positions of the spectrums

described. Table 4 samples the varieties of questions utilized within the Jehng

instrument (Jehng et al, 1993; Jhng & Jacobsen, 1999) as it attempts to tap such

epistemic beliefs.

Table 4

Sample Items from Jehng's Epistemological Questionnaire

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1.   If scientists try hard enough, they can find the answer to almost every
        question.

2.   Most problems have one solution no matter how difficult they are.

3.   If you are ever going to be able to understand something, it will make sense to
        you the first time.

4.   Most words have one clearly defined meaning.

The researcher proposed an added domain for the survey instrument. Within the

instrument, the survey posed questions to subjects related to their epistemology of text,

including beliefs about the omniscience of textual authority, the importance of text to

learning, the process of acquiring comprehension of text, and the importance of text to

subjects' prospective content-areas (Schraw & Bruning, 1996, 1999). These questions

were used to address two factors. First, a composite array of questions sought

descriptive information about the students' dispositions toward reading texts. Second,

an additional composite array of questions sought descriptions of readers' inclinations

toward one of two poles on the spectrum of reading, from transmission models of reading to transactional models of reading.

Table 5

Sample Items from Text Domain

1.	Fiction is not my favorite because it is not about the real world.
2.	I have positive feelings about learning from words on a page.
3.	I study textbooks to know what the right answer is for a test.
4.	When I read something new, I wonder if it will be worthwhile.

The second stage of data gathering in this project used an interview protocol and qualitative methodology. Within a qualitative domain, inductive approaches might be more appropriate than hypothesis-driven approaches. Perry's work (1970) lends the model of interviewing prospective teachers about their beliefs. It works analogously with a driving question in this project: How do students who propose to become teachers describe their own understanding of knowledge and knowledge acquisition, and how does that understanding change over time?

While a research question is a useful start in approaching the phenomenon of student epistemology, it is not sufficient unto itself for beginning to describe phenomena. Following a concept map, the researcher developed a set of interview questions which address conceptual concerns that are of interest. The interview

protocol was judged to be most successful if aligned and balanced with respect to the concept map – questions that didn't address important concepts offered little in the way of useful data. Interviews with teacher candidates could take place over time in a longitudinal design as in Perry (1970), or they could be limited to a particular stage of teacher training, such as the outset of preparing to become a teacher, or alternatively, immediately following the challenging experience of student teaching, which is the final instance of the phenomenon of teacher training.

Developing a fully-fledged concept map that begins to capture the diversity of phenomena associated with teacher-candidate epistemology is a wise move (Creswell, 2007). In this case, the factors of learner epistemology (certainty of Knowledge, omniscient authority, orderly process, innate ability, and quick learning) formed the outline of the map. Fully exploring all of the possible phenomena, including all of the contexts that shape student beliefs about knowledge, is critical. This concept map includes identification of subject-area domains that influence epistemology, demographic variables, such as candidate age, life-experiences, and previous education, as well as programmatic variables that influence learners' attitudes, including graduation requirements, differences in subject-area requirements, and experiences in the field at practicum and student-teaching sites. The interview protocol (Appendix C) follows from this conceptual framework.

This stage of semi-structured interviews used qualitative inquiry to pursue thick description of the narratives and beliefs of candidates who aspire to teach in particular subject areas. A sample of participants (N= 15) engaged in a secondary level of

analysis through semi-structured interviews. This research design allowed triangulation between different data and phenomena, offering "snapshots" of epistemic views and reflective thinking, as well as descriptions of the challenges of university instruction (Creswell, 1994; Glesne, 2006; King & Kitchener, 2004; Thomas, 1994).

Initial interview questions were broad and generic, in hopes of characterizing the student teacher's disposition toward knowledge, school, and texts (DeBacker, et al., 2008; Johnston, et al., 2001; Schommer, 2000). Secondary questions were chosen with the view of eliciting student responses that represent their views of learning and knowledge. Findings would have implications for teaching of literacy methods to content-area teacher candidates, and to teacher preparation programs generally, which must wrestle with the reality of teacher candidates' beliefs about knowledge and learning.

In this study, the epistemic positions of undergraduates who were beginning their preparations to become teachers provided the context. Obviously, this is an excellent place to try to capture and describe what potential teachers say, believe, and learn about their own epistemic worldview. Interview transcripts were transcribed into textual documents, reviewed for categories of data in an initial coding scheme, and refined for further coding into a typology, matrix, or chart of data. Inter-rater reliability will be addressed by the use of parallel instances of coding by additional researcher-observers, with particular attention to the fit (or lack of fit) between conceptual understandings of the phenomena and the typologies that result from data analysis.

Population and Sampling Procedure

The University of Minnesota Duluth offers a course, Education 1101, each semester. In this particular semester, the university offered three sections of the course, with 410 students enrolled. Some students were meeting a liberal education graduation requirement. Others were beginning a progression of courses directed at teacher licensure. During the semester of research, 136 students enrolled in the course indicated that they planned on becoming teacher candidates eligible to teach in one of ten different licensure areas. For the purpose of this study, the researcher identified the 80 students who described themselves as future content-area teachers eligible to teach secondary education. Students who identified themselves as prospective teachers of Communication Arts and Literature were excluded from the study, given a research problem and questions that address content-area pedagogy and teaching of adolescent literacy. Similarly, students who proposed to teach in early childhood or elementary settings were also excluded, as their future licenses will not incorporate content-area teaching in secondary settings.

Sources of Data

Surveys were administered to the approximately eighty prospective content-area teacher candidates. Survey results were compiled, scored, and analyzed for descriptive data about future teachers. Next, the researcher interviewed candidates representing core licensure areas for content-area teaching in grades 7-12. Interview participants represented Teaching Social Studies, Teaching Mathematics, Teaching Life Science, Teaching Physical Science (and /or Chemistry), Teaching Art, Teaching Music, and Teaching Health, and Teaching a Language. The research conducted interviews using a

random sampling, while insuring that each content area was represented. All participants were volunteer participants.

Validity and Reliability.

Jehng's instrument (1993; Jacobsen & Jehng, 1999) has been in use for most of two decades, as has its predecessor, Schommer's survey (1990). Jehng, et al. created their instrument for the particular task of examining level of study and field of study, topics analogous to this researcher's proposed study. Schommer engaged in robust factor analysis to formulate her initial survey. Her ongoing work has sought to increase the validity of the survey construct. The contemporary literature of student epistemology suggests a four or five domain model for measurement of epistemological beliefs, even as researchers use different instruments. This is an example of parallel reliability, or researchers finding similar things with different instruments. Jehng et al. (1993) found epistemological dimensions to consist of five beliefs: Certain Knowledge, Rigid Learning, Innate Ability, Omniscient Authority, and Quick Process. According to this model, student epistemic beliefs will range on a continuum from naïve, and less conducive to learning, to sophisticated, or more conducive to learning (qtd in Cole, et al., 2000). Beliefs will be measured utilizing a Likert Scale instrument and scoring instructions for factors (Appendix A).

More recently (2004; personal correspondence, 2010) Schommer wrote and discussed the dilemma of epistemological beliefs. Inevitably, she argues, epistemological beliefs inquiry includes a trade-off between validity and reliability. On one hand, generic questions can be operationalized to elicit typical epistemological

beliefs. On the other hand, specific operations manufactured by researchers may not be valid representations of actual cognitive challenges encountered by learners.

Nevertheless, the field of epistemological research has converged on a set of concepts that many agree merit consideration as epistemic phenomena. While different researchers have approached epistemology in different ways, from interviews and observation to experimental procedures, they have tended to arrive at similar conceptions of student epistemology. Indeed, the field of learner epistemology has grown exponentially during the decades following Schommer's initial survey, and many researchers, including Jehng et al. have utilized surveys to capture student beliefs. On the other hand, it is a concern of such surveys that items may "load" the factors in different ways, a point argued forcefully by Wood and Kardash (2002). In their survey of research design and analysis within learner epistemology, Wood and Kardash (2002) urge caution with experimental design, longitudinal conclusions, and factor analysis. For these reasons, and because this study will utilize mixed methods, this researcher will argue that validity of construct and reliability are enhanced by the triangulation of methods. Like those researchers who have used interviewing and ethnographic inquiry to describe epistemogy (Perry, 1970; Baxter Magolda, 1992; King, 2000; King and Kitchener, 2004) this researcher will also utilize conversations about knowledge, learning, and texts to create a picture of prospective teacher epistemology. Numerical measures of student beliefs are a great temptation, but not in themselves adequate to the task of describing a sample of future teachers.

This researcher proposed an additional domain for analysis, given that relatively few surveys have treated student text beliefs as a factor in themselves. Student beliefs about text were measured in an epistemology of text domain – henceforth entitled the Reading Belief Inventory. Schraw and Bruning (1996) argue that student epistemology of text may be measured on a continuum analogous to the one previously described by Jehng, et al. (1993). According to this model, naïve readers understand text in primarily *transmission* terms. By contrast, sophisticated readers understand text in primarily *transactional* terms. A sample of instrument items was developed to address this factor. This measure might be understood as the *understanding of the reading process measure.* An additional factor addressed students' dispositions toward reading itself; that is, whether these prospective teachers' basic tendencies included reading, or alternatively, a disinclination to be open to reading. This measure might be understood as the *receptivity to reading measure.*

The researcher devised items to address these factors related to reading texts. Sample items were submitted to panel of professional educators for initial review, and subsequently, any necessary revisions were made to the instrument items. For the purposes of this study, the researcher used these two models of student epistemological measurement in a combined instrument. Appropriate Measures included student scores within the separate epistemological domains, as described above. Combined Measures included a composite score of means across domains.

Extraneous Variables.

The researcher understood that external events could influence subject measures within one or more variables. For example, exposure to a separate course or instructor with unique emphases on text or student beliefs could affect outcomes. Outliers, such as students with distinct life experiences (study of another language, an earlier course of study, a second undergraduate degree, parents who teach language arts) could also influence outcomes. Finally, transformative events, such as work with learners in another setting, could affect student beliefs across the time of the study.

Data Collection Procedures

Surveys were administered via online modules using Qualtrix survey software, a web-based platform suitable to large-scale survey administration. Qualtrix has additional capabilities in coding, factor analysis, and data export to Excel and SPSS statistical software.

Interviews were arranged after randomized sampling of students. Randomly generated numbers were used to assign content-area representatives to interview times. Fifteen (15) interviews were conducted to sample representatives of the content-area licensure programs.

Data Analysis Procedures

Subsequent analysis of this data was largely descriptive; i.e., mean, median, and mode statistics for survey takers, and to some extent, inferential, as in statistical analysis of possible correlation between domain scores, or alternatively, any possible correlation between domain scores and relevant demographic data. For example, did potential

math or social studies majors demonstrate more or less willingness to believe in "certain knowledge," one of the Jehng (Schommer) domains? Or, alternatively, did first-year survey takers show more orientation toward "quick-learning" as compared to second or third year survey takers?

Subsequent to the interviews, data was coded and analyzed. After this initial analysis, data was analyzed in the context of the Epistemological Beliefs Questionnaire data for perspectives on typical epistemological beliefs, the range and stability of these beliefs, and the consequences for teacher-candidates' attitudes toward texts as they proceed in a content-area reading pedagogy course. The result of this procedure was a typology of beliefs and attitudes.

Coding / Data Processing:

The researcher coded responses according to the following criteria. In the epistemology section of the questionnaire, responses will be coded and scored on a scale from "Naïve" to "Sophisticated." On the epistemology of text section of the questionnaire, responses were coded and scored on a scale from "Transmission" to "Transactional." On the disposition / receptivity toward reading section of the questionnaire, items were coded on a scale from "receptive" to "closed." Data analysis allowed a normative description of epistemological beliefs of content-area pre-service teachers, constituted a contribution to the field of teacher preparation.

Reporting on a phenomenological description of teacher candidate epistemology can take several forms. Perry (1970) relied on thick description of student attitudes, personal narratives, and themes that emerged from his interviews. This largely

inductive approach generated a number of themes that guided his subsequent inquiry, which he pursued in a developmental and longitudinal way, resulting in the graphic scheme of intellectual development (with nine stages) that is the hallmark of his work. In the case of a teacher training program, reporting could be focused on description of formative themes that represent typical student epistemologies, or they could focus on developmental themes that represent changes across time. While the research design of this study falls short of "grounded theory," the choice of reporting technique was based on the data observed and recorded, rather than upon hypothetico-deductive pre-suppositions about pre-service teacher candidates. This aspect of 'bracketing,' or developing a meta-cognitive awareness of the interviewer-researcher's relationship to the phenomenon, and consequently, the data, was critical to the research process.

Limitations

Inquiry into student epistemology contains at least a few research concerns, which must be adequately addressed by the research process. First, intervening variables can affect results. First, students who are taking a philosophy course (or some analogous example) would likely produce different results. Second, sampling of the population was an important limitation to bear in mind. Several questions presented themselves: Which of the candidates sampled will actually continue in the field of education? Which candidates were not present for survey-taking because they do well in the course without regular attendance at lectures (certainly, a common phenomenon in many college courses)? Additionally, the epistemic traits of students at the University of Minnesota, Duluth, a mid-sized regional university, may be idiosyncratic

to that setting. Similarly, a particular freshman class of survey takers may have exemplified specific demographic traits not representative of the population. The large sample in this proposed quantitative study is doubtless an advantage that overcomes some of these concerns, but it is certainly the case that results may or may not be replicable over subsequent semesters, and generalizing to larger populations of teacher candidates should be undertaken with care and caution.

Chapter Summary

While the aforementioned quantitative approaches offer powerful applications, they exemplify a particular positivist bias, and all of the challenges associated with reducing mental phenomena such as beliefs about knowledge to numbers. Indeed, too much reduction and emphasis on measured objectives might lead an evaluator-researcher to also consider more *formative* approaches to inquiry, such as participant-oriented methodologies. Interviews of participants in the program, including students and teachers, might well suggest new questions about the nature of student epistemology and the acquisition of more sophisticated epistemology in a teacher training program. They pave the way to actual field observations of teachers in training, a possible design in a more ethnographic approach (Creswell, 2003, 2007; Geertz, 1977), and this more inductive approach could serve program evaluation in rich ways, offering the possibility of "thick description" of phenomena related to teaching and learning within teacher preparation programs in higher education

Deciding upon a research approach has consequences, but there are also risks in ossifying one method for the purpose of describing educational phenomena (Kozol,

2005, p. 333). As prominent qualitative researchers argue, "The choice of which tools to use, which research practices to employ, is not set in advance. 'The choice of research practices depends on the questions that are asked, and the questions depend on their context'" (Nelson, et al., 1992, as cited in Denzin & Lincoln, 1998).

Some researchers have focused on the experimental design as the best tool measuring a hypothesized causal relationship between two variables. A weakness of this design is within the nature of epistemology; if epistemology in learners is domain based, and if it is stage-based or developmental, experimental designs will be tough to make rigorous enough to measure the variability and flexibility within student beliefs about knowledge. The survey design seems particularly well suited for measuring the kinds of variables that make up a significant sample of teacher candidates. Furthermore, surveys allow teacher educators to assess the kinds of beliefs that future teachers hold, and subsequently use the normative descriptions to adjust curricula, programming, and assessments for prospective teachers. If epistemology is significant to learners and teachers, actual observation of learners and teachers, including interview-based discussions of the process of learning and teaching, then observation and naturalistic description offer a good fit that allows "measurement" of the real effects of learner's beliefs about knowledge and learning..

It is extremely useful to measure beliefs about knowledge, learning, and texts through survey design. Research interests about student epistemology and texts can be captured through a significant number of questions about school, learning, background, and reading. There is great utility in gathering this data for the purpose of preparing

curricula in teacher education programs. The data will lend itself to statistical analysis (particularly descriptive), and the flexibility of both cross-sectional and longitudinal study would serve the dynamic needs of teacher preparation well. Additionally, survey designs "export" well; that is, they can be used in different settings where teacher candidates are being prepared.

While the quantitative approaches offer potentially useful data, they exemplify a particular positivist bias, and all of the challenges associated with reducing mental phenomena such as beliefs about knowledge to numbers. Indeed, too much reduction and emphasis on measured objectives might lead a researcher to also consider more *formative* approaches to evaluation, such as participant-oriented methodologies. Interviews of participants in the program, including students and teachers, could prove very useful, and might well suggest new questions about the nature of student epistemology and the acquisition of more sophisticated epistemology in a teacher training program. Field observations could also be employed in a more ethnographic approach (Creswell, 2003; Creswell, 2007, Geertz, 1977), and this more inductive approach could serve program evaluation in rich ways, offering the possibility of "thick description" of phenomena related to teaching and learning.

Secondly, observing and interviewing teacher candidates, particularly in settings that are more naturalistic (actual classroom time, and/or time settings close to teaching experiences) are crucial steps for learning about student epistemology and text. The notion of reflective practice and judgment is a crucial variable within epistemology, and field study offers researchers actual opportunities to observe, record, and potentially

measure this variable. Additionally, if teacher candidate epistemology is to be described well, it might be wise to describe the actual interactions of teacher candidates and students. Taking a survey is not a replacement for the challenges of interactions in real classrooms with actual students, so thick description of candidates' experiences with teaching and learners can offer unique opportunities to learn about epistemology and its effect on teaching literacy. However, as the inclusion of sample transcripts proves, field and interview study offers huge challenges in terms of recording, coding, and quantifying data; it is no wonder that researchers in educational psychology have used "stripped down" epistemological surveys to "capture" this aspect of learners' minds, and particularly when they attempt to create specific measurements.

This researcher is interested in the epistemology of text, which is optimally a dynamic, transactional, and multi-faceted phenomenon. For this reason, larger scale surveying is useful, as are observations and interviews. The observation of teacher candidates in naturalistic settings offers insight into the practical implications of their beliefs about knowledge. The preceding sample suggests a rich opportunity to observe the classroom for epistemic evidence, and use interviews to triangulate analysis of data from learners. Teacher candidates who represent the perspectives and experiences of content-area disciplinarity and teacher preparation have a vital role to play in promoting text-based literacy practices. Observing these candidates during their initial teaching experiences will allow a description of the practices that may embody their beliefs about knowledge, and their understanding of learners' minds. Triangulating between

using survey and observation/interview designs will ideally create useful descriptions of

teacher-candidates' beliefs and attitudes about learning from text.

Chapter Four: Analysis of Data

Data Collection

The study employed two major points of data-gathering. Each data set constituted one of the strands of the mixed methods research design. The first strand was quantitative, and analysis proceeded through several statistical tests. The second strand was qualitative, and analysis proceeded through review and coding of personal interview responses.

The quantitative data strand was in the form of a survey. This instrument included the Epistemological Beliefs Questionnaire (Jehng, et al. 1993; Jehng, et al., 1998), two sections of questions about reading and texts, and questions about demographic factors. The survey was administered through Qualtrics survey software in three sections of Education 1101, "Education and Modern Society," to students who identified themselves as secondary content-area teaching majors. Next steps included the review and analysis of results from the administration of 75 surveys to these teacher-candidates, in light of the research questions central to this study.

The qualitative strand included transcription and analysis of semi-structured interviews with a randomized sample of fifteen teacher candidates from the larger group. The analysis of each of these data sets was aligned with the phenomena associated with learner epistemology, beliefs about reading and texts, and the candidates' futures as classroom teachers. A coding process identified major themes of the participants' interview responses. Themes, descriptive categories, and exemplary quotations were represented in a graphic scheme, to be discussed later in this chapter.

In both the quantitative and qualitative strands, the researcher assessed the data and viewed it through the lens of the research questions, which are identified here:

Research Question:

The following research questions provided a framework for analysis of data derived from both data sources -- survey instrument and the interviews of content-area candidates:

Main Question:

What beliefs and attitudes about learning from text do future teachers hold?

Sub-questions:

1)What beliefs about the nature of learning and knowledge do these beginning teachers hold?

2) What value or role do these teachers place on learning from text, and what value or role do these prospective teachers place on their future students' learning from text?

3) What will a measure of future teachers' attitudes toward text look like, and how will it correlate with existing measures of learners epistemological beliefs?

Quantitative Strand of Analysis

Demographic Profile of Participants.

Seventy-five pre-service content-area teachers took the survey. Students completed the inventory during an instructional period during the last weeks of a semester. Because of issues of sensitivity and privacy, no names were used. Twenty-three (23) of these students were male, and fifty-one (51) were female. The age of the

sample was relatively homogeneous; while there were several older students, 73% of the students were eighteen or nineteen (n = 55), and 20% of the students were 20-21 (n =15). Only a small minority of students (n =5) were older than 23, and these were in the 25-29 age bracket.

Ethnicity in this sample was strongly homogenous. Caucasian-American students were the largest group by far with 72 students for 96% of the sample. Three students represented other ethnic groups: Asian-American, Native-American, and Caucasian-Native American.

Survey takers also provided information about their experience in university settings. As was desired in this research design, participants tended to be relatively new to the university setting, as indicated both by age (73% of the students were eighteen or nineteen (n = 55), and by coursework completed in higher education. At this point in their higher education careers, this group is comparatively inexperienced in matters of educational theory, psychology, and pedagogy. For many, the course setting of Education and Modern Society is their first formal education coursework. Evidence in Table 6 suggests the relative inexperience of this sample of prospective teachers.

Table 6

Length of Study at the University

Semesters	Number of Students	Percentage
1 Semester or Less	44	58.7
2 Semesters	6	8.0
3-4 Semesters	14	18.7
5-8 Semesters	7	9.3
9 or More Semesters	4	5.3

Survey participants represent most of the possible secondary teaching majors available to prospective Minnesota teacher candidates. Table 7 identifies the majors that participants listed as governing their course selection and future teaching plans.

Table 7

Survey Participants by Major

	Students	Percentage
Teaching Social Studies	18	24
Music Education	13	17.3
Teaching Mathematics	12	16
Teaching Art	11	14.7
Teaching Life Science	7	9.3
Teaching World Language (Spanish, French, German)	6	8
Teaching Health	4	5.3
Teaching Physical Science, including Chemistry	3	4
Teaching Earth and Space Science	1	1.3
Physical Education	1	<1.0

Survey participants also had an opportunity to describe their own level of academic achievement in recent years using a school performance scale. Student participants generally viewed themselves as proficient students, with 75% of students (N =56) self-identifying as "strong" or "high" performing students. Table 8 summarizes this self-description among participants.

Table 8

Participants Describe Their School Performance

Performance	Frequency	Percentage
High / Top Ten %	24	32
Strong / 80-90%	32	42.7
Average / 70-80%	18	24
Weak / 60-70%	1	1.3

Participants were also asked to quantify their personal use of technology, media, & gaming. In keeping with the trends of an increasingly digital and technology savvy society, these young people exhibited a strong predilection for technology use, with nearly 80% of students stating that they are moderate or heavy users of technology, media, and gaming. Table 9 offers a picture of such digital technology use among participants.

Table 9

Use of Technology, Media, and Gaming

Use Pattern	Frequency	Percentage
_____	_____	_____
Heavy User	23	30.7
Moderate User	36	48
Light User	13	17.3
Little to No Use	3	4

Analyzing the Factors of the Epistemological Survey.

The first portion of the survey administered was a Likert Scale inventory of beliefs in five factors of thinking about knowledge and learning (Jehng, 1993, Jehng, et al, 1998). Table 10 lists and identifies these factors.

Table 10

Five Factors in the Jehng Instrument

Factor 1	Innate Ability vs. Acquired Ability
Factor 2	Quick Process vs. Gradual Process
Factor 3	Simple / Rigid Process vs. Complex Process
Factor 4	Certain Knowledge vs. Changing / Dynamic Knowledge
Factor 5	Omniscient Authority vs. Self-Regulation

Note. Adapted from Jehng (Jehng, 1993, Jehng, et al., 1998).

Data analysis began with a review of the internal reliability of those blocks of questions intended to measure each of the five factors. A Cronbach's Alpha Coefficient Reliability test was performed on each factor. This test offers insight as to the internal reliability of a set of items purporting to measure a factor. Table 11 shows the resulting Cronbach's Alpha Coefficient scores.

Table 11

Reliability of Factors in the Five Factors Instrument from Jehng (1993, 1998)

Factor	Before Removal		After Removal	
	# of items	Alpha	# of items	Alpha
Factor 1	14	.710	10	.767
Factor 2	13	.496	10	.580
Factor 3	11	.508	10	.584
Factor 4	12	.454	10	.550
Factor 5	11	.461	10	.528

In all cases, it was determined that factor reliability could be improved with the removal of those items with the weakest reliability. The weakest items were removed, and new Cronbach's Alpha Coefficient measures were calculated. This step resulted in improved factor reliability measures. New measures were: F1 = 0.767, F2 = 0.580, F3 = 0.584, F4 = 0.550, and F5 = 0.528. Next, a total reliability factor score was calculated for the five factors derived from the Jehng instrument. That computation resulted in a Cronbach's Alpha Coefficient of .846.

Factors 6 and 7 are new factor instruments devised by the researcher for this project. Factor 6 focuses on dispositions toward reading as a practice, while Factor 7 emphasizes students' understanding of the reading comprehension process. As in the

case of Factors 1-5, these items were tested for reliability using the Cronbach's Alpha test. Each factor was reduced to twenty (20) items after removal of the weakest items by Alpha scores. Resulting factor scores were as follows: Factor 6 = 0.900, and Factor 7 = 0.774.

With the addition of these items to Factors 1-5, a calculation of total instrument reliability was performed, using revised Factors 1-7. This version of the instrument now included 90 items, as compared to the initial 111. The reliability scores for this compiled and revised version of the instrument was calculated. In this calculation, F1 to F7 Cronbach's Alpha was equal to .926.

With this improved instrument in place, data from the survey was analyzed in a variety of ways, beginning with descriptive statistical analysis of each of the seven factors. Table 12 illustrates the general trends within this data.

Table 12

Descriptive Statistics for Seven Factors

Factor	Mean	Median	Mode	SD
1. Innate ability vs. Acquired Ability	2.99	2.85	2.70	0.56
2. Quick Process vs. Gradual Process	3.33	3.40	3.20	0.39
3. Simple/Rigid Process vs. Complex Process	3.27	3.30	3.20	0.43
4. Certain Knowledge vs. Changing/Dynamic Knowledge	3.82	3.90	4.10	0.41
5. Omniscient Authority vs. Self Regulation	3.58	3.60	3.30	0.39
6. Receptivity to Reading	3.42	3.45	3.25	0.62
7. Understanding the Process of Reading	3.31	3.35	3.45	0.42

Discussion of Scores

Mean scores for the seven factors displayed a range from 2.99 to 3.82. Median scores ranged from 2.85 to 3.90. Modes showed a significant range: scores for Factor 1 were frequently at 2.70, the lowest central tendency in all scores, and for Factor 4, modes were frequently at 4.10, the highest central tendency in all scores.

Factor 1 exhibited the lowest mean, median, and modal scores. Factor 1 was significantly lower than the other six factors. Participants were lowest scoring in construct of "Innate Ability vs. Acquired Ability," which describes beliefs about Innate Ability vs. Acquired Ability. Here participants identified their beliefs about the nature of learners. Given that the scale is five points, and a score of 3.0 represents a neutral score, it is not true that the participants believe learners are limited by innate ability, but it is the case that they are more inclined on average to hold innatist beliefs, relative to their higher scores in the other factors. The measure of variability (SD =.56) was also significant in Factor 1. Clearly, students part ways with respect to their beliefs about innate versus acquired ability and knowledge. In this factor, the mode is also of interest (2.70). This suggests that a significant number of participants are inclined toward the more naïve end of scale for "Innate Ability." They see learners as more likely to have fixed or innate characteristics.

Factor 2 measures Quick Process vs. Gradual Process. Mean scores were 3.33, and the mode was 3.20. There is strong central tendency for this score with limited variability (SD = .39). Participants did not have strong beliefs in gradual process, given

that scores of 4 or 5 would have indicated an inclination to believe that learning happens gradually.

Factor 3 measures Simple / Rigid Process vs. Complex Process. Scores of 5 on this metric would suggest that learners understand knowledge and knowledge acquisition to be complex processes. The score reported was 3.27, with a mode of 3.20. Student participants have some sense of knowledge complexity, but they are not particularly sophisticated on this metric, given the strong central tendency here and the fact that this score is among the lower averages reported.

By contrast, participants' highest scores were for Factor 4, which measures beliefs about the stability of knowledge. At a mean of 3.82, this factor suggests that these learners believe knowledge is more dynamic, changing, and unstable than not. For Factor 4, the participants exhibited the highest scores; in this case, the mean was 3.82 (SD = .41), and the mode was 4.10. Participants on average, and in great number, tended to score high for belief that knowledge changes over time.

For Factor Five, "Omniscient Authority vs. Self-Regulation," the group mean was 3.58 (SD = .39), and the mode was 3.30. In this measure of students' orientation toward authority versus self-regulation, many students clearly favored self-regulation, but the inversion of the mean and the mode suggested that a second group of students exists; e.g., one that believes that knowledge and learning stem more from authority than from self-regulated learning. This stands in contrast to the group's higher scores for "Certain Knowledge vs. Changing / Dynamic Knowledge." Participants exhibited

greater tendency to believe in changing knowledge, and they exhibited greater tendency to believe in self-regulation of learning.

Participants' greatest variability was in Factor 6, "Receptivity to Reading" (M = 3.43, SD = .62). In this factor, student responses were diverse. Many students are inclined to read, but just as many are neutral or disinclined to read. This was the weakest central tendency observed in this study. The evidence suggests that for this sample population, there is no clear characterization of the role of reading in their learning. There open-ness or receptivity to reading is highly variable.

Factor 7, "Understanding of the Reading Process," produced a mean score of 3.32 (SD = .42). Factor 7 measured participants' understanding of the reading process. Lower scores would suggest an understanding characterized by simple transmission models, while higher scores would suggest understanding characterized by interaction and construction. It was noted that this scoring was very similar to two factors which might be understood to be measuring parallel or analogous constructs; i.e., Factor 2, " Simple vs. Complex Knowledge, and Factor 3, "Quick vs. Gradual Process."

Following this analysis of descriptive results for each of the seven factors, several tests were performed to examine relationships between factors and variables stemming from the demographic portion of the survey.

An independent-samples t-test was conducted to evaluate the hypothesis that gender might affect scoring on Factors 1-7. The test revealed no significant differences between factors based on the additional variable of gender.

Based on demographic results, participants were grouped into two sample groups based on age. One group was "Young" and comprised of 18-19 year-olds. Another group was "Older," and comprised of all students 20 and older. An independent-samples t test was conducted to evaluate the hypothesis that age might affect scoring on Factors 1-7. A significant difference was observed for Factor 2 based on age, $t = -4.64$, $p = .00$. Factor 2 measures participants' beliefs in quick process versus gradual process in learning. Survey takers who were 18 scored significantly lower (mean score of 3.2407) than the survey takers who were 19 or older (mean scores of 3.585).

A t-test was conducted to test the hypothesis that duration of study at the university affects the scores of participants on factors 1-7. Students with one year or less were placed in group one. Students with more than a year of study were placed in group 2. A significant difference between the groups was observed for Factor 2, with $t = -2.28$, $p = .03$.

Students in group 1 had a mean score of 3.25, while students in group 2 had a mean score of 3.45. Students who have been at the university longer believe more in gradual process in learning. Notably, no differences in other factor scores were observed using this test.

A t-test was conducted to compare the survey takers from math and science with those from other disciplines (humanities, health, art, music, etc.) Using a 95% confidence interval, no significant differences between the groups were found.

Finally, analysis was conducted to test the hypothesis that school performance is a variable that affects factor scores. Students self-reported their perception of their own school performance in recent years. Responses were grouped into three samples for the purpose of this test, representing highest achievement, strong achievement, and average or weak achievement. An ANOVA test revealed no significant difference between three groups of survey takers. In this sample of future teachers, self-perception about school success is not significantly related to beliefs about knowledge and learning.

Data analysis also included an examination of the correlations between each of the seven factors used in the survey. Of particular interest was the pattern of strong correlation; e.g., examples of high correlation inter-relatedness of factors. Conversely, factors were examined for low correlation; e.g., examples where factors appear to be largely independent and unrelated. Table 13 is a matrix that represents these relationships among the factors.

Table 13

Correlation Matrix among Seven Factors

Factor	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Factor 1	1						
Factor 2	.66**	1					
Factor 3	.64**	.58**	1				
Factor 4	.21	.26*	.35**	1			
Factor 5	.12	.10	.40**	.49**	1		
Factor 6	.42**	.42**	.39**	.23	.11	1	
Factor 7	.54**	.55**	.51**	.35**	.25*	.78**	1

Note. ** Correlation is significant at the 0.01 level (two-tailed). * Correlation is significant at the 0.05 level (two-tailed).

Data analysis suggests that the factors for epistemological beliefs are often correlated, but it is also possible for learners to exhibit what appear to be mutually inconsistent beliefs.

Factor 1 and Factor 2 are highly correlated at the .66 level (p =.01, two-tailed). Participants whose beliefs tend toward innate traits in learners will also tend to believe in quicker process in learning. Conversely, those who hold beliefs in acquired ability will also tend to believe in learning as a gradual process.

Factor 1 and Factor 3 are highly correlated at the .64 level (p=.01, two-tailed). Factor 6 and Factor 7 are highly correlated at .78 (p = .01, two-tailed). This measure suggests that learners who are open to reading as an activity will also understand the reading process as more transactional and interactive. By contrast, students who are less inclined to reading as an activity may view reading as a more directed, transmission-based process.

Data analysis revealed low correlations between Factor 2 and Factor 5 at r = .10. This lower correlation may evoke the distinct nature of epistemic beliefs. Beliefs characterized by an emphasis on omniscient authority may not be analogous to beliefs about the speed of the learning process; e.g., a learner may hold beliefs in one or the other without necessarily being in a state of cognitive dissonance. Another possibility is that learners are in a state of developmental flux, with beliefs changing or not changing depending on coursework, environmental factors, and experiences of learning. The low correlations between Factor 1, the measure of Innate vs. Acquired Ability, and Factor 5, the measure of Authority vs. Self-Regulation was found. This correlation, at r = .12,

suggest a similar pattern in which the factors may exist as beliefs independent of another. More importantly, this low correlation suggests an intriguing finding about these prospective teachers. They appear to believe that they are in charge of their own learning, as measured by their Factor 5 responses, even as they tend to believe that learners are defined (and possibly, limited) by their innate ability. These beliefs might be explained using the concept of espoused theory and theory in practice (Argyris & Schon, 1974). These participants' beliefs about the nature of their own learning appear to differ significantly from their beliefs about the nature of learning in other learners.

The matrix also reveals a low correlation between Factor 5 and Factor 6 at $r = .11$. As Factor 5 measures learner belief in authority as the source of knowledge, versus self-regulation, and Factor 6 measures receptivity to reading as a process, we might infer that these students may or may not read for reasons not correlated to their beliefs about authority. Additionally, as the standard deviation for Factor 6 was the largest recorded in this study, it suggests that there is less central tendency to these students' dispositions toward reading as a desired activity.

Qualitative Strand

During the concluding weeks of the semester, the researcher interviewed a selection of study participants through a random sampling of subject areas and consenting participants. The interview sample ($N = 15$) represents approximately 20% of the total sample of study participants. The interview questions and prompts are attached in Appendix C. Interviews represented a chance to gather data about the major research questions as well as the sub-questions. Interviews addressed questions about

the nature of knowledge, learning, and reading texts, as well as questions about the understandings that candidates held about learners' use of texts to learn content in academic courses.

Candidate Interviews

Analysis of interview participant responses included transcription, reading, and rereading of all participants' interview comments. Analysis of this data suggested three major themes. First, participants demonstrated a great commitment to the importance of effort in learning. Second, candidates frequently distinguished between innate and acquired ability, and often related their own content-area major choice as somehow related to innate inclinations or abilities they personally held. Third, students described literacy processes in terms of compliance, transmission, and in some cases, constructivist transactions between readers and texts.

Notably, this theme of literacy processes was most distinctive for what was missing – the particular language and vocabulary of reading instruction. Participants used a vocabulary that is several steps removed from the vocabulary and concepts usually associated with the pedagogy of literacy. Table 14 identifies the three themes, descriptive words or phrases, and exemplary statements.

Table 14

Themes of Interviews

Categories	Descriptions	Example statements
Effort Makes Learners	Repetition, extra work	"Probably just being willing to put in the extra effort and talk to their teachers if they don't understand…persevere through it."
		"There's kids who can get it without even reading or doing anything and then there's kids who actually have to work at it and still get a C. But still they know it, it is just harder for them. And I think that makes a smart person."
Innate vs. Acquired as a Distinguishing Feature of Learners	Liking a subject Interest, disinterest	"Honestly, there are those kids in school that don't want to learn but they can sit in a driver's ed class and get so…do well in that because they want a driver's license – you know what I mean? So like if they are not interested in school they're not going to want it."
		"The thing that comes easy for me is music, and that's partially why I'm going into it."
Literacy Processes That Worked or Were Aversive	Choice	"Like a good motivator from teachers and in high school I had this teacher that instead of assigning novels, he let us choose out of like ten and I thought that was good 'cause then students got to read what they wanted."
	Textbooks	"Textbook reading [is hardest thing about learning in school]. So if I just am expected to learn from a textbook and my professor or teacher is not even [working] from it necessarily, that is definitely hard for me"
	Transmission	"We just read a book and then here's an idea that we want you to take from the book."
		"But it's really weird 'cause I'm taking a psychology class this semester and I actually love reading the textbook. Like I've already read six chapters ahead of where we are just 'cause it's fun and it's like really interesting. I don't know if like kids actually took time to read textbooks they're more interesting than they seem. 'Cause I never read them in high school hardly. Unless it was assigned."

The Effort Theme

Theme 1, effort, is probably most closely aligned with the sub-question of this study related to teacher candidates' general beliefs about knowledge and learning. Theme 2, innate and acquired traits of learners, addresses beliefs about knowledge and learning as well as the qualities that make someone successful in a content-area, which ties directly to the values and attitudes that future teacher may hold about teaching and learning in their content-area. Theme three addresses the major research questions central to this study, namely the attitudes, skills, and experiences that prospective teachers have about reading and learning from texts, and their dispositions toward text within their future content-area. Specific discussion of each of the themes follows.

More interview comments concerned the theme of effort than any other theme present in the interviews. Again and again, participants spoke of effort as the most dynamic force in their own learning and acquisition of knowledge. They extended this theme to other learners as well; that is, they understood the successes or failures of other learners to be largely correlated with effort. This effort theme appears strongly correlated with the belief in self-regulation bias exhibited in the scores for the Epistemological Beliefs Questionnaire; as in the quantitative measure of this construct, the interviews suggested how critical the notions of self-regulation and perceived exertion were to these study participants. For many interview participants, the relatively new challenge of navigating university learning is understood to be an effortful endeavor. Interviews repeatedly suggested that learning was a function of effort.

Allan S. said that successful students have particular effort-based traits.

> …Really just wanting to be there. I mean a good student will, is willing to put in the effort even though maybe he or she maybe doesn't exactly want to learn as much, but they're still willing to just, you know, kind of experience the thought of learning or, you know, just getting on new different subjects like that so even if it's not their strongest, you know, they're still gonna go through and bear it. So just really the hard working aspect is where I like to come in 'cause I think you could almost learn any subject if you put the effort and, sure, you may not get the greatest result in the end but at least you just sort of try and it kind of opens a new kind of path for you to go on and you kind of experience, like, what you're gonna do or exactly what you want to go into. (personal communication, December 15, 2010)

A Health Education major understood that successful learners are effortful: "…I guess someone who is motivated and well-driven… wants to get something out of this experience. Which I think I am – I have not missed a class, so that's pretty good" (Lisa N., personal communication, December 17, 2010). Here motivation that is intrinsic is also linked to compliance, as in not missing classes. This is a theme that a science major also identified:

> Someone who tries hard. They don't skip class and they put time and effort into what they do. They don't just do it to get it done. They want to learn….Well sometimes you just have a really hard time in a subject. But

I think if you try hard you can become good at anything. So students that

aren't good, I don't think really put enough time and effort into it

(Lisa L., personal communication, December 18, 2010).

Students who don't learn are frequently characterized as deficient in effort. One participant explained that [Students who aren't successful] "I would say they don't try and they don't fully put themselves into what they are doing. They don't try" (Tara O., personal communication, December 20, 2010).

Participants exhibited a strong tendency to commingle beliefs about effort with beliefs about interest. They describe participation in courses and learning that are not their favorite thing as a particular struggle as in this comment: "Probably just courses that I've not really been interested in because I haven't put my full effort into and that's why it's harder for me 'cause I have to try harder for it to get the right answers or get a good grade" (Tara O., personal communication, December 20, 2010).

In answer to the question, "What makes someone smart (intelligent)?," students frequently uttered variations on this theme, even as they acknowledged that learning (or some topics) might be easier for some students than for others. "…[T]here are a lot of kids I know that are smart and they don't have to study for a lot of tests. But there are kids that do have to put in a lot of work to get good grades, so that's why they're smart, I think" (Vince L., personal communication, December 20, 2010). For some prospective teachers, effort relates to the student working to get something which belongs to her as a learner. This idea connects to the next major theme revealed by interviews, in which participants suggested their beliefs about innate versus acquired ability.

The Theme of Innate Versus Acquired Ability

In what appears to be a significant corollary to the effort theme, interview participants often demonstrated that core beliefs about ability influence how they see learning, knowledge, and their own relationship to particular content areas. These participants often alluded to beliefs about innate qualities that make some learners more or less amenable to the challenges of school. One student characterized the challenge of school learning for learners generally:

> I don't know what determines a good student per se, their willingness to learn or it just comes to them. So I'd say for someone who wants to learn, then yeah, the more they do it it might come easier for them. But for kids that it just comes easier for them in general, they might take it at face value. You know, I know I can learn this and I'm just going to leave it at that. (Nate T., personal communication, December 12, 2010)

Interviews frequently offered evidence that content-area majors have complex beliefs about their learning in their chosen major and the relation of that major to other fields of inquiry. Many participants see their abilities within their own content area as mostly innate. They tend to see learning or understanding in other fields as "acquired" learning.

> For me, I can understand art concepts right away – I can just cling onto that. But for like math or science, I just don't understand it but if I actually try and learn the material I can understand it…I can understand

it but it takes me more than one time to understand it (Tara O., personal

communication, December 20, 2010).

Student interest in a topic or content-area is understood by these undergraduates to be a

strong predictor of future learning. In many cases, participants intimated that their

choice of study is a function of a subject or content-area coming to them with relative

ease. This choice is a choice about *the area in which they hope to teach,* and it appears

that a major component of it is related to a dynamic involving effort and ease of

learning. In some cases, participants were explicit about the other choices; e.g., they

were less viable as majors because they did not come easily. Within this theme is the

sub-theme of gravitation to a major because that subject offered high interest. Interest

level as a sub-theme: "I like science because I think I became interested in science

because of my middle school teachers because they presented the information in a very

interesting way and it just really clicked for me" (Lisa L., personal communication,

December 17, 2010).

One point of interest in this sub-theme is the disconnect between strong beliefs

in effort as evinced in the first theme and other comments discussed here, and the sense

that one's chosen content-area is easy, or more or less effortless. In analyzing the

responses of professed future teachers, this is a critical issue. In actual 7-12 content-

area classrooms, many students in a particular classroom will not necessarily gravitate

toward that subject area in their own lives, and yet, they will experience the teaching of

a teacher who has found such gravitation effort easy or effortless. This sense of the

inevitability of choosing one's own correct path to learning is commingled with affect,

and for multiple participants, wanting something. They understand learners to be subject to a lack of interest in a topic which will cripple the ability to learn: "…so if they are not interested in school they're not going to want it" (Lisa N., personal communication, December 20, 2010). Another participant put it this way: "I just like it [my content-area] more. I am more interested in it so it makes me want to learn more about it rather than a different subject which wouldn't be…"(Tara O. , personal communication, December 15, 2010).

At times, participants invoked stronger language, with an emphasis on passion as a defining characteristic of successful learning in school. Significantly, passion is also connected to the theme of effort:

> I think an effective learner is a person who will want to go to school because they want to go on and be successful by their own definition….I think intelligence is not based off your I.Q. I think it is based off what you know and what you want to learn about the subject you are passionate about (Denise S., personal communication, December 12, 2010).

If affect, passion, and one's own dispositions are not engaged, school can be a mismatch for "innate qualities," as it requires compliance that is antithetical to one's innate tendencies.

> The hardest thing is being expected to do things one specific way…[in Middle School] I'd have this really unique way of trying to do something but we'd be told you have to do it this way and then I would be really

disillusioned and less inspired to do it. (Rick E., personal

communication, December 17, 2010).

The Theme of Describing Literacy Practices

Throughout the interviews, participants described literacy practices that have

influenced their own learning and approaches to reading. Participants have mixed

feelings about reading and learning within their own educational story. Reading was

frequently understood by students to be reinforcement to learning, rather than as

learning or valuable in its own right. In this sub-theme, reading is a critical tool, but it

is rarely understood as a process of discovery in its own right. A life science major

described the importance of using reading to reinforce understandings emphasized in

lectures: "It [reading], I think it's really important because it reinforces everything I am

learning in class….I don't think I could understand, especially my geology class, the

material if I did not read it in the book" (Lisa L., personal communication, December

17, 2010). Another student framed the issue of compliance as a problem in motivating

readers in high school settings:

>In high school I didn't enjoy – 'cause we had to read certain books and
>
>some of them didn't interest me at all, like we had to read *Beowulf* and
>
>that kind of stuff and I just wasn't into that. So it's harder to get into
>
>something like that. I still read it but it's more just forced
>
>reading….When I read on my own, I can comprehend, but if I read
>
>something I don't enjoy, I am thinking about something else but I am

continuing to read (Lisa N., personal communication, December 20,

2010).

This sub-theme in participants' description of literacy processes appears to

include the idea of reading as transmission, an idea described in the first chapters of this

study, and central to at least some conceptions of naïve or unsophisticated reading in the

literature (Rosenblatt, 1978; Schraw & Bruning, 1996). Some future teachers seemed

almost to despair that reading as reinforcement was not a straightforward process of

transmission. Participants described a phenomenon in which some students function

better at "taking-in" infomation: "Probably someone that can just remember stuff

better, unfortunately, or that can just absorb information better than some people"

(Steve J., personal communication, December 22, 2010).

Some candidates argued for more rigid transmission models of pedagogy. They

hoped such models would simplify learning, making for less effortful activities. These

comments appeared to argue for particular pedagogy with transmission as its central

metaphor: In this model, there could be a one-to-one correspondence between teacher

talk and readings. "Probably the hardest thing for me is just sitting down and trying to

learn material straight from a textbook….a lot of times…they [professors] assign

reading but then they never go over the reading…it wouldn't be hard if they took the

time to go over what they assign for reading" (Vince L., personal communication,

December 18, 2010). "I like reading it and then the teacher kind of reviewing the

chapter book we read that day in class. Kind of going over it and then kind of really

putting it in our heads" (Steve J., personal communication, December 20, 2010).

Related to this is a sense that textbooks may have the factual information a learner needs *in order to receive knowledge: "*But textbooks, depending on how old they are you can believe pretty much anything in there" (Michael B., personal communication, December 16, 2010).

Participants recalled instances wherein instruction and comprehension conformed to this transmission model, as in "We just read a book and then here's an idea that we want you to take from the book" (Tara O., personal communication, December 2010). For some, this transmission model became the hardest thing about school: "Probably that [reading and test-taking] …Just reading and just trying to remember stuff and then taking a test on it" (Steve J., personal communication, December 20, 2010).

Some reading practices in these teacher candidates' stories have clearly been averse. A reading practice that was not appreciated by many participants was reading followed by testing:

> Anything to do with reading tests I don't like because it takes me a long time to learn or process the information so when we had reading tests it was hard because I would take longer than the given time" (Lisa L., personal communication, December 18, 2010).

Another candidate followed this theme by emphasizing how testing can go awry in a standardized reading curriculum such as Accelerated Reader:

[In Accelerated Reader] …if you don't retain the information from the big books and you do worse on the test you don't get all the points. So you end up having to read more and more…I am a slow reader…and sometimes I wouldn't get all of the points. (Michael B, personal communication, December 17, 2010)

Construction / Transaction

Some participants were open to a view of reading that was constructivist and highly transactional, with the reader engaged in a process of creating meaning. Others understood that transmission models might in fact limit the possibility of understanding for some learners:

[When reading authors] I think you are getting some things that the author is trying to say, but everyone's brain is different so will not be taking the information in the same way as the author wants you to. No matter how hard they try, it's just not…everyone's brain develops differently so you're gonna take in information completely different" (Sarah M., personal communication, December 18, 2010).

They saw possibilities in reading for individual construction of meaning. An art major drew a parallel between viewing art and reading a text:

Okay. If you look at a piece of art you can always…the artist is obviously trying to say something, but you can also take away something the artist wasn't trying to say, and you can do the same thing with text, I would say (Tara O., personal communication, December 20, 2010).

Another participant described a highly constructive process of making meaning out of difficult scientific material by reading, re-reading, and use of graphic or visual-spatial strategies:

> [To learn difficult material….] Difficult? I try usually reading through the textbook, like going over it three, maybe four times. But that doesn't seem to work, I think…I have to go to the teacher, at least, go to the library and, I don't know, maybe, like put it on a whiteboard or see or just kind of look at it from like, I don't know, outside. (Allan S., personal communication, December 16, 2010)

Some participants distinguished between reading for reductive purposes, as in recalling specific details, by contrast with reading for holistic, meaning-making purposes. One participant objected to academic reading that missed the point of meaning-making: "When you have to read a book and are tested on specific little details about it…you are supposed to get what you feel out of it and if it does have a main idea you should be getting it…." (Steve J., personal communication, December 18, 2010).

There were moments in the interviews where these prospective teachers described joy in reading. Sometimes such reading was for the purpose of exploring a particular topic, as in pleasure in reading for inquiry:

I love reading fiction…I like just reading for pleasure…But I also really love like more
> academic reading that is just a topic I'm really interested in. I read a book for linguistics [*Mother Tongue* by Bill Bryson] just for kicks once

'cause I thought it was really interesting and it wasn't for class…it

wasn't easy or light reading or fun…but it was interesting so it was just

trippin' (Rick E., personal communication, December 18, 2010).

Participants occasionally related a concern that academic reading might miss the

point of enduring reading experiences: [Memorizing]…there is nothing behind it.

You're just trying to get it done to get it done….And there's nothing behind – no

substance behind it" (Steve J., personal communication, December 20, 2010).   This

notion of substance should be understood as the construction of something permanent,

something belonging to the reader, rather than to the reading purposes that are related

to transitory information.

Comments about taking sheer joy in the creative and pleasurable acts of reading

were rare, but they did occasionally surface, as in one participant's obvious joy in

extracurricular reading: "Those subjects – war and fantasy – those things just get your

imagination going and are interesting" (Vince L., personal communication, December

17, 2010). Here we have a sense of the joyful reader, one who appreciates reading for

the flights of imagination and creativity that the reading process might catalyze.

The researcher combed the transcripts carefully for specific terminology related

to skills and processes related to reading. In several hundred pages of transcripts, the

word "fluency" was used twice. The word "phonics" was used four times. These

instances were related to participants' autobiographical narratives about improving

reading during grade school. Other words that literacy practitioners might use –

strategy, reading strategy, predict, infer, vocabulary, comprehension, lexicon,

orthography, alphabetic awareness, text(s), media, genre, language, syntax, prose –

were completely absent from participants' narratives and descriptions of the reading

process, learning from reading, and reading within their own content-area. Interview

questions did not use such language, in part because the research design was configured

to elicit the language and models that participants currently have to describe their

learning, acquisition of knowledge, and texts. Analysis of the transcripts suggests that

the use of specific language to describe literacy processes is not a prominent skill

among participants. Whether or not the absence of this language means the concepts

are not understood by these undergraduates is a question for discussion in the summary

and in the final chapter of this study.

Summary of the Chapter

In this chapter, the researcher reviewed the results of analysis of two major

strands of data about prospective teachers. By understanding the pattern of evidence

that this data offers us, the study creates an epistemic picture of future teachers.

The quantitative sample exhibited a variety of scores in both descriptive and

inferential categories. This is as might be expected of any sample of college learners

who come to teacher education with a variety of curricular experiences. A sample of

seventy-five is limited in scope, and consequently limits possible inferences about

scores, but major trends can be viewed in the context of other experiences with

undergraduates in the literature of student epistemology.

Using absolute metrics, the central tendencies indicated that this sample of

candidates was not particularly naïve in their epistemological understandings across all

seven measured categories. This is an understanding based on the use of the measure of

3.0 as a median point for scoring. However, it is also clear that at least some candidates

hold very naïve views, just as some hold more sophisticated epistemological views.

However, it may be more useful to view the participants' scores in the context of

what we expect of college undergraduates hoping to teach. These are future teachers,

but they are also novices to higher education, relatively speaking. In this context, it is

also possible that the central tendencies observed here (from 2.99 to 3.82) may be

viewed as relatively naïve when compared to possible scores, which could approach the

developmentally sophisticated score of 5 within the composite scoring.

Particular central tendencies were noted, and offer insight into the developing

epistemic beliefs of these future teachers. The lowest score (2.99 for Factor1) suggests

the prominence of the innate ability theme in these participants' beliefs about the

qualities of learners. When given a picture of learners, these participants tended to color

it in terms of the fixed or innate qualities that individuals possess. The second lowest

score (3.27 for Simple Knowledge versus Complex Knowledge) is also instructive.

When asked to describe the qualities of knowledge, these participants leaned toward a

framework of simplicity, as opposed to one characterized with complexity. Their group

scores for understanding another domain of knowledge, the process of reading, were

very similar. Their mean score (3.31 for the process of reading) suggests that their

understanding of reading as a simpler process is parallel to their understanding of the

nature of knowledge. This finding is amplified by the correlation between Factors 3

and 7, which are highly correlated, .51 at the .01 significance level, two-tailed.

The highest scores may tell us something as well. The second highest score (3.58 for Factor 5, Omnisicient Authority versus Self-Regulation) indicates a robust belief in the effort theme; that is, these participants believe that their own efforts are more responsible for their own learning than the efforts of an authority. The highest score (3.82 for Static Knowledge versus Dynamic Knowledge) indicates that these student participants have become accustomed to a world of changing information and knowledge. That this belief is not highly correlated with other beliefs is interesting, and begs for additional investigation.

Interviews within the qualitative strand offer parallel and complementary pictures of future teachers, as compared with the quantitative strand. As described earlier in the chapter, participants have great faith in the role of effort in their own learning and the learning of others. They also seem to frequently connect effort and motivation with innate qualities that make learners more or less likely to study a content-area. This was evinced through many comments that related how a content-area was easier for them than other things. Interview participants made more comments like this, as compared to any comments that would describe the intrinsic nature of a particular area of study.

Participants were offered many opportunities to speak about the role of literacy processes, and reading in particular, within the interviews. As noted, the comments of participants often lacked the vocabulary associated with thinking about reading processes. Comments about particular skills, qualities or features of language, or strategies for comprehending text, were sparse in this sample. Participants did express a

general frustration with models of reading instruction that were based on compliance or mere transmission of information. They used a variety of examples to suggest how many high school (and college) reading experiences were more or less rote, focused on recall, or compliance in order to gain points. They associated these experiences with textbooks most frequently, but also with genre choices in language arts courses. Several participants offered more constructivist visions of reading, particularly when they described recreational reading not associated with coursework, or reading that was originally associated with a dynamic of choice offered to them by a teacher.

The interview process revealed participants who appear to appreciate that reading plays a vital role in their learning, but they seem at loss for language to be self-reflective about the kinds of cognitive or meta-cognitive strategies they might be employing. What this means for their future career in content-area teaching is a topic for the final chapter of this study.

Chapter 5: Summary and Discussion of Implications

The final chapter of this study will include three major sections: 1) a review of the design of this study; 2) a synthesis of research results; and 3) a discussion of implications for preparation of content-area secondary teachers within teacher education programs.

Revisiting the Design of the Study

The central concern of this study was creating a description of university students' epistemic beliefs and beliefs about reading texts as they begin the process of becoming secondary content-area teachers. The researcher employed a mixed methods design in hopes of gaining several perspectives on prospective teachers' beliefs about knowledge and reading. Here the metaphor of the *bricolage* (Denzin & Lincoln, 2005; Kincheloe, 2001) was viewed as an essential component to this design. Where many studies of student epistemology have utilized quantitative designs in recent years, and where several classic studies used solely qualitative description, this design sought to employ pieces of description in complementary ways in hopes of accurate epistemic portrait of prospective content-area teachers. The following discussion is oriented to the research methodology question posed by this study: What will a measure of future teachers' attitudes toward text look like, and how will it correlate with existing measures of learners' epistemological beliefs?

Quantitative

In the quantitative portion of research design, the Jehng instrument (Jeng, 1993, Jehng, et al., 1998) was used for its potential in measuring core epistemic beliefs of prospective teachers. This instrument and others, including that of Schommer (1990, 1994, 1998) have demonstrated robust capacity as measures for at least some major epistemological constructs in learners. A major advantage of the instrument is its utility in eliciting data that can be juxtaposed with other theoretical constructs in the literature of learner epistemology. For example, the notion of simple vs. complex construction of knowledge an epistemic phenomena is one that partners well with Perry's model (1970) of dualism, relativism, and committed knowledge in learners. Using Jehng's instrument (Jehng, 1993; Jehng, et al., 1998), lower scores in this factor would suggest a learner bias toward dualism, or simple construction of knowledge. A higher score would suggest a learner open to relativistic beliefs, and an even higher score might suggest a learner open to committed positions of knowing based on robust understanding of evidence and the validity of knowledge claims. Similarly, King and Kitchener's model of reflective judgment connects well with constructs measured by the Jehng instrument (Kitchener, 2000; King & Kitchener, 2004). Changing knowledge will demand a different kind of learner judgment than static knowledge; in this case, a learner who believes knowledge is largely static will lack schemas for tackling problems of knowledge in which evidence and claims about knowledge shift over time or context.

The revision of the Jehng instrument resulted in overall strength: Cronbach's Alpha = .846. Nevertheless, the lower scores for individual factors (.528 - .580 for four

of the five factors) suggest potential problems of measurement and reliability within these factors. Others have critiqued this instrument, as well as the instrument used by Schommer, on this point. Schommer is currently working on developing revisions to the instrumentation she has used in various configurations for two decades (personal correspondence, April 2010). As noted in Chapter 4 of this study, simple revisions to the Jehng instrument produced significant improvements in reliability for the five factors. Additional work along these lines is certainly advisable.

Of course, many researchers have been concerned about learners' beliefs about texts, but those who have taken a more cognitive approach to epistemology have often described their work in terms of measuring constructs of epistemology and how they might affect educational outcomes, including learning from reading texts. What has not been done to date is quantitative work which isolates epistemic constructs from textual beliefs in learners.

During analysis of quantitative data, and as the study was concluded, the researcher noted the extent to which Factors 1-5 measure dispositions toward reading indirectly. The literature of the field of learner epistemology has not dealt with this problem directly or with vigor. The use of the Jehng instrument in this study illustrates this challenge. After review and analysis of participant results in this survey administration, it was noted that twelve of the sixty-one items in the original Jehng instrument include words directly reflective of reading dispositions or processes. These keywords include *word, text, book, comprehend, and textbook*. It might be possible to construct new items that are less dependent on text and reading factors, so that measures

of epistemic constructs are understood apart from measures of reading schemas in learners. Additional work on instrumentation that measures epistemic constructs independent of reading beliefs is obviously desirable.

By virtue of the research design, the researcher created a separate instrument for measuring reading dispositions and beliefs. This new instrumentation measured epistemic constructs critical to learners' receptivity to texts and understanding of reading comprehension as a process. After piloting items with education colleagues, the researcher proposed a preliminary fifty item instrument. Analysis of the results from participant responses suggested revisions to this instrument. Consequently, the researcher arrived at a forty item instrument with two text-based factors: Factor 6, "Dispositions toward Reading," and Factor 7, "Understanding the Process of Reading." The researcher suggests that this instrument is an *epistemology of reading* survey.

As measured by Cronbach's Alpha coefficient reliability for these text based factors was high: F6 = 0.900, and F7 = .774. These measures of internal reliability for the text-based factors were high relative to the coefficients observed in the Jehng instrument, which ranged from .528 to .767. As noted in the discussion of factor reliability within Chapter 4, the total instrument reliability including Factors 1-7 was high (Alpha = .926). Prospects for future use of this survey instrument are favorable, given its internal reliability, and the correlation between this instrument and the Jehng epistemic instrument. This suggests the possibility of continued use of this instrumentation for the purposes of measuring learner epistemic beliefs, including work on relationships between factors which include explicitly text or reading-based

constructs and those factors which attempt to measure other epistemic factors not solely related to reading.

Qualitative:

Interview participants were drawn from pools of content-area majors using random selection of individual participants. Students who agreed to an interview became interview participants. In the study, all students agreed to participate when their names were chosen. During the initial gathering of qualitative data the researcher decided to expand interviews to include fifteen subjects instead of the ten proposed in the original design. This decision was motivated by initial interviews and participant responses to the interview protocol. Early interviews suggested that there was a satisfactory match between themes within the quantitative set, but the interview responses were not as prolific as anticipated. Expanding the participant pool was convenient and generated more responses, with the additional benefit of sampling more prospective teachers.

In retrospect, different questions could improve the interview protocol. The structured protocol made for a disciplined alignment with the epistemological questionnaire, but it may have foreclosed possible lines of questioning. One area for future investigation is the role of personal narrative in construction of epistemological viewpoints, as Bruner has discussed (1991). This line of inquiry might well include literacy autobiography; e.g., teacher candidates' narratives of how they acquired their own literacy. This theme is important to future teachers' beliefs about their own self-efficacy as learners (Dweck & London, 2004), knowledge of themselves, including

strengths and weaknesses (Buehl & Fives, 2010) and critical to their own perspectives on how teachers acquire knowledge about teaching and learning (Brownlee et al, 2001; Brownlee, et al., 2003). This is an important theme that would function in complementary ways with quantitative data about epistemic beliefs. For instance, the interview protocol could be revised by using a text prompt about learning to read, and asking students to address their own literacy narrative as juxtaposed to that question.

In most cases, future teachers can benefit from acknowledgement of the role of emotional and affective factors in their own early literacy. Wolf (2007) bears witness to the power of investigation into their personal literacy narratives.   As Buehl and Fives (2010) argue, future teachers need an accounting of their own dispositions, including weaknesses, or they may hold students accountable for them. This kind of awareness is characteristic of a particular kind of epistemic questioning. Learners who are open to such questioning may be moved to the position of epistemic volition, wherein learners consciously become aware of beliefs that they hold about knowledge and learning (Bendixen & Rule, 2010). They begin to see the effects that literacy transactions and attachments had on promoting their own content-area successes and literacy, and they have a nuanced and sophisticated sense of how they arrived. Imagining this in their future students is critical to their understanding of future students, and an interview protocol that more explicitly taps the theme of literacy autobiography might prove very beneficial.

A second area of investigation might include the option of including a word bank later in the interview protocol. Given the paucity of detailed literacy vocabulary

used by the participants, it might be fruitful to ask participants to respond to specific vocabulary and / or literacy processes. A "word bank" of relevant vocabulary would be really useful to the interview conversation. Examples could include: phonics, fluency, reading aloud, comprehension, vocabulary, and genre. While analysis of discussion responses revealed a basic imbalance in students' use of relevant terms, detail, and evidence about reading and texts, such confirmatory questions and discussion could help gather data. As a result of this study, the researcher is asking the following questions: 1) Do future teachers entirely lack a specific vocabulary that describes literacy? 2) Do they lack the vocabulary but entertain understandings about literacy? 3) Have practices in K-12 schools been effective in developing these future teachers' appreciation of reading (literacy) practices? Pursuit of this line of questioning in the future could elicit examples of practices or knowledge that did not become apparent during this interview protocol.

Synthesis of Study Results

Data suggested several answers in response to the questions posed by the study. In response to the first research question, this study did produce data that will help the researcher understand the beliefs of these teacher candidates about learning and texts. The study also produced data about participants' general beliefs about knowledge and learning, and offered a possible model of instrumentation for further inquiry into all of the questions.

The combination of epistemological questionnaires, text-based factors, and interviews gave the researcher a picture of these candidates' beliefs about the nature of

reading. From this data, it is apparent that the transmission model is very prominent in the participants' beliefs about reading. This is consistent with what Allington (2007) calls the teacher as "giver of information" (p. 285). Both survey results and interview responses indicate that a substantial number of these future teachers are thinking in terms of reading for information retrieval, reading for compliance, and reading for the right answer. Reading process scores were highly correlated with beliefs in the factors associated with simple vs. complex knowledge and quick vs. gradual process. Interview comments were fairly explicit in describing transmission or reproduction models of reading as well.

What is less clear is whether undergraduate experiences of reading and learning are beginning to shift this epistemic position. Factor results, such as a high belief in changing knowledge, and some interview comments, suggest participants' receptivity to reader-dependent comprehension that is constructed (Cunningham & Fitzgerald, 1996; Schraw & Bruning, 1996; 2000). In this vein, at least some participants are open to using texts in ways complementary to other course instruction. In these comments there are hints of constructivist thought and an aesthetic or creative response to text (Rosenblatt, 1978). Participants who indicate a desire to read for pleasure or curiosity were infrequent in the interview, but not absent; in the quantitative survey, at least some student participants were clearly wide open to reading as intrinsic to their identity, development, and learning. Perhaps this signals the potential shift observed by some researchers of epistemic development in the college years (Perry, 1970; Baxter-Magolda , 1992). This shift would take students from simple metaphors of

comprehension that are dualistic and transmissive to paradigms where comprehension is more relative and constructed. As Snow (2002) notes, effective teaching must account for motivation to read within the learner, and of course this is closely aligned with dispositions to read within the teacher.

Participants' general beliefs about knowledge and learning also offer insight into prospective teachers' cognitive make-up. A striking finding was the dichotomy posed by candidate belief in self-regulation and belief in knowledge as a simple process. The entire sample of participants showed a bias toward beliefs in knowledge as simple and rigid constructs (M = 3.27). If we look more specifically at the lowest scores, 14 of these prospective teachers scored less than or equal to 2.8, scores which we can characterize as beliefs in simple knowledge. By contrast, these students (including several learners in the late twenty-year-old age-group) have significant belief in their ability to regulate their own learning. The mean score was 3.58, with 69 participants receiving scores equal or greater than 3.0, suggesting a very strong finding for self-regulation beliefs. This might be expected from successful college students, given increasingly rigorous university admission requirements and newly acquired independence from the spheres of influence of home, family, and secondary school. It also is a desirable and not surprising trait of aspiring teachers to see themselves as being in charge of the learning process. Nevertheless, we might ask what happens when prospective teachers are very much taken with their own self-regulatory capacity *while believing that knowledge to be taught is characteristically simple.*

Furthermore, compliance, or doing what the teacher says, was important in the data that emerged from this study, particularly in participant responses to interview questions. Scores for this theme seems closely connected to the theme of effort or self-regulation (M =3.58) from Factor 5. Students see "trying hard" as independent effort, but they also see it as finding out what the teacher wants from them, or desires for them to understand. Clearly teacher preparation programs that focus on developing epistemologies in undergraduates could pay attention to this phenomenon. Teacher candidates must understand the role that two kinds of knowledge play in their own effectiveness; first, they must understand teaching knowledge; second, they must understand knowledge about how learners learn (Brownlee, et al., 2001, 2003). Such self-awareness will help future teachers understand the role of compliance and effort in reading; ideally, they will see that compliance and effort are not the only factors in student learning from texts – motivation, interest, skills, prior knowledge, inference and connection – all have vital roles in teacher recognition of the work to be done in fostering comprehension in learners.

How these challenges play out in the next chapter of their professional narrative remains to be seen. It is noteworthy that at the beginning of teacher preparation, these students generally see themselves as well-equipped to manage and regulate learning, and less dependent on outside expertise for knowledge building. Whether this means they will be open to critical feedback or alternative practices as suggested by veteran teachers, is a question to consider. It is also not clear that these beliefs necessarily

correlate with a strong belief in reading for learning, though, given the survey and interview data where interest in reading was rarely a robust feature of responses.

Vocabulary is the next major theme that resulted from this study, particularly as prompted by interviews. Teacher preparation programs must assess the degree to which future teachers have a vocabulary of teaching and learning about reading and texts. Given that it is hard to shift epistemological positions generally (Brownlee, et al., 2001, 2003; Kagan, 1992) and given that learners often have folk-knowledge understandings about how knowledge and learning work (Bereiter, 2002; Lakoff & Johnson, 1999), it is important to help future teachers construct and use a rich vocabulary about reading. This creates an important tautology. To teach literacy, content-area teachers need to have learned about literacy. They already have discipline-specific resistance to part of this equation, since they have chosen not to study language arts per se. Giving them vocabulary tools that they can use actively within their own developing pedagogies for content-area instruction will be crucial.

Constructivist thinking is also critical to epistemic development in college students who will become teachers. As developmental theorists have noted, epistemic positions often include more constructivist constructs as learners move away from beliefs in simple knowledge, quick process, dualism, and omniscient authority. It was clear from both quantitative and qualitative data in this study that significant numbers of these future teachers still hold models of learning that are more like "the learner as a vessel" (Bereiter, 2002; Lakoff & Johnson, 1999).

Perry's (1970) model of committed knowing makes for an effective metaphor of the transition learners may make toward sophisticated epistemic positions. His ultimate developmental position of committed knowing, in which learners make decisions about evidence, claims to knowledge or authority, and theoretical defensibility. They do this by construction and choice, with a resulting commitment. Future teachers need to understand that knowledge of how to teach, including how to teach comprehension, may come to them from a variety of sources (Brownlee, et al., 2001, 2003. In this sense it will likely be a construction of diverse parts, rather than something merely received from an education program or a mentoring teacher. As noted in Chapter 4, many participants tended toward lower scores for the complexity of knowledge, so intuiting this committed, constructivist model will present an epistemic knowledge. Effective teacher education will need to help future teachers appreciate that their students also need to be given opportunities to construct knowledge from appropriate sources.

Implications for Teacher Education

To discuss the implications of this study in teacher preparation, it may prove useful to imagine two case studies involving young practicing content-area teachers. This model was inspired in part by Bendixen and Rule (2010) who show how a teacher can develop epistemological beliefs in an elementary classroom. Here we will consider how epistemic positions toward knowledge and texts could affect classroom instruction in a secondary setting.

Imagining Case Studies

      Let us imagine a young teacher facing a content-area classroom. The course is science, and the students are tenth graders learning about ecosystems in the Amazonian rainforest. Susan Nelson is a youthful teacher who learned a great deal of science during an undergraduate career at the university, and she has also completed the requisite coursework for teacher licensure. Nonetheless, she exhibits many of the traits that this research project suggests that prospective teachers hold. She has been successful, but she has also resisted or avoided attempts to transform her epistemic world view. She tends to see knowledge, learners, and pedagogy in black and white terms. She tends to believe that learners either display effort or they do not. Understanding this as she does, she believes that effort and motivation will be the most important factors in determining their success in her classroom. To this end, Susan emphasizes effort in her philosophy of teaching. To her, trying hard and complying with the tasks of the classroom mean a good grade is possible. She has boiled down the construct of teaching tenth-graders to a few simple precepts. There are things about life science that are required of her course, students need to show that they learn them, and students need to show lots of effort so that they can be rewarded.

      Susan Nelson does not encourage reading in her science classroom. She assigns students textbooks each fall, but uses them primarily at two times – when desk work is necessary, as in the presence of a substitute teacher, or to complete a worksheet, and when a unit is assessed by a multiple choice and short answer test. Then she uses the end of chapter questions for review and reminds students to read their chapter for test

preparation. Students do some of this, but there is modest engagement. If interviewed at a later date, these tenth graders would say that they barely used the textbook for their science course. For the purposes of this unit she uses powerpoint presentations about the Amazon as well as several video clips. She expects students to get the information transmitted by these media, and she assesses students on notes and completion of worksheet packets in response to these information sources. The model is transmission of information.

Furthermore, Ms. Nelson has not engaged with sample texts to determine what might create high interest and motivation in science readers. She figures that students will read the text book if they are really interested, or, the process of completing labs and activities in the classroom will be engaging and highly interesting in its own right. A colleague is using a passage from *The River of Doubt* that describes the rainforest as Theodore Roosevelt might have seen it in 1920, but Susan has decided not to pursue this path. Texts are more the province of English teachers, she believes. She did not do that much reading about science in her own education K-12, and believes that secondary science is a place to be actively engaged with scientific activities like demonstrations, projects, and field trips. These pedagogical activities match her mental schema of science instruction, which is mostly about demonstrating some skills consistent with the scientific method.

Brian Olson is another teacher working with tenth-graders. He finished a teacher education program several years ago. In that program, he really wrestled with the idea of becoming a different kind of social studies teacher. He had experienced lots

of teacher talk and rote testing as a high school student himself, but during university study he became more and more engaged with the idea of reading in his content-area. He hasn't found reading easy, but he now has trouble imagining a classroom without lots of reading.

Many days he begins class by reading aloud from a daily newspaper. Often these selections are samples of pro and con pieces from the opinion page, or they are current events that link to historical topics. He thinks aloud as he reads, offering explanations and questions while he shares his own reading with the classroom. Whenever possible, he connects this read-aloud to the current topic, which is currently American isolationism prior to World War I. Today's editorial, a piece on the president's responses to revolutions in Egypt and Libya is a perfect match for this exercise. Next, Brian transitions to some specific vocabulary study. He highlights several passages from the textbook, and lists the difficult or new vocabulary on the board in front of students. He has students skim the text for additional examples of vocabulary, as he has left a few items out in hopes that they will find them. A discussion of the completed vocabulary list ensues, with students taking notes on word meanings and applications.

Finally, the summative exercise of the day begins. Brian instructs students to skim and scan selected chapters of the textbook before leaving class. They record answers to a question about the tension between economic interests and isolationism, and they turn these in as exit slips. For homework, students read a high interest passage on American foreign policy from *Rolling Stone* magazine. They are instructed to

compare that article to one assigned two days ago, one which illustrates an opposing point of view. Brian gives them a concept map worksheet in which to record their notes from the opposing texts.

Brian's pedagogy of reading in a content-area class is heartening. It captures two critical understandings central to developing literacy in adolescents. First, it states the need readers have to make strategic decisions about how to read a particular text. Second, it indicates candidate assimilation of the kinds of pedagogical decisions that might make student transactions with text successful. Brian understands that the model of pedagogy in his classroom actually matters in the kinds of understandings his students achieve, (Johnston, et al., 2001). This type of response exemplifies candidate movement toward a more comprehensive and thoughtful epistemology of text.

Ms. Nelson's pedagogy is not surprising; indeed, it may be quite common. It is certainly folk knowledge that effort is critical to learning, and most people do understand learning to be a simple transfer of information. It is also inviting to view knowledge in science as black and white, or simple in nature. Simplifying complex topics is appealing. There are other things at work in Susan's pedagogical profile as well. As an infrequent reader, she has not made a commitment to ongoing reading as the mode of her own learning, and of course that modeling has a shaping and influencing dynamic in her instruction in front of students (Bandura, 1971; Johnston, et al., 2001). She often portrays the concepts central to her teaching of science as facts and information that are more or less inert; characteristically, she believes that over-complicating knowledge or emphasizing change is an unnecessary diversion into things

that most students don't need to know. She believes that offering multiple perspectives or interpretations is not the way science works. Consequently, she will leave interpretation and texts to the language arts teachers.

In each of case studies examined, the teachers wrestle with the prospect of what students may or may not be able to do while reading and writing in a content-area classroom. The teaching strategies of Brian and Susan indicate more or less epistemological tolerance of ambiguity in learner outcomes. Similarly, they represent epistemic positions that likely correlate with the epistemic beliefs described in this study. These beliefs create a particular orientation to teaching reading in content area classrooms.

With respect to teaching literacy to adolescents, these positions represent more or less commitment as articulated by Perry (1970). In this epistemological stance, learners (or in this case, teachers) recognize a variety of possibilities and outcomes, but make a commitment toward a valued goal. Another possibility, exemplified by Susan, is a movment back into a more rigid, simple, and dualistic epistemic position. Establishing and holding epistemic commitments are a challenge for novice teachers, and the prospect of integrating reading with content-area instruction is a possible commitment for prospective content-area teachers, but not an obvious or easy one.

These case studies remind us of the pedagogical challenge in changing a learner's or teacher's beliefs, particularly those that develop in the course of becoming expert in one's discipline (John-Steiner, 1997; Hofer, 2002; Kagan, 1992; Brownlee et al., 2001, 2003). The reality of this challenge is consistent with the findings of Kagan

(1994) who surveyed teacher belief literature and concluded that it is really hard to change beliefs through course instruction alone.

The process of reading is hardly simple; experts, researchers, and teachers all seem to agree that we don't yet fully understand reading, the reading process, and how learners become readers. Successful college learners may take their own reading process for granted, which would help explain their tendency to see it as simple. However, effective teaching of reading comprehension to 7-12 learners often means making the reading and learning process an explicit and strategic pedagogical process (Beers, 2003; Daniels & Zemelman, 2004). These case studies suggest the importance of epistemological reflection in the teaching of reading pedagogy.

One layer of challenges for adolescent readers may stem from challenges related to prior knowledge. How teachers understand the many nuances of prior knowledge may well be related to their epistemic positions relative to knowledge complexity, innate vs. acquired ability, self-regulation, receptivity to reading, and understanding of how comprehension works in learners. Teacher candidates' own views of text are likely predictors of their readiness to engage adolescent readers in instruction that is sensitive to prior knowledge. As Hofer (2002) argues, the assumptions of a particular discipline may create "impediments to learning" (p. 11). Content-area teachers will need to have an open and sensitive approach to their teaching of students who will not have the same discipline-based assumptions and knowledge. As discussed elsewhere, the cognitive work of reading comprehension is made vastly easier when readers have relevant prior knowledge. Cognitive load theory suggests that readers who still struggle with fluency

may not readily do the work of comprehension – there aren't enough 'free circuits,' if you will, for the brain to do this work readily. The work of inference and prediction is lost on readers who are not skilled or fluent with these explicit tasks of comprehension. Successful readers may do these tasks implicitly, of course, but this prior knowledge / schemata effect is invisible to the struggling reader, and too few teachers successfully address this with teaching that explicitly addresses strategies for greater reading comprehension within the content-area.

Students who are not innate practitioners of a discipline will struggle with prior knowledge, and their content-area classroom teachers will need sophisticated skills to help them. As documented in recent literature (Gallagher, 2010; McKenna & Robinson, 2007; Schmoker, 2010), this is very much a reality for contemporary American secondary students. Clearly, many adolescents struggle with the leap from storybook, narrative, of fiction genre work in the primary grades to demanding expository prose in the middle and upper grades. The conventions of print, the vocabulary challenges, and the internal organization of expository prose effectively conspire to thwart readers' progress.

A traditional model of adolescent pedagogy is transmissive in nature; that is, students come to the teacher to 'receive' texts, which are taught to them. Consequently, many school reforms have attempted to address the challenge of high-stakes testing by transmission models of teaching reading comprehension. In these models, reading is extracting information for the purpose of answering multiple test questions (Snow, 2002; Schmoker, 2010, Gallagher, 2010). Moreover, school curricula, for a variety of

reasons, and many of them good ones, employ classic or traditional texts that reflect the narrative of the canon in Western civilization. This model has its place, but it is not sufficient for authentic engagement with a variety of texts in a diverse world, nor will it create the kinds of enduring critical thinking approaches to text necessary for higher education. Without skillful teaching, this problem creates its own vicious circle, and students continue to struggle, with the result that the socio-cognitive factors discussed earlier get activated yet again, and readers lose motivation and interest in texts.

Some challenges for adolescent readers can be ascribed to socio-cognitive factors. Prospective teachers will need to sort out their own beliefs about learner self-regulation and innate versus acquired ability if they are to make sense of these challenges. Successful content-area teacher will need to develop what Wolf (2007) calls the "Two Stories of Literacy" theme. They will need to specifically address the concept of "word poverty," which is often unfamiliar to successful content-area students, and they will need to deal with either shock or recognition at the possibility that reading development can go awry, leading to struggling or non-readers. Struggling readers are not merely learners who do not try. Effort is not the single tool for reversing their struggles. Instead, these weak readers will prominently feature a lack of vocabulary, not unlike the participants in this study who had little vocabulary to describe their own reading. Word poverty creates its own vicious cycle as well, leaving learners without words to connect their own experiences with the ideas, arguments, and concepts featured in demanding texts.

The issues of relevance, authenticity, affect, and motivation will be critical to resolving America's literacy crisis. Teachers who use content-area texts, and who teach diverse learners, and most do today, must engage the social and cultural realities of all learners. This is a challenge that clearly requires the dynamic knowledge that study participants acknowledge, but it will also require a sense of the complexity of cultural systems, an acknowledgement that will pose challenges to more naïve prospective teachers. Furthermore, teacher belief in self-regulation will need to be modulated in favor of understanding the needs of diverse learners who will have their own story, pace, and orientation to academic learning. As Cummins et al. (2005) assert, a teacher who embraces the identities of diverse students will be more effective, and will likely find ways to connect the teaching of texts to learners' real lived lives. By teaching about cultural constructions of knowledge and understanding, teachers can help students make sense of diverse texts. Even better, good teachers find ways to help students activate their own schema, knowledge, and cultural inheritance in ways that enrich the reading and comprehension of new texts.

If empathy is part of understanding (Wiggins and McTighe, 2006), such teacher candidates would be making significant progress toward understanding the varied nature of readers in their classroom. King and Kitchener remind us that development is a result of interactions with the environment; as such, "Students bring with them the attributes, attitudes, and fears they associate with the part of themselves they identify as learner" (p. 229). Awareness of this challenge is the beginning of future teachers thinking about the "ill-structured" problem of literacy acquisition. In this thinking,

teachers don't necessarily see solutions to the problem of student learning as simple, automatic, or easy (King & Kitchener, 1994; King and Kitchener, 2004; Kitchener, 2000). This is consistent with more sophisticated reflective judgment as described by King and Kitchener (2004), or "committed knowing" as described by Perry (1970). It corroborates findings about many college students who have reached a more developed epistemological outlook – one that is more multiplicitous and tolerant of ambiguity.

Conclusion

Viewing content-area instruction through the lens of student epistemology was a valuable exercise. As recently reported in *The New York Times* (Green, 2010) effective teachers must always be working to see inside the minds of learners as they engage in the challenges of a classroom. In describing how one effective practitioner approached his craft, the author reminds us that "…all [of] Lemov's techniques depend on his close reading of the students' point of view, which he is constantly imagining" (Green, p. 5). More understanding of the challenge of reading is what all teacher educators hope for when approaching pedagogy and curricula for teacher education. This research project gives us an initial portrait of the epistemic traits of teacher candidates who work with learners and texts when they begin teaching in content-area classrooms. It also highlights the "ill structured problem" that represents an epistemic challenge (King and Kitchener, 2004, and reflects the very nature of teaching adolescents to read with greater acuity and comprehension. Epistemology gives us insight into learners and future teachers, but there are also challenges and limitations in the field of student epistemology. Thinking about how students and teachers construct knowledge is good

practice and sound educational psychology (Vygotsky, 1997), and it is likely the case

that particular discourses evoke and demand particular epistemologies, or ways of being

literate within that discourse. Gee (2001) calls this" apprenticeship" to literacy, and

enlightened thinking about teaching and learning might well keep this in mind as the

model of a dynamic, shifting, and highly contextualized dialogue between teachers and

learners through which notions of knowledge are constructed (Bakhtin, 1981).

Reducing student epistemology to a mechanistic model is not advisable, as minds and

learners are dynamic and complex; indeed, Schommer (1994), demonstrates that

epistemic domains and orientations may shift over time and within learners, both as

learners acquire new knowledge, and as they encounter different domains of knowledge

requiring distinct cognitive challenges; i.e., solving math word problems as opposed to

writing a laboratory report. Epistemological researchers are wise to use a variety of

methodologies, with careful attention to 'goodness of fit,' and awareness of the

potential for misuse of reductionist data. As Kozol (2005) argues, "Enlightened

practices, when carried out on a large scale, and not reflectively, "do run the risk of

being ossified" (p. 330). Using the model of student epistemology should not be over-

extended or reduced to particulars that are no longer characteristic of the larger

phenomena, contexts, or the diversity of individual experience. Cognition and 'ways of

knowing' are not reducible to a level commensurate with purely quantitative research

models, even as some will attempt to do so. This caution will guide this researcher's

pursuit of new knowledge about how teacher candidates demonstrate and learn the

epistemologies that will affect their future teaching.

The researcher started this project believing that investigating and describing teacher candidate learning (and teaching) experiences, beliefs about knowledge, and understandings of learners' minds, could have significant import for constructing curricula and pedagogy for secondary content-area reading courses. Spending extensive time with the literature that describes student views of learning, knowledge, and texts was invaluable. As Iser (1978) argued, readers do not receive comprehension of text as a result of a "transfer" of inputs according to a transmission model of learning (1978, p.107). Reading is a dynamic and transactional process of construction – and a process that is very dependent upon the epistemology that readers bring to the task of engaging with texts. There is a gap in the literature of epistemology because there has been little investigation of teacher epistemology and its ramifications for teaching literacy to adolescents in content-area courses. This study is a small contribution to investigating what can be learned about that gap in knowledge. The researcher relishes the exciting prospect of more research within this rich vein. Work to gather individual narratives of literacy acquisition can inform teacher preparation, and it can tell us more about the beliefs prospective teachers will bring to their own work with readers. What this study reveals about prospective teachers will have implications for teaching literacy methods to content-area teacher candidates. It will also have implications for teacher preparation programs generally, which continually wrestle with the reality of teacher candidates' beliefs about knowledge, learning, and reading.

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Appendix A: Epistemological Beliefs Instrument

EPISTEMOLOGICAL BELIEFS INSTRUMENT:
SCALES AND ITEMS

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Appendix A: Epistemological Beliefs Instrument (cont.)

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BACKGROUND

The items on this Epistemological Beliefs Instrument were originally developed by Dr. Jihn-Chang Jehng (Jehng, Johnson, & Anderson, 1993). We made some minor rewording changes to the items from the original instrument, and developed a new instrument that was used in our cross-cultural epistemological beliefs study (Jacobson, Jehng, & Maouri, 1996). The first section below lists the factors. The second section lists the statements used in the instrument with the factors indicated. Finally, the complete instrument is listed which also including three open-ended questions we adapted from Kristi Lonka (personal communication).

Factors

1. Certainty of Knowledge
2. Omniscient Authority
3. Orderly Process (Simple view of learning)
4. Innate Ability
5. Quick Learning

Appendix A: Epistemological Beliefs Instrument (cont.)

Items on Instrument with Factors Indicated

Item	Factor
1. If scientists try hard enough, they can find the answer to almost every question.	1
2. How much a person gets out of school mostly depends on the quality of the teacher.	2
3. I do not like situations that can be understood in more than one way.	1
4. Learning is essentially doing what your teachers tell you.	3
5. Students have lots of control over how much they can get out of their education.	4
6. Working on a difficult problem for an extended period of time only pays off for really smart students.	2
7. It usually takes a lot of time to learn important things.	5
8. Forming my own ideas is more important than learning what textbooks say.	3
9. The information we learn in school is always certain and unchanging.	1
10. I like information to be presented in a straightforward manner; I do not like having to read between the lines.	1
11. Learning definitions word-for-word is often necessary to do well on tests.	3
12. I always find the answer keys in the textbooks helpful since I am not confident of my solutions to exercises.	2

Appendix A: Epistemological Beliefs Instrument (cont.)

13. Teachers should keep control of the sequence of the student's learning activity. 2

14. For almost all information that I can learn from a textbook, I can understand most of it on the first reading. 5

15. The statement "Genius is 10% ability and 90% hard work" is not true. 4

16. I dislike working on problems that have no clear-cut answers. 1

17. I prefer classes in which students are told exactly what they are supposed to learn and what they have to do. 1

18. Scientists can ultimately discover the truth. 1

19. People who challenge experts in a general subject area are over-confident. 2

20. Going over and over a difficult textbook chapter many times does not help me understand it any better. 5

21. Even for a smart student, getting ahead takes a lot of work. 4

22. When a problem has more than one solution, it is usually not difficult to decide which is the best solution. 3

23. Being a good student generally involves memorizing a lot of facts. 3

24. Even advice from experts should be questioned. 2

25. Some people are born good learners; others are just stuck with limited ability. 4

Appendix A: Epistemological Beliefs Instrument (cont.)

26. Most words have one clearly defined meaning. 3

27. I feel uncomfortable in dealing with ambiguous situations. 1

28. Learning is a process of building up knowledge gradually. 5

29. Students who are mediocre in high school will remain 4
mediocre in college.

30. An expert is someone who has a special gift for a 4

particular field.

31. Today's facts may be tomorrow's fiction. 1

32. When I encounter a difficult problem, I try to work it out 2
myself without consulting my teachers.

33. The really smart students do not have to work hard to do 4
well in school.

34. When I study, I look for the big picture rather than the 3
details.

35. I prefer that professors stick more to concrete examples 1
and do less theorizing.

36. If I work hard enough, I can usually get what I want. 4

37. If I find time to re-read a textbook chapter, I get a lot 5
more out of it the second time.

38. You just have to accept the answers your teacher gives 2
you even though you do not understand them.

Appendix A: Epistemological Beliefs Instrument (cont.)

39. Course materials and requirements should be spelled out to students.   1

40. I like a course where the instructor presents an outline and sticks to it.   3

41. Sometimes I feel that I lack the talent to do well in school.   4

42. If a person can not understand something within a short amount of time, he/she should keep trying.   5

43. You should evaluate the accuracy of information in a textbook, even if you are not familiar with the topic.   2

44. I wonder how much my teachers really know about the subject matter they teach.   2

45. If I am ever going to be able to understand a topic, it will make sense to me the first time I read or hear about it.   5

46. When I learn, I prefer to make things as simple as possible and avoid looking for different explanations for the same topic.   3

47. Everyone is born with the ability to learn.   4

48. It is annoying to listen to lecturers who cannot seem to make up their mind as to what they really believe.   1

49. When I have missed questions on exams, I have always believed my teachers when they explained to me why my answers were wrong.   2

50. Hard work is more important than talent for learning.   4

51. It is difficult to learn from a textbook unless you start at the beginning and master one section at a time.   3

Appendix A: Epistemological Beliefs Instrument (cont.)

52. If I cannot understand something quickly, usually it   5
   means I am never going to be able to learn it at all.

53. For learning in school, it is best not to ask too many   2
   questions.

54. For good students, understanding a concept is easy.   5

55. Most principles and theories described in textbooks will   1
   change over a period of time.

56. If you are not smart enough, working hard usually does   4
   not help you learn.

57. You can believe most things you read in textbooks.   2

58. When I study, I like to figure out my own ways of   3
   understanding things.

59. Usually the first time I try a new subject, I can tell how   5
   well I am going to do at it.

60. Successful students learn things quickly.   5

61. Most problems have one best solution no matter how   1
   difficult they are.

Appendix A: Epistemological Beliefs Instrument (cont.)

ID _____
(for office use only)

LEARNING QUESTIONNAIRE

We are conducting an international study into the beliefs students have about learning. Your
participation in this study is very important. All information that is collected as a part of this
study will be held confidential. Each of you will be given a subject identification number that
will be used to identify all study materials you use. You may withdraw from this study at any
time and for any reason.

Grade: _____   Age: _____   Sex: _____

Major: _____   Minor: _____

GPA (optional): _____

Please indicate how many courses you have taken at the high school and the college levels in
these areas. Count a quarter session course as 2/3, a semester course as 1, and a year long course
as 2.

Appendix B: Epistemology of Reading Inventory

Each of the following items asks you about your experiences of books and learning

from texts. Beside each of the statements presented below, please indicate whether you:

Strongly Agree (**SA**), Agree (**A**), Neither Agree or Disagree (**N**), Disagree (**D**), or

Strongly

Disagree (**SD**).

Factor 6: Disposition toward Reading and Texts

SA   A   N   D   SD

1) I am motivated and eager when asked to read aloud for a group.

2) What other people are reading for fun and pleasure is something I wonder about

often.

3) I have positive feelings about learning from words on a page.

4) I don't talk about books or reading because I struggle with books and reading.

5) Fiction is not my favorite because it is not about the real world

6) I would be eager to join a book discussion group if invited.

7) I can enjoy the task of reading a long book.

8) Reading cannot substitute for learning by doing.

9) I would be a more successful student if reading didn't count so much in some

subjects.

Appendix B: Epistemology of Reading Inventory (cont.)

10) When assigned a difficult reading, I look for ways to avoid actually reading the assigned text.

11) Some of my fondest memories have to do with books and reading.

12) People who fix things, build things, or solve problems, are probably closer to the real world than writers are.

13) I am likely to seek out a written review as part of buying a product, visiting a restaurant, or going to a movie

14) When I hear about something new, I make a mental note to read about it sometime soon.

15) I find that others call attention to my love of reading.

16) I am eager for books to be replaced by electronic media.

17) I get rid of my books immediately because I do not need the information any longer.

18) Long books make me anxious or fearful when I think about reading them.

19) I am known for "losing myself" in reading.

20) I receive books as gifts because others think of me as a reader.

Appendix B: Epistemology of Reading Inventory (cont.)

Factor 7: Beliefs about the Reading Process

SA   A   N   D   SD

1) A student either "gets it" when reading, or she/he is unlikely to understand the material.

2) I do what I need to do earn my grade, but reading is not usually my priority.

3) To understand a book, you need to know what the author means.

4) In the past, books have led me to question what my teacher says.

5) I study textbooks to know what the right answer is for a test.

6) My best learning is when I get to read about a variety of perspectives on a topic

7) Reading well is about getting the words right; for example, reading aloud accurately.

8) Complicated language in a book is usually the writer trying to show that she /he is smart.

9) Syllabi that contain multiple readings or text sources describe courses that I try to avoid.

10) I skip some assignments in texts because they are just too hard.

11) When I read an assignment, I am often want to ask the teacher / professor exactly what they want.

12) I expect most books to be pretty much like others I have read.

13) I am inclined to write / compose in ways that imitate something good I have read.

Appendix B: Epistemology of Reading Inventory (cont.)

14) Electronic media like the web, movies, video games, or texting are much better than any book could ever be.

15) I am likely to read two biographies or histories in order to get different perspectives on a person or an event.

16) Teachers' / professors' comments on student papers are usually just opinion.

17) You can be expert in my content-area without much reading comprehension.

18) My teachers have assigned reading because they knew the texts were valuable to understandings about the topics in the course.

19) If I teach, I will not assign much reading because it is not a valuable part of my content-area.

20) My teachers (or parents) encouraged active reading of lots of texts, and it is a practice I follow to this day.

Appendix C: Interview Protocol

Questions for Interviews / First Level.

How do you like studying at the university?

What is the easiest thing about learning in school? Why?

What is the hardest thing about learning in school? Why?

What makes someone a good student?

What makes someone smart?

What do students do who aren't good students?

What is your favorite kind or reading? Why?

How are books important to your learning?

Questions for Interviews / Level Two.

Tell me what you think – agree, disagree—as you answer each of the following

questions? Any examples?

If you are going to be able to understand something, it will make sense to you the first

time you hear it.

To do well in school, it is best not to ask very many questions.

How much you learn in school depends on how good the teacher is.

I often wonder how much my teachers really know.

Good students learn things quickly.

Appendix C: Interview Protocol (cont.)

You can believe almost everything you read.

Reading something more than once probably won't help you "get" the material.

Smart kids are smart because of their hard work, not their brains.

A text doesn't mean much unless you know the author or situation it comes from.

Being a good student is about memorizing facts.

I like / don't like science and math because…

I like don't like the humanities and arts because….

What is true means different things to different people.

I think a lot about what sense I am making of a text when I read.

When you read, you are getting the author's exact thoughts in your brain.

_____

I've struggled in _____(content area) when…..

One of the ways that reading has helped me is…..

When I think of myself as a teacher in _____(content area) I think the most important thing I will be doing is…..

Appendix D: Consent Form for Participants in Study

CONSENT FORM
Research Investigating Teaching and Student Epistemology

You are invited to be in a research study of student beliefs about knowledge, which is also known as "student epistemology." You were selected as a possible participant because you are a student in Education 1101, "Education and Modern Society," which is the course setting for the investigator's inquiry. We ask that you read this form and ask any questions you may have before agreeing to be in the study. Please note: your decision whether or not to participate in the study will not impact your relationship with the instructor or affect your grade in the course.

This study is being conducted by: Christopher W. Johnson, Faculty Member and Doctoral Candidate within the Department of Education, University of Minnesota, Duluth. The study is a final project for a dissertation in the Ed.D. program offered by the Graduate School of the University of Minnesota.

Background Information

The purpose of this study is inquiry into undergraduate beliefs about learning and reading. Literature in three fields -- reading comprehension, teacher preparation, and teachers' beliefs – all suggest the importance of epistemology to eventual practices related to the teaching of reading. This study will focus on student beliefs about knowledge and learning from text. The particular focus will be on course participants who have identified plans to major in secondary education in the content-areas.

Procedures:

If you agree to be in this study, we would ask you to do the following things: complete an online survey instrument which will take approximately 40 minutes, and participate in a taped interview of approximately 30 minutes duration. Surveys will be analyzed and treated using statistical methodologies. Interviews will be transcribed and used as a part of a descriptive analysis of themes, concepts, and examples of prospective teachers' beliefs.

Appendix D: Consent Form for Participants in Study (cont.)

Risks and Benefits of being in the Study

The study has limited risks: First, interviews may include discussion personal opinions and beliefs, and participants may choose to discuss academic history that is personal information.

Participant interviews will be with an instructor who will be responsible for assessing and evaluating other student work for course credit. The instructor will take all usual steps for assessing and evaluating student work before utilizing data from this project for research purposes. Interviews and questions about course work are part of the normative work of teacher preparation in a university, so these steps are minimally intrusive and pose little risk to potential subjects.

The benefits to participation are: participation in a survey instrument that yields data about one's own beliefs about knowledge, and participation in an interview process that may contribute to professional development and better teaching practices, both for the researcher and for prospective classroom teachers.

Compensation:

No renumeration will be offered to participants. Participants will be offered up to 20 participation points for their active part in the study. Other students (non-participants) will be offered a parallel opportunity that is not part of the study.

Confidentiality:

The records of this study will be kept private. In any sort of report that the researcher might publish, he will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. Audio-recordings of interviews will be kept by researcher, and will be used for no other purpose than the study of student epistemology and better teaching practice for the researcher. The researcher plans to remove all student records one semester after the completion of the project.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researchers conducting this study is: Christopher W. Johnson. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at UMD.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be given a copy of this information to keep for your records.

Questions you are welcome to discuss with the researcher:

Do you understand why the researcher is conducting this project?
Do you have any questions about the nature of this project?
Do you understand which students are eligible participants?
Do you understand that participation is voluntary?
Do you have any questions about participation?
What do you understand will be the kinds of data that the researcher will gather?
Do you have any questions about this data?
How will the researcher analyze this data?
Do you have any questions about the analysis of this data?
Can you explain how the researcher will keep data private / confidential?
Do you have any questions about confidentiality?

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I understand that my decision whether or not to participate in the study will not impact my relationship with the instructor or affect my grade in the course.

I consent to participate in the study.

Signature:_____ Date: _____

Signature of Investigator:_____ Date: _____