The Dissertation Committee for Michelle Fulks Read Certifies that this is the approved version of the following dissertation

FACULTY CHANGE FOR DISCIPLINARY LITERACIES INSTRUCTION: EFFECTS OF COGNITIVE MODELING AS AN INSTRUCTIONAL STRATEGY IN ONLINE PROFESSIONAL DEVELOPMENT

Committee:

Joan E. Hughes, Supervisor

Marilla Svinicki, Co-Supervisor

Paul E. Resta

Melissa Mosley Wetzel

Karen D. French

FACULTY CHANGE FOR DISCIPLINARY LITERACIES INSTRUCTION: EFFECTS OF COGNITIVE MODELING AS AN INSTRUCTIONAL STRATEGY IN ONLINE PROFESSIONAL DEVELOPMENT

by

Michelle Fulks Read, B.S.; M.Ed.

Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

May 2014

Dedication

To my husband, Greg Krueger,

and our children, Brett, Marc, & Abby

(Korena, Michael, & Shelly, too).

Thank you for your love, support, and patience!

To my committee

Simply… Thank you!

To Dr. Mike Sullivan

Thank you for not letting me fall!

And to the memory of

Our angels, Nicholas & Brayden

My parents, Donald Joe & Lyni Charlene Read Fulks

and grandparents, Marcus B. & Nahni Hamby Read

for instilling in me the love of reading and life-long learning!

My aunt, Mattie Kathryn Read

for lighting the way!

Acknowledgements

My mother would tell you that I wanted to be a teacher since Kindergarten and a teacher educator since I realized they existed in middle school. My parents, Don and Charlene Fulks, and maternal grandparents, Marc and Nan Read, instilled the value of life-long learning, and it has never left me.

In my parents' and grandparents' time here on earth, I never saw them fail to ask questions, read, research answers to their questions, or engage in an intellectual debate. My mother was an avid reader for both knowledge gain and joy. In addition, she wrote and published articles for various magazines and local newspapers. So that she stayed current on equine issues for her horse-breeding business, she was constantly researching and reading the most recent literature. My father initially began college work through correspondence school while serving in the Air Force overseas. At the end of his time in the military, he became an estimator in the construction industry, and he continued his education by obtaining various certifications in his field. He was continuously reading industry-related literature and the occasional political figure biography. Through his continued quest for knowledge, he afforded himself the opportunity to open a successful construction-related business in the last few years of his life.

My mother no doubt inherited her tendencies from her parents. My grandfather was also an avid reader and enjoyed sharpening his mind with the Sunday crossword puzzle and nightly Wheel-of-Fortune and Jeopardy television games. The latter activities followed many years of Air Force and civil service continuing education. My grandmother was also an ardent reader who enjoyed her work and continued education in

Civil Service. Of the four, she was the only one with extended college experience having attended Blinn College in the late 1930s.

Although circumstances prevented my parents and grandparents from either attending or finishing college, there never seemed to be a question that I would attend and finish. It was my grandparents, particularly my grandfather, who were probably my strongest advocates for a degree in education—perhaps because his father had been a teacher in rural Mississippi in the early decades of the 20th century. He made sure I received my great-grandfather's teaching certificates, teacher exam records, and a brass bell shaped like an apple given to him early in his teaching career. All four supported my undergraduate endeavors both financially and emotionally.

My mother's time to attend college came just as her father transferred to France. Luckily for me, she opted to go since that is where she met and married my father. Her younger brothers and sister all attended Texas A&M, however. Although she decided not to enter the teaching profession, my aunt, Mattie, did receive her teaching degree and certification. She was my first female role model to continue her education in a formal way. I was always aware of her away-at-college status when I played alone in her bedroom at my grandparents' house. Because I idolized her as a child, there was no way that I would not follow her example. My entire family showed me that to achieve your dreams and goals you must continue learning either formally or informally.

Like many, I went straight to teaching upon graduation from Texas State University, what was then Southwest Texas State University. I taught for ten years before I stumbled across an advertisement for online learning through the UT Telecampus system. I quickly realized that I could obtain my master's degree in Educational

Technology, conferred by the University of Texas at Brownsville, while continuing to work. It was there that I met Dr. Mike Sullivan.

Dr. Mike was instrumental in supporting me through my first attempts at online learning but more importantly on not losing vision when my two-year old son, Nicholas, suddenly passed away. He immediately did what he could for me in terms of obtaining incompletes for my courses, notifying administration, and helping me register and get to my GRE exam, which I had yet to take but needed in order to continue work on my degree. He called me often to see how I was doing. The following semester, when I thought I could come back, my father suddenly became ill and passed away, and Dr. Mike repeated the process all over again. This time, incompletes were not an option, but he still carried me through that semester with gentle reminders, emails, extensions, and general support. When I graduated, I wanted to push further. Although there was talk of an online doctoral program at UT Brownsville, it did not materialize, and I sought a second online master's degree in Literacy Studies from UT Arlington. When I finished, it was Dr. Mike, a graduate of our own Instructional Technology program, who encouraged me to attend classes face-to-face allowing me to finish my now 20-year-old goal. He provided recommendations for me and made sure I was prepared.

Once I arrived at The University of Texas at Austin, my support system grew vastly. Each and every one of my professors at the College of Education were, and continue to be, one hundred percent supportive and caring of all of their students. They were easy to approach and willing to listen. In particular, however, the members of my committee have been the most instrumental in helping carry me forward to the dissertation finish line through continued personal struggles with the additional losses of

my grandfather the year after I started and my mother, aunt, and grandmother in just these last few months. They provided the time and care for me to bounce ideas around or provide resources for additional help.

Drs. Paul Resta and Karen French were my first supporters. I met Dr. Resta previously through a course I took while obtaining my online educational technology degree. Since then, he has continuously engaged in many discussions with me regarding my varied interests. Dr. French, whom I also worked for during my time here at UT Austin as a graduate research assistant, has guided me through many brainstorming sessions while providing much needed direction and advice. Dr. Melissa Mosley Wetzel was the one who reminded me of my original contention that literacy and technology go hand-in-hand and provided me with the understanding and the ability to explain why.

Finally, my supervisors, Dr. Joan Hughes and Dr. Marilla Svinicki, have both spent countless hours reading, editing, providing feedback, and engaging in lengthy conversations with me while I struggled to not only develop a research plan but also design the online professional development that provided context for the study. Without them, I am positive I would have not made it this far.

It goes without saying that my success is also attributable to my husband and children. My children have put up with countless attempts on their part to play or talk only to be put off because Mommy was studying or writing. To them, I say, “Mommy will have more free time now.” My husband, Greg, has been by my side all along providing a sounding board for ideas, listening to my concerns and worries, and wiping my tears when I hit obstacles that I feared I couldn’t surmount. He often cooked, cleaned, and took care of the kids’ activities and homework. Without his support, this pursuit would have been impossible and thus, abandoned.

My road to this point has been long and sometimes bumpy because life tends to be that way. When I graduate, my earliest role models and supporters will not be there. However, my husband and children will be there, as will my parents, grandparents, aunt, and young son in spirit.

Because of the support of everyone mentioned here, I was able to continue the pursuit of my goals and reach my ultimate lifelong goal. I am indebted to each of you.

Faculty Change for Disciplinary Literacies Instruction: Effects of Cognitive Modeling as an Instructional Strategy in Online Professional Development

Michelle Fulks Read, Ph.D.

The University of Texas at Austin, 2014

Supervisors: Joan E. Hughes, Marilla Svinicki

This mixed-methods case study centered on an online professional development event targeting university-level teacher educators and higher education discipline-specific instructors. The topic of the online professional development was disciplinary literacy and the promoted use of metacognitive modeling via think-aloud as an instructional strategy for secondary students in various discipline areas. The study aimed to understand how the use of the same instructional strategy by the professional development facilitators affected participants in terms of changes to (a) their knowledge about and attitudes towards reading instruction in the disciplines (e.g., mathematics, social studies, science, the arts); (b) their beliefs regarding learner-centered/non learner-centered classrooms; (c) their general teaching philosophies; and (d) their self-efficacy to use and teach the strategy to others. Specifically, it looked for any relationships between these

changes, their intention to apply the same instructional strategy in their own classes and/or teach their pre- and in-service teachers the strategy, and participant perceptions on the importance of the strategy to their learning. The professional development seminar was accessible over a period of four weeks in the winter/spring of 2012. Ten teacher educators and/or discipline-specific higher education instructors from various institutions participated in this study by completing surveys, submitting metacognitive modeling samples pre- and post- professional development, and participating in interviews.

All participants experienced change during this professional event through the acquisition of new knowledge, while many showed resultant changes to their attitudes and beliefs. Changes in knowledge were most evident in the pre- and post- metacognitive modeling samples the participants provided, with increased scores indicating improvement in their ability to use the instructional strategy. Most evidence of other change is found throughout their interviews. Overall, the participants rated and ranked the metacognitive modeling example videos provided by the professional development facilitators as nearly integral to their learning.

The largest limitation of the study was the small number of participants. Discussion discerns the nature of teacher change, provides suggestions for future professional development design/research, and asserts that the goal of professional development, traditionally to result in changed teaching practices in the classroom, instead be to provide the knowledge *and* initial experience educators can use as a foundation to change in all areas.

Table of Contents

List of Tables ..... **xvi**

List of Figures ..... **xviii**

Chapter 1: Introduction **1**

Defining Professional vs. Faculty Development 4

Importance of Professional Development 6

K-12 teachers 6

University-level teacher educators 8

Changes in the field 9

Study Context 10

Importance/Significance of the Research 15

Research Questions 17

Theoretical Framework(s) 18

Overview of Dissertation 19

Chapter 2: Literature Review **21**

Teacher Change 22

Factors Impacting Teacher Change 27

Teachers' knowledge 28

Teachers' beliefs 30

Teachers' attitudes 32

Teacher self-efficacy 34

Adult Learning Theory, Transformative Learning Theory, and Motivation 38

Adult learning theory 38

Adult Motivation....40
Transformative learning theory....45
Learning Theories in Professional Development....47
General learning theories as frameworks for professional development....48
Cognitive apprenticeship....53
Current Professional Development Research....56
Summary of current professional development research....56
High-quality professional development....60
Critiques of professional development research....66
Online professional development....69
Modeling in professional development....79
Professional development in literacy....82
Literacy instruction in the disciplines....87
Content-area literacy....88
Disciplinary literacy....89
Metacognitive skill development via think-aloud instructional strategies....96
Summary....100
Chapter 3: Methods....101
Research Method....103
Research Design....104
Research setting....108
Description of professional development....109
Sampling....119
Participants....120

Procedures 125
Data Analysis 126
Trustworthiness 130
Researcher Positionality 131
Chapter 4: Results 134
The Participants 135
Instructor Change: Individual Experiences 139
Aaron 140
Eugenie 145
John 151
Kate 156
Ivy 161
Rachel 166
Sam 171
Sarah 177
Susan 182
Victoria 189
Cross-Analysis 194
Change in Knowledge 195
Change in Beliefs 200
Change in Attitudes 205
Change in Self-Efficacy 208
Plans for classroom change 214
Relationship between professional development and teacher change 218

Summary 222

Chapter 5: Discussion 225

Discussion of findings 225

Understanding the reality of teacher change 226

The value of metacognitive modeling in this professional development 244

The potential for cognitive apprenticeship in professional development 246

Limitations and Rigor 250

Future Research Recommendations 252

Needed Change in Professional Development Design and Goals 255

Appendices 261

Appendix A: Knowledge Pre- and Post-Survey 261

Appendix B: Beliefs, Attitudes, Efficacy Pre- and Post-Survey 265

Appendix C: Interview Protocol 273

Appendix D: Observation (Metacognitive Modeling Sample Video) rubric 276

Appendix E: Research Matrix 278

Appendix F: Correlation Chart 282

Appendix G: Metacognitive Modeling Example Video Transcripts 283

References 286

List of Tables

Table 1: *Identified High-quality Professional Development Characteristics* 64

Table 2*: Metacognitive modeling examples (Wilhelm, 2001)* 97

Table 3*: Shapiro-Wilk Test for Normality Results Per Variable* 127

Table 4*: Participant Information* 137

Table 5*: Grade Levels Taught by Participants When Employed in K-12* 139

Table 6*: Aaron's Results: Pre/Post Professional Development Scores* 141

Table 7*: Eugenie's Results: Pre/Post Professional Development Scores* 146

Table 8*: John's Results: Pre/Post Professional Development Scores* 151

Table 9*: Kate's Results: Pre/Post Professional Development Scores* 157

Table 10*: Ivy's Results: Pre/Post Professional Development Scores* 163

Table 11: *Rachel's Results: Pre/Post Professional Development Scores* 167

Table 12*: Sam's Results: Pre/Post Professional Development Scores* 173

Table 13*: Sarah's Results: Pre/Post Professional Development Scores* 178

Table 14*: Susan's Results: Pre/Post Professional Development Scores* 183

Table 15: *Victoria's Results: Pre/Post Professional Development Scores* 190

Table 16*: Participants' Perceptions on Importance of the Metacognitive Modeling Videos to Their Learning* 195

Table 17*: Participant Statements Indicating Contradiction to Changes in Knowledge Survey (KS) Scores and Knowledge Application Through the Metacognitive Modeling Sample Videos (KV) Scores* 199

Table 18*: Participant Statements Reflecting Belief Change* 203

Table 19: *Participant Statements Reflecting Increased Advocacy* *207*

Table 20*: Participant Statements Showing Feelings Associated with Using Metacognitive Think-Alouds During Instruction* *211*

Table 21: *Participants' Immediate Incorporation and Stated Plans for Integrating Metacognitive Think-Aloud Instructional Strategies* *215*

Table 22: *Relationship Between Identified HQ PD Design Elements, Alignment With Cognitive Apprenticeship, and Alignment Activities* *248*

List of Figures

Figure 1. The online professional development home page. 110

Figure 2. Navigation areas within the professional development site. 111

Figure 3. Facilitator's video modeling her metacognition through think-aloud instructional strategies. 113

Figure 4: Journal activity example 114

Figure 5: "Bright Ideas" example 114

Figure 6. A whole-group word wall created in a Google Doc. 115

Figure 7. Partner submission work displayed via an image carousel. 116

Figure 8. Participant recording tool. 117

Figure 9. Participant's recorded sample and her peers' "Gems and Jewels" feedback. 117

Figure 10. Discussion centered on metacognitive modeling example video in VoiceThread provided by the PD facilitators. 118

Figure 11. PD discussion forum for specified topics generated by PD facilitators. 119

Figure 12. Aaron's ratings of the PD elements shown in ranked order. 144

Figure 13. Eugenie's ratings of the PD elements shown in ranked order. 149

Figure 14. John's ratings of the PD elements shown in ranked order. 155

Figure 15. Kate's ratings of the PD elements. 160

Figure 16. Ivy's ratings of the PD elements shown in ranked order. 165

Figure 17. Rachel's ratings of the PD elements shown in ranked order 170

Figure 18. Sam's ratings of the PD elements shown in ranked order. 176

Figure 19. Sarah's rating of the PD elements shown in ranked order. 181

Figure 20. Susan's ratings of the PD elements shown in ranked order. 187

Figure 21. Victoria's ratings of the PD elements shown in ranked order. 193

Figure 22. Participants' means: Pre/Post PD conceptual knowledge surveys 197

Figure 23. Participants' means: Pre/Post PD metacognitive modeling samples. 197

Figure 24. Participants' means: Pre/Post PD LC & NLC classroom beliefs: 201

Figure 25. Participants' means: Pre/Post PD LC & NLC classroom beliefs. 201

Figure 26. Participants' means: Pre/Post PD: General Teaching Beliefs. Scale=1(Traditionalist)-5(Constructivist). 202

Figure 27. Participants' Pre/Post professional development attitude means and totals. 206

Figure 28. Participants' Pre/Post self-efficacy scores to integrate the metacognitive think-aloud instructional strategy in their classrooms. 209

Figure 29. Participants' Pre/Post self-efficacy to teach the metacognitive think-aloud instructional strategy to others. 210

Chapter 1: Introduction

"Never before in the history of education has greater importance been attached to the professional development of educators" (Guskey, 2000, p. 3).

There is a continuous and growing concern reflected within our American society regarding the education of those who will teach its children as illustrated in this opening quote by Guskey (2000). Over the years, there has been an ongoing buzz about how well prepared our teachers truly are to make ready our leaders and workers of tomorrow as evidenced through the creation of federal policies that specifically point out the need for high-quality teacher education such as No Child Left Behind (2001) and the Race to the Top Initiative (2009). At the state and local levels, authorities and policy-makers make decisions based on standardized test performances regarding how teachers deliver instruction and how administrators evaluate teachers. The fact that we constantly compare our children to children of other countries compounds the problem. The American tendency to compare has been particularly true since the Russians beat the Americans in 1957 in the politically and socially perceived race-to-space by launching their satellite, Sputnik, into orbit. In 1983, the Nation at Risk report came out accentuating our educational shortcomings. Furthermore, today's rapid and constant changes in technology and innovation present new challenges and new directions for our education system. One area of targeted criticism over the decades has come to settle on the initial preparation of pre-service teachers, including the overall quality of the

country's university teacher preparation programs (Darling-Hammond, 2000; Wiseman, 2012). Similarly, the continued education of K-12 teachers after their initial preparation courses is critical to keeping up with these changes and preparing our children for global competition for years to come. Likewise, discipline-specific higher education faculty must also stay current on best teaching practices for their students. Most specifically, in order to prepare pre-service teachers and keep in-service teachers abreast of the newest strategies, approaches, and theories deemed *best practice,* teacher educators must also receive professional development to stay abreast of advances and changes in their fields.

Educators are not the only professions expected to engage in life-long learning. Nurses, doctors, lawyers, bankers, and members of other professions must be knowledgeable about their fields and changes within it, including evolving industry best practices. Professional development on a worldly, broad scale "refers to the process whereby a practitioner acquires and improves the knowledge and skills required for effective professional practice" (Hoyle, 1982). For educators, Guskey (1996) describes it as a purposeful endeavor to bring about teacher change in beliefs, attitudes, and practice.

With the understanding that professional development is critical for educational success (Hargreaves, 1994; Hawley & Valli, 1999; Darling-Hammond, 2006; Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009; Guskey & Yoon, 2009), there is also ongoing confusion on how best to deliver professional development for educators that brings about changes in knowledge, beliefs, attitudes, self-efficacy, and ultimately instructional practice. Research is growing for K-12 professional development, but higher

education faculty development is evaluated significantly less often and even less often for teacher educators (Smith, 2003). At a time when researchers still cannot definitively say what approaches and practices work best to result in teacher change, the platform for professional development is shifting and expanding—from primarily face-to-face settings to blended or totally online settings (Dede, 2009). What works in face-to-face settings may be completely different than in online settings. Because online learning is relatively new, research for online professional development is just now beginning to emerge.

The purpose of this study was to add to that nascent research by examining the use of a particular instructional strategy, metacognitive modeling via think-aloud, in an online professional development and its impact on teacher change in conceptual and procedural knowledge, beliefs and attitudes, self-efficacy, and finally, intentions to change classroom practice. Specifically, this study examined data generated from an online professional development on the topic of disciplinary literacies and modeling of mental processes through think-aloud as instructional strategies for facilitating awareness of participants' metacognition and metacognitive strategies. It utilized case study (Yin, 2009) approaches for exploring the experiences of online faculty development participants and how their knowledge, teaching attitudes and beliefs, and self-efficacy for practice, along with their future plans for implementation was impacted by the use of metacognitive modeling example videos in the professional development design.

The professional development under study targeted instructors with students from all grade levels, K-12 through university. Previously offered only in face-to-face settings,

the professional development provider wanted to plan future online deliveries of the professional development. The online professional development instance studied in this research specifically targeted university-affiliated teacher educators who were preparing pre-service teachers, in-service professional development providers, and university-level discipline-specific instructors teaching undergraduates who had expressed plans to become teachers. Teacher educators stand apart from other higher education faculty, such as professors of engineering, law, medicine, history, or chemistry, in that they are typically experts in pedagogy, curriculum, and instruction, and, most importantly, in the instruction of K-12 children. However, it is difficult to find research on this group in isolation (Smith, 2003). Due to the goal to design online professional development for instructors at all levels and the lack of research specific to teacher educator professional development, this study strays from the traditional manner of treating K-12 professional development and higher education faculty development as separate phenomena and instead examines and synthesizes findings from both lines of research.

Defining Professional vs. Faculty Development

In education, professional and faculty development are related terms that differ mostly in participant affiliation. K-12 teacher professional development, or staff development, refers to the continued education of K-12 teachers and paraprofessionals, typically with goals set to change teaching practices and improve K-12 student learning. These opportunities provide teachers with what they need for instructional changes in the K-12 classroom, including new and developing ideas, skills, and competencies (Guskey,

2000). Professional development for K-12 teachers can take a variety of forms including workshops, courses, programs (Fullan, 2007) and individual inquiry, mentoring/coaching, action research, open-ended local learning communities, and distance learning (Joyce & Calhoun, 2010). Often, K-12 teachers are required to attend a certain number of hours and specific types of professional development events each year.

Faculty development, or educational development, for university-level instructors traditionally meant improving or gaining knowledge in one's disciplinary field (Lewis, 1996). This did not necessarily include the development of teaching skills. The sabbatical approach from Harvard, started in 1810, fit in nicely with this mindset. Today, however, faculty development refers to the continuing education of higher education instructors in both instruction and discipline. Like K-12 teacher professional development, faculty development is defined as "an institutional process which seeks to modify the attitudes, skills, and behavior of faculty members toward greater competence and effectiveness in meeting student needs, their own needs, and the needs of the institution" (Francis, 1975, p. 720). Unlike K-12, faculty members are seldom required to attend faculty development. The underlying philosophy for most faculty development programs is that the faculty member is "the driving force behind the institution; therefore, assisting that person to be as productive as possible will make the entire institution more productive" ("POD Network," 2011). Higher education faculty development also comes in a variety of formats, including workshops, seminars, conferences or professional meetings, sabbaticals, and research (Lewis, 1996). Each institution organizes many of these

opportunities through centers, often called Centers for Teaching and Learning (CTL), developed specifically for faculty development (Lewis, 1996).

It is important to note that the term "professional development" in education is also often used in the literature to describe the various types of professional development sequence courses and sessions that pre-service teachers attend as part of their formal education. For the purposes of this dissertation, the term "professional development" is used solely to describe the ongoing, post formal education of both K-12 and university-level educators.

Importance of Professional Development

Literature spanning the last 30 plus years in both K-12 and university-level professional development show increased interest in the continued education of instructors and how that is best approached in terms of change in knowledge, beliefs, attitudes, self-efficacy, and practice. Pressures from government, parents, students, and other stakeholders are causing policy changes at both the state and national levels for both teachers and teacher educators.

K-12 teachers

Researchers and policy makers regard professional development in general, particularly for K-12 teachers, as a necessary component to overall education reform. They recognize that in order to make lasting changes to teaching and student learning, teacher change in knowledge, self-efficacy, beliefs, and attitudes must occur, and

professional development opportunities are best for accomplishing desired change. This includes not just the training of pre-service teachers in universities and alternative certification programs, but also the continuing education of in-service teachers (Fullan, 2007) and teacher educators who provide professional development for in-service teachers and preparation courses for pre-service teachers.

While researchers and policy-makers recognize that design and delivery changes in professional development are needed to build teacher knowledge in and across these areas, this does not appear to be happening on a large scale. K-12 teachers, for example, are still receiving much of their professional development in traditional ways (Wei, Darling-Hammond, & Adamson, 2010; Borko, 2004). In a report for the National Staff Development Council, Wei and colleagues (2010) provide several findings from analyzing the teacher and school questionnaire data from the federal schools and staffing survey. During the 2003-2004 school year, 92% of teachers reported participating in some sort of professional development opportunity. While 91.5% of teachers report participation in the traditional workshop, conference, or training sessions, only 22.4% reported observing at other schools and 39.8% reported opportunities for individual or collaborative research on a topic of professional interest.

Professional development is the key to educational improvement (Dede et al., 2009) and educators' progress and growth (Guskey & Yoon, 2009). The No Child Left Behind (NCLB) act of 2001 highlights the importance of professional development. This act requires that states ensure the availability of "high-quality" professional development

for all teachers. Following suit, the national Race To The Top initiative repeatedly stresses the importance of high-quality professional development to ensure that teachers are ready to prepare their students (US Dept of Education, 2009). Professional development is considered an "essential mechanism for deepening teachers content knowledge and developing their teaching practices" (Desimone, Porter, Garet, Yoon, & Birman, 2002, p. 81). High-quality professional development is fundamental in order for educational reform and initiatives to be successful. It is necessary to teach teachers how to provide students with the skills they need for the 21st century (Desimone et al., 2002).

University-level teacher educators

Teacher quality has been a focus of policy at both state and national levels for years in response to concerns that our children are graduating high school unprepared to go to college and are not as highly skillful as students from other high-achieving countries. Identifying potential shortcomings of our nation's teachers, stakeholders often scrutinize teacher pre-service and in-service education and question the competencies of teacher educators.

At first, claims were that the nation's teachers were not knowledgeable about the subject matter they were teaching. The NCLB act, legislated during the presidency of George W. Bush in 2001, re-energized a focus on teacher preparation by attempting to define and create "high-quality" teachers through subject matter preparation (Wiseman, 2012). Then, Secretary of Education, Rod Paige, "asserted that teacher certification did not ensure teacher quality" (Wiseman, 2012). A rise in teachers coming to the classrooms

with subject-related degrees and little, if any, teaching experience occurred (Wiseman, 2012); meaning that teachers had high levels of subject matter or content-area knowledge but less knowledge about how to teach the material in a pedagogically appropriate way.

The Race to the Top Initiative, enacted by President Barack Obama's administration in 2009, specifically identified teacher quality improvement as integral to education reform. Through this initiative, accountability is tied to student performance, teacher performance, and their teacher preparation programs (Wiseman, 2012). Some states, such as Texas and Virginia, have opted out of this initiative and the chances for additional funding. Pressures for improvement in teacher preparation and professional development programs still prevail through competition for nationally recognized best programs and accreditation agencies such as the National Council for the Accreditation of Teacher Education (NCATE), the Teacher Education Accreditation Council (TEAC), and the newly combined Council for the Accreditation of Educator preparation (CAEP). In consideration of this information, it is critical that university-level faculty preparing teachers for K-12 service be knowledgeable in how best to prepare them.

Changes in the field

Ironically, at a time when federal, state, and local policies are demanding change in education, including improved preparation for pre- and in-service teachers and teacher educators, the economic means to address these cries is decreasing rapidly. Many factors including a lack of understanding of the term "high-quality" in regards to professional development design, time, and cost affect the ability to provide high-quality professional

development to teachers and teacher educators. In light of recent budget concerns, many states, universities and colleges, and local districts are cutting spending; therefore, resulting in their decreasing ability to provide various forms of professional development (Cook & Sorcinelli, 2002; Guskey & Yoon, 2009; Khimm, 2011; Torres, 2011). Several universities have closed down their entire CTL (Center for Teaching and Learning) programs (Cook & Sorcinelli, 2002), and K-12 schools are losing professional development days (Smith, Anthony, Wright, & Russell, 2011).

Because of these events, some are turning to online professional development (Clayton, 2010; Smith et al., 2011). There are additional questions regarding if what we do know about face-to-face professional development is transferrable and applicable to online settings. We simply do not know what the best practices are for design and implementation of online learning (Dede, et al., 2009). What research does exist for online teacher professional development (oTPD) is often, like face-to-face professional development research, too contextual and/or relies on satisfaction surveys immediately following the professional development event(s). Lack of funding (Dede et al., 2009) and time can thwart attempts to look into long-term effects. These authors call for looking past what works to discover why/how it works, thus blending both evaluative and empirical research.

Study Context

In January 2012, a group of area university faculty gathered for the first of a two-part professional development on the topic of disciplinary literacies facilitated by a group

of College and Career Readiness Initiative (CCRI) specialists at a large university in the southwest region of the United States through a grant funded project. The hosting university's CCRI Initiative began in 2008 with funding ending in August 2013. The initiative's primary purpose was three-fold:

- To integrate the College and Career Readiness Standards (CCRS) into pre-service teacher education programs;
- To enhance teacher education so that teachers successfully address the diverse needs of today's students; and
- To ensure that high school students graduate ready for college and/or careers.

Disciplinary literacy is a relatively new theory targeting discipline-specific reading comprehension and writing within the adolescent reading sphere. The theory continues the movement that reading and writing instruction within a discipline is a necessary component to student achievement within the discipline. Specifically, it promotes and fosters metacognitive skill development in order to submerge oneself in discipline-specific literature via the discipline's particular perspective. In other words, it guides readers to read and write while thinking "like a historian," or "like a chemist," or other perspectives as appropriate (Jetton & Shanahan, 2012).

Metacognitive skills, however, are internal processes that are not ordinarily observable by students. In order to teach the art of thinking, instructors need to model their thought processes as they are attacking discipline-specific reading and writing so that students can begin to understand how to think about their thinking in varied contexts.

"Think-aloud" (Wade, 1990) instructional strategies, in which the instructor vocalizes his/her thinking while doing with students either observing and/or following along, is often suggested as an instructional strategy for accomplishing this goal. The instructor displays his/her tacit, heuristic, and procedural knowledge making each step, which may be invisible to veterans and experts, visible for the novice.

CCRI suggests think-aloud of mental or metacognitive modeling strategies to develop metacognition followed by scaffolding student practice with peers and partners before independent attempts. Individual reflections and group discussions round out the cycle. Students are encouraged to share their thinking, thus, coming to understand that there are many ways to think about an idea rather than a singular correct process.

In this way, the disciplinary literacy approach aligns with the tenets of Cognitive Apprenticeship Learning Theory (Collins, Brown, & Holum, 1991; Collins, Brown, & Duguid, 1989; Brown, Collins, & Newman, 1989), which views learning from a mentor-apprentice stance. Unlike traditional apprenticeship where the learner often strictly mimics the actions of his/her mentor, cognitive apprenticeship facilitates the growth of an individual's awareness about his/her thinking by first demonstrating for the learner how to recognize and utilize one's metacognition and developing schema (Collins et al., 1991). Cognitive learning theorists suggest a cycle of modeling, coaching, scaffolding, articulation, reflection, and exploration and rely on students working in teams on projects or problems. Project and problems are deliberately designed just beyond students' ability to complete or solve independently, thus initially relying on each other and their

instructor's guidance. This design reflects Vygotsky's Zone of Proximal Development (ZPD) theory. Cognitive apprenticeship is a situated learning theory within the socio-constructivist paradigm (Brown et al., 1989; Collins et al., 1991; Hennessy, 1993).

In this professional development, participants developed their own metacognition while reading discipline-specific texts by initially observing the presenters' thinking through the use of think-aloud instructional strategies and then practicing their skills with groups and partners. During the professional development event, the facilitators acted out the modeling cycle proposed by CCRI and cognitive apprenticeship theorists, providing the audience of educators with authentic experiences as learners/observers. Activities focused on general comprehension of language arts texts including poetry and expository texts. While reading skills such as rereading, activating prior knowledge, summarizing, paraphrasing, and predicting are not new, the instructional approach for building these skills through metacognition attempts to demystify the process for learners by *showing* tacit and procedural knowledge.

It was during this initial round of faculty development events that the CCRI group came to understand the need to continue its work despite grant funding ending in 2013. The group began considering the possibility of duplicating its faculty development online so that the objectives of the program could continue after funding ended. In addition, faculty at a distance could also participate and potentially benefit.

With online learning for K-12, university-level, and non-degree seeking learners on the rise (Clayton, 2010; Smith et al., 2011) it is only natural to expect the same for the

continued development of professionals. Yet, that does not seem to be the case as Zepeda (2012) points out, "To date, teacher professional development has not used all the benefits that technology has to offer. Leaders should understand the need for distance professional development and strive to provide it to their teachers" (p. 2). This lack of use is likely due, at least in part, to lack of understanding on how best to design online learning environments that best facilitate change in the key domains (e.g., knowledge, attitudes, beliefs, self-efficacy, practice).

From the decision to build the professional development in an online environment came the opportunity for research regarding how modeling via think-alouds, as an instructional strategy and professional development design element, impacts various aspects of instructor change, particularly in online settings where it would be expected to "look" very different. Several studies in face-to-face professional development in the last decade attempt to identify high-quality design characteristics, but while researchers have identified many, including collective participation, active learning, collaboration, reflection, and feedback, few isolate the act of modeling. Modeling is usually ill-defined and embedded within coaching and mentoring frameworks. In this case, modeling is the act of demonstrating metacognition through think-aloud instructional strategies. Throughout the remainder of this dissertation, this act is referred to as metacognitive modeling.

The ability for instructors to learn and use metacognitive modeling strategies in the classroom requires a shift in philosophy regarding the roles of teachers and students

in the classroom. In a strictly behaviorist classroom, teachers typically pass out knowledge, and students absorb it. When modeling occurs in a typical behaviorist framework, the expectations are that students will simply repeat the process or procedure modeled to them. Successful imitation indicates learning. This is not metacognitive modeling and does not develop the metacognitive skills needed to evaluate, assess, or critically judge the situation at hand. In a constructivist, socio-constructivist, cognitive apprenticeship environment, students learn from each other and the instructor as they attack the situation or reading at hand. They learn not just what to do, but why, how, and when by observing others at practice while they think-aloud and practice themselves, directing focus to their own metacognition. As such, cognitive apprenticeship becomes the ideal learning theory to ground the instructional design for both the professional development of the instructors and for the instruction of their own students.

Importance/Significance of the Research

Before the mid-1960's, research devoted to professional development was difficult to find (Zeichner, 1999). Anders, Hoffman, and Duffy (2000) contend that between 1965 and the time of their writing, that less than 1% of all research studies addressed teacher professional development. Since the turn of the 21st century, a growing body of literature has developed to inform its readers of the best practices related to professional development with many attempting to highlight the most effective design features, namely the structural designs, of these best practices, both in general professional development literature and content area literacy-based professional

development research. The disciplinary literacy paradigm, for which this professional development was designed, is new and as such, specific effective design elements in this field's professional development are scant. With the exception of a few studies, research fails to identify which are the most efficacious professional development characteristics in general (Guskey & Yoon, 2009). Ideally, these characteristics could be isolated and utilized in other professional development programs regardless of context or discipline.

Additionally, it is not fully known how identified high-quality characteristics play on the knowledge growth of instructors and more importantly on student achievement (Lawless & Pellegrino, 2007). Garet, Porter, Desimone, Birman, and Yoon (2001) point out that "relatively little systematic research has been conducted regarding the effects of professional development on improvements in teaching and student outcomes" (p. 917). Researchers reiterate this need often throughout the literature. We still do not know the most effective approaches to professional development in terms of how teacher change in knowledge, beliefs, attitudes, self-efficacy, and practice are impacted. Borko (2004) adds that we should know to what extent the concepts, skills, and/or ideas advanced during professional development was actually enacted in the classroom. Guskey and Yoon (2009) suggest the identification of core elements that make for effective professional development regardless of context. We need to know what works for teacher change and student success, along with how and why it works, so that a specific approach can be utilized in varied contexts. This study aimed to begin that quest by focusing on one particular element, the use of metacognitive modeling via think-alouds, as an

instructional strategy, and determining its effectiveness in terms of indicators of teacher change. Because we know many factors (e.g., knowledge, attitudes, beliefs, self-efficacy) contribute to teacher change, these factors were considered independently.

Identifying elements which work across context, time, discipline, and platform is critical as educators at all levels, K-20, face major changes in how and when they receive professional development. To add complexity, the contextual lines encountered by face-to-face professional development research blurs somewhat in oTPD research as instructors potentially come together from various locations, backgrounds, experience, beliefs, attitudes, and school cultures in a neutral platform.

Research Questions

This study explored one design attribute and instructional strategy, metacognitive modeling via think-aloud delivered in an asynchronous online setting, and its impact on changes in instructor knowledge, attitudes, beliefs, and self-efficacy, along with instructors' intent for change in classroom practices. The following overarching question and its sub-questions drove this study:

> To what extent is instructor change evident after participation in an online professional development that utilizes metacognitive modeling through think-aloud strategies?
>
> 1. How does the use of metacognitive modeling during online professional development affect instructors' potential for change/transformation in classroom practice?

i. How does metacognitive modeling in PD affect instructor *knowledge* about literacy instruction in the content areas?
ii. How does metacognitive modeling in PD affect instructor *beliefs* about literacy instruction in the content areas?
iii. How does metacognitive modeling in PD affect instructor *attitudes* about literacy instruction in the content areas?
iv. How does metacognitive modeling in PD affect instructor *self-efficacy* in modeling literacy/ metacognitive processes in the content-area classroom?

2. How do instructors plan for and incorporate metacognitive modeling in their courses post-professional development?

Theoretical Framework(s)

The general theoretical frameworks grounding this study were the change process, specifically teacher change, along with adult learning and motivation theories, specifically cognitive apprenticeship. The purpose of this study was to add to the body of research on effective professional development approaches, particularly in online platforms. The goal of this and of any professional development is improvement or change in teacher knowledge, teacher practice, and ultimately student knowledge and achievement. In order to affect teacher knowledge, learning theory principles, as applicable in this context, need to guide understanding, along with learning theories and motivation specifically for adult learners. Additionally, in order for professional

development to affect teacher practice, professional development providers must be cognizant of how the change process in general occurs and how teachers' self-efficacy, educational philosophies and beliefs, and attitudes all come into play.

Overview of Dissertation

In order to develop high-quality professional development for both K-12 teachers and university-level teacher educators, additional research must be conducted to find what approaches and considerations are the most beneficial. More important, research is needed that explores how these approaches are beneficial in transforming teacher knowledge, attitudes, beliefs, self-efficacy, and their classroom instructional practices.

The remaining chapters focus on the study at hand. The second chapter provides a comprehensive literature review on several factors related to the design and evaluation of the professional development under study. This includes (a) the theoretical frameworks, such as change theory, potential domains for teacher change, and the learning and motivation theories that supported the design and study; (b) current professional development research and the identified *high-quality* characteristics which are most likely to render desirous results in any given professional development, along with research related specifically to online professional development, modeling in professional development, and literacy related professional development; and (c) a concluding section which provides detailed information on the topic of the professional development under study-disciplinary literacies. The third chapter describes the research methodology, design, and context, while the fourth chapter presents findings derived from various

qualitative and quantitative research data. Finally, the fifth chapter interprets these findings, aligns these findings to current research, and identifies these findings' contribution to the field.

Chapter 2: Literature Review

The purpose of this literature review is to bring together research findings and theories about professional development, how it has and continues to change, and how it can positively affect teacher change in knowledge, beliefs, attitudes, self-efficacy, and classroom practice, particularly in the area of disciplinary literacies and, most specifically, metacognitive modeling through think-alouds. It is comprised of five sections. The first section looks more closely at teacher change, one theoretical framework providing a lens for this study. It also identifies factors from research known to affect teacher change including teacher knowledge, teacher beliefs, teacher attitudes, and teacher self-efficacy. It is important to look more closely at these impacts on teacher change, as potential targets for professional development design. The second section describes what is known about adult learning and motivation and transformation, a second theoretical framework surrounding this study. Learning theories applicable to professional development, namely cognitive apprenticeship, are discussed in the third section. The fourth section looks specifically at contemporary research on professional development, including the identified high-quality characteristics or design elements, and known barriers to implementation. Additionally, this section looks at online professional development research, how it is advantageous, and what its limitations include; describes modeling specifically in professional development settings; and discusses development findings specifically in the area of literacy. Finally, the last section reviews the literature

on the topic of this particular professional development, disciplinary literacies, its importance, and its relation to the recently coined phrase "new literacies." Together these sections describe what we know and are learning about change and learning, specifically adult learning, in professional development, and how it is typically deployed versus what we are coming to understand is more effective.

Teacher Change

"As much as change is about adapting to the new, it is about detaching from the old."

~Ronald S. Burt, (2000, p. 1)

Change is two-fold as Burt (2000) suggests in the quote above, and it is the aim of any professional development (Guskey, 1996, 2000). Everyone faces change in his or her life. What we know about the process of change can help in designing effective professional development that ultimately affects what transpires in the classroom.

Teachers are often accused of failing to change. The notions that "teachers do not change" and "they resist change" are incorrect. Teachers are constantly changing (Richardson, 1998). Lanier and Little (1986) also state that "teachers, like other normal human beings, are capable of learning new thoughts and behaviors in ways that conform to a set of generally accepted principles of human learning" (p. 538). Although these authors refer specifically to K-12 teachers, it is reasonable to believe that higher education faculty and teacher educators change their practice as appropriate too, particularly in response to demands of increased quality through policymakers and accreditation agencies such as those described in the first chapter. University-level and

professional teacher educators represent the topmost level for systematic changes that spirals to K-12 classroom teachers, bringing research identified *best practices* to the field.

Teachers, however, may be slow to react to change, particularly if it is imposed upon them (Richardson, 1998), as is so often the case (Fullan, 2007). Richardson (1998) quotes Morimoto (1973):

> When change is advocated or demanded by another person, we feel threatened, defensive, and perhaps rushed. We are then without the freedom and the time to understand and to affirm the new learning as something desirable, and as something of our own choosing. Pressure to change, without an opportunity for exploration and choice, seldom results in experiences of joy and excitement in learning. (p. 255)

Between negative feelings associated with coerced change and loss of comfort in replacing or giving up what they felt already worked, teachers face challenges, both personally and professionally, when presented with change proposals or mandates.

Chin and Benne (1969) describe three types of change: empirical-rational, normative-reeducative, and power-coercive. The first, empirical-rational, is a research-to-practice transfer; with change agents bringing the information to the group who wishes to use the information to reach a united goal (Richardson & Placier, 2001). They will use the information and implement change because it is good. The second, normative-reeducative, describes the individual's need or desire to change. This type promotes autonomy and growth. The final, power-coercive type represents forced change in which

change occurs due to pressure, rather than personal agreement with the proposed change. Both the first and last types of change center on the institution or innovation itself, while the second focuses on the individual. Individual change is the focus of this study, as its transformation is the most likely to induce ownership in change. When an individual's beliefs and attitudes truly shift about a practice, or an innovation, it is reasonable to expect that they will embrace the said innovation, exercise persistence in making it work for them, and even fight for it.

People face change many times in their lives. Change, including adoption of new practices or innovations, such as technology, unless imposed through administrative lead or top-down initiatives (Rogers, 2003), is a personal journey. Innovation always involves change to some degree.

Rogers (2003) writes about the change process from the perspective of various people or groups of people including educators, but also farmers, doctors, nurses, the military, and even women in remote villages adopting new forms of birth control. He describes five stages adopters pass through when adopting (or rejecting) a new technology, innovation, or practice. The five stages in the innovation-decision process include (a) knowledge of an innovation; (b) persuasion; (c) decision; (d) implementation; and (e) confirmation (Rogers, 2003).

The knowledge stage includes initial discovery or awareness of an innovation. Through understanding, persuasion occurs to form either a favorable or an unfavorable attitude that leads to decision, which takes place when one opts to adopt or reject the

innovation. Implementation occurs, if one decides to adopt, when the innovation is put into practice. Here the possibility for reinvention exists perhaps to meet the individual needs of the teacher and his/her students or perhaps because of false clarity regarding the purpose of the innovation or understanding of how to use the tool (Fullan, 2007). Rogers (2003) posits "a higher degree of re-invention leads to a faster rate of adoption" and "a higher degree of sustainability of an innovation" (p. 183). The more flexible a tool is in meeting the individual needs of an adopter, the more likely he/she is to adopt it, keep it, and influence others through direct suggestion and/or modeling. Finally, confirmation comes after implementation and refers to the reinforcement typically sought after adoption. The adopter seeks to reinforce his knowledge and validate his use of the innovation. The possibility exists for discontinuance (Rogers, 2003) of the innovation. This choice is often due to the realization that an older innovation was better or the adopter was otherwise dissatisfied. If positively confirmed, this last stage is characterized by full integration into one's ongoing routine and promotion of the innovation to others (Rogers, 2003). At this point, possible transformation in beliefs have occurred, if the innovation and practice were not already aligned with the teacher's beliefs and attitudes.

During this process, several factors exist that can affect a person's decision-making. Roger's identifies these factors as: compatibility, relative advantage, trialability, complexity, and observability. "Compatibility" (Rogers, 2003) refers to the way an innovation parallels existing values and needs. The "relative advantage" aspect "refers to the superiority of an innovation when compared to its predecessor" (Rogers, 2003). The

new system must be perceived to be better in some way than the tools already in use. Additionally, “trialability” is the degree to which a system can be tried out before full-scale adoption, while 'complexity' describes the ease of use (Rogers, 2003). The easier the innovation is to use, the more likely adoption will be successful (Black, Beck, Dawson, Jinks, & DiPietro, 2007). Finally, “observability” refers to the degree of visible measures of success and failures (Black et al., 2007). Satisfaction is the primary necessity for successful adoption.

Professional development can help facilitate Roger’s process. Hughes, Guion, Bruce, Horton and Prescott (2011) suggest a framework for an action model that potentially targets facilitation for change at critical points in the adoption process. These “points of factor interaction” are potential times for intervention. The authors criticize the existing change models for lacking emphasis on interaction of factors during the process and lack of recognition of transformative learning and teaching as the goal and sign of success.

Hughes et al. (2011) developed their framework specifically around the adoption of Web 2.0 technologies by K-12 teachers and target transformational use of digital technologies over simple adoption; however, much of their framework can be applied to the adoption of innovations and best practices in general by either K-12 or higher education faculty. For example, Hughes et al. (2011), describe the adoption of a digital innovation in which varying degrees of complexity affect adoption outcomes. We know from Rogers that a complex innovation is likely to be abandoned. This perception of

complexity is unique to each participant. Professional development providers should plan to address these perceptions of compatibility, relative advantage, trialability, complexity, and observability, in a way that promotes their professional development goals.

Understanding change is an initial step in knowing what to target besides general knowledge about an innovation in designing professional development. Other factors affect implementation of innovation including teacher's applicable understanding such as how and why to use it (Bransford, Derry, Berliner, Hammerness, & Beckett, 2005; Resnick, 1987; Schunk, 2004), teacher's fundamental beliefs (Ertmer, 1999, 2005; Pajares, 1992; Polly & Hannafin, 2010; Richardson, 1996; Richardson, Anders, Tidwell, & Lloyd, 1991), and motivation (Pintrich, Marx, & Boyle, 1993). It also includes self-efficacy (Bandura, 1977/2006; Schunk, 1991; Stein & Wang, 1988; Tschannen-Moran & Hoy, 2007) and values and attitudes (Kennedy & Kennedy, 1996; Richardson, 1996; Stein & Wang, 1988; Stern & Keislar, 1977) that likely affect whether change will occur in the classroom.

Factors Impacting Teacher Change

There are several possible areas or domains of change for educators as they move through a potential change process. Understanding these various areas of potential change can help a professional development designer develop learning events and environments that best facilitate change across the domains. These individual domains can also be the basis for evaluation in determining if change occurred because of professional development.

Teachers' knowledge

Building teacher knowledge is a predominant need in professional development, and success in knowledge development is necessary for teacher change in the classroom (Richardson, 1994). Knowledge is not just about content knowledge. Subject matter knowledge is an obvious component, but just knowing one's subject does not necessarily promise high student outcomes (Wiseman, 2012). While some studies show a correlation between a teacher's degree in a subject and higher student gain, others do not (Bransford et al., 2005). Teacher knowledge refers to a variety of knowledge pertaining to cultural and linguistic knowledge, culturally informed pedagogical knowledge, knowledge about learning differences, knowledge about how people learn, knowledge about home-school relationships, knowledge about assessment, knowledge about teaching methods and materials (Bransford et al., 2005) including technology integration. These are all examples of various forms of knowledge teachers need for success.

Habermas (1971) identifies three types of knowledge: instrumental or technical, communicative, and emancipatory. The first, "instrumental" or "technical," is objective and easy to evaluate. It is fact-based and verifiable. The second, "communicative," is more interpretive and judgmental, changing as context changes and is socially constructed. Finally, the third type of knowledge, "emancipatory," is more critically self-reflective and subjective. Typical professional development addresses only the first type. However, Cranton and King (2003) argue that knowledge about teaching is

communicative and emancipatory, and professional development design should address those types more often.

In 1986, Lee Shulman put forth the idea of pedagogical content knowledge (PCK). He noted that professional development usually separated content and pedagogy (Shulman, 1986). Instead, teachers need to not only know content, but they also must understand the various ways of teaching that specific content. It requires a fusion of content knowledge (CK) and pedagogical knowledge (PK) to create Pedagogical Content Knowledge (PCK). Garet et al. (2001) reiterates that professional development requires a dual focus on both knowledge of subject matter content and an understanding of how children learn specific content (p. 924).

> In sum, a key challenge in professional development is promoting participants' commitment and capability to interpret and apply principles of effective practice in flexible ways tuned to their own practical circumstances. (Wiske, Perkins, & Spicer, 2006, p. 50)

Teachers need to be aware of a myriad of ways for teaching that mirrors best practices and also works in their given situations and audience.

Knowledge intake affecting beliefs. Teachers and instructors, as learners in professional development, are faced with assimilation and accommodation options (Wiske, et al., 2006). This Piagetian theory states that learners assimilate, mesh new information with existing ones, or they accommodate, adjust what they already knew to accept new information, when faced with new knowledge. If people constantly

assimilate, their original beliefs become "fossilized and impervious to adaption rather than renewed to take genuine account of the new data" (Wiske et al., 2006, p. 51). On the other hand, if they always accommodate "wisdom built up through prior experience may be neglected rather than used effectively to interpret new information or perceptions" (Wiske et al., 2006, p. 51). Learners should not forget to use what they already know to critically evaluate what they are learning.

Wiske et al. (2006) state that most teachers assimilate new information learned during professional development opportunities and as such keep their original beliefs, often traditional, "impervious to adaption." Unlike conceptual development issues that Piaget credits for children's assimilation and accommodation issues in learning, Wiske et al. (2006) suggest that teachers are faced with commitment and other issues related to their revision of practice, including necessities related to their professional lives and immediate teaching/learning environment.

Teachers' beliefs

When considering changing knowledge and beliefs it should be understood that "distinguishing knowledge from belief is a daunting undertaking" (Pajares, 1992, p. 309). There is both cognitive knowledge and "knowing" (Nisbett & Ross, 1980; Pajares, 1992). Ernest (1989) posits that "knowledge is the cognitive outcome of thought and belief [is] the affective outcome," while also suggesting that beliefs are somewhat comprised of cognitive knowledge. Knowledge is semantically stored, while beliefs come from experience and cultural upbringings (Nespor, 1987). It is suggested that beliefs are

stronger than knowledge in terms of change (Pajares, 1992). In other words, although we may know something to be true, it is not necessarily our belief.

The more central the belief, the more difficult it is to change (Rokeach, 1968). Rokeach (1968) places beliefs on a 5-point continuum that range from core beliefs to those increasingly peripheral. Those on the greatest periphery are easier to change, while those at the most core are the most difficult to change. Belief systems are comprised of overlapping beliefs (Pajares, 1992), and those belief systems greatly influence change in the classrooms. Pajares (1992) states:

> Beliefs are unlikely to be replaced unless they prove unsatisfactory, and they are unlikely to prove unsatisfactory unless they are challenged and one is unable to assimilate them into existing conceptions. When this happens, an anomaly occurs—something that should have been assimilable is resisted. Even then, belief change is the last alternative. (p. 321)

In other words, if teachers see that what they have been using in the classroom works, they may not be motivated to make seemingly unnecessary changes.

Even for teachers whose personal beliefs about teaching are already aligned with the foundational beliefs behind an innovative tool or practice, or they are shifted as a result of professional development and implementation of the innovation, they often feel pressured to do what is being done around them and/or comply with the expectations of administration. Thus, they abandon change if a mismatch exists. Teachers are not necessarily "free agents" (Somekh, 2008) and, as such, teachers' beliefs do not always

match their classroom practices (Ertmer, 2000; Polly & Hannafin, 2010). Fullan (2007) states that administrative support, as evidence through action, is critical for change in the classroom.

Marzano, Zaffron, Zraik, Robbins, and Yoon (1995) suggest that change often fails as a result of the tendency of professional development and their proposed innovations and accompanying changes to target first-order change over second-order change. Marzano et al. (1995) defines first-order change as being psychological in nature, while second-order change is ontological. A paradigm encompasses these beliefs, and a 2nd order paradigm shift occurs when existing paradigms are "judged as bankrupt" (p. 165). These shifts are more controlled and likely sustainable as compared to 1st order changes in which change is forced due to circumstance.

Change is "primarily an experientially based learning process for teachers" (Guskey, 2002a, p. 384). Guskey (1986) also argues that changes in beliefs comes through practice and that teachers must be supported to adopt new practices that are seen as successful in order make those changes in their beliefs. Ongoing professional development opportunities should provide these opportunities through activities such as coaching, mentoring, and feedback.

Teachers' attitudes

An instructor's attitude is as important as their belief. Richardson (1996) notes that early research on attitudes was almost synonymous with beliefs and that it was not until the late sixties when researchers began separating the two. However, Rokeach's

(1968) definition of attitudes still included the concept of belief. According to Richardson (1996), it was Fishbein, in 1967, who first described differences between the two, assigning attitudes an affective domain and beliefs a cognitive one (Fishbein, 1967). "Attitudes are an individual's affective and evaluative response to something, while beliefs are cognitive and reflect the knowledge or information we may have about something" (Kennedy & Kennedy, 1996, p. 355). Attitudes are determined by beliefs (Ajzen, 2005; Kennedy & Kennedy, 1996) and always deal with the way person feels (Stern & Keislar, 1977).

Stern and Keislar (1977) separate beliefs and attitudes by noting that attitudes always involve beliefs, but teachers can possess many beliefs not reflected in their attitudes. Two teachers can have similar attitudes, but different beliefs undergirding the attitude. For example, two teachers may always rely on male students for technical support in the classroom. One teacher does so because she feels girls, like her, are not interested in technology and just simply want the tools to work. The other teacher believes girls are simply not cognitively inclined for technical troubleshooting. The result of the unstated attitude, regardless of the belief behind it, is the same: boys help the teacher with technology issues, while the girls sit back and watch.

Typically, we hold a "belief about something" that may or may not impact our "attitude towards something or someone." Stern and Keislar (1977) point out that observation of teacher behavior would be the best indicator of attitudes, but yet most attitudes are determined via self-reported, close-question surveys, which often contradict

behavior either because teachers do not own or recognize their attitudes, or they are unwilling to admit them.

In terms of innovation adoption and classroom change, Stein and Wang (1988) align attitudes with teachers' perceived value of the innovation and towards its various components. "If the values and goals implicit in the project's design were not congruent with those of the project participants, the innovation was likely to be either symbolically implemented or not implemented at all (Berman & McLaughlin, 1978; Berman, Greenwood, McLaughlin, & Pincus, 1975, p. 18; Stein & Wang, 1988, p. 174). This suggests that 'implementation' of an innovation or technology may merely be compliance.

Teacher self-efficacy

Another factor for change is a teacher's self-efficacy, or the degree to which one feels his/she can or cannot do something. In fact, some argue that it is the singular most important variable for change (Berman, McLaughlin, Bass-Gould, Pauly, & Zellman, 1977; Berman & McLaughlin, 1978; Coladarci, 1992; Gibson & Dembo, 1984; Guskey & Passaro, 1994; Tschannen-Moran & Hoy, 2001), particularly in the area of content area literacy instruction (Cantrell & Hughes, 2008; Tschannen-Moran & Hoy, 2001). Bandura (1997) defines self-efficacy in his seminal article as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. vii). Four factors influence or affect self-efficacy according to Bandura (1997). These include personal experience, vicarious experience, verbal persuasion, and emotional

states, such as stress. Professional development can positively affect self-efficacy by providing opportunity for experience, both personal and/or vicarious.

Teachers' self-efficacy beliefs are directly related to their behavior in the classroom (Tschannen-Moran & Hoy, 2001). Tschannen-Moran and Hoy (2001) add, "Efficacy affects the effort they invest in teaching, the goals they set, and their level of aspiration" (p. 783). Those with strong levels of self-efficacy are more organized and are open to new ideas. According to Bandura's social cognitive theory, teachers will put forth less effort in both preparation and delivery of instruction if they do not believe they are capable or that success is likely. "Self-efficacy beliefs can therefore become self-fulfilling prophesies, validating beliefs either of capability or of incapacity" (Tschannen-Moran & Hoy, 2007, p. 945).

Specifically, teacher self-efficacy is an important factor for teachers of reading in the discipline areas, particularly when faced with students with varied reading abilities. For example, teachers with higher self-efficacy are more likely to attempt many strategies to achieve success, whereas a teacher with lower self-efficacy is more likely to blame the student for his/her lack of ability (Tschannen-Moran & Johnson, 2011).

Bandura (1997) suggests that self-efficacy is likely lower when initial learning requires a great deal of assistance. Mastery experiences increase self-efficacy in both novice, who Tschannen-Moran and Hoy (2007) tell us possess somewhat lower self-efficacy, and veteran teachers.

Typical professional development does not offer a great deal of experience and practice. To provide experience that affects self-efficacy, professional development must change. Minimally, professional development should at least provide teachers with explicit opportunities to connect their new learning to their prior knowledge and beliefs. Working with other learners and through the support of each other and experts, teachers should be given multiple experiences to learn through observation and practice. These experiences should be scaffolded and mentored to increase likelihood of mastery. Metacognitive modeling, the focus of this professional development, is an important source of Bandura's vicarious experience need (Bandura, 1977; Schunk, 1991).

Traditionally, research supports the notions that lower self-efficacy results in teachers' resistance to integrate innovation in their classroom; however, some research indicates that the opposite is true (de Laat & Watters, 1995; Collopy, 2003). In other words, teachers with high self-efficacy are the ones most resistant to true implementation because they feel that what they are already doing is more effective. In one study on the adoption of a science program, de Laat and Watters (1995) found this to be the case. The teachers with lower self-efficacy beliefs were more bound to the prescriptive materials, while teachers with higher self-efficacy were more likely to continue using the methods that they had previously adopted. In another study, Collopy (2003) interviewed two teachers, one with low self-efficacy and one with higher self-efficacy. The teacher with lower self-efficacy relied on the new materials and remained bound to the outlined curriculum. Although the teacher with higher self-efficacy used the new materials, she

adapted the materials and program to her own personal use. This aligns with Roger's idea of reinvention. In these cases, the innovative practice is potentially misaligned with the teachers' previous beliefs, attitudes, and practices and the professional development did not sway the teachers' positions.

Many assumptions and questions could arise for readers of this last paragraph. The professional development failed in producing complete fidelity of program implementation, which is problematic if that was its goal. In other words, a counter argument could be made that self-efficacy is not the most important variable for classroom change after all. With research that argues for each factor (e.g., knowledge, belief, attitudes, self-efficacy) as integral for classroom change, it is likely a combination of factors that must be addressed.

As teachers of children and those who will teach children, educators understand the pedagogies of teaching and the philosophical stances on knowing that support those pedagogies. Once we are no longer children, we continue to learn and professional development providers should take pedagogical considerations and their philosophical underpinnings into account when designing instruction for adults. The following section reviews what is known about adults, learning, and change and transformation.

Adult Learning Theory, Transformative Learning Theory, and Motivation

"Adult educators come from backgrounds as diverse as the settings in which they practice" (Cranton, 1996, p.xi).

In this quote, Cranton (1996) reminds professional development designers and providers that adults are a unique group of learners. They are past their formative years in education and often already established as experts in their fields. The following sections in this literature review look at adult learning and motivation theories, which were specifically considered in the design, development, and delivery of the online professional development under study.

Adult learning theory

There are special considerations for adult learning in planning professional development. Knowles (1973) developed the idea of "andragogy," or the science of teaching adults (Knowles, Holton, & Swanson, 1998), with six basic assumptions about learners and their motivation to learn. These assumptions (Knowles et al., 1998) include:

- Need to Know - adults need to understand why they are learning;
- Foundation - learner's previous experiences as basis for learning must be considered;
- Self-Concept - learner's degree of personal accountability for learning impacts their learning;

- Readiness - learner's interpretation of content relevance to them impacts their learning;
- Orientation – learner's want to learn something which solves a problem; and
- Motivation – adult learners respond better to internal vs. external motivation.

Speck (1996) notes the following important, specific considerations, many of which are aligned with Knowles' assumptions, when planning professional development:

- Goals and objectives must be realistic and important;
- Adult learners should be given some control over their learning;
- Content must be relevant;
- Experiences must be concrete and direct;
- Professional development should provide peer support and be free of judgment;
- Opportunities must be built-in to allow for practice;
- Adults, like children, need feedback;
- Adults need participation in small-group activities;
- Adults come from a wide range of background experiences, knowledge, self-direction, interest, and competencies. Professional development should embrace and respect those perspectives; and
- Transfer of knowledge must be facilitated through activities such as coaching and mentoring soon after delivery of professional development material.

These suggestions for adult learning should serve as a general, but customizable, framework for professional development design. Specific instructional practices within the professional development will need to be designed as appropriate for the content and learning goals. Often a goal of professional development is to bring about transformation in teachers' ways of thinking (Mezirow, 1991; Cranton, 2002; Guskey, 1996, 2000), and the professional development activities utilized during the learning event can help facilitate those transformations.

Adult Motivation

While Pintrich et al. (1993) ties motivation and cognition to change, Schunk (1991) ties self-efficacy to motivation. Self-efficacy is a strong predictor of change for any adult including academic achievements, social skill development, smoking cessation, pain tolerance, athletic performance, career choices, assertiveness, coping with feared events, recovery from heart attacks, and sales performance woes (Bandura, 1986). As noted above, self-efficacy is also tied to teacher change in the classroom (Berman et al., 1977; Berman & McLaughlin, 1978; Coladarci, 1992; Gibson & Dembo, 1984; Guskey & Passaro, 1994; Tschannen-Moran & Hoy, 2001).

Polly and Hannafin (2010), writing about Learner-Centered Professional Development (LCPD), note, "Motivation influences the extent to which learning occurs" (p. 560). Several factors influence motivation including: interests, relevance, beliefs, and goals, along with contributions from the individual's background, preferences, experiences, and need. They also add reflection, ongoing (longer duration), collaboration,

active learning, focus on student learning, and teacher-ownership as characteristics needed for LCPD. Much of this aligns with the identified professional development high-quality characteristics found in other professional development literature.

Two motivational theories help to explain teacher adoption of innovation and change in the classroom and potentially affect Roger's (2003) change model. These include Expectancy Value theories and Social Cognitive Theory.

Expectancy Value theories and models (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1973; Fishbein, 1963; Vroom, 1964; Tolman, 1932) focus on the learner's beliefs about probability of success or truthfulness of ideas and the value or attitudes regarding the task, idea, or associated goal. From a professional development designer's point of view, thinking about expectancy value is easy to consider and can take advantage of and build upon a teacher's existing tendencies. By observing others, teachers can see that the task is doable (Vroom, 1964) and gauge the value of the task by looking at final outcomes, such as student reactions and knowledge gain and/or the observed teacher's reactions and perceptions on how the innovation benefitted instruction.

Social Cognitive Theory, as a motivation theory, states that motivation comes from modeling and the vicarious experiences (Bandura, 1989) of success by others. By observing others, teachers find that their colleagues are successful, and therefore, they believe they too can be successful. Additionally, Social Cognitive Theory plays on the importance of self-evaluation and self-regulation as important elements of motivation. A professional development provider can help a participant to evaluate their own strengths

and weaknesses and plan accordingly, creating accomplishable goals for the teacher to meet through self-regulation. Moreover, within a supportive community, participants can openly reflect and support one another.

In higher education faculty professional development, two additional theories of motivation are as applicable to explain higher education instructor's motivation for learning in general. These include self-directed learning and self-determination as motivation. These are less applicable at the K-12 teacher level due to a variety of factors including the above mentioned barriers to professional development, but more because the necessary elements for self-directed learning and self-determination often cannot be met in K-12 without extreme effort. This effort can result in teachers taking graduate courses, independently paying for and attending discipline area conferences while losing personal days at work, and/or joining online communities of practice. However, most professional development is still offered and designed without teacher input (Fullan, 2007), thus eliminating many of the elements described below, particularly autonomy. While some argue that teachers do exercise ultimate autonomy in their classrooms (Fullan, 1993), others contend that many factors affect today's teacher autonomy including building and district mandates and parental, administrative, and governmental pressure. Fewer argue, however, that teachers have autonomy in their professional development options. Although teachers are expected to be independent and self-directed, the historical and current models of professional development do not allow them to be (Cranton, 1996).

Cranton (1994) reminds us that faculty, too, are adult learners. They do tend to be more self-directed and collaborative by nature. This aligns with Knowles's andragogical considerations. Self-directed learning is described by Knowles (1975) as "a process in which the individual, with or without the help of others, to diagnose their learning needs, formulate learning goals, identify resources for learning, select and implement learning strategies, and evaluate learning outcomes" (p. 18). It is important to note that Knowles uses the phrase "help of others" not "mandates by others" (1975).

Candy (1991) describes self-directed learning as both process and a goal and includes four components: personal autonomy, self-management, learner control, and autodidaxy (Cranton, 1994, 1996). Autodidaxy is the individual's intentional pursuit of learning opportunities, not driven by administration or other external factors (Candy, 1991; Cranton, 1996). Cranton (1994) argues that to become self-directed, most faculty must change their current assumptions and beliefs about themselves as learners. While the assumption that most faculty are self-directed may be true, not all are, and faculty development providers should not assume this to be true. Some, for example, attend faculty development mandated by administration. Although this does not occur as frequently in higher education as it does for K-12 teachers, it still instills a loss of autonomy, learner control, and specifically, autodidaxy.

Deci and Ryan (1985, 2000) bring forth the notion of self-determination as a theory of motivation. They describe motivation as a continuum from amotivated to four levels of extrinsic motivation to finally, intrinsic motivation. The four levels of extrinsic

motivation include completely external, somewhat external, somewhat internal, and internal. This theory identifies three innate needs that must be met for true intrinsic motivation: competence, relatedness, and autonomy. “Competence” describes the learner’s need to control the outcome and experience mastery. “Relatedness” describes the need to connect, and “autonomy” refers to the need to be in control of personal choices.

Ryan and Deci (2000) also explain how different approaches in adult education can inhibit or facilitate growth in either intrinsic or extrinsic motivation; intrinsic motivation being the more powerful motivator. For example, positive feedback can enhance intrinsic motivation, while negative feedback tends to diminish it (Deci & Ryan, 1985; Ryan & Deci, 2000). While these needs are innate, they can be developed. Autonomy can grow from satisfaction of basic needs. However, both autonomy and competence are needed to increase intrinsic motivation. “Relatedness” is developed as motivation become less external and internalized (Ryan & Deci, 2000).

Both self-directed and self-determination theories rely on constructs of autonomy, a characteristic that most university level faculty members have, but, as noted, many K-12 teachers lack. Recent editorials suggest that the government should yield slightly and return autonomy to the teachers. Culbert (2011) adds:

> The way to make stars out of teachers is to let teachers be stars, to let them be as innovative as they can be, to let them find the path that works best for them and

> their students. If they are allowed to search for the best answers, they will find them. (Culbert, 2011, para. 2)

Although K-12 teachers were not the targeted audience in this particular instance of the disciplinary literacies professional development under study, the online professional development was designed with instructors of all levels in consideration with intentions that future instances would be made available directly to in-service K-12 teachers. Remembering their lack of autonomy is critical for understanding why K-12 teachers might seem averse and/or reticent to change. Changes in their knowledge, beliefs, attitudes, and even self-efficacy, that are counter to the environment and administrative expectations they face are not likely to be seen in the classroom (Fullan, 2007).

Transformative learning theory

Change is a process; one that is not likely to be realized immediately following a single, professional development event (Guskey, 2000). Understanding this can help in evaluating the success of a specific professional development event by forcing the evaluator to realize that transformation is a process that may continue in the weeks and months that follow.

Mezirow (1991) defined transformative learning as "a process of learning through critical self-reflection, which results in the reformulation of a meaning perspective (the way we understand the world) to allow a more inclusive, discriminating, and integrative understanding of one's experience" (Cranton, 1994, p. 730). Adults have already formed beliefs, values, and assumptions generated by their previous experiences that affect how

they perceive new experiences. People, events, contextual changes, crises, or new experiences can challenge these (Cranton, 1994). Mezirow (1991) adds that beliefs and assumptions are often distorted psychologically (likely by event), sociolinguistically (likely by environment), and/or epistemically (misinformation). Particularly, in the case of the first two distortion types, it can be seen how beliefs and knowledge and beliefs and actions do not always match. It often takes a new event or environment to create a new realization. Cranton (2002) elaborates:

> Through some event, which could be as traumatic as losing a job or as ordinary as an unexpected question, an individual becomes aware of holding a limiting or distorted view. If the individual critically examines this view, opens herself to alternatives, and consequently changes the way she sees things, she has transformed some part of how makes meaning out of the world. (p. 64)

In order for transformation to be complete, however, Cranton (1994) argues, those changed beliefs must be enacted upon.

The key to transformation is acknowledging one's current assumptions and beliefs, evaluating them against new knowledge and experience, reflecting, and then revising new beliefs and behaviors. In today's professional development, just as Guskey (2000) declared "change" as the predominant goal of professional development, Mezirow (1991) and Cranton (2002) identify "transformation;" although Cranton (2002) also states that it should not be the only goal. Also, professional development providers should be prepared for the fact that transformation cannot be imposed on participants (Cranton,

2002; Veletsianos, 2011). Because transformation cannot be imposed or forced, it is difficult to predict in terms of expected outcomes, and equally difficult to measure. Finally, transformative success in one professional development event cannot be translated to other professional development events (Veletsianos, 2011), as participants will vary in their preconceived notions and beliefs, openness to change, depth of reflection, and whether transformation is even needed. For some participants, validation may be the final outcome rather than transformation.

Learning Theories in Professional Development

Understanding various potential learning theories and their relevant applications to professional development design helps developers and facilitators create learning environments and activities that can be identified as *high-quality* and, thus, best practices for promoting teacher change across the various domains (e.g., knowledge, beliefs, attitudes, self-efficacy). Professional development should use a blend, or "complementary" set of learning theories, particularly in online professional development (Couros, 2010). According to Couros (2010), these should include social cognitive theory, social constructivism, and andragogy, or adult learning theory. The theoretical framework related to learning theories for this study and professional development design also contain complementary theories.

In the typical professional development, teachers are taught how to do some skill or apply a program. The skills are often modeled and teachers may be given opportunity to follow along and/or practice on their own in the presence of the instructor who

provides assistance and feedback throughout. The session may end with a partial product, but no discussion on how this new skill, which is unlikely well developed, can be used in the classroom to assist instruction and student learning. There is seldom follow-up.

General learning theories as frameworks for professional development

Traditional behaviorist theory suggests that learners learn by forming associations or connections in learning through practice and trial and error (Schunk, 2004). Learning moves forward through positive and/or negative feedback or consequences. This can be accomplished by following a typical 3-phase lesson structure: introduction, presentation, and guided practice, which are often seen in the classroom but less in professional development.

Social cognitive theory posits that presentation in the form of modeling facilitates learning through observations (Schunk, 2004). Regardless of presentation form, however, learning is a result of the learners' response to an environmental stimulus, not analysis and critical evaluation of cause and effect.

Early cognitivists recognized that more internal or mental processes occur to explain learning. Information processing theory contends that information enters, is maintained in short-term memory through practice, eventually stored in long-term memory, and is therefore, learned (Schunk, 2004). Information is organized into our schemata (Schunk, 2004).

While an information processing/social cognitive approach might be acceptable for the development of basic skills, which is external and observable (Sprinthall,

Sprinthall, & Oja, 1998), it is not for the understanding of pedagogical concepts through interconnected schema, or internal mental constructs, because it lacks the essential connections to prior knowledge about subject content and understanding of pedagogical considerations. Teachers need to build schema that helps them to understand the connection between desired skill, teaching, and student learning. Additionally, teachers need to experience success in application to increase their knowledge, motivation, and self-efficacy. This can only be accomplished by applying an additional instructional approach based on a different learning theory in professional development.

Many of the high-quality professional development features suggested in the literature parallel desired teaching approaches in the classroom. Upon consideration, it could be determined that many of these high-quality professional development characteristics reflect an epistemology aligned with cognitive, constructivist educational paradigms.

Constructivism, as an ontology, holds that there is a real world that we experience, and that we construct knowledge from that experience (Schunk, 2004, p. 286). This is unlike objectivism (behaviorism and early cognitivist, such as information processing), which believes that meaning is independent of us (Duffy & Jonassen, 1992). We use the processes of accommodation and assimilation (Piaget & Inhelder, 1969) to construct new meaning and organize and attach that meaning to what we already know. That meaning ideally comes from experience and can be structured in a variety of ways. There is not an absolute correct meaning (Duffy & Jonassen, 1992). Because of that,

individual learners often correctly take away individual, slightly varied, understandings. In order for meaning to be applicable in real-world contexts, it must come from real-world contexts.

Dewey (1904, 1933, 1938) was one of the first to suggest experimentation and hands-on engagement by learners in the early 20th century. In 1933, Dewey wrote the book, *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process*. Many suggested professional development features align with Dewey's position including those that employ the "reform" approach (Darling-Hammond & McLaughlin, 1995; Matzen & Edmunds, 2007; Penuel, Fishman, Yamaguchi, & Gallagher, 2007; Polly & Hannafin, 2010), which are participant-driven. These often include opportunities for reflection (Darling-Hammond & McLaughlin, 1995) and active learning (Garet et al., 2001; Darling-Hammond & McLaughlin, 1995), while focusing on content/concepts over skill development (Desimone et al., 2002; Ingvarson, Meiers, & Beavis, 2005).

Cognitivist constructivism holds that learning must be contextual and active. Like earlier cognitivist theories, such as information processing, development of schemata is a way for connecting knowledge. With information processing, learners are recipients of information. With constructivism, on the other hand, the learner constructs his/her own meaning through experiences. Any received information is used to construct meaning through higher-order cognitive processes.

With constructivist teaching and learning approaches, the learner actively constructs their own knowledge by connecting new information to what they already know. When they do this together, or collaboratively, they "share the process of constructing their ideas, instead of simply laboring individually" (Strommen & Lincoln, 1992, p. 468).

Many constructivists also believe that learning is situated in physical and social contexts (Schunk, 2004, p. 289). Social constructivism is based on Vygotskian theories (1978) of sociocultural influences on learning. Adding social features to professional development (e.g., group discussions, collaboration, observations) allows for individual knowledge growth framed and supported by group-generated knowledge. Each individual within a group begins within their own ZPD (Zone of Proximal Development). ZPD is the space between what one can already do on their own and what they can do with assistance. According to Vygotsky (1978), with co-constructed knowledge, each person's ZPD is stretched and cognitive development occurs (Schunk, 2004, p. 295).

Additionally, constructivist approaches can positively affect motivation. Intrinsic motivation can be cultivated by providing instruction that is salient and giving learners choice in what/how they learn (Schunk, 2004). Through choice, teachers feel some autonomy and control in their learning and are open to setting mastery goals.

The use of authentic tasks in constructivist theory also promotes motivation as it requires learners to use tools and practice self-regulation (Dewey, 1938). "Motivation comes from attempts to complete authentic tasks, social interaction, personal

dissatisfaction with current conceptions, and recognition of the superior explanatory power of new ideas" (Blumenfeld, 1992, p. 278). Instructors become facilitators that scaffold learning, turning control over to the learner.

Voogt, Tilya, and Akke (2009) posit that student-centered approaches, such as those that derive from constructivist and socio-constructivist paradigms, are best for all learners. Teacher educators and their prospective teachers need to experience learning in environments consistent with learning principles (Bransford et al., 2005). Teacher preparation courses should be designed consistently with what is known about how people learn. This thought should be stretched to include in-service teachers and teacher educators as they develop as learners themselves.

In order to "successfully prepare effective teachers, teacher education should lay a foundation for lifelong learning" (Hammerness et al., 2005, p. 359). Many teacher education programs are embracing the idea of "adaptive" expertise (Bransford et al., 2005). These experts "are able to balance efficiency and innovation" (Bransford et al., 2005; Hammerness et al., 2005). This leads to lifelong learning habits and practices, which is a goal of the Partnership for 21st Century Skills, a national organization that pushes for student readiness in today's society ("Partnership For 21st Century Skills," 2011). In order to provide modeling of the adaptive expertise idea, it is reasonable to extend this expectation to teachers and teacher educators.

Modeling, in general, is an instructional practice wherein the instructor acts out a skill or process for students to learn. Students then mimic or reproduce the actions.

Described within Bandura's (Bandura, 1971/2006, 1977; Bandura, 1971/2006, 1986) Social Learning Theory (Social Cognitive Theory), people learn from each other through observation, imitation, and modeling. Referred to as observational learning, he provides four necessary components: attention, retention, reproduction, and motivation. Bandura's theory situates learning in a social context and bridges behaviorist and cognitivist learning theories.

Modeling can be both live and symbolic (e.g., video, simulations). Moreover, modeling can be deliberate or unintentional, negative or positive. Finally, learning can occur *without* a change in behavior.

Modeling could be seen as an objectivist or behaviorist-like instructional strategy. What moves it beyond a mimicking event is the degree of discussion and critical analysis embedded in the lesson including the infusion of metacognitive statements that answer additionally contextual questions about the process.

Cognitive apprenticeship

Cognitive apprenticeship, a theory supported by Bandura's theory of modeling, is built on the idea that the teacher models to a learner. It is based in both constructivist and socio-constructivist paradigms in addition to social cognitivism. It is described here as the primary learning theory providing the foundation for the design of the professional development under study.

Collins et al. (1991) draws a parallel between traditional and cognitive apprenticeships, reminding us that apprenticeship is the oldest form of teaching:

> In traditional apprenticeship, the expert shows the apprentice how to do a task, watches as the apprentice practices portions of the task, and then turns over more and more responsibility until the apprentice is proficient enough to accomplish the task independently. That is the basic notion of apprenticeship: showing the apprentice how to do a task and helping the apprentice to do it. There are four important aspects of traditional apprenticeship: modeling, scaffolding, fading, and coaching. (p. 2)

Modeling, scaffolding, fading, and coaching are critical components within cognitive apprenticeship as well. Reciprocal teaching and think-alouds are two activities that fit neatly within the cognitive apprenticeship model (Collins et al., 1991).

In traditional apprenticeship, the skill or process to be learned is easily observable. Cognitive apprenticeship is making the thinking about a process visible (Collins et al., 1991). The teacher thinks aloud as he/she works through a problem or activity. This thinking is often transferrable to other situations, problems, or contexts. This normally invisible construct is not usually shared between teacher and student in traditional apprenticeship. On the other hand, in traditional apprenticeship, learning occurs in the most natural and authentic of contexts, but is not always applicable in other contexts. Brown et al. (1989) suggest that cognitive apprenticeships are less effective when taught outside of real-world situations. Therefore, the greatest challenges for cognitive apprenticeships are in embedding modeling in authentic and transferrable ways.

Brown et al. (1989) provide six teaching methods used to promote both cognitive and metacognitive (thinking about thinking) skills. The first three are core and reflective of traditional apprenticeships. They include: modeling, coaching, and scaffolding.

Cognitive modeling is the act of the teacher (or any master) thinking and doing as he/she illustrates a new skill, task, process, or concept, vocalizing his/her procedural knowledge. It provides vicarious experience (Bandura, 1977) for the student. As the learner begins to take on the task him/herself, the teacher coaches and provides feedback for continuous thought. The teacher also scaffolds or breaks down the task into manageable chunks for the learner.

The next two steps within cognitive apprenticeship include articulation and reflection. Articulation occurs when the learner vocalizes his/her thought processes during the task. Examples of this include think-alouds, inquiry teaching, and critical student role, in which one student critically examines the think-aloud practices of his/her partner. Reflection allows student comparison of their thought processes to the others, including the teacher.

The final step in cognitive apprenticeship is exploration. In this stage, the teacher begins to withdraw support and scaffolding and encourages the learner to explore other contexts in which the newly mastered skill/knowledge is applicable.

The focus of the professional development under study is disciplinary literacies. More specifically, it is about the use of think-aloud strategies to help secondary teachers to teach secondary students about metacognition and to read like a discipline-area expert

(e.g., mathematician, historian, chemist) by understanding discipline-specific rhetoric and behaviors for communication and understanding. Modeling metacognition through think-aloud strategies is the primary way that students learn to think in a discipline-specific mindset (Jetton & Shanahan, 2012). Through the cycles of modeling, coaching, scaffolding, articulating, reflecting, and exploration, in a situated and authentic way, learners (including teachers) become masters. This processes exemplifies cognitive apprenticeship principles.

Current Professional Development Research

As noted previously, professional development research is limited, but growing with increasing focus on determining *best practices* for K-12 in-service teachers. There is less focus at the university level and even less for teacher educators specifically (Smith, 2003). As such, this literature review looks at findings from research on professional development across all educational levels, K-12 through university.

Summary of current professional development research

In the past, broad research on effective strategies for K-12 teacher professional development was limited and focused more on evaluation of specific professional development events (Guskey, 2000). Today, research is focusing on promising changes in professional development approaches, with specific focus given to teacher and student outcomes and is based on larger professional development programs. “Reform” professional development is thought to be more effective than “traditional” approaches (Putnam & Borko, 2000). Reform approaches tend to be more student-centered than

teacher-centered, engaging the teachers in related activities rather than acting as passive audience members. Garet et al. (2001) describe reform activities as coaching/mentoring, committee and/or study groups, or internship engagement. Loucks-Horsley, Stiles, and Hewson (1996) include these plus the need to use or model with teachers the strategies they will ultimately use with their students. Other studies also suggest longer duration, coherence and relevance, collaboration, active learning, collective participation, deeper intensity, content-focus, follow-up and support, and the use of professional learning communities. However, most of this research is based on self-evaluative participant reports. While some research is looking at components of professional development that make it particularly successful for teacher change and student outcomes, such as those mentioned above, much less is known about how these elements or characteristics facilitate knowledge development and change.

Several barriers exist to make change, adoption, and implementation difficult for teachers. In a study by Buczynski and Hansen (2010) on the effects of professional development for math and science teachers, the teachers identified several reasons why they were unable to implement the inquiry-learning practices that they had learned. These included time allotted for science/math instruction, need to teach mandated curriculum, content-related vocabulary skills for both regular and ESL students, lack of resources, and classroom management issues.

Ertmer (1999) describes barriers as either first- or second-order. First-order barriers are those extrinsic to teachers and beyond their control including lack of

resources, time, training, materials, or mandated curriculum. Second-order barriers are more intrinsic to the teacher and reflect the teachers' fundamental beliefs about teaching and learning. These beliefs may not be apparent to others or even the teachers' themselves. Ertmer suggests tactics such as modeling, reflection, and collaboration to aid in overcoming these barriers.

Although Ertmer talks more specifically about technology adoption, Hammerness et al. (2005) discusses barriers in a more global context. They identify three personal barriers from earlier literature:

- "the apprenticeship of observation" (Lortie, 1975/2002). -- Teachers should reflect and understand that teaching and learning may be quite different from their experiences as students.
- "the problem of enactment" (Kennedy, 1999). –Teachers need to be able to put their new knowledge into action. Not only do teachers need to know what, but they need to know why and how. Some of Ertmer's (1999) first-order barriers, such as lack of resources, materials, and support, could impede this ability.
- "problem of complexity"(Hammerness et al., 2005). – Finally, Hammerness et al. (2005) used this phrase to describe general complexity of day-to-day life in a teacher's classroom and/or daily schedule. This complexity factor differs in definition from Roger's (2003) idea of complexity of the targeted innovation itself. However, if teachers do not have time to learn and implement an

innovation due to the complexity of their classroom itself, it can be easily understood why adoption fails. This aligns with Ertmer's (1999) first-order change barrier, "time."

Even less empirical research indicating best practices in university-level faculty development appears in the literature with most examples appearing in disciplines other than education, such as medical and nursing instructors. Much of this research delivers the same conclusions in terms of effective characteristics for professional development. These, too, mostly rely on self-evaluative reports of teacher satisfaction, knowledge gain, skills, and attitudes (Skeff et al., 1997). Many models of faculty development are espoused including workshops, mentoring, and collaborative models (Yilmazel-Sahin & Oxford, 2010).

Several barriers exist for faculty's participation in professional development including (a) a tendency to underestimate the value of a given program; (b) a belief that clinical skills are more important that the utility of teaching skills; and (c) a lack of recognition between teacher training and teacher excellence (Skeff et al., 1997). Unlike K-12, who often face top-down administrative insistence to take professional development, higher education faculty often lack institutional support (Skeff et al., 1997), and professional development is seen as "invisible work" (Yilmazel-Sahin & Oxford, 2010). Schön (1973) and Senge (1990) tell us that higher education often lacks a "long-term, interdisciplinary, systems view of innovation and change (Yilmazel-Sahin & Oxford, 2010). Yilmaz-Sahin and Oxford (2010) add that this is reflected in the

"scatterplot, unsystematic manner in which faculty development is offered, typically as a set of unconnected workshops, the planning of which has not involved potential participants." Smith (2003) blames this lack of "systematic routes" for faculty development on the lack of documentation regarding the professional development of teacher educators (p. 210). Smith (2003) adds that like K-12 professionals, time is a huge barrier for professional development participation, along with "fear of change" (p. 212). Sunal et al. (2001) also cites lack of time as an issue and adds lack of resources and turf conflicts as faculty barriers to change. Smith (2003) adds that teacher educators need to see a reason for change and feel a sense of ownership in the change.

Like K-12 teacher professional development, research in higher education faculty development finds that their potential participants need motivation to learn (Skeff et al., 1997). Motivation is essential for adult learning and change (Fullan, 2007). Motivation and adult learning theory were critical factors for consideration in designing the professional development under study.

High-quality professional development

Most empirical research in professional development is really an evaluation of a professional development event against desired outcomes. In recent years, quantitative findings in research on teacher professional development report existing correlations between design characteristics and gains in teacher knowledge and/or change in teacher beliefs, attitudes, and practice. Those with highest correlation are identified as high-

quality. Knowing these can help a professional development designer develop activities that encompass these characteristics, which are already known to be effective. Taken all together, identified high-quality characteristics include:

- highly intensive (Kanaya, Light, & Culp, 2005; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007);
- reflective (Tate, 2009; Darling-Hammond & McLaughlin, 1995); between peers (Zeichner & Liston, 2010) and individually (Schön, 1983);
- collaborative (Lawless & Pellegrino, 2007; Marzano, 2003, Hunzicker, 2010);
- of longer duration, or ongoing (Brinkerhoff, 2006; Desimone, 2009; Desimone et al., 2002; Garet et al., 2001; Lawless & Pellegrino, 2007; Yoon et al., 2007; Hunzicker, 2010).

Additional suggested characteristics include:

- collective participation (Desimone, 2009, Desimone, et al., 2002);
- a clear vision (Guskey & Yoon; 2009; Guskey, 2000);
- supportive follow-up (Penuel, 2007; Ingvarson et al., 2005, Darling-Hammond & McLaughlin, 1995; Hunzicker, 2010) such as mentoring or coaching (Darling-Hammond & Richardson, 2009);
- active learning and interaction (Garet et al., 2001; Desimone, 2009; Desimone et al., 2002; Lawless & Pellegrino, 2007; Tate, 2009), such as collaborative examination of student work (Ingvarson et al., 2005);

- opportunities for observation (Darling-Hammond & McLaughlin, 1995; Wei, Darling-Hammond, & Adamson, 2010);
- coherence with standards and curriculum (Desimone, 2009; Desimone et al., 2002), instructionally focused (Hunzicker, 2010), and generally relevant by serving their own needs (Guskey, 2002a, 1986; Hunzicker, 2010);
- feedback by instructor (Ingvarson et al., 2005);
- peer feedback (Hunzicker, 2010);
- modeling (Loucks-Horsley et al., 1996; Martin, Strother, Beglau, Bates, Reitzes, & Culp, 2010);
- provides a sense of ownership in what they are learning and doing (Garet et al., 2001; Penuel et al., 2007; Polly & Hannafin, 2010);
- participant-driven, employing a reform approach (Penuel et al., 2007; Darling-Hammond & McLaughlin, 1995; Polly & Hannafin, 2010) that promotes active teaching (Garet et al., 2001; Darling-Hammond & McLaughlin, 1995);
- content, rather than skill, focused (Desimone et al., 2002; Ingvarson et al., 2005; Tournaki, Lyubinskaya, & Carolan, 2011; Hunzicker, 2010).

Mostly, Darling-Hammond and Richardson (2009) point out that research does not support professional development that (a) relies on the one-shot workshop model; (b) focuses only on training teachers in new techniques and behaviors; (c) is not related to teachers' specific contexts and curriculums; (d) is episodic and fragmented; (e) expects teachers to make changes in isolation and without support; and (f) does not provide

sustained teacher learning opportunities over multiple days and weeks. In Table 1, the efficacious professional development qualities found in several larger-scaled empirical studies from the last decade are presented.

With a sense of agreement among researchers, some researchers do disagree about the specifics regarding these characteristics. For example, Brinkerhoff (2006) found that 2 years (or 90+ hours) of professional development was a target number of hours to provide teachers for "longer duration." Guskey and Yoon (2009) suggest 30+ hours, and Desimone (2009) proposes 20 + hours.

Additionally, there doesn't seem to be a consensus on the ranking of these characteristics (Guskey & Yoon, 2009) and which are the most critical in terms of teacher change. The most oft-cited characteristics seem to include: active learning, longer duration, coherence/relevance, and content-focused.

Table 1

Identified High-quality Professional Development Characteristics

HQ Characteristic	**Garet et al. (2001)**	**Desimone et al. (2002)**	**Penuel et al. (2007)**	**Ingvarson et al. (2005)**	**Matzen & Edmunds (2007)**	**Kanaya et al. (2005)**	**Martin et al. (2010)**	**Tournaki (2011)**
Reform**	Y	Y	Y		Y			
Duration	Y	N	Y	N				
Time span/Intensity	Y					Y		
Collective participation	Y	Y	Y	N				
Active learning	Y	Y	Y	Y			Y	
Coherence/relevance	Y	Y	Y	N			Y	Y
Support			Y	Y			Y/N	
Follow-up	*		Y	Y				
Collaboration	*							

Table 1 (continued)

Feedback	*		Y*		
Reflection			Y	Y	
Professional community			Y		
Modeling				Y	
Content-Focus		Y	Y		Y

* These characteristics were embedded within other elements and were not looked at in isolation.
** Reform characteristics are a combination of several other high-quality characteristics and studied as a whole.

Critiques of professional development research

Like earlier professional development evaluation endeavors, most of this highlighted research is conducted only in K-12 and is often simple evaluations of specific professional development programs within a single site evaluating the professional development itself as a whole without breaking down its design elements or considering the context surrounding the professional development event. Moreover, almost all of these studies tend to look only at teacher self-reporting of changes, which may or may not be profound or sustaining, or even accurate.

Issues with self-reporting. Data collection via self-reporting is often critiqued in professional development literature, particularly when asking participants to judge their own attitudes and beliefs about a subject. One reason for this could be that the use of teacher perception and self-evaluation centers on a teacher's tendency to be either over confident or under confident (Ackerman, Beier, & Bowen, 2002) in their assessment of their knowledge, with overconfidence occurring most often (Lichtenstein & Fischhoff, 1977; Kruger & Dunning, 1999). A variety of reasons exists for why teachers may or may not over/under estimate their abilities including (a) internalized gender stereotypes (Ackerman et al, 2002; Lundeburg, Fox, Brown & Elbedour, 2000; Marsh & Yeung, 1998); (b) degree of self-confidence in the general domain (Lichtenstein & Fischhoff, 1977); and (c) vagueness versus specificity in what skill or knowledge judges are being asked to self-evaluate (Ackerman et al., 2002; Kruger & Dunning, 1999; Dunning,

Meyerowitz & Holzberg, 1989). Furthermore, misjudging can occur due to "social comparison," our tendency to compare ourselves to other learners (Kleitman & Stankov; 2007). Finally, misjudgment can occur due to faulty, or otherwise fuzzy, memory, particularly when one is asked to compare the present to the past.

> Herein lies a difficulty in any autobiographical sketch, which purports to deal with one's mental development. It is a story of oneself in the past, read in the light of one's present self. There is much supplementary interference—often-erroneous inference—wherein "must have been" masquerades as "was so." (Morgan, 1930/1961, p. 237)

Learners may understand what changes were supposed to occur even though those changes may not occur in reality. The social comparison factor mentioned above and even one's tendency to please themselves or others can lead to either knowingly or unknowingly false reporting. This professional development study does include self-reports. However, it also includes objectively scored instruments to determine knowledge gain.

Suggested models for professional development research. Several models for professional development evaluation and broader research have developed over the last several decades (Kirkpatrick, 1959, 1996; Guskey, 2000; Lawless & Pellegrino, 2007; Desimone, 2009; Borko, 2004). Kirkpatrick (1959, 1996) and Guskey (2000) propose looking at multiple facets of professional development, while Desimone (2009) calls for using a common basic conceptual framework for evaluation of all professional

development. Borko (2004) suggests a three stage evaluation/research agenda first looking at the local event and then moving to a much larger, broader implementation that uses the same approaches in different contexts. Research in this progression would move us from the often-critiqued evaluation of single professional development events and our attempts to generalize those results to a broader evaluation of common characteristics in multiple programs that is varied by provider, audience, and content. This would provide a "macro-level" view proposed by Lawless & Pellegrino (2007, p. 604).

Lawless and Pellegrino (2007) also suggest looking at development and change beyond knowledge and practice. The authors look to Bloom and colleagues (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956) and their learning taxonomy of instructional objectives. Three primary domains include cognitive (e.g., knowledge, skills), affective (e.g., feelings, values, attitudes), and psychomotor. Woolfolk (1998) suggests that an intertwined relationship between cognitive, affective, and behavioral dimensions exists (Lawless & Pellegrino, 2007).

Theoretically, a combination of these evaluative approaches could provide a combined evaluation/research agenda. This begins, as Borko (2004) suggests, with evaluating a single professional development program/event, moving to evaluate the program on a broader scale with multiple participants and facilitators, and identifying the most successful elements within the program. Evaluation should be consistent at all levels (Desimone, 2009) and be comprised of multiple, cyclical layers within each of the three levels that is constantly evaluating and assessing changes in knowledge, beliefs and

attitudes, self-efficacy, and practice (Kirkpatrick, 1959, 1996; Guskey, 2000), along with relevant students outcomes (Garet et al., 2001; Guskey & Yoon, 2009; Lawless & Pellegrino, 2007).

A long-term study of this magnitude would take years to complete and is beyond the scope of this dissertation. However, this study begins the initial cycle of this proposed combined model by evaluating a core component (Desimone, 2009; Guskey & Yoon, 2009; Lawless & Pellegrino, 2007), metacognitive modeling through think-aloud, and its effectiveness on various aspects needed for sustained teacher change (Guskey & Yoon, 2009; Lawless & Pellegrino, 2007).

With the increasing use of online platforms for professional development delivery, these issues are compounded. Critiques of research related to oTPD are often the same as for face-to-face professional development (e.g., more evaluation than research, relies on self-reporting, is K-12 focused.) The following section provides information on oTPD research and findings such as platform preferences, platform efficacy, and new barriers, along with specific models of oTPD.

Online professional development

The professional development under study was delivered via an online platform in hopes of creating a sustainable professional development on the topic of disciplinary literacies for educators at all levels for a period of time after grant funding ended. As such, literature regarding what is known about oTPD effectiveness is reviewed here.

Online platforms are rapidly becoming additional venues for teacher professional development (Sawchuk, 2009; Vrasidas & Glass, 2004). These opportunities are coming in the form of completely online or blended formats. Blended formats allow for a combination of both face-to-face and online learning environments. Dede et al. (2009) adds, "The availability of attractive online options not available in pure face-to-face teacher professional development is one reason why many programs are moving to blended or hybrid models that attempt to combine the strengths of both" (p. 10). Some identified benefits of oTPD over face-to-face professional development include accessibility, effectiveness, scalability, and compatibility with current issues and trends (Salo, 2011).

> The need for professional development that can fit with teachers' busy schedules, that draws on powerful resources often not available locally, and that can create an evolutionary path toward providing real-time, ongoing, work-embedded support has stimulated the creation of online teacher development programs." (Dede et al., 2009, p. 9)

This is true for both K-12 in-service teachers and higher education faculty (Walsh, 2009). Walsh (2009) identifies additional benefits for faculty participants, such as giving them opportunities to develop new technology skills along with opportunity to "become students" (p. 518).

Several models of oTPD exist (Dede, 2006; Sprague, 2006). Haddad & Draxler (2002) identify four common models: (a) course supplement model; (b) online lecture model; (c) online correspondence model; and (d) the online collaborative model.

The Milwaukee Professional Support Portal (Spicer & Dede, 2006) and the Inquiry Learning Forum (Barnett, 2006) are two highly sophisticated systems developed through multiple partnerships (Sprague, 2006). Sprague (2006) notes, however, that many, much less formal, models exist as well, including spaces for case studies, email, discussion boards, or course websites. Sprague (2006) and Dede (2006) add that the same questions posed for face-to-face professional development should be asked of online professional development. Does oTPD have an impact on teachers' practice? What issues arise? What motivates teachers to take online professional development?

oTPD offers unique opportunities to include many of the high-quality characteristics described above for effective professional development experiences. Through either synchronous (e.g., chatting, video-conferencing) or asynchronous activities (e.g., forums, blogging), learners engage in collaboration, discussion, and reflection. Participants have access to experts, opportunity for collaboration, time for reflection, and dialogue (Dede et al., 2009). Lebec and Luft (2007) found studies that suggested that oTPD found better opportunities for student teachers in the area of reflection and communication. Additionally, oTPD offers flexibility in scheduling, timing, and the "development of one's own personal learning spaces" (Sprague, 2006, p. 658). Moreover, "online environments can be designed to nurture the development of

online learning communities to facilitate teacher professional development" (Lock, 2006, p. 664). With this, there is potential to move learning communities from the local level to a global level. Rogers (2003) describes these types of relationships as "cosmopolite." These relationships exist beyond the immediate environment of the institution in which people work. These relationships are valued for the role they play in bringing in new knowledge from the outside.

Many barriers for face-to-face professional development exist for oTPD as well. The National Research Council (2007) identify several barriers to oTPD for teachers including:

- knowledge about online technologies and programs;
- support from administrators;
- access to technologies;
- time, financial support, and parental support;
- materials;
- support from higher education; and
- teachers' beliefs and practices.

Limitations of oTPD include a lack of understanding by designers, developers, and online instructors regarding pedagogical implications. Experts are not always the best teachers (Sprague, 2006). Moreover, interactions in an online environment are new to many and thus, miscues and misinterpretation can interfere with communication and learning. With most interaction being text-based, there is a considerable lack of visual

cues, gesturing, and other non-verbal acts of communication that help us to interpret meaning in a face-to-face settings.

The technology learning curve for online professional development, or online learners in general, is often overlooked. Reeves and Li (2013) highlight its importance, and Zepeda (2012) warns us, "Leaders must account for different levels of technological mastery and varying access to technology, as one would take any specific context into account when planning and implementing learning opportunities on site" (p. 2). In addition to skill level, it is important to recognize that not all participants are guaranteed to own computers with the requisite technology specs for online professional development success, such as enough RAM, current browsers, or video/audio recording features. Therefore, online professional development must be designed with these issues in mind.

Moreover, not all educational institutions and homes have access to quality, reliable Internet, which is integral according to Treacy, Kleiman, and Peterson (2002):

> It is important that participants in OPD have convenient access to a computer with a reliable Internet connection, ideally from both school and home. Without ready and reliable access, the major advantages of OPD—to provide anytime, anyplace access to a learning community—cannot occur. (p. 45)

This problem still exists in today's online learning environment with inclusion of more advanced web-based technologies including video-conferencing and/or virtual reality.

In a recent study conducted by Reeves and Li (2013), 11,397 online professional development participants from the e-Learning for Educators' initiative funded by the Department of Education were asked about their technology skills specifically related to what they would need to do within the online professional development. They found that participants reported higher proficiency with navigating websites, performing Internet/library searches, and downloading documents. However, professional development designers should take note that the participants' self-reported lower proficiencies included: troubleshooting computer programs, reading and posting to threaded discussions, and installing support programs such as QuickTime. Additionally, participants were asked about how their anxiety in taking an online professional development, working with the online workshop format, having adequate technical skills, and experiencing technical difficulties interfered with their course participation. While the majority answered, answered "not at all" or "not that much," over 25% said their anxiety interfered, while significant numbers specified that their ability to work with the online format (14.8%), lack of adequate skills (19.75), and technical difficulties (17.9%) also interfered. Many stated that the skills they feel they lacked beforehand increased as a result of participation, particularly reading (78%) and posting to (80%) to threaded discussions.

Ruey (2010) identifies several high-quality characteristics for online professional development. These include collaborative, contextualized learning by simulating authentic contexts, setting a collective goal and shared vision, and requiring students to lead discussion and teamwork. Facilitation of instructors includes provision of feedback, summation of online discussions, and promoting students' participation in discussion when the feed becomes stagnant. Like face-to-face professional development, oTPD should be constructivist-based.

A great deal of theoretical literature exist to discuss how oTPD could or should be effective, however rigorous studies on oTPD effectiveness are scarce (Dede, Fulton, & Rose, 2006; Ketelhut, McCloskey, Dede, Breit, & Whitehouse, 2006). The National Research Council (2007) wrote that very little research had been "done on the effects of online professional development on teachers or their students" (p. 24). In a literature review by Dede et al. (2009), the authors found 40 studies in total, which matched their criteria for rigorous, empirical research regarding online professional development. Four broad categories of research foci included: program design, program effectiveness, program technical design, and learner interactions, with primary focus on program design and effectiveness in a community of practice setting

What little research exists is finding that there are no significant differences in terms of effectiveness in face-to-face and online professional development (Dede, 2006; Fishman, Konstantopoulos, Kubitskey, Vath, Park, Johnson, & Edelson, 2013). The Fishman et al. (2013) research specifically compares outcomes from face-to-face and

online professional development on the same topic using the same curriculum materials in an attempt to isolate modality as the independent variable. Forty-nine teachers total participated (25 in the online condition; 24 in the f2f condition). In regards to increase in teacher knowledge, there was a small, insignificant mean difference in content knowledge pre- and post- professional development between the two groups favoring the online condition.

One study looks at impact through post-test analysis and random participant assignment to experimental and control groups, finding that well designed and implemented online professional development can positively impact both teacher and student knowledge and teacher instructional practices. Three hundred thirty teachers and 7,000 students from thirteen states participated across three semesters (Boston College, 2010). Improvement was clear in both teacher knowledge and practice scores in the experimental group. The student knowledge improvement was less consistent, but researchers attribute timing to some of the inconsistency since many teachers lacked time to implement before student testing.

Lebec and Luft (2007) describe their findings from a 3-week course delivered via WebCt to biology teachers. It utilized a mixed-methods approach to answer the questions: (a) what is the nature of knowledge learned by participants enrolled in this online biology course? and (b) how did the Web-based environment influence learning by participants? A total of five experienced teachers and two student teachers enrolled. Data included a pre- and post- test for participants, artifacts such as concept-maps, and

participant interviews. Five out of seven students increased their knowledge pre- to post-test with a mean total increase of 10 points. However, the participants did cite, via interviews, that they were not easily motivated to continue the course on their own—time being a huge factor. Personal accountability or lack thereof, was also provided as a reason for easily putting off the course.

Rienties, Brouwer, and Lygo-Baker (2013) describe an oTPD targeted specifically at higher education staff. It sought to answer how the oTPD affected instructors' TPACK (Technological Pedagogical Content Knowledge) levels (Mishra & Koehler, 2007) and instructors' belief changes towards more student-centered beliefs. The dual synchronous and asynchronous oTPD did appear to positively affect TPACK scores and their confidence as shown by ICT implementation. The researchers had also hypothesized significant changes towards student-centered beliefs but instead found that participants' beliefs changed only marginally away from teacher-centeredness. They attribute this to the notion that change takes a long time (Postareff, Lindblom-Ylänne, & Nevgi, 2007) and that many of their participants were long-term teaching veterans. Scholars such as Ertmer (2005) and Marsh (2007) do suggest that senior academics are even less inclined to change attitudes about student-centered instruction, most believing strongly in instructional practices that are considered more teacher-centered. Encouragingly, the researchers did find that previous technology experience did not affect whether a participant continued the oTPD or withdrew, and that "teachers could benefit from online

training programs irrespective of whether they are more inclined towards student-centred or teacher-centred approaches" (Rienties et al., 2013).

Finally in 2013, Reeves and Pedulla published findings from a large scale (n=1231) correlational study that examined the impact of the e-Learning for Educators (EfE) initiative funded by the U.S. Department of Education provided during the previous five years across ten states. Each 6-7 week course is entirely online, asynchronous, and facilitated. This study validated similar face-to-face studies that find that teacher knowledge predicts classroom practice change and, in turn, student achievement. The study findings also reinforce previous f2f research that teachers who receive practical, relevant, and immediately useful information are more satisfied with their professional development experience (Darling-Hammond & McLaughlin, 1995; Guskey, 2002; Hunzicker, 2010).

Regarding preferences for platform, Casale (2011), in her dissertation study, found that most teachers liked online settings, with only some still preferring face-to-face. Several years ago, Zhao, Lei, Yan, Lai, and Tan (2005) looked at professional development provided online versus face-to-face by comparing many previously published studies. It was discovered that approximately 2/3 of teachers preferred face-to-face settings and found considerable gains in teacher knowledge, while the other 1/3 preferred distance education, and noted there was an increase in the preference and perceived effectiveness for distance education after 1998, when most distance education went online. Dede et al. (2009) looked at the effectiveness of professional development

taken online through EdTech and found that approximately 90% of the teachers felt they benefitted, approximately 85% integrated what they learned about inquiry learning in the classrooms, and confidence in implementing grew from 40% to 90%. In the previously mentioned Reeves and Li (2013) study, the majority of participants (69.4%) initially agreed, "online professional development workshops can be as effective as traditional face-to-face professional development workshops." By the end of the workshop, 59.6% strongly agreed with the statement, resulting in a significantly increased mean to the question pre- and post- professional development experience.

Modeling in professional development

Metacognitive modeling is the specific characteristic under study in this research. It is also the primary topic within the disciplinary literacies professional development.

A model is a representation. Modeling, as an act, can be purposeful or inadvertent. In terms of instruction, you can see behavioral modeling (e.g., role playing), procedural modeling (e.g., demonstrations, simulations), example modeling, (e.g., display of final product) or metacognitive modeling (e.g., think-alouds). Jonassen (1991) simplified these modeling types into two main types, behavioral and cognitive. "Behavioral" is the type most people, teachers, and students identify with and is typically used to teach psychomotor skills while encouraging simple imitation of the demonstrated skill (Dennen, 2007). "Cognitive modeling," however, is much more complex (Dennen, 2007; Tharp & Gallimore, 1988) involving visualization of the modeler's thinking as he or she proceeds through the act. "Individuals who engage in a process of expert

observation, reflection, and practice being more likely to be able to apply the learned knowledge in a different setting that those who receive a passive model" (Dennen, 2007, p. 817). Modeling in professional development can be isolated or embedded.

In the literature, modeling is most often embedded within other types of professional development models including mentoring, coaching, and observing (Glazer & Hannafin, 2006). Yet, many researchers communicate that modeling is an important teaching tool for successful learning. As discussed above, it is the foundation for the cognitive apprenticeship model. Brown et al. (1989) describes modeling as the means of making tacit knowledge "visible" to learners, so they can learn through observation and practice.

Research exists that provides description and frameworks for the use of modeling and cognitive apprenticeship for a number of purposes including integrating technology in the classroom (Schrum, 1999), technical skills in medicine (Reznick, 1993), military training (Collins, Brown, & Holum, 1991), and/or science and mathematics instruction (Loucks-Horsley et al., 1996). Darling-Hammond and McLaughlin (1995) include the act of modeling for professional development participants as part of their general guidelines. Professional development for teachers "must be sustained, ongoing, intensive, and supported by modeling, coaching, and the collective solving of specific problems of practices" (Darling-Hammond & McLaughlin, 1995, p. 82).

Glazer and Hannafin (2006) developed a model for collaborative apprenticeship and situated professional development learning that calls for modeling of strategies in

either a workshop or a classroom environment during the introduction phase. In this initial phase, learners observe and participate in learning and then discuss and reflect among themselves, specifically analyzing how what they learned can be applied to their own practice (Glazer & Hannafin, 2006). The next phases involve scaffolding practice for the participants, autonomously designing activities and sharing those experiences, and participants themselves entering a "teacher-leader" role. Earlier in 1991, Browne and Ritchie proposed a professional development design with an underlying foundation in cognitive apprenticeship that included instruction, modeling, coaching, and empowerment through practice and reflection. The professional development designed for this study has many of these same elements.

In a 2010 study, Martin et al., evaluated the effectiveness of the features (collectively referred to as PD Fidelity) of eMints Professional Development on quality of teacher lesson plans and the effectiveness of PD fidelity and lesson-plan quality on student outcomes. PD fidelity was comprised of features related to modeling instruction, community building (collaboration), technology utilization, connection to practice (coherence), and IBL (Inquiry-based learning) strategy discussions and activities (active learning). Overall, modeling, as an isolated characteristic, held the strongest correlation with high-quality lessons plans, and was the biggest predictor of high-quality lesson plans (Martin et al., 2010).

Cognitive modeling specifically is shown to be effective in professional development of pre-service teachers. In an experimental study, Gorrell (1993) used

cognitive modeling and direct instruction as variables for determining impact on the students' ability to apply behavior analysis rules in classroom management issues. Those who received training through cognitive modeling were better at problem solving the developing behavioral situations in the classrooms. A few years earlier, Gorrell and Capron (1990) reported that pre-service teachers who received cognitive modeling as an instructional approach in their training better applied the strategies for finding main idea when teaching to children than those who received direct instruction training.

Professional development in literacy

In reviewing literature for professional development, it is also important to examine research most pertinent to the discipline. Like general professional development research, research on identifying effective characteristics in literacy-based professional development, particularly in disciplinary literacies, is limited. Disciplinary literacies is a new literacy paradigm that extends the older, less favorable content-area literacy theory (Alvermann & Moore, 1991; Fisher & Ivey, 2005) by moving away from teaching basic literacy strategies in subject-area classes and focusing on demonstrating to students how subject experts use those strategies while they engage in reading and writing for the discipline. However, only a few research studies examining effective professional development of content-area literacy exist and studies regarding effective elements in disciplinary literacies professional development are non-existent at this time.

When one looks specifically at effective professional development in literacy instruction, they find that many of the high-quality professional development attributes

described for other disciplines apply in literacy related professional development as well. The research in this discipline focuses less on the professional development design and more on the general outcomes of professional development, as does much of the professional development research at large. In investigating each study to uncover the professional development design, those which are deemed most successful as per the researcher or professional development provider's standards are those which utilize many of the same high-quality attributes such as longer duration of professional development, modeling through coaching, collaboration, and relevance.

A review of professional development for content literacy written by Reed (2009) found that training for content literacy should be based on teachers' perceived needs, building knowledge and skills over time. These suggestions could be labeled as relevance and longer duration, two high-quality professional development attributes discussed above. Additionally, Reed (2009) found a common theme indicating that collective participation, supported by administration, and collaboration were beneficial elements for building knowledge and classroom implementation for content area teachers. All studies also included high-quality aspects of self-reflection and modeling which were recommended for repeated successful results. For example, one article Reed (2009) reviewed by Bryant, Linan-Thompson, Ugel, Hamff, & Hougen (2001) reported that many teachers expressed a need for more in-class modeling, suggesting once per week until teachers became comfortable.

In 2008, Cantrell and Hughes (2008) reported on the relationship between their professional development, which utilized long-term coaching, and the development of content area teachers' independent and collective self-efficacy for using "literacy skills to facilitate students' academic reading and content area learning" (p. 105). Using surveys, interviews, and observations, they found that the use of coaching increased both personal and collective efficacy and in turn increased fidelity in classroom implementation of strategies. Modeling was a key component in both the initial professional development institutes and in the follow-up coaching activities.

Tschannen-Moran and McMaster (2009) developed a quasi-experimental study that contained four treatment groups receiving professional development on a particular reading program. Using three of Bandura's identified sources of increased self-efficacy (e.g., verbal persuasion, vicarious experience via modeling, and experience through practice), the researchers created four treatment groups. The first received information about the program only. The second received information plus modeling of practice by the professional development providers. The third group received this, plus the opportunity to practice within the professional development environment. The fourth group received all of these, but had additional contact with the professional development providers through coaching, in which they received the opportunity to practice within their own classroom. The efficacy of the teachers in the first group went up, but implementation did not necessarily occur. The efficacy in groups 2 and 3 initially went down before rising. However, overall gains went up with the addition of each of

Bandura's identified sources. The group with the highest degree of both efficacy gains and classroom implementation was group four; leading to the conclusion that, of those characteristics tested, coaching was the most essential attribute for professional development in terms of anticipated returns in classroom implementation. However, a couple of factors possibly came into play in the seeming success of coaching over the other treatments. For example, at each level of treatment participants received added sources and had more allotted exposure time because of those added sources. This suggests that time and multiple sources were potentially the most critical factors.

Finally, Wilson, Grisham, and Smetana (2009) found that following a year long professional development that delivered theoretical knowledge, demonstrations, and opportunities for practice resulted in increased use of the QAR (Question-Answer-Relationships), as prescribed, for improving metacognitive functioning in both teachers and their students. Teachers needed both vicarious and personal experience in metacognitive skill development in order to transfer that skill to their students. This professional development and its proposed strategy relied on metacognition through think-aloud:

> The think-aloud strategy was modeled across all the professional development sessions and was expected as part of teachers' lesson planning. Therefore, when teachers did a think-aloud they demonstrated how they were, themselves, metacognitive in their use of QAR. They describe the strategy, they model and use the strategy, and they describe situations under which it is appropriate to

implement the strategy. (Wilson et al., 2009, p. 710)

Teachers must become metacognitive themselves before they can help others to become metacognitive (Wilson et al., 2009). As noted, many of the high-quality characteristics identified in the general professional development literature are also recognized as such in the literacy specific professional development literature (e.g., longer duration, collective participation, coherence/relevance, support/follow-up/opportunity for practice through mentoring/coaching, reflection, modeling). The most oft-noted effective professional development characteristics in the content area literacy professional development literature were vicarious experience through modeling and personal, guided experience through coaching.

Developing instructors' metacognition via modeling in order to increase metacognitive awareness in their own students is the primary goal of the professional development under study and leads us back to the overarching question: To what extent is instructor change evident after participation in an online professional development that utilizes metacognitive modeling through think-aloud strategies? Does participation in this professional development impact the participants' knowledge, beliefs, attitudes, and self-efficacy in any way? Are these changes related to the degree of intended incorporation of metacognitive modeling in their own courses? This study adds to the research on literacy professional development, specifically modeling, by adding the element of modeling delivered via video.

Disciplinary literacy is a relatively new theoretical construct, and it differs from the tenets of content area reading and content area literacy in a variety of ways. Because it is still new, it warrants dedicated research. The last section of the literature review describes the differences between the older concept of content-area literacy, which was not always well received by K-12 practitioners, and the newer concept of disciplinary literacies, which helps to bridge the connection between the development of discipline-specific reading skills and the development of discipline-specific understanding in general.

Literacy instruction in the disciplines

The topic of the professional development under study is disciplinary literacies. The term "literacy" has meant many things over time and is a continuously evolving construct (Leu, Kinzer, Coiro, & Cammack, 2004; Lankshear & Knobel, 2006, 2007). Before the 1970's it simply meant being able to read and write, and was considered a symbol of social status (Buckingham, 2010). According to Lankshear and Knobel (2006), shifts began as socio-cultural based movements as Paulo Freire began to express his contentions that oppressed people must learn to read and write and do so critically, else they would not be able to recognize oppression and thus would remain oppressed (Freire, 1970, 1970/2000, 1972; Freire & Macedo, 1987). Concerns with educational quality fueled additional definition shifts to the term. In the last few decades, in particular, the meaning has shifted to accommodate the growth of technology (Lanham, 2005) along with Web 2.0 tools (Warschauer and Grimes, 2007) its impact on society, and its role as a

bridge for easier access to various cultures. Leu et al. (2004) describe "new literacies" as those derived from evolving technology, such as gaming (Gee, 2003), or video related technologies (O'Brien, 2001).

The following sections describe two somewhat dichotomous (Brozo, Moorman, Meyer, & Stewart, 2013) philosophical viewpoints on literacy development and instruction in the disciplines that have emerged over the decades. The final section describes metacognitive skill development through think-aloud (Wade, 1990) instructional strategies, which are proposed by disciplinary literacies experts and is the topic of this professional development under study.

Content-area literacy

In conjunction with the development of new mediums for print and multi-media (Mayer, 2002) for information presentation, concern that adolescents in particular are struggling with content area literacy has risen. Fang (2012) refers to reports stating that 70% of 4-12th graders encounter difficulties with reading and writing across academic content areas.

Initially, as these concerns grew, this pressure resulted in efforts to increase standardized reading scores in the elementary grades and/or to force content-area teachers to also teach reading and writing; the latter commonly referred to as content-area reading or literacy. The first plan, increasing student scores in elementary grade levels, did not result in an increase in discipline-specific literacy test results (Alvermann & Moore, 1991). The second approach failed because content-area teachers did not see themselves

as reading and writing teachers, and they were particularly resistant to doing so (Alvermann & Moore, 1991; Fisher & Ivey, 2005).

Fisher and Ivey (2005) separate the terms "content area reading" and "content area literacy" by aligning the first term with the unfavorable "every teacher a teacher of reading" mantra and the second with the idea of capitalizing on reading and writing to teach content as opposed to teaching isolated and decontextualized reading and writing skills. Content area reading tends to perpetuate the traditional, teacher-centered model of learning (Fisher & Ivey, 2005). It is curriculum-driven and often textbook based. Often, discipline-specific, or content area teachers, felt they had additional skills to teach in addition to their content specific concepts. Teachers often resented this notion. With content area literacy, students construct and co-construct knowledge through discussion and multi-perspective activities. This approach is more student-centered and socio-constructivist in nature. However, it is often inconsistent with secondary curriculum goals and is compounded by the problem that teachers cannot see the connection between literacy and content (O'Brien, Stewart, & Moje, 2005).

Disciplinary literacy

It is generally accepted that the Disciplinary Literacy Framework was created in 2002 at the Institute for Learning at the University of Pittsburgh's annual conference. At the time, literacy instruction was synonymous with reading instruction particularly among practitioners. As McConachie, Petrosky, Petrosky and Resnick (2009) point out,

"The prevailing wisdom was that students should be taught generic reading strategies to apply to any and all texts and that thinking skills could be taught separately from specific content inquiries" (p. ix). Fisher and Ivey's (2005) modified term "content area literacy" attempted to move away from the generic skills set of "content area reading" and the separation of generic reading strategies and thinking skills. "Disciplinary literacies" was established as a similar step in that evolvement.

Shanahan and Shanahan (2012) explain that disciplinary literacy is not a new name for content-area reading. Content area reading was previously defined as the ability to use reading and writing skills to learn discipline-specific subject matter (Vacca & Vacca, 2002). "Disciplinary literacy, on the contrary, refers to the ability to engage in social, semiotic, and metacognitive practices consistent with those of content experts" (Fang, 2012, p. 19). This aligns disciplinary literacies with the social, creative, and critical skills desired today.

Whereas content area reading focused on study skills, disciplinary literacies emphasizes the tools a discipline uses to engage in the discipline related work (Shanahan & Shanahan, 2012). In addition to thinking like professionals, such as a mathematician, a historian, or a scientist, students learn vocabulary and functional linguistics in a discipline-specific manner. For example, most students who encounter the word "plane" in geometry for the first time must adapt their understanding of the word from a mathematical perspective, learning to recognize that in the geometrical context, a "plane" is not a mode of transportation, but rather a 2-dimensional flat surface. Finally, some

disciplines call for critical attention to resources, author, meaning of words, as in the previous example, and visual representations.

Many teachers do not understand the distinction between teaching the content and the need to translate and teach students to navigate discipline-specific discourse. Shanahan and Shanahan (2012) write:

> Whether the academic area is English language arts, mathematics, science, or history, it is difficult to separate content learning from the discipline-specific ways of reading, writing, and talking needed to generate and communicate that learning. A discipline's content and habits of thinking always go hand in hand. (p. 6)

The authors add, "Each academic discipline necessitates certain processing strategies that are quite specific to that discipline and its typical tasks or problems" (Shanahan & Shanahan, 2012, p. x). Therefore, an English teacher, normally responsible for teaching literacy skills, who is not an expert in the field of science or science-related "Discourses" (Gee, 2007), for example, would experience great difficulty in trying to assist students to think like a scientist. By first developing their own metacognition, the professional development participants could then combine these skills with their discipline-specific expertise (e.g., English, literature, mathematics, science, history) to help students reach this goal.

Gee (1998) defines "Big D" Discourse as "a socially accepted association among ways of using language, of thinking, and of acting that can be used to identify oneself as

a member of a socially meaningful group or "social network"" (p. 51). Ways of knowing within a group go way beyond reading and writing and include behavior, values, interactions, beliefs, and ways of thinking. "Little d" discourses are products (e.g., conversations, oral or printed stories, essays, debates) that make up a Discourse (Gee, 1998). A primary Discourse is one's birthright; others must be learned (Gee, 1998). In other words, we are born into a culture with its own Discourse. As we navigate into other cultures, we must learn and adapt to their Discourses. Gee (2005) uses the term "affinity spaces" to define virtual or physical spaces for these groups, and even offers it as alternative to a community of practice. Additionally, semiotic domains are areas of specialized representations, modalities, knowledge, and practice belonging to a unique group (Gee, 2005, 2008), in which unique discourses occur. Examples include any group created by interests, career, or circumstance such as Chess groups, spoken-word poetry groups, marine biologists, or an Al-Anon group. Each group possesses its own "design grammar" or way of communicating within the group which new members, to completely engage, must master. While no one minimizes the need for foundational reading and writing skills, today's world requires additional, higher-order literacy skills that include creation, analytical and critical thinking, and problem solving in order to better understand these "Discourses," particularly as navigation through the various and growing number of "Discourses" is made easier via the Internet. Many of these new "Discourses" are technology related such as gaming (Gee, 2003) and coding "Discourses."

In their book, *Adolescent Literacy in the Academic Disciplines: General Principles and Practical Strategies*, Jetton and Shanahan (2012) present full chapters of information and guidelines for each discipline (e.g., mathematics, science, English language arts, history, and the arts). They note that these differences per discipline are a primary reason why professional development for disciplinary literacies is generally difficult. With the exception of some generic strategies such as paraphrasing (Fang, 2008; Fang et al., 2008), prior knowledge development, summarizing, and visualizing, each discipline utilizes its own unique strategies, "Discourses", and processes for comprehension.

The Shanahans (2008) conducted a two-year study on disciplinary literacies, specifically how experts in each discipline react and engage in their reading (Shanahan & Shanahan, 2008). For example:

- A chemist states that he visualizes formation transformation, writing down formulas or going back and forth between charts and text.
- A historian thinks critically about his source or author while reading texts.
- Theoretical mathematicians must critically examine every word and computation within a proof, assumed true, looking for errors.

Each discipline expert attacked his or her discipline-specific related literature "with the norms and expectations of their particular disciplines" (Shanahan & Shanahan, 2008, p.51). This is similar to Gee's (1998) notion of "Discourses."

Moje and colleagues (2008) also suggest the development of disciplinary

literacies programs rather than recommending content-area teachers simply teach reading and writing. This recommendation comes in part due to the differences and related needs discussed above, but also so discipline teachers themselves "take up new media and literacy practices" (Moje, Overby, Tysvaer, & Morris, 2008, p. 96).

Like Leu et al. (2004), Moje et al. (2008) tie the need for disciplinary literacies to the growing new literacies practices most often associated with technology and the web. For example, Jenkins (2006) describes one current practice in which English teachers are having students analyze pop-cultural texts (e.g., fanfiction) just as much as traditional texts. Technology tools are being used to explore the scientific phenomenon, and historians are compiling and analyzing digital archives to learn more about why and how things happened. Moje et al. (2008) refer to disciplinary literacies as a critical literacy. It is also collaborative, communicative, and can be creative. As such, it reflects those skills endorsed by the Partnership for 21st Century Learning ("Partnership For 21st Century Skills," 2011).

New literacies are a social practice (Lankshear & Knobel, 2008; Street, 2003, 2006). Street (2006) provides examples of social practices such as a particular job market or a particular educational context. One must understand context, including who the author is and what the author wants you to think. Literacies are "socially recognized ways of generating communication and negotiating meaningful content through the medium of encoded texts with the contexts of participation in Discourse" (Lankshear & Knobel, 2006, p. 64). The information is no longer author-centered, but rather participatory

knowledge is continuously created, reshaped, user-driven and provides little to no individual credit. This participatory culture (Jenkins, 2006) evolves over time to establish its ways of knowing and being, or its "Discourses" (Gee, 1998).

Disciplinary literacies recognize that "the disciplines are constituted by discourses" (Luke, 2001, p. xii). Moje et al. (2008) adds that literacy education must include teaching students what the "privileged discourses" of a discipline include such as what, but also when, why, and how to use that knowledge. Students should be expected to participate and apply those discourses throughout each day, while weaving and handling multiple identities and discourses (Gee, 2007).

Students juggle multiple identities and discourses outside of the school day through their online identities, extracurricular activities such as sports and choir, along with personal activities such as church, and this calls for teachers to teach metadiscursive skills (Cazden, Cope, Fairclough, Gee, Kalantzis, Kress, Luke, et al., 1996; Moje et al., 2008, Moje, 2007).

> Metadiscursivity is the ability to engage in many different discourse communities, to know how and why one is engaging, and to recognize what those engagements mean for oneself and others in terms of social positioning and larger power relations. Metadiscursiveness provides access to many different literacies because readers and writers can understand the different discourses that authors bring to bear on a text or can produce such discourses themselves. (Moje et al., 2008, p. 112)

In the fast-paced world today, facilitated by increased use of technology to achieve professional and personal goals, metadiscursivity is quickly becoming a necessary talent.

Metacognitive skill development via think-aloud instructional strategies

Within the disciplinary literacy framework, the use of metacognitive skill development for students is suggested so that he/she can understand the various ways to attack discipline-specific reading and writing activities exist and that by varying their approaches they may better comprehend or express understanding. The use of metacognitive modeling through think-aloud is an oft-suggested instructional strategy in the disciplinary literacy literature and is the professional development strategy under study in this dissertation.

Think-alouds alone, as an instructional strategy, are not new. Pressley and Afflerbach (1995) note the existence of the strategy as far back as the days of Aristotle and Plato. Wilhelm (2001) suggests four steps for modeling in reading:

1. Modeling of Strategy (Teacher Does/Students Watch)
2. Apprenticeship of Use (Teacher Does/Students Help)
3. Scaffolding Strategy Use (Student Do/Teacher Helps)
4. Independent Use (Students Do/Teachers Watches)

Wilhelm (2001) provides examples of the Teacher Does/Student Watch step (p. 46-47):

Table 2

Metacognitive modeling examples (Wilhelm, 2001)

Text from book	**Thoughts verbalized (*Note the use of "I" language. "I" language is used to illustrate that this is the teacher's thinking as he/she reads.)**
A girl walked across the beach…and his LiteSuit began to shimmer with the color of blood.	Hmm. I wonder if that's because she's beautiful. I predict that the LiteSuit reflects his mood or feelings because if his LiteSuit turns red and simmers I bet that means he is excited or interested by her. Things shimmer when they are excited or stimulated.
The sky was golden.	Hmmm. I know the first lines of text are important and I should notice them. This one's funny-skies aren't usually gold. I wonder if this means he's happy, or it's a good day or something.
Corgan knew what blood looked like. Once, a few months ago, as he'd walked along the tunnel from his Box to his Clean Room, a tile fell from the ceiling and hit his hand. His knuckles had bled, the first and only time he had ever seen real blood.	Hmmm. There sure is a lot on this first page! This is weird. Why has he only seen blood once? I predict that he must be totally protected…I bet that he is special in some way; I can't imagine that they would spend that much attention on everybody, plus he must be one of the main characters of this book.

By having students think-aloud as they perform a task, they are building their own metacognition and providing their teachers with a tool for diagnosing when/where/how a problem occurs during performance of task. The purpose of metacognitive skill development is to be able to engage in text, in which you are not an expert, in order to understand what is being read by consciously thinking about your employment of reading strategies, both generic and discipline-specific. Therefore, modeling by teachers should

be authentic, or at least appear to be authentic (Schoenbach, Greenleaf, & Murphy, 2012). Schoenbach et al. (2012) state,

> Ideally, Think alouds are modeled as the teacher's authentic problem-solving responses to or engagement with a text. Sometimes, however, the teacher is very familiar with the text and understands it; authentic interaction with the text is not an option. In these cases, the teacher instead models the *kinds of reasoning* that students might use to unpack the text. (Chapter 4, Section 3, Subsection 1, para. 4)

The use of one's metacognition is a useful tool not only for young, developing readers, but for advanced readers as well, particularly as they engage in topics in which they are not expert. Think-alouds and thinking about your metacognition is a reflective practice, and reflection is a key element to learning (Dewey, 1933).

Again, this explicit and direct instruction at first may appear to come across as traditional rather than constructivist and socio-constructivist in nature. However, when used in conjunction with the other steps Wilhelm (2001) describes including discussions, scaffolding, student practice, and feedback, this overall strategy is not only metacognitive, but also constructivist and socio-constructivist, and student-centered.

The approaches promoted by disciplinary literacies experts are not new and are dependent on instructional strategies including metacognitive modeling through think-alouds to build the necessary reading skills within discipline-specific contexts in order to further develop advanced metacognitive and problem-solving skills. The awareness of

one's own thinking, or metacognition, helps students to better construct their own knowledge and co-construct knowledge with their peers while developing additional skills in communication, critical thinking, creativity, and collaboration—the 4 C's promoted by The Partnership for 21st Century Skills ("Partnership For 21st Century Skills," 2011).

Why do students need to develop "new" literacies and 21st Century skills? Darling-Hammond (2006), Dede (2009), Zhao (2009), and McLeod (2010) are researchers that point out that tomorrow's workforce needs more sophisticated skills in order to be productive and for "economic, civic, and personal participation in a globalized society" (Leu et al., 2007, p. 42). Some authors refer to this as the New Capitalism (Gee, 2000a, 2000b; Gee, Hull, & Lankshear, 1996). Tomorrow's workforce will not have manual and basic cognitive skill jobs to fill. Computers will fill most of these lower cognitive-skilled jobs, and those jobs not filled by computers will be sent overseas (McLeod, 2010). To make money and thrive (Dede, 2009), students will need to be able to work together, to collaborate, to problem-solve, and to think critically and creatively.

Like many innovations, technology, or programs, this modified approach to literacy in the content-area, discipline-specific classroom promises the potential to greatly impact instructional change and student achievement in the classroom. However, it leaves little room for continued attitudes and beliefs aligned with traditional, teacher-centered instructional practices. Research shows that change in multiple domains (e.g., knowledge, beliefs, attitudes, and self-efficacy) must occur unless the proposed innovation happens to

already be aligned with the given factor. Professional development must address these potential areas for change if the desired outcome is changed practice in the classroom. Professional development must provide not only theory and information, but also opportunities for vicarious and personal experience. This study seeks to find if the think-aloud instructional strategy for metacognitive skill development can affect teacher change in an online professional development.

Summary

This literature review provided information related to the design of the professional development under study and to research on professional development. It showed that modeling, particularly metacognitive modeling, is an understudied professional development characteristic and instructional strategy. Additionally, the utilization of online platforms versus traditional face-to-face environments is much less studied. Moreover, it clarified the various domains of potential and necessary teacher change for true transformation in the classroom while emphasizing that true transformation is an ongoing process that extends long beyond the professional development event, making it a difficult variable to measure. This study broke down the components of transformation, the aforementioned domains of potential change (e.g., knowledge, beliefs, attitudes, self-efficacy), and studied them both in isolation and holistically.

Chapter 3: Methods

This case study (Yin, 2009) sought to answer how metacognitive modeling via think-aloud instructional strategies in professional development impacts teacher change in terms of knowledge, beliefs, attitudes, efficacy, and intention to change practice in a single professional development event. To find these answers, the research design included a combination of both quantitative and qualitative approaches. By using a mixed-method, or pragmatic (Howe, 1988; Mertens, 2009; Tashakkori & Teddlie, 1998, 2003; Teddlie & Tashakkori, 2008) approach, both post-positivist and constructivist/interpretivist paradigms were embraced.

Post-positivist epistemology challenges traditional positivism, which contends that knowledge comes only from observable and quantifiable, measurable things deduced through strict scientific methodological, experimental standards (Guba & Lincoln, 1994; Tashakkori & Teddlie, 1998; Teddlie & Tashakkori, 2008). It is *a priori*, or independent, of experience (Tashakkori & Teddlie, 1998), outside factors or context (Guba & Lincoln, 1994), and the researcher(s) themselves (Creswell, 2003; Guba & Lincoln, 1994; Johnson & Onwuegbuzie, 2004; Mertens, 2009). Post-positivism allows for the existence of factors and context, which are not readily observed and measurable, such as feelings and thinking (Mertens, 2009), including the researcher and his/her perceptions (Clark, 2002). It is "imperfectly apprehendable" (Guba & Lincoln, 1994, 2005). Post-positivism is a critical realism because derived understandings must be "subjected to the widest critical

examination" before acceptance (Guba & Lincoln, 1994, 2005), which is still imperfect because "absolute truth can never be found" (Creswell, 2003, p. 7). The hypothesis is presumably true unless falsified. Like positivism, knowledge accumulates with findings added to a growing body of research. The goal is to explain and predict (Guba & Lincoln, 1994). Ontologically, both paradigms believe in a single reality; however, post-positivists acknowledge humans' inability to understand it perfectly (Mertens, 2009). Both paradigmatic views allow researchers to garner conclusions from an objective, etic, or outsider (Denzin & Lincoln, 2005; Guba & Lincoln, 1994), position.

As discussed in Chapter 2, constructivism, as a learning paradigm, contends that knowledge of reality is socially constructed and therefore is apprehendable in a variety of ways, which may conflict with other understandings (Mertens, 2009). The paradigm's idea that reality is socially constructed is ontologically opposed to the single reality put forth by post-positivists. Constructivism is contextual in nature and is an interpretive paradigm (Mertens, 2009; Creswell, 2003; Johnson & Onwuegbuzie, 2004). Interpretation is ongoing and always open to further analysis. It should be the researcher's goal to understand the multiple social constructions by engaging in qualitative, interactive approaches and processes, such as interviews and/or observations, with participants. Additionally, arguments in this paradigm take on an inductive logic, often proposing a "grounded theory" (Glaser & Strauss, 1967) in attempting to explain from the particular to the general. This paradigm, which is also referred to as "naturalistic inquiry" (Guba & Lincoln, 1988; Lincoln & Guba, 1985), takes the opposite

epistemological stance from positivism contending that the knower and the known cannot be separated. Constructivism/Interpretivism gives researchers an opportunity to come to conclusions from a more emic, or insider (Denzin & Lincoln, 2005; Guba & Lincoln, 1994; Johnson & Onwuegbuzie, 2004), position.

This study takes a pragmatic (Mertens, 2009; Tashakkori & Teddlie, 1998, 2003; Teddlie & Tashakkori, 2008; Howe, 1988) approach to looking at how metacognitive modeling through think-aloud instructional strategies facilitate change in teachers' knowledge, beliefs, attitudes, self-efficacy, and intended practice in the classroom. It is feasible (Guba & Lincoln, 2005), appropriate, and practical to blend paradigms in case studies (Yin, 2009). Mixed-methods approaches potentially "help bridge the schism between quantitative and qualitative research" (Johnson & Onwuegbuzie, 2004, p. 15). Mertens (2009) uses the term "pragmatic*"* to describe the paradigm that frames a combination, or mixed-methods, approach to research. Researchers studying under this paradigm are free to choose any method, qualitative, quantitative, or both, which meets its purpose (Mertens, 2009; Creswell, 2003). Mixed-methods inquiries rely on abduction, deduction, and induction (Johnson & Onwuegbuzie, 2004; Peirce, 1878).

Research Method

This study was an exploratory and explanatory case study (Yin, 1984). A case study is a common way to do qualitative research (Stake, 2005) because, as Flyvbjerg (2006, 2011) states, "Predictive theories and universals cannot be found in the study of human affairs. Concrete case knowledge is therefore more valuable than the vain search

for predictive theories and universals" (Flyvbjerg, 2006, p. 224). Knowing a case well provides useful information about context, which is applicable to future studies and future professional development design.

Case study is a preferred research method when answering "how" and "why" questions. The researcher yields little control over events, and the focus is on a contemporary phenomenon within a real-life context (Yin, 2009). The goal of case study is to explore and explain. It can be complementary to quantitative experimental data, but it also can contain quantitative elements that support other forms of qualitative data. Case study methods work well in mixed methods research. In fact, Yin (2009) explains that an embedded case study already represents a form of mixed methods research calling on surveys or other, quantitative, techniques to collect data about the embedded unit(s) of analysis.

Research Design

Yin (2009) suggests the identification of five components for consideration when specifically designing a case study: the study's questions; the study's propositions or hypotheses (if any); the study's unit(s) of analysis; the logic linking the data to the propositions; and the criteria for interpreting the findings. For this study's research design, the identified components were:

1. **Question(s):** To what extent is instructor change evident after participation in an online professional development that utilizes metacognitive modeling through think-aloud strategies?

a. How does the use of metacognitive modeling during online professional development affect instructors' potential for change/transformation in classroom practice?
    i. How does metacognitive modeling in professional development affect instructor *knowledge* about literacy instruction in the content areas?
    ii. How does metacognitive modeling in professional development affect instructor *beliefs* about literacy instruction in the content areas?
    iii. How does metacognitive modeling in professional development affect instructor *attitudes* about literacy instruction in the content areas?
    iv. How does metacognitive modeling in professional development affect instructor *self-efficacy* in modeling literacy/ metacognitive processes in the content-area classroom?
b. How do instructors intend to plan for and incorporate metacognitive modeling in their courses post-professional development?

2. **Proposition(s):**
    a. Metacognitive modeling helps facilitate movement through the change process (Rogers, 2003) by providing the vicarious experience (Bandura, 1971/2006, 1977; Bandura, 1986) needed as an impetus to

critical reflection providing opportunities for realization and understanding of current knowledge, beliefs, attitudes, self-efficacy, and practice and transforming them to changed beliefs and attitudes and improved knowledge, self-efficacy, and practice aligned with professional development goals as appropriate.

   b. Increased knowledge results in changes to attitudes, beliefs, and self-efficacy.
   c. Changes in attitudes, beliefs, and self-efficacy result in intention to change practice.

3. **Unit(s) of analysis:** This study's primary unit of analysis was the online professional development platform. Subunits included the individual participants. Individual participants were used as the smallest unit of analysis since change and transformation is an individual journey.
4. **Data/Proposition links:** This study used explanation building and cross-case synthesis to link data to propositions.
5. **Interpretation Criteria:** Yin's suggestions include identifying rival explanations. Anticipated rival explanations included:
   a. Metacognitive modeling does not facilitate change and transformation in an online setting.
   b. Other design characteristics facilitate change and transformation in an online setting.

c. Increased knowledge does not necessarily dictate changes in belief, attitudes, and self-efficacy.

a. Changes in beliefs, attitudes, and self-efficacy do not affect instructor's plans for change in classroom practice.

In addition, Yin (2009) identified four tests for high-quality research design:

1. **Construct validity:** Suggested solutions include multiple sources of evidence, chain of evidence, and/or informant review (Yin, 2009). This study employed data triangulation (Corbin & Strauss, 2008) through four types of data collection: interview, observation, knowledge tests, and surveys. It also used informant review (Yin, 2009), or member checking (Glesne, 2005, 2010).
2. **Internal validity:** The main concern for explanatory case studies is the validity of the internal analysis. Suggestions (Yin, 2009) include data/pattern-linking techniques such as pattern matching, explanation building, time-series analysis, logic models, and cross-case synthesis. This study employed explanation building, which is a special form of pattern matching in which data from one case is compared against a proposition, the proposition is revised if necessary, comparing other details about the case against the revision, then comparing additional cases against the revised addition. This process was repeated with each case. Additionally, the cases were compared against each other for cross-case synthesis.

3. **External Validity:** Is it generalizable? Yin (2009) says, "In analytical generalization, the investigator is striving to generalize a particular set of results to some broader theory" (p. 36). By using the participants as individual subunits of analysis, this study attempted to develop replication logic to suggest potential generalizability, but more importantly a need for further testing in broadening contexts.
4. **Reliability:** Suggestions include a case study protocol and/or a case study database. This study utilized a case study database to store findings and organize raw data. Yin (2009) describes four elements needed within a case study database:
    a. Case study notes from interviews, observations, or document analysis;
    b. Annotated case study documents, including reflective memos;
    c. Tabular materials such as survey and other quantitative data; and
    d. Narratives—open-ended answers to the questions, citing sources.

    These research artifacts are stored on the university's secure server system.

Research setting

This professional development and the accompanying research took place in virtual space. The following sections describe the professional development design, the research sampling and participants, the research procedures, and data analysis.

Description of professional development

This four-week long professional development was provided entirely online through the university's College of Education server space and delivered via a customized website created in Drupal (See Figure 1), an open-source content management and website development system. Also integrated within the learning environment was VoiceThread (See Figure 2, Label D), an online utility for building discussions and conversations around video and other artifacts and Google Docs for partnered and group work (See Figure 6). The purpose of this professional development was to a) build participants' metacognitive awareness and skills for demonstrating them through think-alouds because as Wilson et al. (2009) points out teachers must become metacognitive before they can teach others to do so; and b) consider how the use of the same instructional strategies and metacognitive skill development goals could be used in their courses. Professional development activities and resources included:

- written material and PowerPoint video lectures to read or watched and reflected on with opportunity for discussions (See Figure 2, Label D);
- example videos provided by the professional development facilitators (See Figure 3) as modeling is an effective PD element (Loucks-Horsley et al., 1996) and modeling was provided in the f2f PD.
- independent journaling (See Figure 4);
- participants' individual "Bright Ideas," (See Figure 5) collection of take-a-ways from the professional development;

- partnered and group activities (See Figures 6 and 7);
- submission of video-recorded sample of metacognitive modeling (See Figure 8) and peer feedback (See Figure 9); and
- asynchronous discussions around specified topics (See Figure 10) and/or pre-recorded metacognitive modeling video examples provided by the professional development facilitators and selected topics (See Figure 11).

Figure 1 shows the opening page to the online professional development being studied. The site required secured user login and provided additional links for those involved in the research (See Figure 2, Label A).

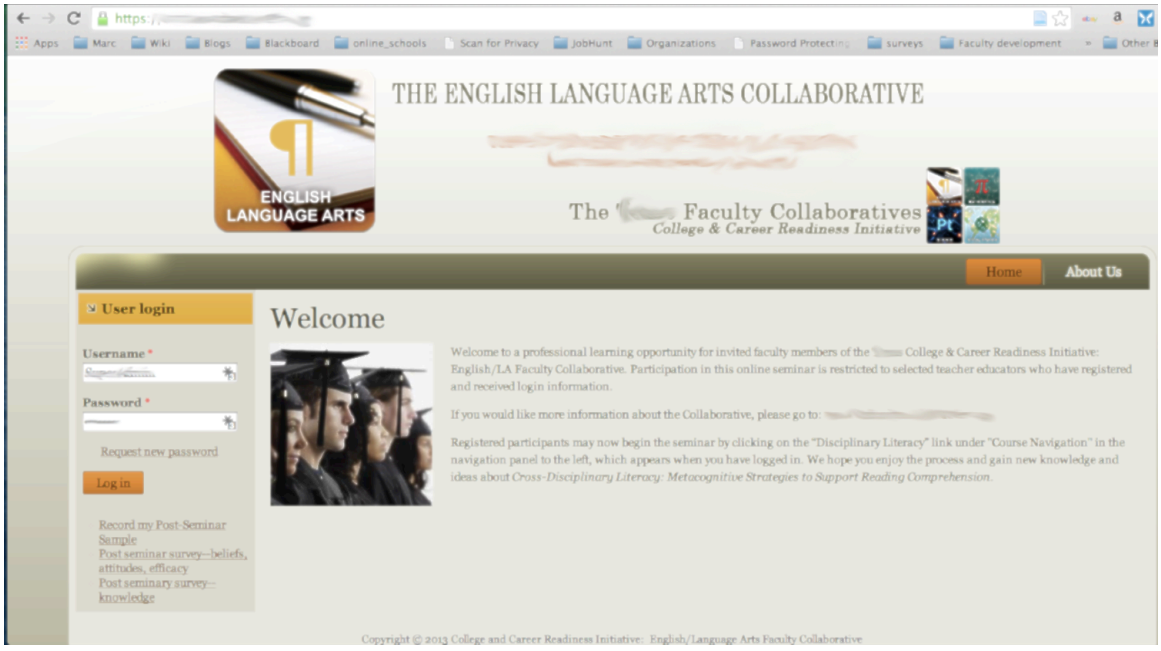

Figure 1. The online professional development home page.

The professional development was divided into ten modules (See Figure 2, Label B) and presented in linear, tabular form (See Figure 2, Label C). Due dates for

assignments were not set, but recommendations included scheduling times with their assigned partner to work within the four-week window the site would remain open. Each module included a PowerPoint audio-recorded lecture and additional readings from either supplemental articles or the books, *Adolescent Literacy in the Academic Disciplines* by Jetton and Shanahan (2012) and *Literacy instruction in the content areas: Getting to the core of middle and high school improvement* by Heller and Greenleaf (2007), which were given to each participant.

Although VoiceThread was used to deliver the PowerPoint lecture videos and other, related videos, participants only had to login into VoiceThread at the professional development site and then were given access without having to leave the learning environment (See Figure 2, Label D). Each skill taught (e.g., metacognitive modeling via think-aloud, "Gems and Jewels" peer feedback) was demonstrated through video. Appendix G provides the transcript to two think-aloud video examples.

Figure 2. Navigation areas within the professional development site.

Note: A) Navigation only research participants could see for access to recording tools and surveys. B) Professional development navigation. C) Linear, tabular navigation within a module. D) Example of video discussion in VoiceThread embedded in the professional development site.

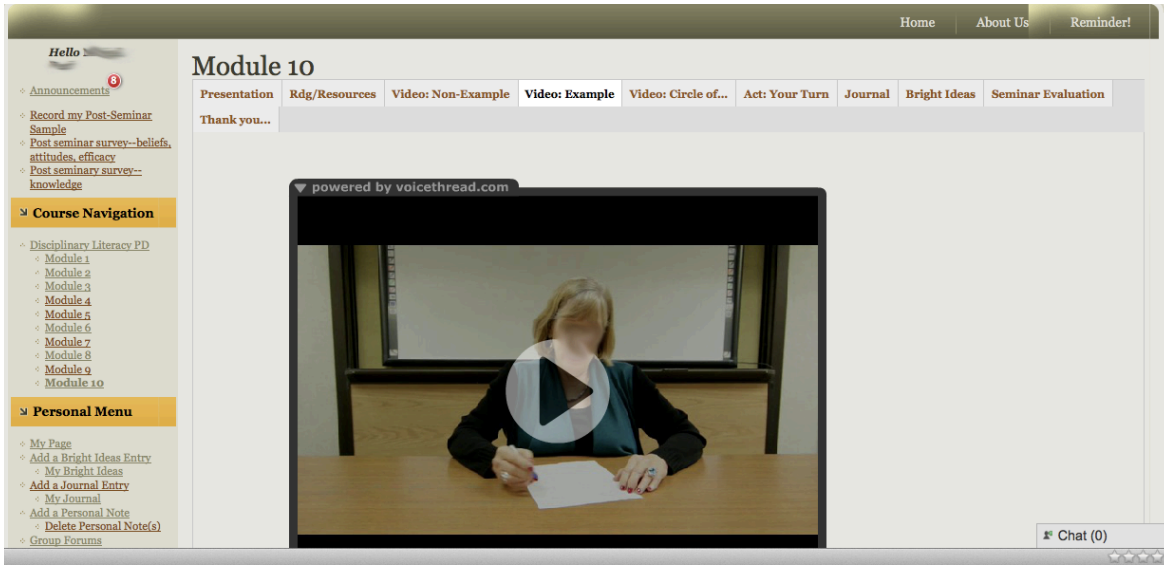

Figure 3. Facilitator's video modeling her metacognition through think-aloud instructional strategies.

Each module contained several activities (e.g., readings, PowerPoint lectures, journal reflections (See Figure 4), Bright Ideas (See Figure 5), whole group work (See Figure 6), partnered work (See Figure 7), discussions around video (See Figure 10), PowerPoint lecture (See Figure 2, Label D, and/or specified topics (See Figure 11)). Each activity within the modules was described and directions given for completing and sharing individual, partner, or group work. Links to oft-accessed areas (e.g., personal journals, personal Bright Ideas, personal notes, chat transcripts) were made available under "Personal Menu." These entries were saved for later access. Metacognitive modeling example videos and the opportunity to record their own sample were provided in later modules.

Figure 4: Journal activity example

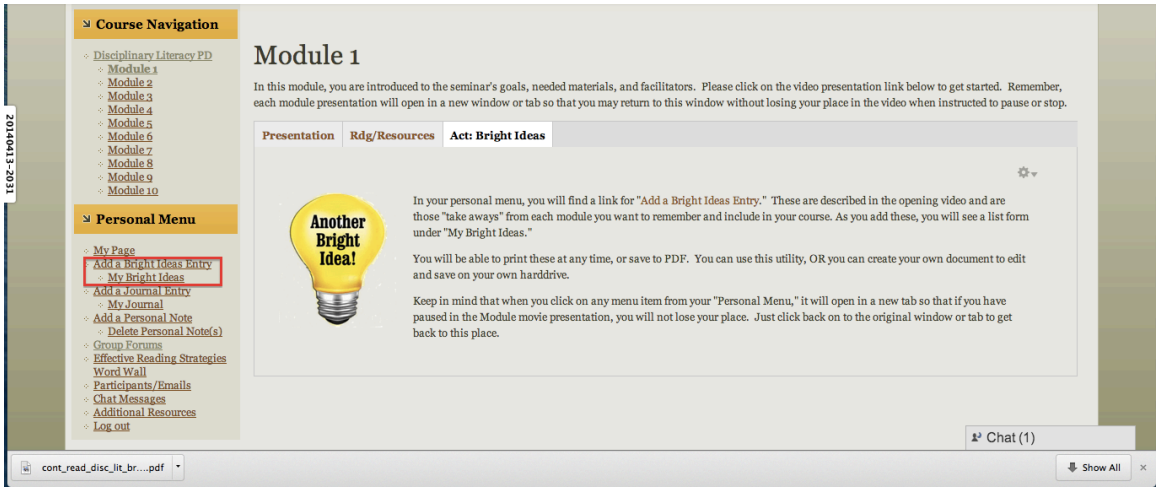

Figure 5: "Bright Ideas" example

Partner and group work sometimes included community building in a Google doc, which each member had access to and when logged in could see and edit through the site's portal to the professional development accounts (See Figure 6). At other times,

participants were asked to upload screenshots of their work (See Figure 7). Each uploaded document was added to a rotating carousel so that all participants could see each other's work.

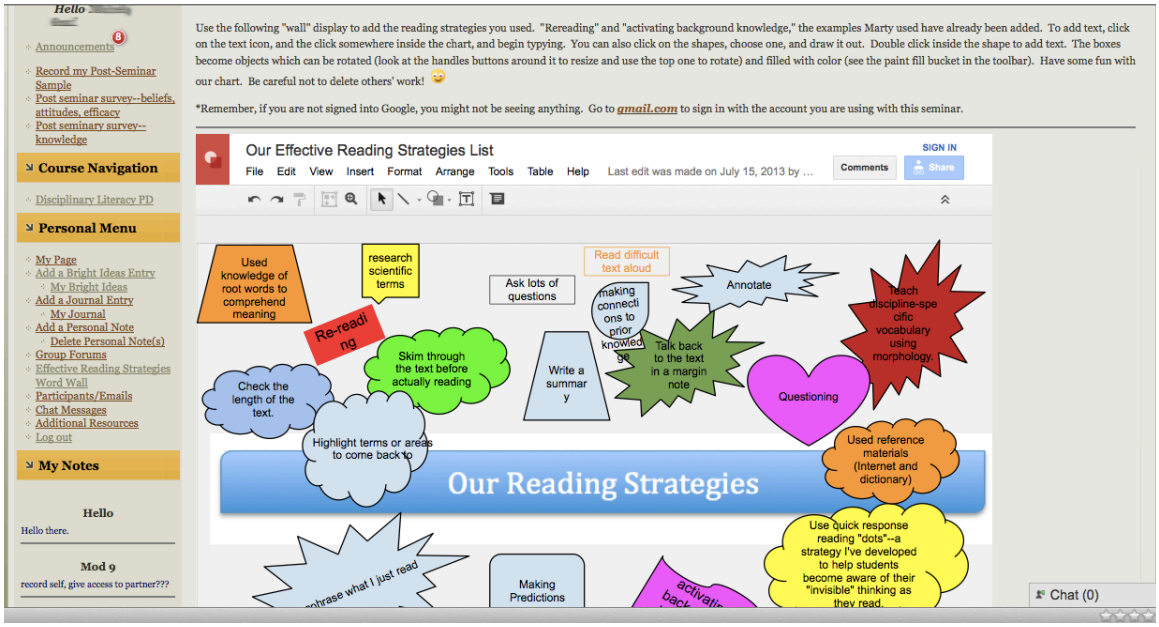

Figure 6. A whole-group word wall created in a Google Doc displayed through the PD site.

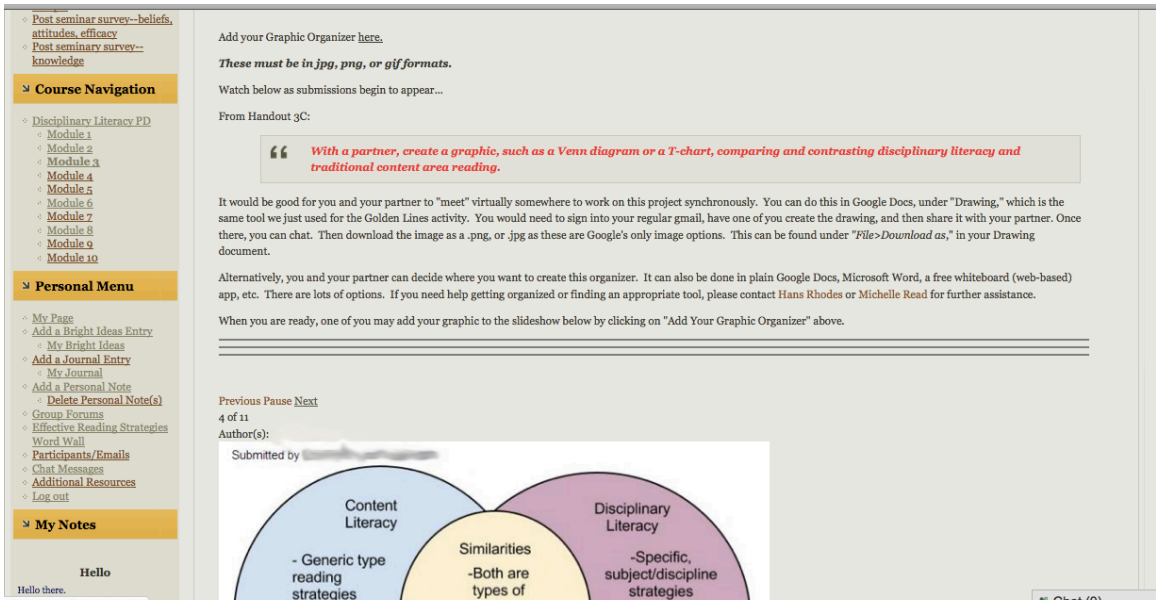

Figure 7. Partner submission work displayed via an image carousel.

A recording tool (See Figure 8) was used for participants to record their metacognitive think-alouds in Module 10. The text used was their choice. This was a group activity in which group members then provided specifically structured peer feedback called “Gems and Jewels” by the facilitators (See Figure 9). This manner of peer feedback was taught to the participants.

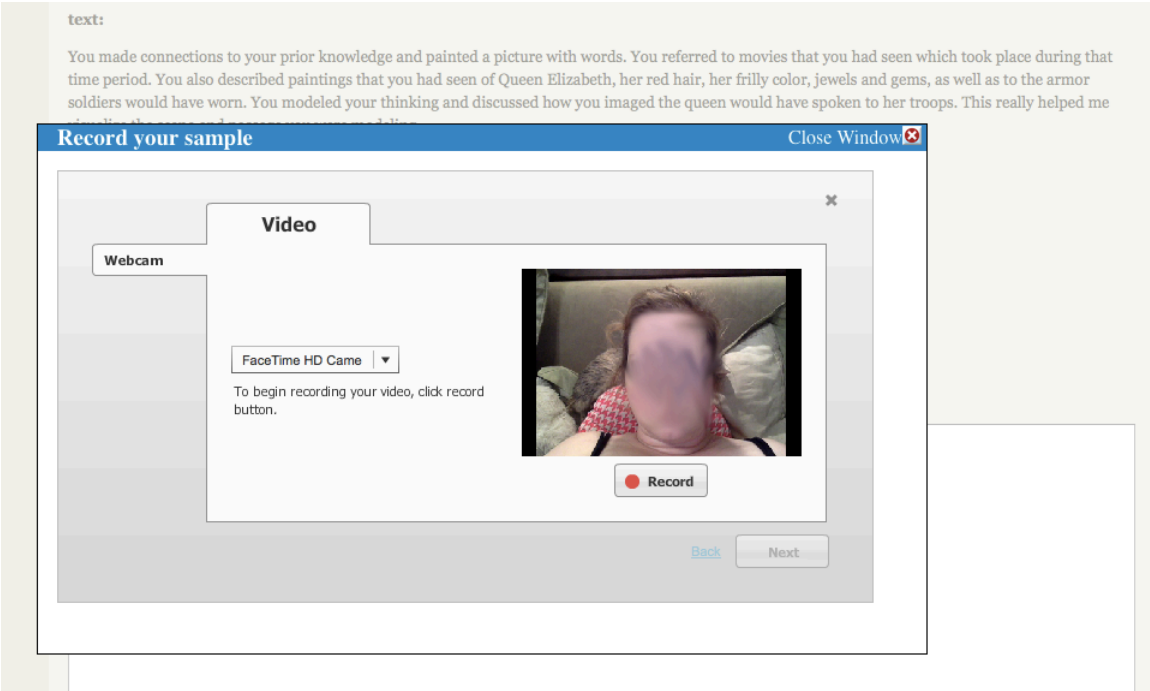

Figure 8. Participant recording tool.

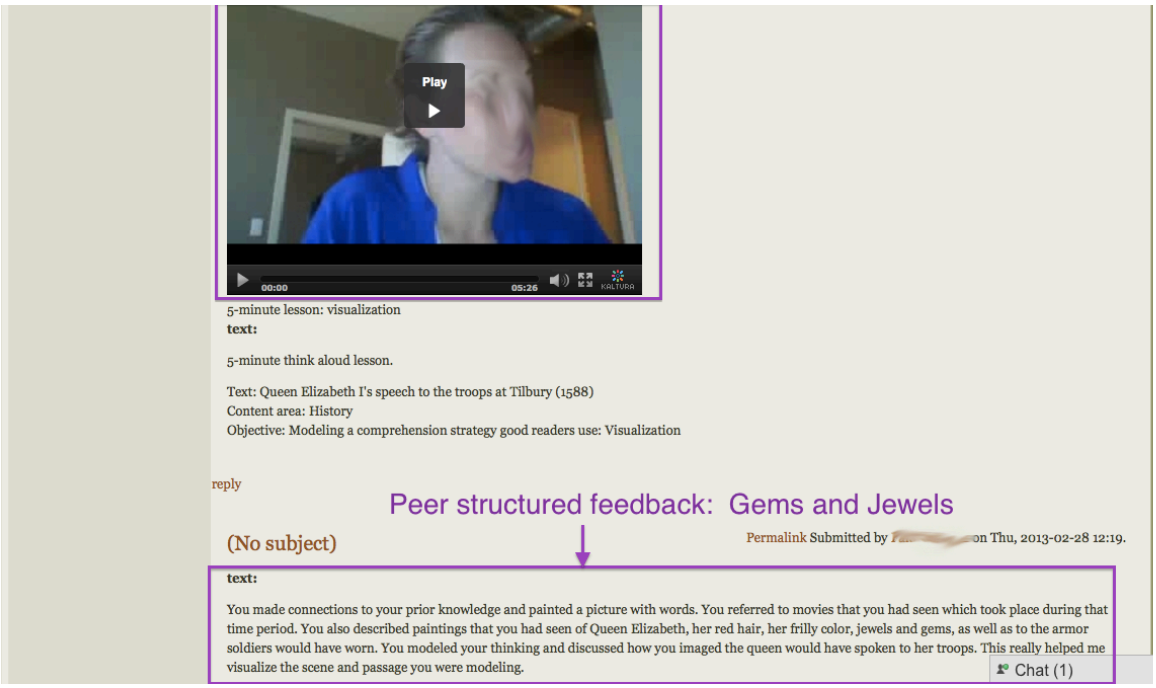

Figure 9. Participant's recorded sample and her peers' "Gems and Jewels" feedback.

Finally, in addition to peer feedback, a number of opportunities for asynchronous discussions were planned throughout the modules. These opportunities were available for each PowerPoint lecture video and metacognitive modeling example videos (See Figure 10). Specified topic discussions were held in small group forums (See Figure 11).

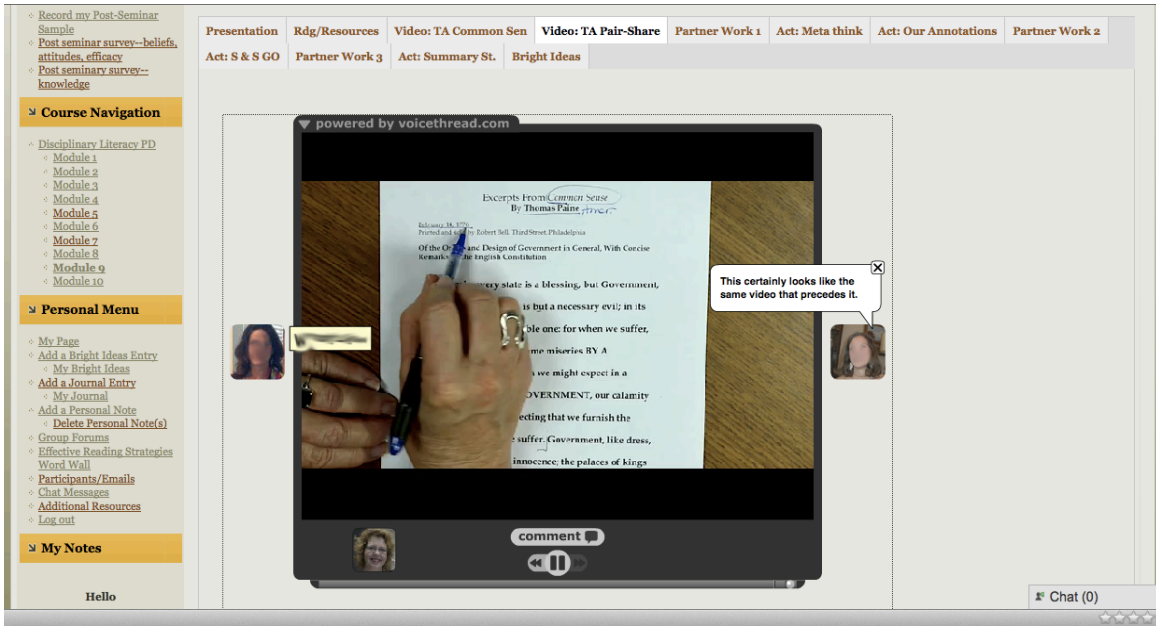

Figure 10. Discussion centered on metacognitive modeling example video in VoiceThread provided by the PD facilitators.

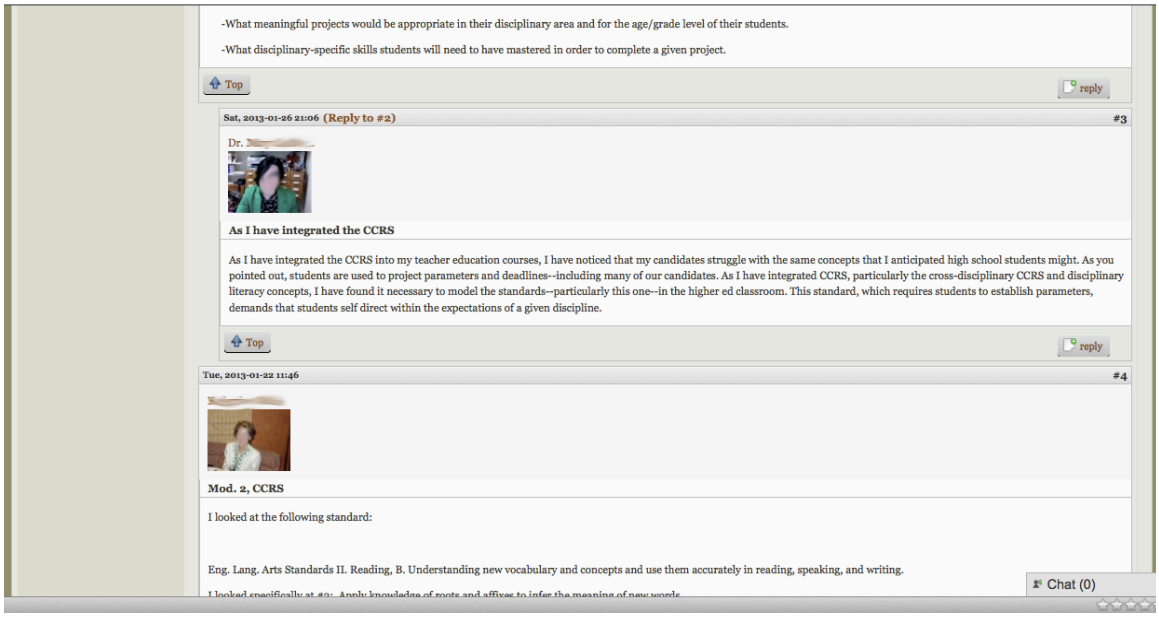

Figure 11. PD discussion forum for specified topics generated by PD facilitators.

The professional development was targeted specifically at teacher educators, those whose students were pre- and in-service teachers. Previously, the professional development was open to teacher educators and any discipline-specific higher education instructor. Because this was the last planned facilitated professional development to be given by this group before funding ended, special permission was given to also include non-teacher educators in select cases.

Sampling

All participants in the professional development were invited to complete all aspects of the research protocol including pre- and post- professional development surveys, pre- and post- professional development attitudes, beliefs, and self-efficacy surveys, submission of pre- and post- metacognitive modeling video samples, and

interviews. This sampling technique is convenient, meaning that the group represents a particular group (e.g., teacher educators, discipline-specific higher education instructors), and they are all participating in the delivered professional development event under study.

Participants

Participants included consenting members of a mixed group of teacher educators and higher education faculty of various disciplines who may be teaching undergraduate students who plan to become teachers. Of the thirty-six professional development participants, thirteen consented to participate in this research effort.

Data Sources

Potential evidence for case studies includes documentation, archival records, interviews, direct observations, participant-observation, and physical artifacts (Yin, 2009). This study focused on four primary forms of data: surveys, conceptual knowledge pre- and post- tests, participant interviews, and pre- and post- video participant submissions of their metacognitive modeling video samples for procedural knowledge growth and assessments. All collected data were stored electronically on the university's secure server system, including videos and interview recordings, which were destroyed post analysis.

Surveys. Surveys were administered both pre- and post- professional development. The surveys were constructed to measure participant conceptual knowledge

of disciplinary literacies as aligned to the professional development objectives including modeling of metacognitive strategies, and their attitudes, beliefs, and self-efficacy related to modeling metacognitive strategies in the classroom.

First, the professional development facilitators composed conceptual knowledge questions in alignment with their goals and objectives. A panel of disciplinary literacy experts reviewed the questions before the providers piloted them in an open-ended questionnaire form to a group of participating teachers in a previous, face-to-face professional development event on the same topic. Synthesized answers from the pilot helped develop multiple-choice options, which the same expert panel again reviewed. Additional survey questions included collection of basic demographic and background information related to possible K-12 certification, discipline specialization, gender, age, years of experience in both K-12 and as teacher educator or higher education discipline-specific instructor, previous disciplinary literacies training, and online learning experiences.

In addition to these and the knowledge questions described above, questions asked respondents to gauge their agreement with statements on attitude regarding reading in the discipline-specific (e.g., mathematics, history, science, arts, physical education) courses. These modified attitude questions originated from the Otto-Smith Inventory (1969) and included all 14 original statements worded equally, negatively and positively. Two additional questions worded both negatively and positively were included to look at attitudes towards modeling metacognitive strategies specifically. Positively worded items

were scored 5-1, while negatively worded items were scored 1-5 with total scores of 16-80 points possible. Higher scores indicated increasing general positive attitude toward literacy instruction in the discipline-specific courses. Means were calculated on a 1-5 scale, with 1, equaling a more negative attitude, 3, a neutral attitude, and 5, a more positive attitude. Smith and Otto (1969) reported reliability for each item at .85 (p. 302). Hargrove (1973) reported reliability measures from three studies at .848, .84, and .87 (p. 65).

Self-efficacy questions were developed based on the newly developed Teachers' Self-Efficacy for Literacy Instruction (TSELI) survey instrument (Tschannen-Moran & Johnson, 2011) and used to measure participants' self-efficacy and beliefs related to their ability to teach reading. Modified wording addressed the audience of higher-education faculty with questions appropriate to only K-12 teachers removed. The remaining ten questions were answered on a 7-point confidence scale from 1: Very non-confident to 7: Very confident.

The general teaching belief questions came from two different established instruments. The first borrowed from Ravitz, Becker, and Wong (2000). One part of Ravitz et al. (2000) survey instruments calls for paired comparison questions, which present three pairs of philosophically juxtaposed positions from strongly traditionalist to strongly constructivist. The second set of questions regarding teacher beliefs originated from Dr. Jody Paul's Instructor Beliefs Survey (1998). Originally, the survey addressed three core areas including: educators' beliefs for learner-centered beliefs about learners,

learning, and teaching (LCB-LT), non learner-centered beliefs about learners (NLCB-L), and non learner-centered beliefs about learning and teaching (NLCB-LT). For the purposes of this study, I removed questions addressing the middle set along with questions not applicable to this context. This left 15 total questions, 10 non learner-centered beliefs about learning and teaching (NLCB-LT) and 5 learner-centered beliefs about learning and teaching (LCB-LT). The first ten were scored on a 4-point scale, strongly disagree (4) to strongly agree (1); while, the last five were scored the opposite at 1 (strongly disagree) to 4 (strongly agree). Higher scores suggest beliefs more aligned with learner-centered learning and teaching. Lower scores indicate more non learner-centered beliefs regarding learning and teaching.

I created and administered all survey questions via Qualtrics, which is stored on the University's network server. Doing so provided security for respondents' answers. Appendices A and B contain these survey questions.

Interviews. Post- professional development interviews were conducted, recorded, and transcribed electronically and stored securely. Audio files were destroyed post analysis. Holstein and Gubrium (2004) describe interviews as an active, collaborative, communication process, involving both the interviewer and interviewee. "In simple terms, interviewing provides a way of generating empirical data about the social world by asking people to talk about their lives" (Holstein & Gubrium, 2004, p. 140). The participant interviews for this study were semi-structured (Willis, 2007), focused

interviews which can be open-ended and assume a conversational manner, but follows a protocol (Yin, 2009). The protocol for this study is located in Appendix C.

The purpose of these interviews was to provide insight and explanation to survey results and to discover ways in which participants applied what they had learned from professional development into their courses. Additionally, participants gave their perceptions regarding the importance of the various professional development structural design elements to their learning. Interviews are appropriate for seeking out opinions and attitudes and comparing (Yin, 2009). Interviews lasted approximately 35 minutes on average.

Observations. Yin (2009), notes that observational data provide additional information about the topic under study. "In a quantitative observational study, a complex phenomenon, behavioral or otherwise, is first conceptually reduced to a number of measurable and observable behavioral variables" (Suen & Ary, 1989, p.5). Behavioral observations find evidence, or lack thereof, of application in practice. Short (3-5 min) metacognitive modeling video samples were evaluated against an observation instrument created by the professional development facilitators and providers both pre- and post-professional development to find growth in the participants' abilities to effectively model their metacognition through think-aloud strategies. A scoring rubric is located in Appendix D. The video files, along with grader's notes and scores provided electronically, were also stored confidentially on the university's secure server. The video files were destroyed post analysis to further protect participants' confidentiality rights.

Procedures

Data collection took place throughout the professional development event. The following outlines the process:

1. Pre-professional development—Potential research participants were informed of research background, purpose, and procedures as they signed up for the professional development event. Upon signup, participants completed their consent forms and initial survey on their attitudes, beliefs, and self-efficacy online through Qualtrics.
2. Pre-professional development--Just before the beginning of the professional development event, all participants took a conceptual knowledge survey assessing their prior knowledge on the subject and submitted video/audio examples of modeling the act of reading by think-aloud.
3. Post-professional development-- Participants retook the conceptual knowledge survey to assess growth from the professional development event.
4. Post-professional development-- Participants submitted their second video-modeling sample for evaluation and comparison against their first submission.
5. Post-professional development--Participants took a post-survey to determine changes in attitude, beliefs, and self-efficacy.
6. Post-professional development—Participants were interviewed about their professional development experience and future plans for implementation.

Data Analysis

Normality in score distribution is often necessary for running statistical analysis. The larger the number of participants, the more likely normality occurs. With such a low number of participants, a greater concern existed for non-normality. Tests for normality sought for the differences in pre- and post- professional development scores in each of the following five variables:

- metacognitive modeling sample videos;
- knowledge surveys; learner-centered versus non learner-centered beliefs for self and students' classrooms;
- attitudes towards reading in the discipline areas, both means and totals; general teaching philosophies;
- confidence to use the think-aloud teaching strategy in the classroom; and
- confidence to teach others to do the same in their classrooms.

The Shapiro-Wilk test showed that all of the mean differences were distributed normally (see Table 3), with significance levels greater than .05. One-tailed t-tests were then run for comparison of pre- professional development and post- professional development participant means, with the prediction that post scores would be higher than pre-professional development scores.

Table 3

Shapiro-Wilk Test for Normality Results Per Variable

Variable	**Significance[a] of Difference from normal**
Conceptual knowledge survey score mean difference	p=.401
Procedural/Applied knowledge video sample score mean difference	p=.177
Learner-centered vs. non learner-centered beliefs --classroom mean difference	p=.722
Learner-centered vs. Non learner-centered beliefs --Student classroom mean difference	p=.410
Attitudes towards reading in the disciplines totals difference	p=.924
Attitudes towards reading in the disciplines mean difference	p=.924
General teaching philosophy mean difference	p=.095
Confidence to use think-aloud instructional strategy in teaching mean difference	p=.868
Confidence to teach others how to use think-aloud instructional strategies with their students mean difference	p=.799

[a]p>.05=non-significance; Indicates normality

I employed several varying analysis methods once normalcy was established. To begin, descriptive statistics were run in SPSS and comparisons made from pre- and post-professional development surveys, along with pre- and post- metacognitive modeling sample video scores. Reliability of knowledge survey items was sought using Cronbach α. The reliability of the instrument items measured .63 on the Cronbach's α scale.

A team of four graders scored the 5-minute pre- and post- professional development metacognitive modeling sample videos using a rubric provided by the

professional development facilitators (see Appendix D) to insure inter-rater reliability. Pre-professional development video sample analysis across all raters had a Cronbach's $\alpha = .80$, while the post-professional development videos sample analysis across all raters had a Cronbach's $\alpha = .63$.

Pearson's R and Point-Biserial correlations were conducted to seek the existence of relationships between all variables and against ratings participants gave to the metacognitive modeling video examples provided by the professional development facilitators. I ran paired-sample T-tests to compare means between pre- and post-professional development changes in participants' knowledge, beliefs, attitudes, self-efficacy, and metacognitive modeling sample scores.

Interviews used a simultaneous coding (Miles & Huberman, 1994, Saldana, 2009) system for analysis, meaning that I coded the same datum in multiple ways. Saldana (2009) describes a variety of what he refers to as 1st-cycle analysis including In Vivo (p. 76), an elemental method, as a means of looking for patterns using participants' own voice. Codes found through this approach, preferably line-by-line (Charmaz, 2006), helped to build more conceptual codes (Saldana, 2009) through 2nd-cycle analysis such as pattern coding (Saldana, 2009), or focused coding (Charmaz, 2006). In Vivo coding can be employed as initial (Saldana, 2009; Charmaz, 2006) or open (Glaser & Strauss, 1967) coding. "Initial, or open, coding is intended as a starting point to provide the researcher with analytic leads for further exploration" (Glaser, 1978, p. 56) and to determine the best direction to take the study.

Additionally, affective coding methods, such as emotion coding and value coding, used during or just after initial coding, looked for evidence of emotion, value, attitudes, beliefs, conflict and judgments, within participants' responses. Researcher positionality was imperative during researcher analysis, since interpretation of response could be reflective of the researcher's own values, attitudes, and beliefs (Saldana, 2009). I used the practices of member checking (Glesne, 2005, 2010) and peer/colleague consultation to ensure reliability and trustworthiness in representation.

Participants answered additional follow-up interview questions regarding how they rated the metacognitive modeling video examples provided by the professional development facilitators and the impact the video examples had on their learning. The five point scale ranged from 1="not at all" to 5="integral to my learning." Participants also rated and ranked the nine professional development design elements, or activities (e.g., metacognitive modeling video examples; recording own metacognitive modeling samples; readings; PowerPoint video lectures; asynchronous discussions; partnered activities; participants collection of take-a-ways from the professional development (Bright Ideas); independent journaling; and whole group activities). They described their plans for implementing the metacognitive skill development strategies in their own classrooms. Rankings were assigned values opposite their rank number (e.g., 1=9; 2=8; 3=7; 4=6; 5=5; 6=4; 7=3; 8=2; 9=1). Rating and ranking means for the group were calculated and correlations run, both individually and as a group, to find potential relationships between the ratings and rankings of the metacognitive modeling video

examples and pre- and post- professional development scores and the likelihood to implement strategies in their own classrooms.

Finally, I completed a research matrix (Appendix F), which aided in aligning survey and interview questions, along with analysis of all data sources to the study's research questions.

Trustworthiness

Trustworthiness is attained through several means of data validation. In this study, I employed various means to compare and validate findings such as member checking (Glesne, 2005, 2010) and data triangulation (Corbin & Strauss, 2008) through several sources of data, including pre- and post- professional development surveys, interviews, pre- and post- metacognitive modeling samples, and interviews. Additionally, because of my role as professional development designer and tech support during the professional development, I was able to embed myself in the experience as opposed to a researcher who is in no way involved in the professional development event itself. During these times, I took notes of things such as technological frustrations and frustrations related to lack of peer involvement. In that way, I could review my field notes when these topics appeared again during interviews.

While scoring the metacognitive modeling samples, I discussed expectations with professional development facilitators and helped with the creation of a scoring rubric. I then relied on three doctoral candidates in a Language and Literacy program to help me with scoring. Initial assigned scores were based on three graders' initial unanimous

scores. When disagreement between graders occurred, we used an additional grader and assigned the mode of all graders' scores.

Finally, I frequently discussed my interpretations, determinations, and analysis with my advisors and peer researchers. This helped to identify confusion, alternate perspectives, and potential bias on my part.

Researcher Positionality

As a 14-year teaching veteran, I have taught kindergarten reading, 3rd and 4th grade general/ESL classrooms, and 6th grade general, AP, and inclusion mathematics. As such, I have been responsible for teaching across all four core disciplines, mathematics, language arts/reading, social studies, and science at a variety of levels.

As a teacher, I attended many professional development events, mostly designed as the 45-minute, after-school, workshop specials described in chapter 2. I also provided professional development to teachers primarily in the area of technology integration, the majority of which occurred during my final year when I became a Curriculum Specialist in Technology on two campuses, elementary and middle school. Before that time, I facilitated several professional development courses of longer-duration (6 weeks) to teachers, K-12, interested in learning how to integrate technology in their classrooms as part of my position as an Intel Master Teacher. Interest in professional development effectiveness began at that time when I completed an action research agenda to identify changes in students' technological projects in terms of both quality and quantity of those

teachers who had participated in the Intel Teach to the Future professional development program under my instruction.

In my later years of teaching, I completed two masters' degrees, both obtained entirely online, in Educational Technology and Literacy Studies respectively. Not only did my experiences cause me to shift beliefs to a more constructivist way of thinking, unlike any of my previous professional development experiences, but it also spiked my interest in the development and effectiveness of online learning for both children and adults. I designed my first online book study and professional development in 2005, recruiting several teachers from my school district as participants.

In my continued studies through my doctoral program and my employment as a graduate student and technology trainer in the college, I train both faculty and their students in technology integration and the use of specific technology tools and have assisted in the design and development of online learning environments. Additionally, I am currently an online adjunct instructor of computer-mediated communications at a small, private university. As such, I am often evaluating the design of my course and its online platform, making necessary changes. The opportunity to help this group design an online professional development in literacy opened the door to this specific study.

It is important to note these experiences as teacher and learner and to clearly state my position in this study as both researcher and online professional development designer/developer. To separate myself during analysis, I gathered input from members of my committee and various colleagues. The use of reflective memos in an ongoing

manner through data analysis helped me to separate my personal opinions, bias, and outcome hopes from those of the participants and reality.

Chapter 4: Results

Through this study, I sought to find answers to the following research question: To what extent is instructor change evident after participation in an online professional development that utilizes metacognitive modeling through think-aloud strategies? To answer this question, I examined the following sub-questions:

1. How does the use of metacognitive modeling during online professional development affect instructors' potential for change/transformation in classroom practice?
    i. How does metacognitive modeling in PD affect instructor *knowledge* about literacy instruction in the content areas?
    ii. How does metacognitive modeling in PD affect instructor *beliefs* about literacy instruction in the content areas?
    iii. How does metacognitive modeling in PD affect instructor *attitudes* about literacy instruction in the content areas?
    iv. How does metacognitive modeling in PD affect instructor *self-efficacy* in modeling literacy/ metacognitive processes in the content-area classroom?
2. How do instructors plan for and incorporate metacognitive modeling in their courses post- professional development?

This chapter is organized in three parts. The first section discusses the group demographics, providing additional detailed background information for each participant. The second section provides participant case narratives describing how the professional development may or may not have facilitated change in each participant. The last section presents cross-case results, which directly answer the research questions.

The Participants

Thirteen of the thirty-six professional development registrants consented to participate in the research. Three of these participants were removed from analysis due to incomplete participation, resulting in10 participants. Eight of the ten remaining participants were instructors of pre-service teachers or students who had expressed likely interest in teacher preparation programs. The group contained three men (John, Sam, and Aaron) and seven women (Ivy, Rachel, Victoria, Kate, Eugenie, Sarah, and Susan). Table 4 provides additional information about the participants including:

- their age range;
- their status as a teacher educator;
- the type of institution where they taught;
- the number of years they have taught at the postsecondary level (as of the 2011-2012 academic year);
- the disciplines they taught;

- their experience with content area literacy instruction training and online learning; and,
- their K-12 certification status as of the 2012-2013 academic school year, the year in which these participants took the online disciplinary literacies seminar.

Table 4

Participant information

Name	Age Range	Teacher educator	Yrs. Teaching Ex. (Higher Ed.)	Type of University-level Institution	Discipline	Previous DLPD Ex.	Online PD Ex.	K-12 certified	Yrs. Teaching Ex. (K12)
Aaron	31-40	Y	3	4 year college/university	Social Studies	No	Yes	Yes	4
Eugenie	51-60	Y	6	4 year college/university	English	Yes	No	Yes	2
John	31-40	Y	2	Professional Development School	Social Studies/ History	Yes	Yes	Yes	3
Kate	>60	N	6	4 year college/university	English Literature	No	Yes	No	n/a
Ivy	41-50	Y	4	4 year college/university	ESL	Yes	Yes	Yes	2
Rachel	41-50	Y	3	4 year college/university	English Comp.	Yes	Yes	No	n/a

Table 4 (continued)

Sam	41-50	Y	4	4 year college/university	Social Studies/ History	Yes	Yes	Yes	3
Sarah	41-50	Y	2	4 year college/university	Social Studies/ Science	No	Yes	Yes	6
Susan	31-40	Y	3	4 year college/university	English Comp.	Yes	No	Yes	3
Victoria	51-60	N	4	Community College	English Comp.	Yes	Yes	No	n/a

The following table shows the specific grade levels this group taught, indicating that participant experience varied by discipline and by grade, having taught students from approximately 5-18 years old in the K-12 setting. These experiences provided them with contextual background for determining the needs of the child. The most commonly taught grades were grades 6-10.

Table 5

Grade Levels Taught by Participants When Employed in K-12

Grade	K	1	2	3	4	5	6[a]	6[b]	7	8	9	10	11	12
# of participants	2	3	3	3	3	3	2	4	5	6	4	4	2	3

[a] 6th grade in an elementary setting
[b] 6th grade in a secondary (middle school) setting

Instructor Change: Individual Experiences

The following section portrays the individual participants and their online professional development experience. For each participant, details are provided on their background coming into the professional development, including their experience, their teaching beliefs and attitudes, their knowledge of disciplinary literacy, and their confidence level for metacognitive modeling in front of their students and in preparing others, such as their teacher candidates and/or colleagues, to use the strategy. Additionally, I describe findings regarding the changes to their knowledge (conceptual and procedural applied through performance), beliefs, attitudes, and self-efficacy levels for modeling in the classroom. Finally, I discuss their plans for use of the strategy in their

own classes and the participants' perspective on how the metacognitive modeling videos within the online professional development setting helped their learning.

Aaron

Background. At the time of this study, Aaron was a K-12 certified teacher in grades PK-8 specializing in science, reading/language arts, history, foreign language, and Physical Education (P.E.). He previously taught 5th and 6th grades in an elementary setting, 7th and 8th grades in middle school settings, and high school. He was a 31-40 year old male with four years of K-12 teaching experience, some in self-contained settings, and three years university-level teaching experience at a 4-year college/university. He taught social studies methods courses and had taught several of these courses online. He did not have previous disciplinary literacy professional development but had taken online professional development.

Coming into the professional development, Aaron was somewhat knowledgeable about disciplinary literacies, scoring a 5.66/9.00 (see Table 6). However, he scored a "0" on his pre- professional development metacognitive video sample. He spent his time telling the audience how he would teach his teacher candidates to read the text but then proceeded to read the whole document without modeling his think-aloud processes. He held moderately positive attitudes about reading in the discipline areas and slightly more learner-centered teaching beliefs for his classroom and his students' classroom according to his survey responses. Additionally, according to his selections on the pre- professional development survey, he felt more confident to use metacognitive modeling via think-

alouds as an instructional strategy in his classroom than to teach others to do so (see Table 6).

Table 6

Aaron's Results: Pre/Post Professional Development Scores

Aaron	Video Sample Score[a]	Knowledge (facts) Score[b]	Attitude Score Total and Mean[c]	Belief Score (self/ students)[d]	Beliefs Score (teaching phil-osophy)[e]	Self-Efficacy to use the strategy[f]	Self-Efficacy to teach others the strategy[g]
Pre	0	5.66	55 (3.44)	2.73/2.87	4.33	5.40	4.91
Post	1	7.00	68 (4.25)	2.93/2.87	3.67	6.00	5.64

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Changes. In his post-professional development metacognitive modeling video sample, Aaron improved his score- from "0" to "1." In the second sample, he directed the students to look at various elements and explained how he would approach reading the text (see Table 6). However, he never read the text. While improvement was minimal, Aaron did begin to show rather than just tell. He believed, though, that his performance score improved more than it had as evidenced in his enthusiastic response to the question that asked him to compare his pre- and post- professional development modeling sample

videos. He remarked, “So, I noticed a real change from the ways I approached the text from before and after the seminar.”

Aaron’s general conceptual knowledge score about the concepts related to the professional development topic improved (see Table 6), as did his attitude score about teaching reading in the discipline areas. His confidence for using metacognitive modeling in his lessons and his confidence in teaching others how to do so increased as evidenced by his post- professional development survey selections. He described dual elements of vulnerability and empowerment when using it with his students. He stated,

> I think there is a certain *vulnerability* to it especially, maybe not when you do it with the video; although you always wonder what the people like you Michelle might be thinking about when you see us do it. I would feel a little *vulnerable,* you know, like are they getting this, do they see what the point is? But then there is certainly an empowerment, and empowering quality to it as well to say this is a way of modeling metacognition. Yeah, there is a little bit of both to that *vulnerability* and *empowerment.* (Interview with Aaron, 04/09/2013, emphasis added)

Meanwhile, his classroom beliefs scores remained mostly balanced with a continued slight lean toward learner-centeredness. Additionally, his general teaching philosophy score still signified more constructivist associations.

In his interview, Aaron noted that he previously taught the concept of metacognition. He talked about a professor he had who felt passionately about the topic, and he did as well. However, he realized he spoke much more about it than he modeled it.

> When I did the metacognition, I don't think I ever did a sort of read aloud. It was more, I wanted to encourage students to understand what metacognition was and that this is how they are thinking to be able to process that and to talk that out. I really tried to encourage a lot of discussion for different problems, but to connect back into their metacognitive strategies. I think what was lacking, was my own model of it. (Interview with Aaron, 4-9-2013)

This shift was illustrated in his pre- and post- professional development video samples as he went from only talking about it in the first sample to some modeling and explaining in the second.

Perception of PD Structure/Plans. On a scale of 1-5, Aaron rated the metacognitive video example videos by the facilitators a "5, Integral" to his learning. He also rated each of the other elements and was then asked to rank them in order of importance. He ranked it second to the readings as integral to his learning (see Figure 12).

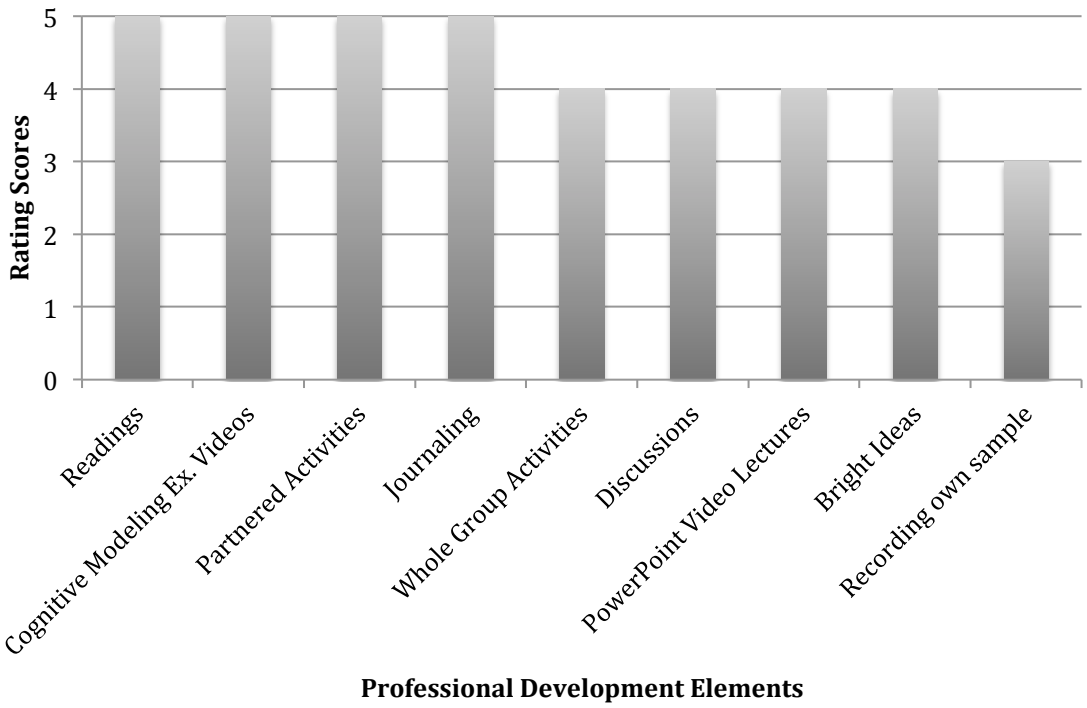

Figure 12. Aaron's ratings of the PD elements shown in ranked order.

Aaron planned to integrate modeling metacognitive reading strategies 3-5 times in each of his three pre-service and one graduate level courses in fall 2013. He was anxious to try using the strategy online much in the same way it was presented in the professional development. Specifically, he planned to use VoiceThread in his online courses to hold discussions around metacognitive modeling videos.

Summary: Aaron's case. Aaron experienced change through his professional development experience. Increases occurred to his conceptual knowledge and procedural scores, to his attitude scores towards reading in the discipline areas, and his confidence to both use the instructional strategy with his students and to teach others to do so. His beliefs remained largely unchanged. He made specific plans on how he would

incorporate what he learned in the following semester. He rated the metacognitive modeling videos examples a "5, Integral to my learning" and ranked them 2nd out of the nine professional development elements.

Eugenie

Background. At the time of this study, Eugenie was a 51-60 year old woman who taught language arts in 10th and 11th grades for two years before turning to university-level education where she taught English for the past 6 years in a 4-year college/university setting. Her students were undergraduates, and it was unknown how many would enter teaching. Although she did not teach professional development sequence (PDS) courses for pre-service teachers at the university, she did work in the public schools providing in-service teacher professional development. She had had previous training in disciplinary literacy but had not ever taken an online professional development or course.

Entering the professional development, Eugenie possessed positive attitudes for reading instruction in the disciplines. She also indicated student-centered beliefs for her own and her teachers' classrooms, and "most constructivist" associations. She held complete confidence to use the strategy in her classroom and to teach others to do so in their classrooms.

Eugenie was already quite knowledgeable about the topic of disciplinary literacy from her previous workshops and seminars on the subject (see Table 7). However, in her

pre- metacognitive modeling video sample, Eugenie scored a "0." She tells her audience that "we" are going to solve a problem. She reads the text in its entirety and then explains to her audience how she utilized a system of sticky notes to mark her questions, emotions, and her thoughts throughout the text.

Table 7

Eugenie's results: Pre/Post Professional Development Scores

Eugenie	Video Sample Score[a]	Knowledge (facts) Score[b]	Attitude Score Total and Mean[c]	Belief Score (self/ students)[d]	Beliefs Score (teaching phil-osophy)[e]	Self-Efficacy to use the strategy[f]	Self-Efficacy to teach others the strategy[g]
Pre	0	8.00	71 (4.44)	3.33/3.33	5.0	7.0	6.91
Post	3	8.66	71 (4.44)	3.07/3.00	5.0	7.0	6.55

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Changes. In the post- professional development video sample, Eugenie increased her score to a three. She modeled several reading strategies including making connections, identifying words with negative connotations to determine mood, connecting religious words, and looking at the date to determine possible time/context. In

her interview, Eugenie talked about her changes from the first sample submission to the second.

> I understood more clearly what the disciplinary literacy approaches were. In the first one, I thought I was extremely instructional in that I was up there like a professor guiding students and telling them stuff rather than actually letting them at insights into my thinking. I tried really hard the second time, and I think I probably recorded it twice because I caught myself doing the directive stuff rather then the "here's what I'm thinking." And, even when I went back and listened to it again I thought, "Oh, I could've done this a lot differently." So, I think that more of my thinking language was evident in the second video. I wasn't so interested in having them understand the text, as I was interested in having them understand how I accessed the text. (Interview with Eugenie, 3-29-2013)

Eugenie's conceptual knowledge score, already high, also increased.

Her attitudes towards reading instruction in the discipline areas, her beliefs on learner-centered versus non learner-centered classroom environments, and her confidence levels to use the instructional strategy and teach others how to do so remain nearly constant (see Table 10). She explained that she used think-aloud strategies before this professional development but changes to her knowledge and confidence came as a result of participating in this professional development, "I feel like I was doing an impoverished version of think-alouds prior to this and now I feel really *strengthened and empowered"* (emphasis added). Still, Eugenie also admitted that she did research on the subject before

doing her sample videos because, “I’m a professor, I had to go in with huge background knowledge.” This teacher-as-expert mindset goes against the nature of metacognitive modeling and disciplinary literacy by violating the main objective of metacognitive skill development—to demonstrate thinking about your thinking. The process of thinking is going to be different between an expert and novice. Authenticity is jeopardized when a teacher only pretends to be a novice during modeling. Ideally, in metacognitive modeling teachers demonstrate their authentic problem-solving tactics (Schoenbach et al., 2012). Research to bolster background knowledge is a strategy that could be used, if needed, in front of the students to demonstrate the implementation of a reading strategy for comprehension.

Perception of PD Structure/Plans. Despite the large increase in her performance, Eugenie gave the impact of the metacognitive modeling examples provided by the facilitators a “3” on a scale of 1 (Not at all) to 5 (Integral to my learning). She stated,

> I thought I knew how to do this, but I learned quite a bit, especially about the thinking-in-action language by watching the modeling. However, some of the think-aloud comments seemed terribly elementary, especially the video done by the student. That ended up being a waste of my time, although it did serve as a very good example of what I did not want to sound like. (Interview with Eugenie, 3-29-2013)

She rated recording her samples, the readings, and the lecture presentations as more impactful than the modeling videos to her learning (see Figure 13).

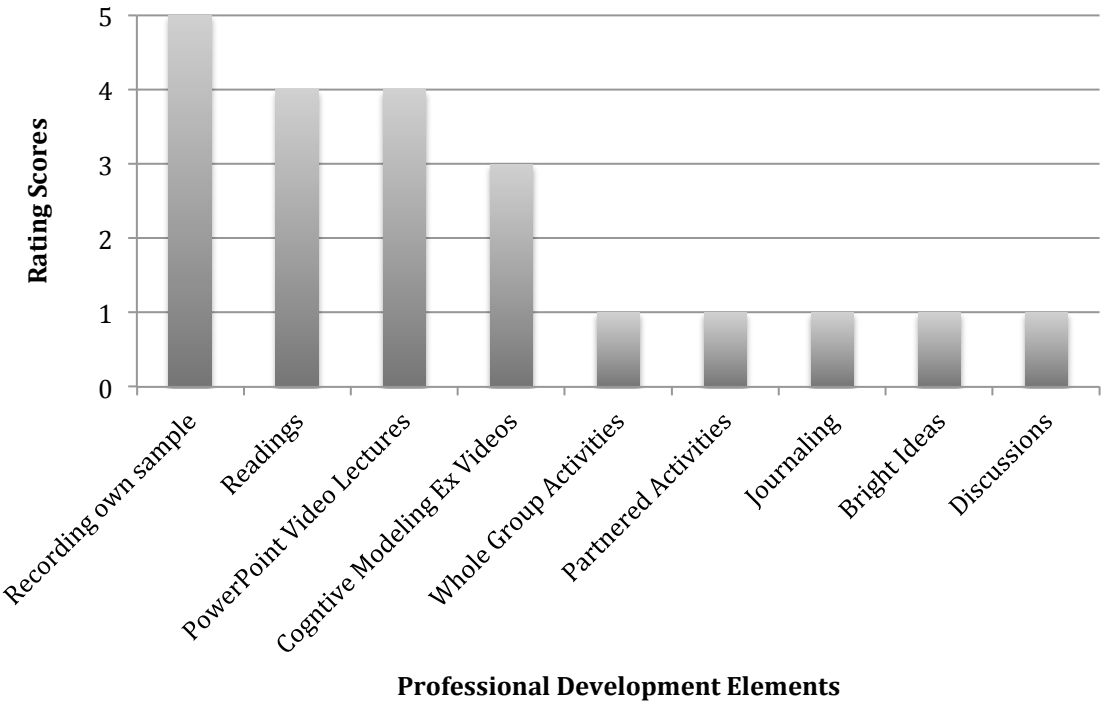

Figure 13. Eugenie's ratings of the PD elements shown in ranked order. Although Eugenie rated all the elements, she only ranked the first four, noting that the remaining was of little value to her learning.

Eugenie had immediate plans to implement the metacognitive modeling instructional strategies in her classroom at the end of the professional development course. Additionally, she planned to use what she learned multiple times in the following semester. During her interview she declared, "I've become sorta a messenger or advocate for this approach now."

She adds,

> My teaching practice, as I said, also extends to public schools so I see myself as not just working with those teachers that happened to be at the workshop, but that teacher is representing 100, or 150 students, and it would be awesome if I could inspire them to go out and do the same. (Interview with Eugenie, 3-29-2013)

By sharing what she has learned with others, Eugenie is being further "cosmopolite" (Rogers, 2003) and helping to bring knowledge learned not only into the environment in which she works, but also into the additional environments in which she interacts. This behavior helps to spread the ideals of disciplinary literacy, like any new innovative practice, more quickly as excitement builds between practitioners.

Summary: Eugenie's case. The biggest change for Eugenie was in her procedural knowledge, which she showed in her metacognitive modeling video samples as she increased her score from 0-3. Her conceptual score also increased slightly, while the remainder of her scores in attitudes, beliefs, and self-efficacy remained mostly constant, with a few minimal increases and decreases. She does not attribute her procedural knowledge growth primarily to the videos, rating their value a "3" to her learning, and ranking them fourth in importance among the nine elements. Eugenie planned for both immediate and future implementation of the think-aloud instructional strategies.

John

Background. At the time of this study, John fell in the 31-40 years of age range and had taught in K-12 for 3 years. He was certified to teach all grade levels, K-12 Special Education classes and had taught 1st, 2nd, 3rd, 4th, 7th, and 8th grades. He had previously taken online courses and had previously learned content-area and/or disciplinary literacy instruction. At the time of this study, John was currently employed as a project specialist in a reading center within the College of Education of a very large, metropolitan state university where he provided professional development for in-service teachers. He was also a doctoral candidate in the Special Education Administration Program at the university where he worked.

John came into the professional development with above average knowledge regarding disciplinary literacies, scoring one of the highest scores on the knowledge pre-professional development survey (7.66/9). His attitudes were positive towards teaching reading in the disciplines, and he held just slightly more learner-centered beliefs for classroom environments and a more constructivist general teaching philosophy (see Table 8) as determined by his pre- professional development survey answers. On a scale of 1-7, John chose "confident" to describe his ability to both use metacognitive modeling in his instruction and teach others how to model metacognitively for their own students (See Table 8).

Table 8

John's results: Pre/Post Professional Development Scores

	Video Sample Score[a]	Knowledge (facts) Score[b]	Attitude Score Total and Mean[c]	Belief Score (self/ students)[d]	Beliefs Score (teaching phil-osophy)[e]	Self-Efficacy to use the strategy[f]	Self-Efficacy to teach others the strategy[g]
Pre	1	7.66	69 (4.31)	2.73/2.67	3.33	6.00	6.00
Post	3	7.00	62 (3.88)	2.73/2.6	3.33	5.00	5.00

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Changes. Changes to John's knowledge, attitudes, beliefs, and confidence level, pre-, and post- professional development is also shown in Table 8. Changes were slight and increased and decreased in some areas.

John improved his knowledge of metacognitive modeling as evidenced by his pre- and post- performance scores in the video sample (see Table 8). In John's pre-professional development sample, he told his students what 'he' was going to do as he read, using statements such as "I'm now going to summarize" without actually illustrating his summary building. However, in his second sample, he began to use "I" statements genuinely, such as "Now I know aqua means water, so I bet aquatic is

related." Occasionally, during his post lesson he returned to telling students what he would do next, or using "we" references, such as "it is telling us the water is blue." He received a top score of "3" for modeling more than four strategies.

While his performance score on the second metacognitive modeling sample video showed increased skill in displaying metacognition through think-aloud, John's pre- to post- conceptual knowledge score regarding the topic declined. He mentioned continued confusion in his interview regarding his post- professional development conceptual knowledge, "Even the second time around I was a bit confused." His attitude scores about reading instruction in the discipline areas also slightly declined. Additionally, his confidence level in using the think-aloud strategy in his teaching and in preparing others to do so dipped from "Confident" to "Somewhat confident" (see Table 8). John noted that others might not feel as comfortable,

> I think that it is possible to feel *vulnerable*, because you feel maybe like you're not that, you know, an expert. But I don't think it is a legitimate concern. Personally, I'm not really bothered by being in front of people, or feeling humiliated. (Interview with John, 3-28-2013)

John's self-identified extroverted personality potentially made it easier for him to implement this instructional strategy and be willing to experiment.

His beliefs regarding the classroom and his overall teaching philosophy did not change remarkably (see Table 8). When interviewed, John also noted that his learner-centered versus non learner-centered beliefs and his teaching philosophy beliefs had not

changed much, but they were reinforced through the professional development. For example, he noted that the professional development strengthened his previous notions about preferring concepts to facts, “I think there was a focus on teaching concepts to students so that they can be lifelong learners, versus teaching sheer facts that don't necessarily enhance an individual's ability to go out and learn beyond that” (Interview with John, 3/28/2013).

John’s scores on the post- professional development survey suggested his beliefs regarding learner-centered versus non learner-centered environments continued to be slightly more non learner-centered, yet he held a more constructivist general teaching philosophy. He explained that while he personally preferred to always teach concepts, his decision to push concepts over facts in his class was dependent on the standards he must teach, and he acknowledged that sometimes facts are needed to be “laid as groundwork.”

Perception of PD structure/Plans. John picked “4” on a scale of 1 (Not at all important) to 5 (Integral to my learning) when ranking the importance of the metacognitive modeling examples provided by the professional development facilitators to his learning, indicating the videos were “Nearly integral” to the knowledge he gained. However, he ranked the example videos second behind the assigned readings in importance to his learning. Figure 14 shows how John ranked all of the professional development elements and the rated scores he gave each.

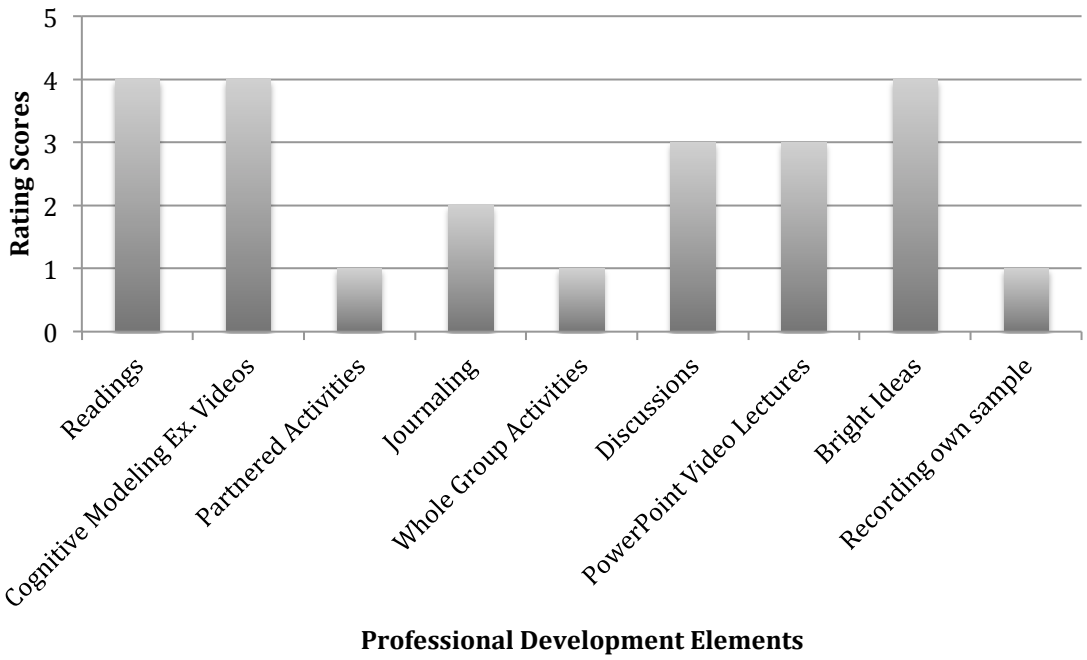

Figure 14. John's ratings of the PD elements shown in ranked order.

John planned to incorporate and model think-aloud instructional strategies as a suggestion for in-service teachers to use with their secondary students. He planned to embed the development of these skills within other professional development he provides.

Summary: John's case. Overall, John underwent change as a result of the professional development. Even though his conceptual knowledge score declined by less than a point, his procedural knowledge performance score improved greatly. Although his confidence to use the strategy and to teach others to do so decreased a point, he was not concerned about using and teaching this instructional strategy to in-service teachers. He rated several elements as important to his learning including the metacognitive modeling video examples provided by the professional development facilitators, ranking

the videos as the second most important to his learning. John planned to model think-aloud instructional strategies to his in-service teachers.

Kate

Background. At the time of this study, this 60+ year-old woman had spent the last six years teaching English and literature in a four-year college/university setting. She participated in online learning before but had no previous disciplinary literacy training. She was not K-12 certified and was not a teacher educator although she expressed awareness of which students planned to become teachers in her class.

Kate came to the professional development with some knowledge about the topic, somewhat positive attitudes about teaching reading in the disciplines, slightly learner-centered and constructivist beliefs, and some confidence for using and teaching metacognitive reading strategies (see Table 9) as evidenced by her selections on the pre-professional development knowledge test and survey. Kate scored a "0" on her pre-professional development video submission. In the video, she made appropriate connections for students by comparing modern and Revolutionary War time-periods, provided contexts, and reviewed reading strategies. She then read the text without any modeling of those strategies or her metacognition.

Table 9

Kate's results: Pre/Post Professional Development Scores

	Video Sample Score[a]	Knowledge (facts) Score[b]	Attitude Score Total and Mean[c]	Belief Score (self/ students)[d]	Beliefs Score (teaching phil-osophy)[e]	Self-Efficacy to use the strategy[f]	Self-Efficacy to teach others the strategy[g]
Pre	0	5.33	56 (3.5)	2.87/2.87	3.67	5.4	4.82
Post	0	7.33	75 (4.69)	2.87/2.87	3.33	7	6.64

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Changes. Despite evidence of knowledge gain (two points) on her post-professional development knowledge survey score, Kate's post-video sample did not illustrate improvement and received a score of "0." She discussed the importance of 5,000-year-old text and the oral tradition, asking the question 'but why do we care' to both. She directed the students to go into groups to declare their favorite parts of the story; but before sending them out, she provided them with a summary. She never read the text and, therefore, never modeled her metacognition while reading.

In her interview, Kate expressed her belief that she had incurred more gains in knowledge than her actual post- professional development modeling sample score

indicated. She stated, “I had no real perception of it” before the professional development, but she increased her confidence in using it and planned to be “more deliberate” in her approach of modeling metacognitive strategies to her students. However, in explaining the difference between content area literacy and disciplinary literacy, she expressed some confusion, “Truthfully, I still have to stop and think about the two because they sound so similar.” She expressed enthusiasm for how her teaching practices had changed since the professional development, “I used this before in my teaching without really knowing what it was. Now, I’m doubling down on it and using it with a lot more confidence. I am enjoying my classes, and as a result, I think my students are enjoying and learning right along with me.” Her performance scores support the possibility that she may not be applying it as modeled by her professional development facilitators in her courses.

In addition to her conceptual knowledge score increase, her attitude scores jumped considerably from 56 to 75 points. She discussed this in her interview.

> Since I am in the English area, I am used to doing a certain amount of reading instruction, although it is limited. When thinking about it throughout all the discipline areas, I thought it would be quite a feat since I know biology teachers and social science teachers, etc. and know that they don’t consider themselves reading teachers and would be quite threatened if they thought they had to do that. Reading instruction in the sense of phonics, word recognition, vocabulary, etc. This has definitely changed. (Interview with Kate, 4-24-2013)

Her slightly learner-centered belief scores remained the same, while her general teaching philosophy scores became a bit more "traditionalist." Her confidence to use the strategy and teach others to do so increased nearly two points. Plainly put, she stated, "Now, I'm more confident in my approach."

Perception of PD Structure/Plans. Kate rated the provided metacognitive modeling videos a "2-3" noting that she had difficulty getting them to play on her computer, but found the ones she could watch "very helpful." Although she rated the videos a "2-3," she deemed them the most helpful ranking them before activities and reading material (see Figure 15). Kate did not provide ratings for five of the elements (PowerPoint Video Lectures, Readings, Recording own sample, Partnered Activities, Whole Group Activities). She also did not rank the elements in order of importance to her learning. Instead, she provided a written narrative, which said, "Most helpful were the videos along with the assignments and the reading material sent before the seminar." It is unclear if she is referring to the metacognitive modeling video examples or to the PowerPoint Video Lectures, which she did not rate, and "assignments" was not an element she was asked to evaluate. Her ratings and rankings were removed from analysis.

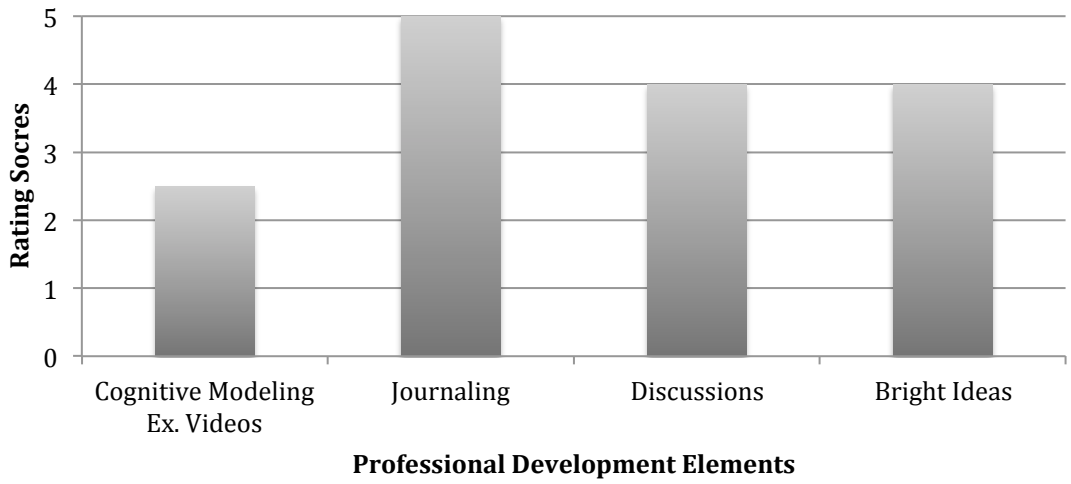

Figure 15. Kate's ratings of the PD elements. (These are not shown in any particular order because Kate did not rank them in order of importance.)

In the interview, Kate remarked how she would love to conduct a seminar at her institution to show others the think-aloud strategies. "I now feel that all of the above instructors could do this and really improve the results of their teaching." Additionally, for fall 2013, she planned to implement what she learned 5-10 times in two of her classes, World Literature and English Composition II, and 10 + times in Classic Literature, which is a general education class but with several pre-service teachers enrolled. She was a bit concerned though about her ability to do this all the time, stating, "In order to do these strategies effectively, I think the teacher actually has to have a huge arsenal of information." However, modeling metacognition authentically, as disciplinary literacy experts suggest, means displaying one's thought processes *as* they learn or comprehend, therefore one does not need to be an expert in the content being read (Schoenbach et al., 2012).

Summary: Kate's case. Kate changed substantially in her conceptual knowledge score gain and increased attitude score regarding reading instruction in the discipline areas. Her beliefs and philosophy scores changed only slightly, both up and down the scales. However, her confidence also increased more than a point, both in using the think-aloud instructional strategy and in teaching others to do so. Despite her knowledge gain, she did not improve her procedural knowledge score in her post- professional development metacognitive modeling video performance. She noted that she was unable to view all of the example videos provided by the professional development facilitators, and so ranked them either a "2" or "3." Since it was not entirely clear how she perceived the importance of the metacognitive modeling videos examples to her learning, her responses to these questions were removed from analysis. She had plans for both sharing what she had learned with her colleagues and incorporating the instructional strategy with her students.

Ivy

Background. At the time of this study, Ivy was a K-12 certified teacher who was certified in grades 6-12 to teach ESL/Foreign Languages. She taught 6-8 grades over a period of two years. She was 41-50 years old, with four years of university-level teaching experience in a four-year college/university setting teaching ESL classes to teacher candidates. She had had previous online professional development and training in disciplinary literacy.

Ivy came into the professional development with quite a bit of knowledge about the topic receiving an 8.66/9.00 on her pre- professional development knowledge survey. She had moderate positive attitudes about reading in the disciplines, slightly learner-centered classroom beliefs, and a balanced position between traditionalism and constructivism in regards to her general teaching philosophy as evidenced by her choices in the pre- professional development survey. She indicated slight confidence about modeling her metacognition in front of her students, but chose "somewhat confident" to teach others how to do so (see Table 10).

Although Ivy came into the professional development with a high degree of knowledge on the topic, she still received a "0" on her pre- video submission. In it, she provided some general context, simply read the text to the students, and then provided direction to the students to find certain elements within the text.

Table 10

Ivy's results: Pre/Post Professional Development Scores

	Video Sample Score[a]	Knowledge (facts) Score[b]	Attitude Score Total and Mean[c]	Belief Score (self/ students)[d]	Beliefs Score (teaching phil- osophy)[e]	Self-Efficacy to use the strategy[f]	Self-Efficacy to teach others the strategy[g]
Pre	0	8.66	59 (3.69)	2.6/2.67	3.00	4.8	5.55
Post	3	7.66	68 (4.25)	3.0/3.0	3.00	6.4	6.64

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Changes. Post- professional development resulted in a slightly decreased conceptual knowledge score but a significantly higher procedural knowledge performance score, from a "0" to a "3." In this sample, Ivy read and showed her knowledge such as, "I know it is a research article because of the way it looks. It uses citations." She activated her prior knowledge regarding what constitutes a research article, paraphrased to cement her understanding, and questioned what she read. Her modeling was pure and authentic, as she did not go back and forth between modeling and teaching. In her interview, she credited the metacognitive modeling videos stating, "I knew going in there the concept was disciplinary literacies but not having an idea

specifically about what I needed to do to model. The examples throughout really showed me what to do."

In addition to the increase to her procedural knowledge score, Ivy's attitude score regarding reading in the disciplines increased from 59-68 points, her slightly learner-centered beliefs became more strongly learner-centered, and her confidence to use the strategy with her students and teach them how to do the same with others increased to nearly "Very confident." Her general teaching philosophy remained perfectly balanced.

Perception of PD Structure/Plans. Ivy rated the metacognitive modeling videos a "4, Nearly integral" to her learning, stating that "visuals are beneficial." However, she ranked them behind the readings, partnered activities, and discussions in terms of most helpful (see Figure 16).

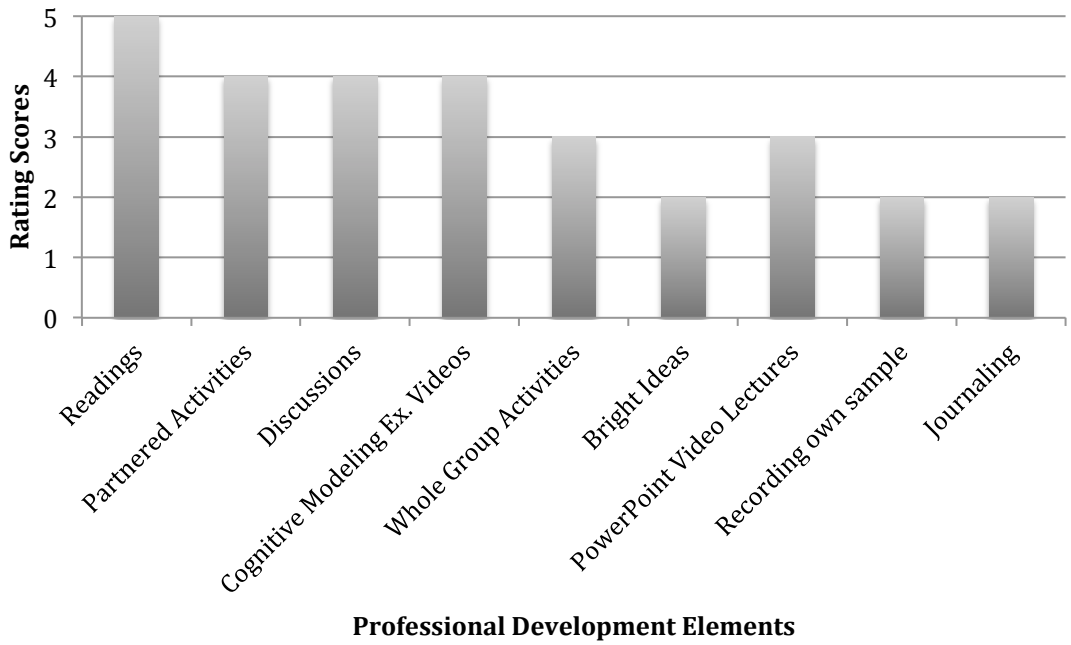

Figure 16. Ivy's ratings of the PD elements shown in ranked order.

Ivy said in response to the question on how her overall teaching practices changed since the professional development, "Not as much in teaching yet, but in thinking about approaching my own reading/writing from various perspectives." In the future, Ivy said she planned to use modeling metacognitive skills through think-aloud twice with teacher candidates.

Summary: Ivy's case. Ivy's knowledge score dropped from 8.66 before the professional development to 7.66 post professional development. However, her metacognitive modeling sample video score increased from 0-3. Her attitudes towards reading instruction in the disciplines improved by 9 points, while her beliefs stayed exactly the same. Her confidence to use the strategy and to teach others how to use the

strategy improved as well. Ivy said that the modeling videos showed her "what to do," and she rated them a "4" out of "5" as "Nearly integral to my learning" and ranked them 4th out of the nine professional development elements in importance to her learning. She planned to use the strategy twice with her teacher candidates.

Rachel

Background. Rachel was a 41-50 year old woman who had taught three years in a 4-year-college/university setting at the time of the professional development. She previously attended disciplinary literacy training and had online professional development experience. She had taught English Composition, developmental writing and reading, and Introduction to Linguistics and worked with teacher candidates.

Rachel scored a "1" on her pre- professional development metacognitive modeling sample. She highlighted several strategies readers should use while reading such as looking at the date the paper was written to connect to schema about the time-period and identifying the audience. She provided context and then directed students to read further without actually reading more than a couple of lines of text. She illustrated some conceptual knowledge about disciplinary literacies, scoring 6.66 out of 9 possible points on her pre knowledge survey. Additionally, she held moderately positive attitudes towards reading in the disciplines and leaned more towards learner-centered and constructivist classroom beliefs and general teaching philosophies as her pre-professional development survey selections indicate. Possibly due to her previous training in disciplinary literacies, Rachel already indicated pre- professional development

that she was "mostly confident" about modeling metacognitive processes in her own classroom but only "somewhat confident" about teaching others to do it (see Table 11).

Table 11

Rachel's Results: Pre/Post Professional Development Scores

	Video Sample Score[a]	Knowledge (facts) Score[b]	Attitude Score Total and Mean[c]	Belief Score (self/ students)[d]	Beliefs Score (teaching phil- osophy)[e]	Self-Efficacy to use the strategy[f]	Self-Efficacy to teach others the strategy[g]
Pre	1	6.66	58 (3.63)	3.13/3.13	4.00	6.80	4.73
Post	2	7.66	57 (3.56)	3.00/3.07	3.67	7.00	4.45

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Changes. Rachel's pre- and post- professional development metacognitive modeling sample scores increased although she continued to waver between being a reader showing her students insight into her thinking and teaching reading strategies to her students. She noted this herself in her interview when she was asked to compare her pre- and post- metacognitive modeling samples. She explained that in her second metacognitive modeling sample she created "a triangle between me, the text, and my

audience." This triad formation is contrary to the principles of modeling think-aloud as prescribed by disciplinary literacy literature.

On the other hand, Rachel later described that think-alouds were really about the students watching the instructor's engagement with reading. She said, "You really have to do it in the first person, and you have to narrate sort of everything that would be going through your mind, not just on the surface, and not just do it in the 3rd person or the 2nd person." Metacognitive modeling think-aloud strategies, from a disciplinary literacy perspective, means having others observe you reading and thinking. When the audience is removed and becomes only an observer, a person modeling their metacognitive thought processes should only be using the "I" pronoun. Her description was accurate according to the professional development facilitator's modeling sample rubric (See Appendix D). However, her description contradicted her actions in the sample video submissions.

Overall, Rachel's conceptual knowledge score also increased a point. Her confidence levels for implementing the strategies in her own classrooms increased slightly, while her confidence for teaching others to do so decreased slightly. Her attitude score towards reading instruction in the discipline areas remained about the same. Finally, her beliefs scores remained largely unchanged, still more learner-centered and constructivist than not.

However, while describing changes to her pre- and post- professional development modeling samples, she alluded to her feeling that she must be an expert in what she was reading in order to model metacognitive thinking skills. Rachel stated,

> Of course with the post video I wasn't really sure that I was enacting, I felt like I was enacting more the content area literacy than the disciplinary literacy because I think without knowing the discipline you are teaching very well… I felt like for the post I knew what was wanted but I also don't think I did everything that was taught. (Interview with Rachel, 03/25/2013)

These expressed sentiments suggest that Rachel was still struggling with bridging her prior knowledge and beliefs about content area literacy instruction and the new methods proposed by disciplinary literacy instruction for the development of metacognitive skills. This includes not only the acceptable, but preferable, fact that the instructor him/her self may be unfamiliar with the content and concepts within the reading, thus making the modeling more authentic for the audience.

Perception of PD structure/Plans. Rachel did not find the metacognitive modeling example videos provided by the professional development facilitators helpful at all; she ranked them a "2" on the 1 (Not at all) to 5 (Integral to my learning) scale. She added that the videos were "not helpful because the same text was used, and it kind of gave it away." Instead, she identified other factors such as recording her own sample, the partnered activities, the readings, and whole group activities more helpful in her learning, ranking the metacognitive modeling video examples next to last (see Figure 17).

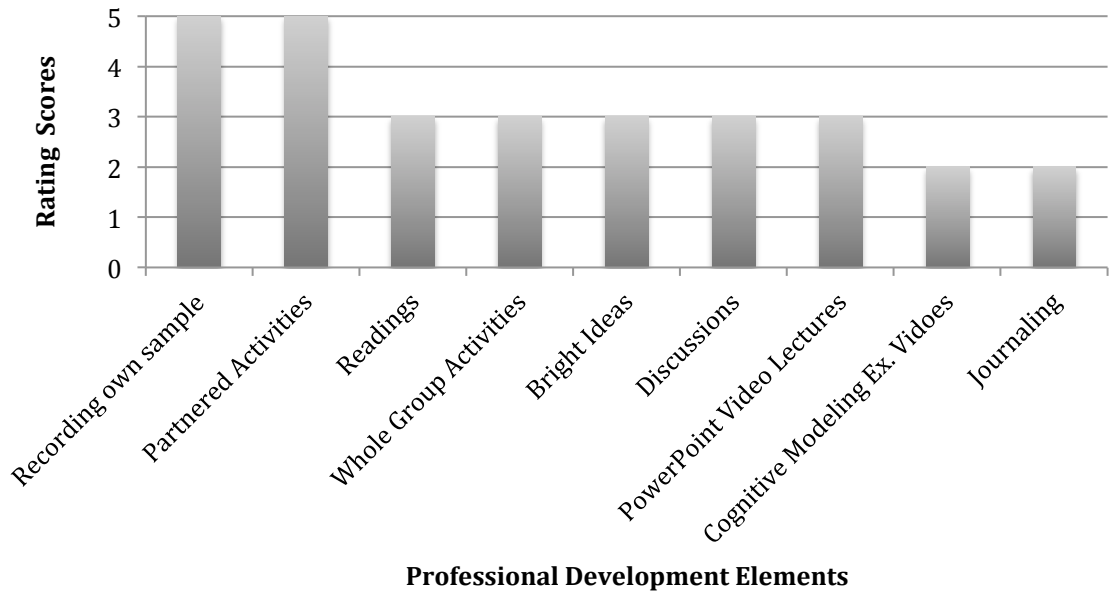

Figure 17. Rachel's ratings of the PD elements shown in ranked order of importance.

In her interview, Rachel said that the professional development gave her ideas to model and share with both her pre-service teachers and with her non-teaching bound students, particularly those in her Introduction to Linguistics class. Previously, she expressed that she could not understand why her students did not understand what they were reading in their textbooks. As English majors and graduate students, she expected them to be good readers. She came to realize that reading novels was likely easy for them but they probably lacked the skills needed to read scholarly work in rhetoric and composition or in linguistics. She intended to use this approach to help them learn to read like a scholar or linguist as appropriate.

Rachel exhibited excitement about her new knowledge, "I mean I'm kinda a proponent about it. I've been going around talking to people about it. I have. So, yeah,

you have made a convert." At the beginning of the fall 2013 school year, five months after the professional development, Rachel shared that she included in her syllabus plans to use the think-aloud instructional strategy for building metacognitive skills with both her English courses and her pre-service teachers.

Summary: Rachel's case. Rachel increased her conceptual knowledge about disciplinary literacy concepts. Likewise, she increased her procedural knowledge in her metacognitive modeling video sample from a 1 to 2. Her attitudes, beliefs, and self-efficacy changed only slightly in either direction. Afterwards, she declared herself "a proponent about it" and planned to use the think-aloud strategy in her fall 2013 classes. She expressed that the professional development made her "a convert." There were several elements that she reported as important to her learning, but the metacognitive modeling video examples provided by the professional development facilitators ranked low on that list (8th out of 9), and she only rated the video examples a "2." She shared her syllabus plans to use the think-aloud instructional strategy with both her pre-service teachers and her English course students.

Sam

Background. This 41-50 year old prior K-12 teacher was certified all-level Special Education and spent three years in the K-12 public schools teaching self-contained emotionally and behaviorally disturbed children. He spent the last four years teaching in a 4-year college/university setting preparing pre-service teachers in social studies methods.

Sam came into the professional development with previous experience in online learning and disciplinary literacy training. As such, Sam's initial knowledge scores were already high (7.33/9.0), and he already possessed strong positive attitudes, as per his pre-professional development survey selections, about teaching reading in the discipline areas. His belief scores indicated slightly learner-centered views and he was balanced precisely between traditionalist and constructivist teaching philosophies. According to his survey responses, he came to the professional development already somewhat confident about his ability to model metacognitive skills and to prepare his teacher candidates to do the same (see Table 12).

Sam's video sample showed that he already had a well-developed skill set for modeling metacognition. In his first sample, which was an actual video from a lesson with his students, Sam told his teacher candidates that he was going to do a think-aloud. He reviewed the reading skills that they previously discussed, such as chunking and summarizing, and then moved forward to the text itself, taking note of the date, the likely audience, his own questions which arose throughout, and then stopped to summarize the chunk he just read and use the text to answer his own questions. While he bounced back and forth regularly between modeling and teaching, he did model via think-aloud several reading strategies, earning a "3" on the pre- professional development modeling sample.

Table 12

Sam's results: Pre/Post Professional Development Scores

	Video Sample Score[a]	Knowledge (facts) Score[b]	Attitude Score Total and Mean[c]	Belief Score (self/ students)[d]	Beliefs Score (teaching phil-osophy)[e]	Self-Efficacy to use the strategy[f]	Self-Efficacy to teach others the strategy[g]
Pre	3	7.66	69 (4.31)	2.67/2.8	3.0	5.8	5.64
Post	3	8	77 (4.81)	2.73/2.67	3.0	7	7

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Changes. In the second video, Sam modeled his own metacognition while reading the Gettysburg Address. He vocalized his considerations of the time-period, calculated the date for "Four score and seven years ago," and used a variety of chunking and summarizing strategies along with word analysis. He was less explicit in telling what he was doing and did considerably more modeling, using "I" statements to indicate the audience was hearing him as the reader. This made for more authentic and pure (see Appendix D) modeling and a stronger "3" than the first submission. Only occasionally, did he slip back into "we" language bringing the audience back into focus.

As noted, Sam came into the professional development having taken several disciplinary literacy professional development seminars from the facilitators of this one in the past. He already had strong scores, but they became stronger. Yet, despite the apparent gains in his knowledge, Sam stated, "And so, I'm still honestly grappling with it, and trying to, I think it is going to be an area of further study and research for me because I think it is very complicated."

Sam's confidence levels increased to "Very confident" in both his ability to use modeling metacognition through think-alouds and teaching the instructional strategy to his students. Interestingly, though, Sam voiced during his interview his own fears and how one should overcome them:

> I think it definitely makes me self-conscious and, so to that degree, somewhat vulnerable. But I think the only way you get over that, because you're basically putting yourself out there as a performer, you're modeling what you want them to do. And, anytime you do that, you know, you are putting yourself out there, and of course, you want to be a good model. And I think the only way that you master any of the types of fear that you have about things like that is to do it, get practice at it, get good at it because it's so necessary that they see how the practice is supposed to look, I think. (Interview with Sam, 4-11-2013)

When asked how he felt when students pointed out his mistakes, he said:

> That makes you look like you're still more *vulnerable*, because you are put on the spot that way, but that is the kind of discussion you want to have with your

> students. You want to put it out there. I can also see a scenario where you might go up and do some things wrong and see if they critique you, and pick that out, and say no that is really the you shouldn't have done it. Sometimes giving an anti-model is helpful, but definitely, you want to get up there and show them the right way to do it. (Interview with Sam, 4-11-2013; emphasis added)

Finally, he added, ""But I think in the end, when you have success with it, it is definitely *empowering*" (emphasis added). After several professional development events and ample opportunity for practice in his classes, Sam recognized his increased confidence in his abilities but also recognized that the increased confidence came through continued knowledge gain, practice, and reflection.

Perception of PD Structure/Plans. Sam rated the metacognitive modeling examples provided in the professional development a "5, Integral to my learning" because "it was an explicit demonstration of how to do the process." He ranked them just below readings and whole group activities for most beneficial (see Figure 18). In his interview, he noted that the videos were better than live demonstrations "because I could go back and view them more than once, and sometimes I did."

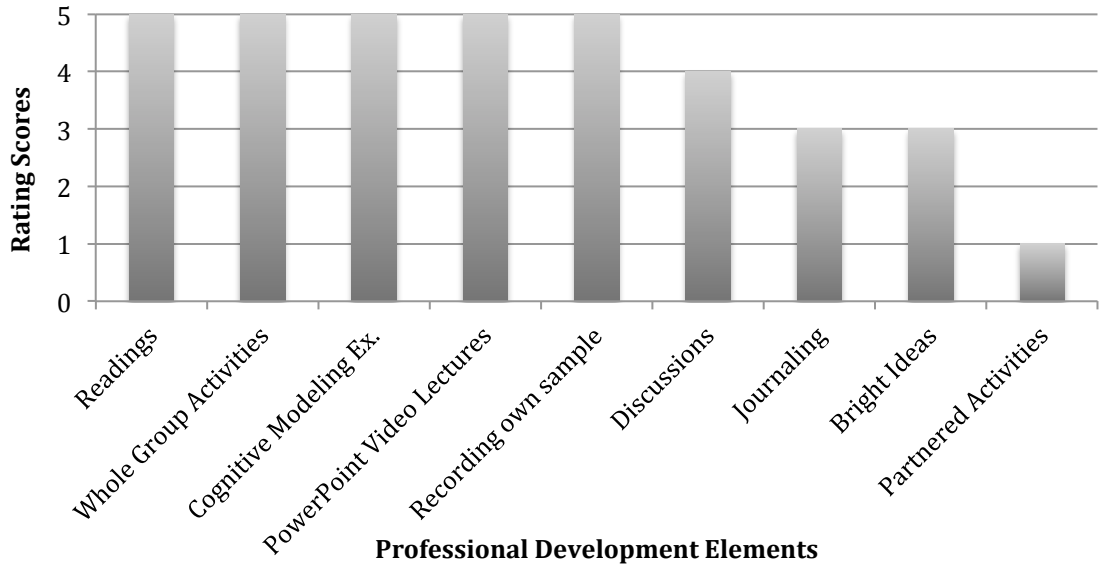

Figure 18. Sam's ratings of the PD elements shown in ranked order.

Personally, he noted plans to teach this concept to his pre-service teachers and graduate students two times each during his next fall semester. However, he also noted the importance of utilizing this strategy department wide. He stated,

> We are constantly going through review, and this is one area that we are missing, we need to add it into the curriculum in different ways. And, we have specifically focused on the more generic content area learning, but this is an area that we are going to preach, and get students to practice in think-alouds in different content areas, in field specific think-alouds processes. (Interview with Sam, 4-11-2013)

Like Eugenie, Sam planned to contribute to systematic change in his department by sharing and promoting what he learned and developed himself.

Summary: Sam's case. Sam's changes are not as apparent compared to other participants because he came into the professional development with already high scores.

In evaluating his performance in his post- modeling sample, it was apparent, however, that he had developed even stronger skills in modeling his metacognition. He rated several elements as integral to his learning including the metacognitive modeling example videos provided by the facilitators, and he ranked those only second in importance among all the professional development elements. He planned to continue modeling his metacognition with his students and to have them begin practicing the skill themselves as well as suggest the use of the strategy for department wide implementation.

Sarah

Background. Sarah was a certified K-12 teacher who spent six years teaching grades K-5 and 6-8 grades in a middle school setting. She was certified to teach science, reading/language arts, and history. At the time of this study, she had spent two years teaching social studies methods to teacher candidates at a four-year college/university. She was 41-50 years of age and had taken online professional development before this seminar. She had not taken other professional development specific to disciplinary literacy.

Sarah entered the professional development with a good conceptual understanding of the concepts related to disciplinary literacy (see Table 13). However, in her pre-professional development video sample, she never read the text or modeled her thinking processes while reading. She did explain how she would tell her pre-service teachers how to do it. Her learner-centered versus non learner-centered belief scores in her and her students' classrooms was balanced while her teaching philosophy score leaned more

towards constructivism than traditionalism. Her scores indicated that she did not possess high self-efficacy to use the metacognitive modeling through think-aloud instructional strategy in her own classroom or teach others how to do so (see Table 13).

Table 13

Sarah's results: Pre/Post Professional Development Scores

	Video Sample Score[a]	**Knowledge (facts) Score[b]**	**Attitude Score Total and Mean[c]**	**Belief Score (self/ students)[d]**	**Beliefs Score (teaching phil-osophy)[e]**	**Self-Efficacy to use the strategy[f]**	**Self-Efficacy to teach others the strategy[g]**
Pre	0	7.00	63 (3.94)	3.4/3.47	4.33	3.8	3.82
Post	3	8.66	62 (3.88)	3.27/3.27	4.33	6	5.73

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Changes. In her post-professional development video sample, Sarah jumped from a "0" to a "3" illustrating many of the appropriate reading strategies including looking at the date to orient her schema in time, the title, and the author, making predictions, and analyzing parts of words to glean meaning. Her modeling was authentic (see Appendix D). Once she began reading the text, the audience watched her *be* a reader. Sarah

described how her perception of modeling metacognitive reading strategies and think-aloud instructional strategies changed,

> I did not have a very good understanding of modeling metacognitive reading strategies/think-aloud strategies prior to this PD. My training is not as a literacy instructor. I was aware of these types of strategies but did not utilize them in my course. My perception of using these strategies changed when I read about how professionals in their own fields such a scientists and historians read for information. This made a lot of sense to me. (Interview with Sarah, 4-1-2013)

Sarah's knowledge, both conceptual and procedural, jumped considerably (see Table 13). Post- professional development, she could succinctly define the difference between content-area literacy and disciplinary literacy.

> Content-area literacy are [*sic*] strategies/tools that you can use with your students to assist them in comprehending the material read. These would be things like interactive word walls, word sorts, anticipatory activities etc. There are tons of them! Disciplinary literacy, on the other hand, involves actually teaching your students to read for information as a practitioner in the field would. It involves intensive modeling of how to read for information. (Interview with Sarah, 4-1-2013)

This aligns well with Shanahan and Shanahan's (2008) position that content-area literacy skills are those often taught to younger students learning to read and are more generally

applicable across all texts; whereas, disciplinary literacy skills are specialized skills germane to specific context and disciplines.

Additionally, Sarah's confidence scores increased in using the think-aloud strategy for metacognitive skill development with her own students and in teaching her pre-service teachers how to do so with their secondary students. Nonetheless, she still voiced her own vulnerability in her interview, "I feel somewhat self-conscious and embarrassed when modeling metacognitive strategies to my students. I'm not sure why, and I hope that these feelings will dissipate after practicing this over time." According to her post- professional development survey selections, her attitudes, already rather positive regarding reading instruction in the discipline areas, and her beliefs favoring learner-centeredness and constructivism, remained mostly constant (see Table 13).

Perception of PD Structure/Plans. Although Sarah declared several factors influenced her learning during this professional development including the readings, the module lectures, and recording her own sample, she ranked the metacognitive video samples provided by the facilitators to be the most beneficial, ranking them a "5, Integral to my learning." Figure 19 shows how she rated and ranked the professional development elements.

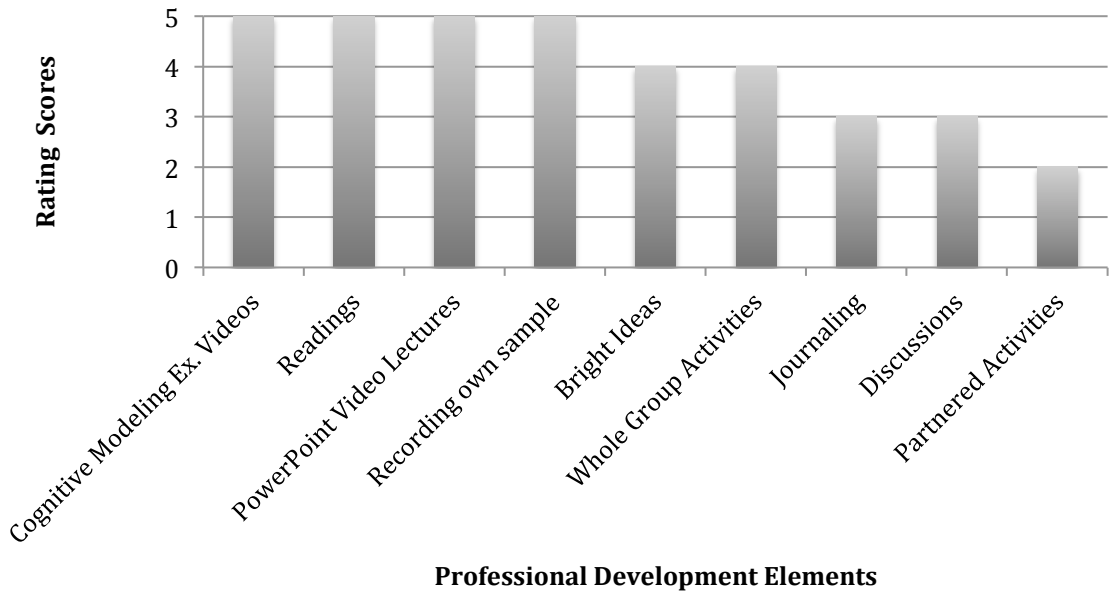

Figure 19. Sarah's rating of the PD elements shown in ranked order.

When questioned five months post professional development at the start of the 2013 academic school year, Sarah planned to use and teach this instructional strategy 3-5 times in her "Reading in the Content Areas" course and once in her "Learner-centered Middle School" class during the fall semester.

Summary: Sarah's case. The biggest changes for Sarah included growth in her conceptual knowledge and in her procedural knowledge through her metacognitive modeling video samples in which she increased her score from 0-3. Her attitude and belief scores remained approximately constant. Her self-efficacy score increased considerably. She attributed her learning specifically to the metacognitive modeling video examples provided by the professional development facilitators, ranking them as most important of the professional development elements and rating them as "5, Integral

to my learning." She planned to incorporate this instructional strategy in her classroom and to teach her teacher candidates how to do so.

Susan

Background. At the time of this study, Susan was certified to teach middle and high school reading/language arts. She had taught 9th, 10th, and 12th grades over a three-year span before this study. She fell into the 31-40 years old age range, and had spent the last three years teaching English in a four-year college/university setting. She was also a teacher educator. She had previous disciplinary literacy professional development but no previous online learning experience before coming to this professional development.

Before this professional development, Susan had a moderate level of knowledge about disciplinary literacy, scoring a 5.33/9.00 on her pre- knowledge survey. According to her pre- professional development survey selections, she possessed conservatively positive attitudes about teaching reading in the disciplines, was slightly learner-centered in her classroom beliefs and constructivist in her overall teaching philosophy. She was "somewhat confident" in her ability to model metacognition with her students and to teach them to do the same with their students should they become teachers (see Table 14).

Table 14

Susan's results: Pre/Post Professional Development Scores

	Video Sample Score[a]	Knowledge (facts) Score[b]	Attitude Score Total and Mean[c]	Belief Score (self/ students)[d]	Beliefs Score (teaching phil-osophy)[e]	Self-Efficacy to use the strategy[f]	Self-Efficacy to teach others the strategy[g]
Pre	1	5.33	54 (3.38)	3.13/3.07	5	5.4	5.55
Post	3	7.66	59 (3.69)	3.4/3.4	4.67	5.6	5.91

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Susan's scores showed slightly positive attitudes towards reading in the discipline areas. However, she talked about her passion, prior to the professional development, for the subject in her interview. She told about a job offer as a literacy specialist that she turned down because she believed the teachers would resist teaching reading in the disciplines—the very teachers she would be servicing in her new role.

> I interviewed for a job to kind of be a, what were they calling it at the time? I don't know if they still use this term, like a literacy specialist where my job would have been to work with teachers in various disciplines. I was there for lots of

reasons; I was very excited about the job. But there were lots of reasons why I didn't take that job. And, I wouldn't say that this was a contributing factor, but I, and this goes to my opinion about teaching reading in the disciplines, I felt very strongly that it was completely appropriate. But, I felt that teachers within the disciplines would resist it. I felt like that would be a huge challenge to overcome. You know, that if my colleagues, my peers, saw me as someone who was trying to tell them how to teach, trying to bring English into their science classroom, math classroom, that it would be hostile and not welcomed. But to be honest, and I was just looking through the literacy instruction in the content, I don't know, this document, it mentions that even English teachers don't see the teaching of reading and writing as part of their work. And, there is a line, I'll read the line to you, it's not, let me read the line to you. Because it is something that I've seen. Um. It says, "Ask the English teachers though and many of them will shake their heads. English teachers tend to regard themselves as content area specialists too, with literature as their subject matter, and only partly as reading and writing instructors." I definitely have seen that. It has been really interesting to me, as I've watch teachers invest so much time in preparing their students for the standardized tests but what that ends up looking like is exposing them to prompt after prompt after prompt and not spending a lot of time talking about writing pedagogy, writing strategy. Exposing them to passage after passage after passage and not talking a lot about reading strategies. (Interview with Susan, 3-29-2013)

Her story was contradictory to her pre- professional development attitude score. Susan's moderate attitude scores increased a small amount post- professional development, from a 54 to a 59.

On her pre- professional development video sample, Susan scored a "1." She used common content-area general reading strategies such as a KWL chart, directed the students to look for the source, and guided the students through the text. She read the passage to the students having them circle words they did not know. She did not model her metacognition.

Changes. Changes were apparent as shown in Table 14 above. There were changes to Susan's knowledge, attitudes, beliefs, and confidence scores from pre-to-post professional development. Her knowledge levels, both conceptual and procedural, improved and her attitude score became slightly more positive as her learner-centered beliefs became a bit stronger. However, she dipped slightly in her constructivist philosophy score and increased her confidence to implement and teach the metacognitive think-aloud strategy a small amount. She noted however, "I wasn't afraid to show my confusion, you know."

Susan added,

> I think that like on a very personal level I find it very *freeing*, I guess. I find that it's those moments when I'm showing them that this is a complex, that when I'm taking the curtain away, and I'm saying like this is complicated and its complicated for me as well and let me show you where I stumble and where I

have challenges. I find it to be extremely *freeing.* (Interview with Susan, 3-29-2013, emphasis added)

This is the essence of the metacognitive modeling via think-aloud instructional strategy (Jetton & Shanahan, 2012). It demonstrates reading and thinking about your reading to the students.

In her post video sample, Susan began to use a lot of "I" statements clearly displaying her metacognition as she read aloud. She told the students she was showing them a strategy they might use with their own students. She modeled several reading strategies through metacognitive modeling think-aloud. Her score increased to a "3."

Although Susan showed improvement in her knowledge and modeling sample scores, she was not initially cognizant that her knowledge had changed. She remarked, "I don't know that my thinking about it changed" what her perception of modeling metacognitive reading strategies and think-alouds instructional strategies were pre/post professional development. As she continued to talk, however, she added, "I'm realizing that in my pedagogy class, we talk about that, but I've never modeled for them explicitly what that would look in the classroom like as I did in the video."

Susan, who tells her students that she reads the New Yorker and applies metacognitive skill awareness to articles on topics she is unfamiliar with, states,

I do, as an adult, I definitely have read, you know I am reading more nonfiction that is about science, and about history, and um, certainly my tools for that are less, like I don't have the tools. I think even being a facilitator of teacher prep has

helped me to become a better reader outside my own discipline even just thinking about strategies, and what I'd tell my own students to do. (Interview with Susan, 3-29-2013)

By sharing her personal practice of utilizing her metacognitive skills, her students realize that the skill is appropriate and useful outside of the formal school setting.

Perception of PD Structure/Plans. Susan rated the metacognitive modeling videos a "4" and ranked them fourth in the list of most impactful and beneficial professional development elements. She ranked recording her own samples, the readings, and the module lectures above the modeling example videos (see Figure 20).

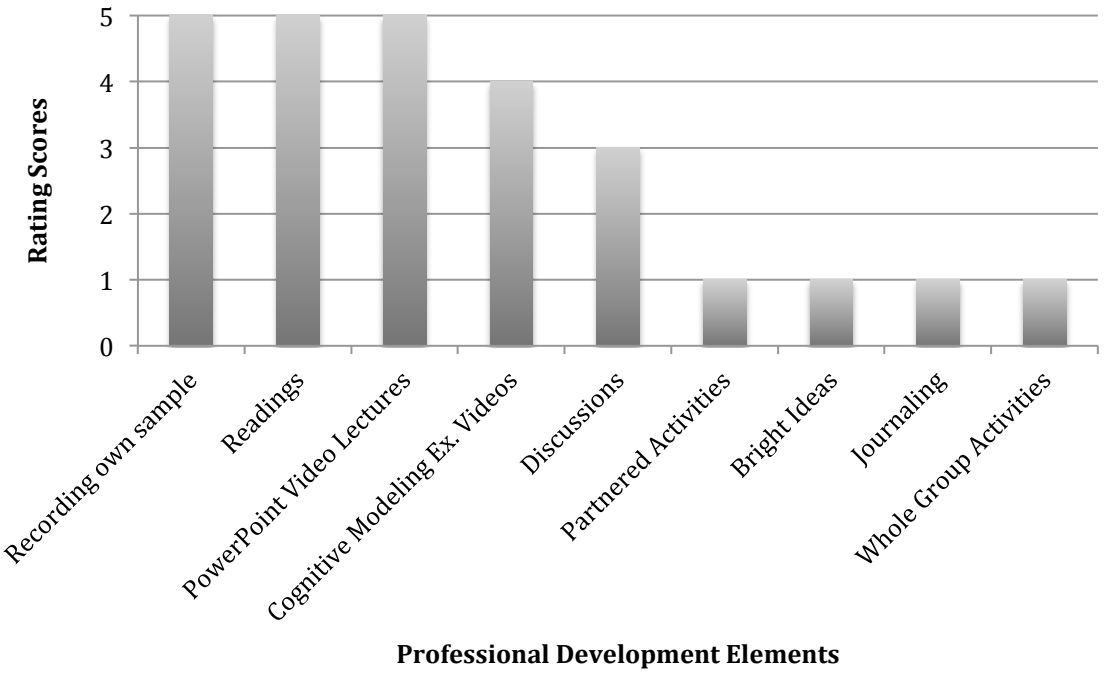

Figure 20. Susan's ratings of the PD elements shown in ranked order.

Immediately following the professional development, in her interview, Susan talked about using the think-aloud strategy with her English Composition students and was looking forward to using it in the future. She showed her enthusiasm and plans to share with her colleagues in the following statement,

> And, I have to say, I spend a lot of time in the public schools. I can't tell you the last time I saw a think-alouds, you know. And, so, it has made me realize, that it is a strategy I really believe in, and in order for my future students teachers, my pedagogy students to buy into it, they need to see it. Um, so I'm inspired to well, I'll teach that pedagogy class in a year. There are four of us who teach it, and I will certainly, too, talk to my colleagues. I don't think any of my colleagues participated in this. It is definitely something we need to talk about. (Interview with Susan, 3-29-2013)

Susan worried that she was not seeing this strategy used in the pubic schools. She provided a suggestion, "I think one of the solutions is to get teachers in the school who are willing to try it and see that it is valuable and talk about it." She was developing a plan that extended beyond her own classroom walls.

In a follow-up several months, Susan announced that she was not teaching any classes for which this approach would be "applicable." She anticipated that her pedagogy class would be on the course schedule for spring 2014.

Summary: Susan's case. Susan increased both her conceptual and procedural knowledge performance scores by 2 points. Her attitude scores regarding reading in the

discipline areas also increased, while her beliefs and self-efficacy scores remained almost constant. She ranked the metacognitive modeling video examples behind recording her own sample, the readings, and the PowerPoint lecture videos, all of which she rated as "5, Integral to my learning." She rated the example videos, however, a "4, Nearly integral to my learning." She expressed enthusiasm about integrating the instructional strategy immediately following the professional development. However, five months later she was not teaching any classes she thought would be appropriate for using metacognitive modeling think-alouds.

Victoria

Background. Victoria was a 51-60 year-old female at the time of this study, with a business and editing background before teaching English Composition the last four years in a community college. She had previous disciplinary literacy training and had taken online professional development courses in the past. She was not a teacher educator.

Victoria came into the course with a good deal of conceptual knowledge. On the other hand, her own modeling of her metacognitive thoughts was not illustrated in her pre- professional development sample. She provided her audience with a lot of context, provided direction, and then simply read the text. As evidenced by her pre- professional development survey responses, she possessed moderately positive attitudes about teaching reading in the disciplines, leaned towards learner-centered and constructivist

beliefs in her classroom, and indicated confidence about her abilities to model metacognition with her students and to prepare others to do so (see Table 15).

Table 15

Victoria's results: Pre/Post Professional Development Scores

	Video Sample Score[a]	**Knowledge (facts) Score[b]**	**Attitude Score Total and Mean[c]**	**Belief Score (self/ students)[d]**	**Beliefs Score (teaching phil-osophy)[e]**	**Self-Efficacy to use the strategy[f]**	**Self-Efficacy to teach others the strategy[g]**
Pre	0	6	59 (3.69)	3.0/3.0	4.33	5.8	5.91
Post	3	8.33	70 (4.38)	3.07/3.07	5	6.4	6.27

[a] Scale 0-3, see Rubric, Appendix D.
[b] Scale 1-9, knowledge Survey, 1 pt/question; Q9 consists of a 3 part question allowing for .33, .66, & .999 scores
[c]Scale 16-80 (Total), all negative scores value 16; all positive scores value 80. Scale 1-5 (Mean).
[d]Scale 1-4, asked for both themselves and for their students' classrooms. Non learner-centered vs. learner-centered beliefs.
[e]Scale 1-5, teaching philosophy beliefs questions; 1=most traditionalist; 3=balanced; 5=most constructivist
[f&g=] Scale 1-7; 1=least confident, 4=Neither confident or non-confident; 7=most confident

Changes. Victoria's scores climbed in almost every regard post- professional development. Her conceptual knowledge increased and her attitude score rose. She became even more confident in her ability to implement modeling through think-alouds, and to teach others the strategy. Her constructivist beliefs became stronger. Her already learner-centered beliefs increased even more.

The biggest increase, however, was in her video samples, where she increased her score from "0" to "3." She tended to go back and forth between showing the audience her metacognitive processes versus telling the audience what she is going to do next. However, she modeled several reading strategies and used the pronoun "I" multiple times to highlight herself as the reader. When discussing the changes she made between the pre- and post- video sample, Victoria stated that she did not believe she illustrated her newly developed skills as well on video as she did with her students in the days just before submitting the video. She said, "But with the second one, I don't think I truly captured what I learned from the course because as I said I don't do well performing on video."

Victoria showed some lingering confusion she explained the difference between content-area literacy and instruction and disciplinary literacy and instruction. She stated, "I was going through the post quiz thing; I had no clue on a lot of the stuff." She then adds, "I'm sorry I'm not able to articulate this very well…" (Interview with Victoria, 03/25/2013). Her inability to articulate the differences does not necessarily mean she is not grasping the central tenets of metacognitive modeling, as evidenced by her post-professional development modeling sample, which showed substantial growth in her ability to model her metacognition.

Victoria described her feelings regarding watching someone else model their metacognition, "I think what it does is create a mind frame that says I can do this. I can

do what she did in the think-alouds, I can understand this, I can master this one.“ She said that by modeling to students, they would feel the same way.

Victoria shared that she used the skills learned in this professional development personally. She stated,

> Here is kind of off-topic thing, my mother passed away a few years ago, and I got an oil lease in the mail, that was tiny, tiny print and pages and pages of dense text, so I used it for this. I understood what they were saying to me and I found it very helpful. (Interview with Victoria, 3/25/2013)

By employing metacognitive skills in her personal life, Victoria developed a deeper understanding of why and how this works to help readers achieve deeper comprehension in areas in which they are not experts.

Perception of PD Structure/Plans. Victoria rated the metacognitive modeling videos a “5, Integral” to her learning and rated them as the most impactful of the professional development elements followed by the lecture presentations, the readings, and the partnered and whole group activities. She noted, “The videos made it easy to see what to do.” Figure 21 shows how Victoria ranked and rated the professional development structural elements.

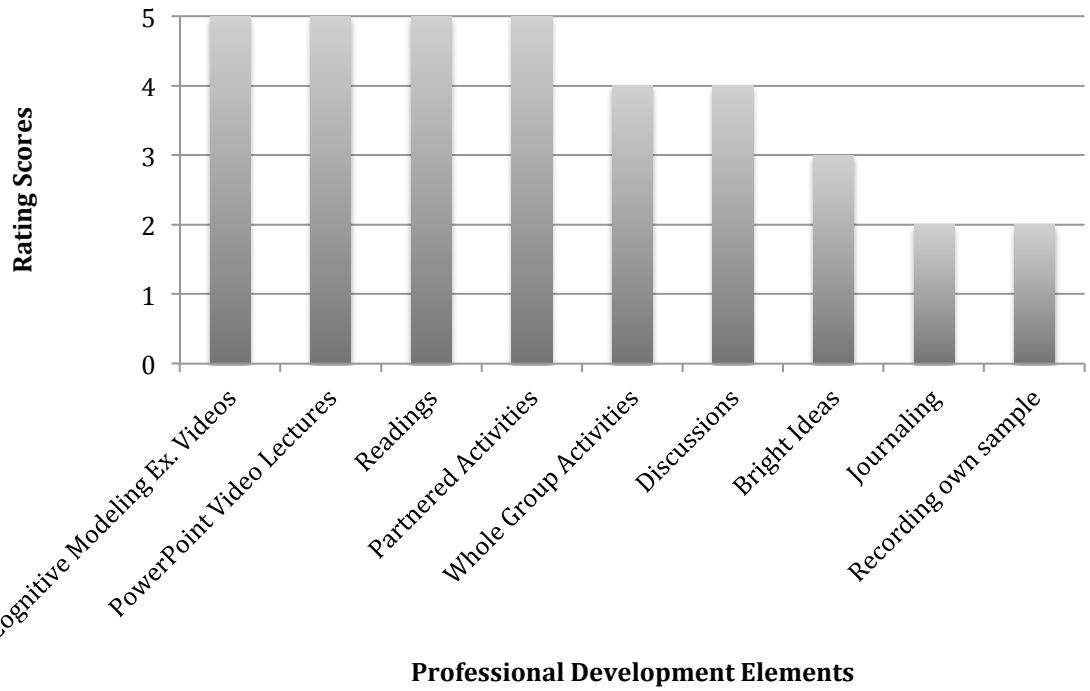

Figure 21. Victoria's ratings of the PD elements shown in ranked order.

Immediately following the professional development, Victoria was looking forward to going back and sharing what she learned with her colleagues during their "brown-bag lunches." She stated, "I'm going to talk to the department chair about having the opportunity to lead one in the fall for my department to share what I've learned from this." For the fall 2013 semester, Victoria planned to use metacognitive modeling as an instructional strategy in her English courses 3-5 times.

Summary: Victoria's case. Victoria experienced the most change overall among the participants. Her conceptual knowledge scores went from 6 to 8.33 while her procedural knowledge scores went from 0 to 3. Her attitude score about reading

instruction in the discipline areas also increased. Her beliefs and self-efficacy scores were also positively impacted by the professional development. She attributed her changes to several elements in the professional development structure, ranking the metacognitive modeling video examples as the most important and integral to her learning.

Cross-Analysis

The following sections provide results for the group of participants as they relate to the original overarching research question: *To what extent is instructor change evident after participation in an online professional development that utilizes metacognitive modeling through think-aloud strategies?* The sections present the group results concerning the various change domains under study: knowledge, attitudes, beliefs, self-efficacy, and plans for classroom change.

Each section references the participants' answers to a common post professional development question asking them to rate the metacognitive modeling examples provided by the professional development facilitators on a scale of 1 (Not at all helpful) to 5 (Integral to my learning). Table 16 reviews those answers, which were also outlined in each participant's case narrative along with any provided supporting statements. Together, the group rated the metacognitive modeling videos as "Nearly integral" to their learning (M=3.95, SD=1.12, N=9). In addition, participants were asked to rank the nine professional development elements (e.g., metacognitive modeling video examples; recording own metacognitive modeling samples; readings; PowerPoint video lectures;

asynchronous discussions; partnered activities; participants collection of take-a-ways from the professional development (Bright Ideas); independent journaling; and whole group activities) based on perceived impact to learning. These ranked scores were reversed for seeking correlations. As a group, the metacognitive modeling example videos ranked as approximately the third most important professional development element to their learning (M=3.22, SD=2.16, N=9).

Table 16

Participants' Perceptions on Importance of the Metacognitive Modeling Videos to Their Learning

Question	**Aaron**	**Eugenie**	**John**	**Kate**	**Ivy**	**Rachel**	**Sam**	**Sarah**	**Susan**	**Victoria**
On a scale of 1 (Not at all) to 5 (Integral), how important were the metacognitive modeling videos to your learning?	5	3	4	*	4	2	5	5	4	5
Ranked position (1-9) on impact of metacognitive modeling video examples on learning.	2	4	2	*	4	8	3	1	4	1

* Kate's answers are not included, as she did not rate these according to scale but rather provided a narrative.

Change in Knowledge

Conceptual knowledge. At the time of the study, some participants reported having previously attended disciplinary literacies professional development (see Table 4). Therefore, several entered the professional development with varying degrees of knowledge on the topic. All entered with some knowledge. As a group, the majority of

the participants increased their conceptual knowledge score (see Figure 22). However, John and Ivy's scores decreased by less than a point. They began with grades at 7+ and 8 + and ended with final scores for both still above 7 points. The groups' overall pre-professional development conceptual knowledge mean increased from pre-professional development (M=6.80, SD=1.19, SE = .375) to post-professional development (M=7.80, SD= .61, SE = .193). The t-test shows that there was statistically significant improvement in the scores following professional development that did not occur by chance t(9)= -2.69, p=.025.

Procedural Knowledge. All but two, Kate and Sam, increased their procedural knowledge, as illustrated through metacognitive modeling think-aloud videos (see Figure 23). Sam scored the highest score possible in the pre- professional development video sample. It is important to note that his modeling did improve in the second video, as it stayed consistent with little wavering in and out of reader/teacher mode. Kate increased her conceptual knowledge by two points on a scale of 1-9, but did demonstrate her newfound knowledge to her metacognitive modeling sample video. She received a "0" both pre- and post- professional development.

The overall group mean of the metacognitive modeling video sample scores increased nearly two full points from pre (M= .8, SD=.92, SE= .291) to post (M=2.4, SD=1.07, SE=.34). The t-test shows a very large statistically significant difference for increased scores post-professional development (t(9)=-4.71, p=.001).

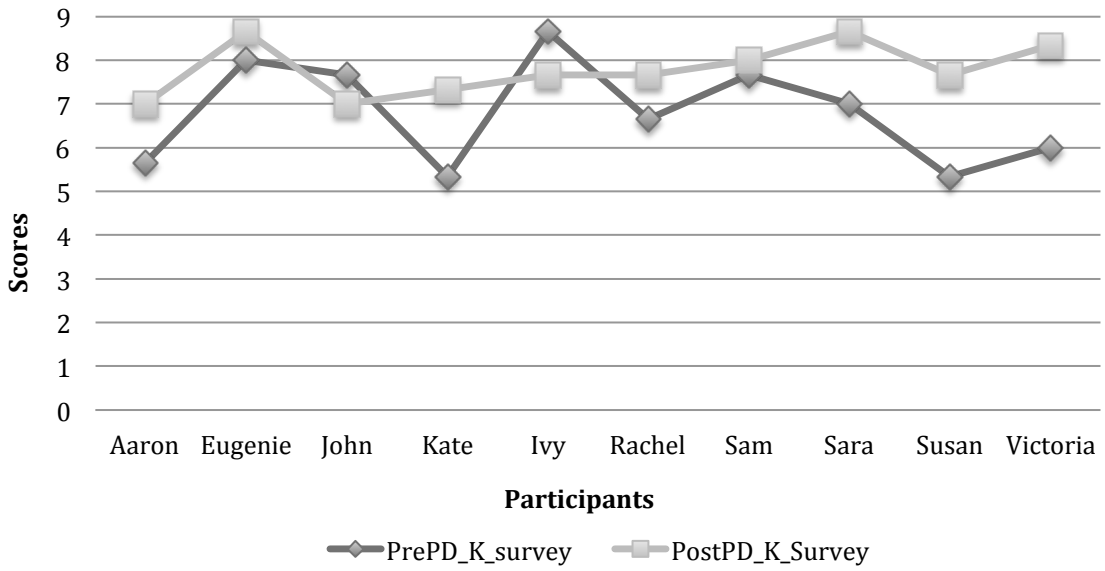

Figure 22. Participants' means: Pre/Post PD conceptual knowledge surveys, Scale=0-9.

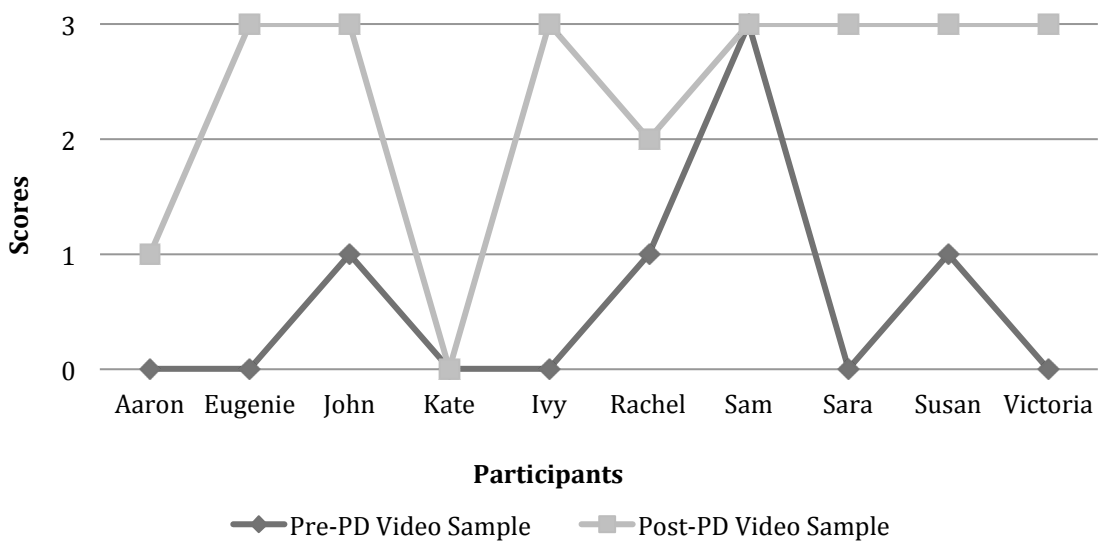

Figure 23. Participants' means: Pre/Post PD metacognitive modeling samples, Scale=0-3.

Interestingly, seven of the ten participants either a) indicated their awareness of improvement with scores that suggested otherwise, or b) appeared unaware of improvement where scores suggested growth had occurred and/or occurred to a much greater degree than they acknowledged (see Table 17). Three participants acknowledged their growth and change in their post professional modeling video sample to a degree, but expressed their new, growing, and/or continued confusion with the concepts of disciplinary literacy and modeling through think-aloud. Another three participants made statements suggesting they believed that they grew in their understanding more than their scores indicated. One participant, Kate, expressed both extreme confidence and confusion.

Table 17

Participant Statements Indicating Contradiction to Changes in Knowledge Survey (KS) Scores and Knowledge Application Through the Metacognitive Modeling Sample Videos (KV) Scores

Name	Evidence of knowledge gain	Contradictory statement
Aaron	KS: 5.66-7.00 KV: 0-1	"So, I noticed a real change from the ways I approached the text from before and after the seminar."
John	KS: 7.66-7.00 KV: 1-3	"Even the second time around I was a bit confused."
Kate	KS: 5.33-7.33 KV: 0-0	"Truthfully, I still have to stop and think about the two because they sound so similar."
Rachel	KS: 6.66-7.66 KV: 1-2	"more like a triangle between me, the text, and my audience" "You really have to do it in the first person and you have to narrate sort of everything that would be going through your mind, not just on the surface, and not just do it in the 3rd person or the 2nd person."
Sam	KS: 7.66-8.00 KV: 3-3	"And so, I'm still honestly grappling with it, and trying to, I think it is going to be an area of further study and research for me because I think it is very complicated."
Susan	KS: 5.33-7.66 KV: 1-3	"I don't know that my thinking about it changed."
Victoria	KS: 6-8.33 KV: 0-3	"I was going through the post quiz thing; I had no clue on a lot of the stuff." She adds, "I'm sorry I'm not able to articulate this very well, I think I probably two weeks ago I could probably better, I think that, and I know I'm going to say it wrong, I think that I'm going to struggle here, um…"

Change in Beliefs

Participants' scores regarding their beliefs toward learner-centered versus non learner-centered beliefs or constructivist versus traditionalist general teaching philosophies remained largely unchanged. Mean change from pre- professional development to post- professional development for both sets of classroom belief questions and general teaching philosophies per participant were small, if changed at all. If changed, the means tended to decrease after professional development. T-tests showed that none of these mean differences were statistically significant. The overall group pre-PD mean for learner-centered versus non learner-centered beliefs in their own classrooms (M=2.96, SD=.28, SE=.089) increased only slightly as a whole (M=2.99, SD=.23, SE=.074, t(9)=-.504, p=.63). The opposite is true for participants' learner-centered versus non learner-centered beliefs regarding their teacher candidates' or in-service teachers' classrooms, with the pre-PD value (M=2.993, SD=.26, SE=.082) dropping only slightly post- PD (M=2.986, SD=.07, SE=.074, t(9)=.10, p=.92). This slight decline occurred again with the general teaching philosophy beliefs when the pre-PD (M=4.0, SD=.73, SE=.233) dropped a tenth of a point post- PD (M=3.9, SD=.79, SE=.248, t(9)=.90, p=.40). Tables 24-26 show the changes in participants' scores across all three.

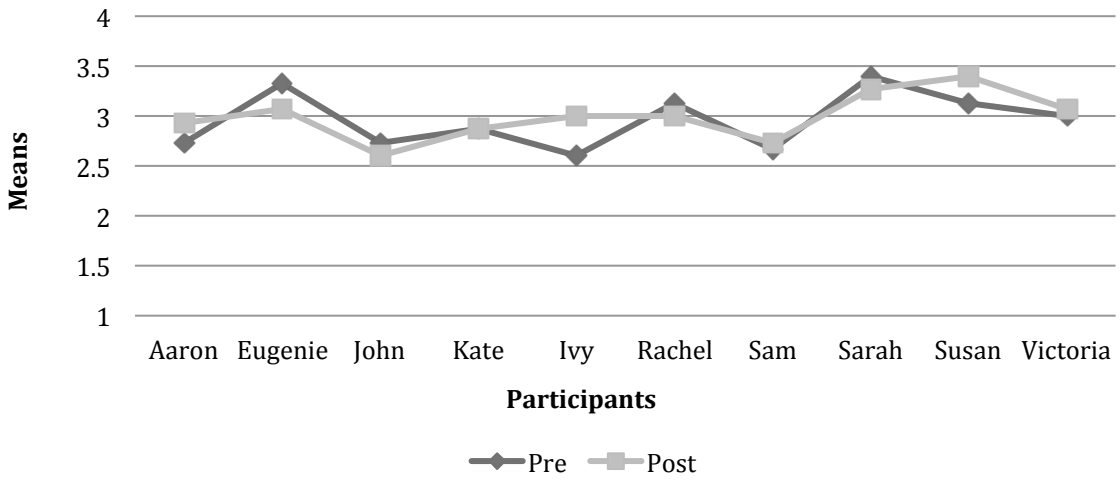

Figure 24. Participants' means: Pre/Post PD LC & NLC classroom beliefs: Self, Scale 1-5.

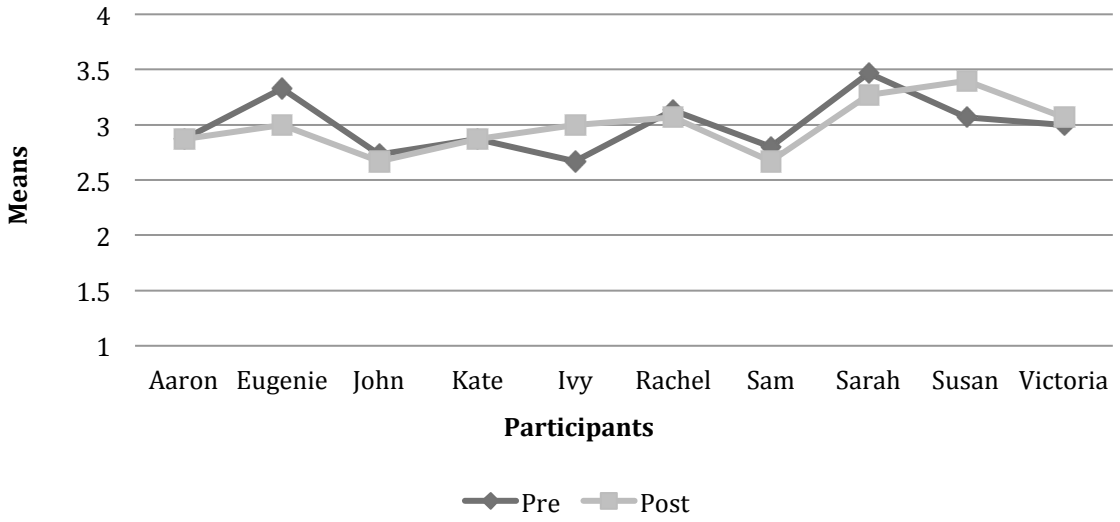

Figure 25. Participants' means: Pre/Post PD LC & NLC classroom beliefs: Student, Scale 1-5.

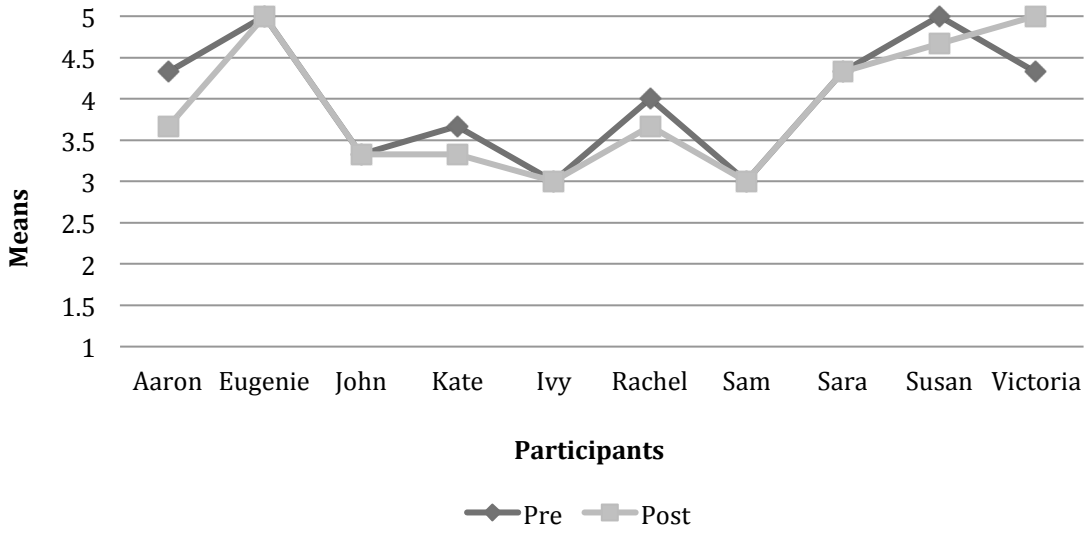

Figure 26. Participants' means: Pre/Post PD: General Teaching Beliefs. Scale=1(Traditionalist)-5(Constructivist).

Evidence throughout individual interviews (see Table 18) showed that, regardless of beliefs and philosophy survey scores, many participants expressed thoughts that were more in line with learner-centeredness and constructivist beliefs; however, Rachel expressed the opposite. Many participants expressed ideas that suggested changes and/or reinforcements were made to their beliefs about classroom atmosphere (learner-centered versus non learner-centered) and their overall teaching philosophy. Interestingly, for Eugenie, her learner-centered/non learner-centered belief scores were more balanced, while her traditionalist to constructivist continuum was extremely constructivist.

Table 18

Participant Statements Reflecting Belief Change

Participant	Survey score change	Evidence of changed/reinforced beliefs
Aaron	LC/NLC[a]: 2.87-2.87[b] Philosophy: 4.33-3.67[c]	"I really stress to them to be able to break out of the understanding of what Freire calls the banking model of education, right, where you just deposit information and then at the end if there are any questions." "It's not just regurgitating the facts, not banking, not depositing this kind of information but it is really engaging students and helping them to I mean facilitating them and guiding them towards their own independent thinking and problem-solving."
Eugenie	LC/NLC[a]: 3.33-3[b] Philosophy: 5-5[c]	"I feel like I'm a member of the class community." "So, basically we're making meaning together and every once in a while somebody will say something like I had not thought of that's really a great way of looking at that." "And, I want them to think of themselves as a part of a community of readers and writers in my class."
John	LC/NLC[a]: 2.73 – 2.6[b] Philosophy: 3.3-3.3[c]	"I think there was a focus on teaching concepts to students so that they can be lifelong learners, versus teaching sheer facts that don't necessarily enhance an individual's ability to go out and learn beyond that."

Table 18 (continued)

		"I don't lecture much at all anymore. I want to get rid of the glassy-eyed looks. I actually let them use their smart phones in class while I'm talking, if they use them to look up information, which pertains to class. They actually do this and sometimes I get huge amounts of research from students which I can use in later classes."
Kate	LC/NLC[a]: 2.87-2.87[b] Philosophy: 3.67-3.33[c]	"As questions come up spontaneously in class we utilize the computer and YouTube and whatever else is available to try and answer those questions." "I also encourage them to work together in small study groups in the library outside of class. They seem to learn a lot this way." "In other words, the teacher has to be willing to share a piece of himself/herself with the students and let them know how everyone develops a process for learning."
Rachel	LC/NLC[a]: 3.13-3[b] Philosophy: 4-3.67[c]	"Well, I know as a writing teacher I know I'm probably more directive than probably conceptually I think I should be, but I think that students they often want more direction." "Really maybe not that much, but I did a thing where I put a student's paper up on the projector and went through the paper and showed them how I would correct the punctuation. So, yeah, in the past, I don't think I would've done that…put up a student paper and demonstrate how I would think through the fact that this is a run-on sentence, what the punctuation needs to be, where the subject is, where the verb is, and well all went through that together as a class, we went through the thought process. They need to see that in action."

Table 18 (continued)

Susan	LC/NLC[a]: 3.07-4.00[b] Philosophy: 4-3.67[c]	"…it allows the students to see, to perceive, me differently like as somebody who is willing, who is not an expert, is willing to make them aware of the challenges." "…try to let them see me as a reader and a learner, and not just a teacher. And, even beyond a facilitator, like kinda of this idea that we are doing this together, and this is something we all do together."

[a]LC=Learner-centered; NLC=Non learner-centered
[b]Scale 1-4; [c]Scale 1-5

Change in Attitudes

As the graph below (Figure 27) indicates, 7/10 participants' attitude scores towards reading instruction in the discipline-specific courses scores (60%) increased, one participant's attitude score stayed the same, and three (30%) scores dropped. Two of the scores that declined were very slight, less than a tenth in both instances; however, one score did fall nearly a half point (.43). The group mean increased from pre- PD (M=3.83, SD=.394, SE=.12) to post- PD (M=4.18, SD=.42, SE=.13, t(9)=-2.2, p=.051). Although attitude scores towards reading instruction in the discipline-specific courses did not appear to change significantly, more than half of participants expressed newfound or increased advocacy positions for disciplinary literacy and in modeling metacognition through think-aloud to build students' metacognitive skills (see Table 19).

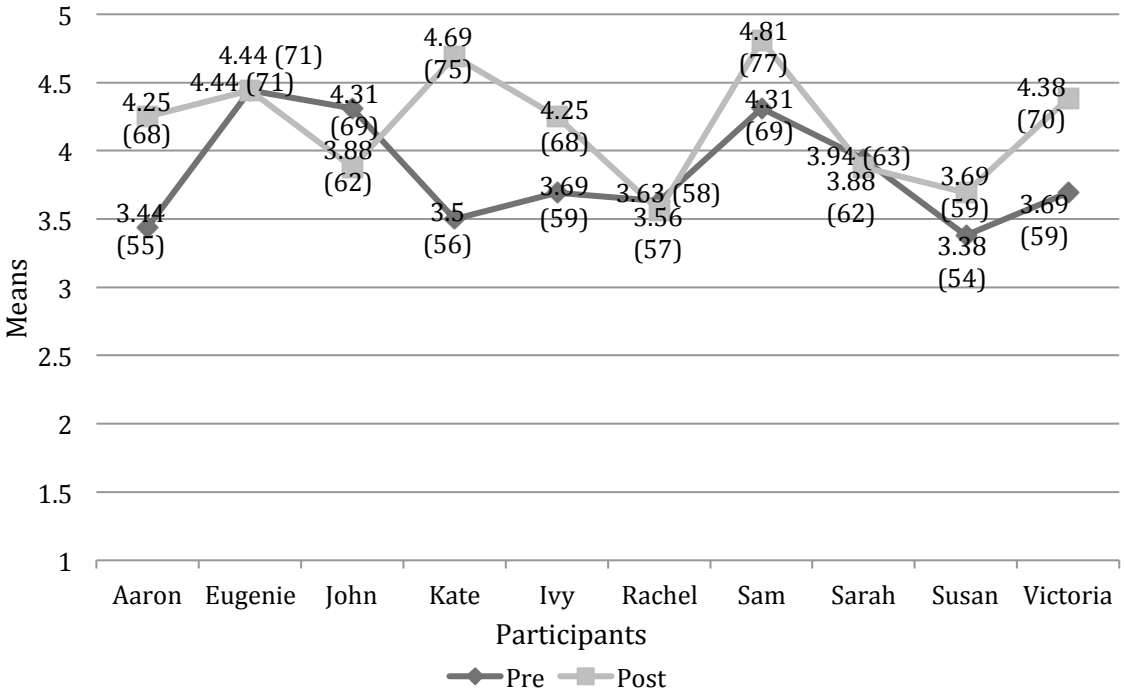

Figure 27. Participants' Pre/Post professional development attitude means and totals. Mean Scale= (5,1) Strongly Disagree to (1,5) Strongly Agree; Totals are shown in parenthesis, Scale=16-80).

Table 19

Participant Statements Reflecting Increased Advocacy

Participant	Attitude Score change	Evidence statements
Eugenie	No change	"My teaching practice, as I said, also extends to public schools so I see myself as not just working with those teachers that happened to be at the workshop, but that teacher is representing 100, or 150 students, and it would be awesome if I could inspire them to go out and do the same." "I've become sorta a messenger or advocate for this approach now."
Kate	+19	"I now feel that all of the above instructors could do this and really improve the results of their teaching. I would love to have a little seminar here and who them how to do this."
Rachel	-1 point	"I mean I'm kinda a proponent about it. I've been going around talking to people about it. I have. So, yeah, you have made a convert."
Sam	+8 points	"We are constantly going through review, and this is one area that we are missing, we need to add it into the curriculum in different ways, and we have specifically focused on the more generic content area learning, but this is an area that we are going to *preach*, and get students to practice in think-alouds in different content areas, in field specific think-alouds processes."

Table 19 (continued)

Susan	+ 5 points	"I felt very strongly that it was completely appropriate, and I felt that teachers in the disciplines would resist it." "And, I have to say, I spend a lot of time in the public schools. I can't tell you the last time I saw a think-alouds, you know. And, so, it has made me realize, that it is a strategy I really believe in, and in order for my future students teachers, my pedagogy students to buy into it, they need to see it. Um, so I'm inspired to well, I'll teach that pedagogy class in a year. There are four of us who teach it, and I will certainly, too, talk to my colleagues. I don't think any of my colleagues participated in this. It is definitely something we need to talk about." "And, in fact, I have this very real worry that I'm not seeing it in the public schools. I think one of the solutions is to get teachers in the school who are willing to try it and see that it is valuable and talk about it."
Victoria	+11 points	"I'm going to talk to the department chair about having the opportunity to lead one in the fall for my department to share what I've learned from this."

Change in Self-Efficacy

With the exception of one, all participants' self-efficacy scores for integrating the strategies learned in the professional development increased. However, 30% of the participants' scores for self-efficacy to teach others how to integrate the strategies in their secondary classrooms decreased (see Figures 28 and 29).

Each set of group means rose somewhat pre- to post- PD. Self-efficacy to integrate the teaching strategy in their own classroom increased from a mean of 5.62

(SD=.92, SE=.29) to 6.3 (SD=.69, SE=.22). T-tests showed a statistically significant increase in self-efficacy to incorporate pre- and post- results (t(9)=-2.4, p=.04). Self-efficacy to teach others how to integrate the teaching strategy in their secondary classrooms also increased from 5.38 (SD=.85, SE=.27) to 5.98 (SD=.80, SE=.25), but this was not statistically significant.(t(9)=-1.96, p=.08).

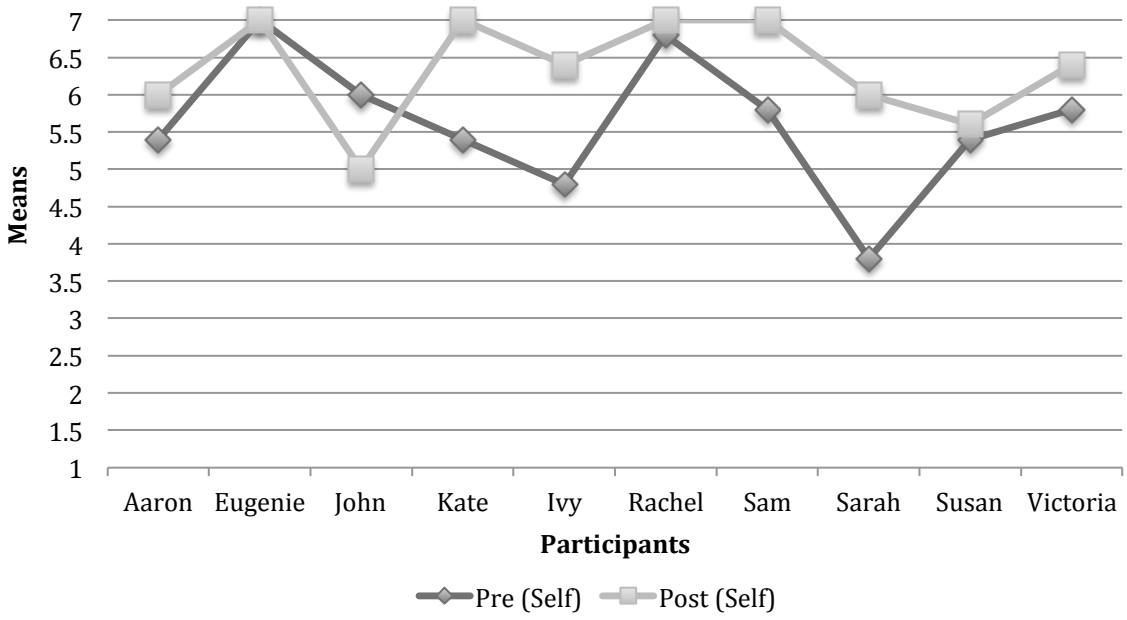

Figure 28. Participants' Pre/Post self-efficacy scores to integrate the metacognitive think-aloud instructional strategy in their classrooms.

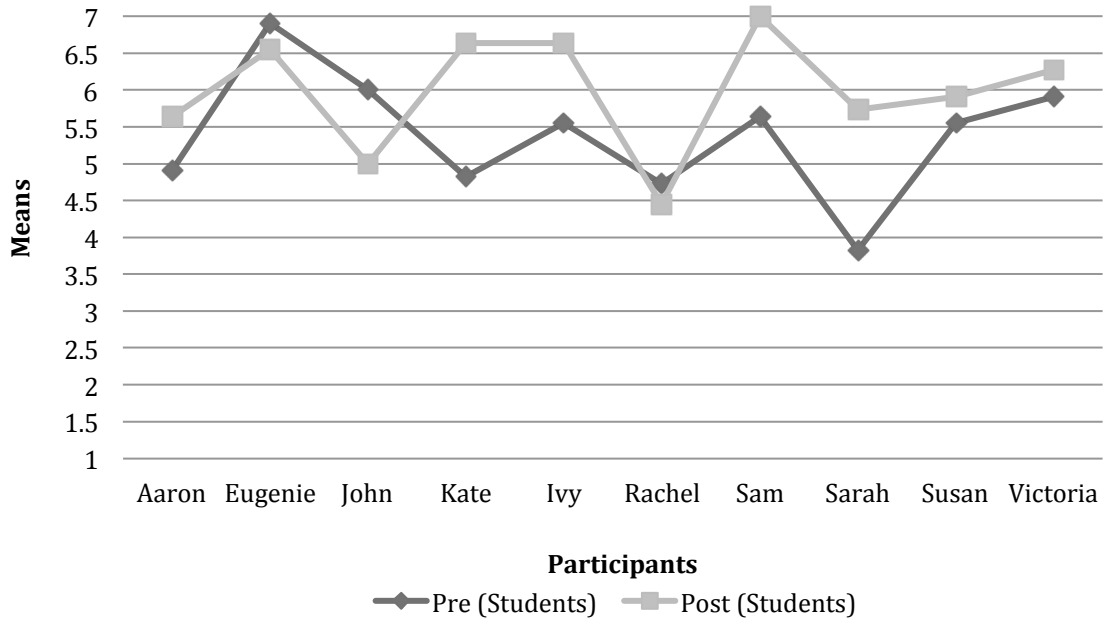

Figure 29. Participants' Pre/Post self-efficacy to teach the metacognitive think-aloud instructional strategy to others.

In order to explore deeper into participants' changing self-efficacy, they were asked during their interviews, "How do you feel when you model your metacognition through think-aloud?" Five expressed that they felt vulnerable or could see how others who embrace a more sage-on-the-stage approach to teaching could feel vulnerable, as it would directly affect their credibility as an expert. On the other hand, empowerment, or anticipated empowerment, and freedom, were two other common feelings expressed by participants. Examples of participants' expressions of feelings are provided in Table 20. Modeling metacognition means, as one participant stated, "putting yourself out there."

Table 20

Participant Statements Showing Feelings Associated with Using Metacognitive Think-Alouds During Instruction

Participant	Self Confidence (Classroom)/ Modeling sample score change	Evidence statements
Aaron	Confidence score change: 5.4-6 (Scale: 1-7) Modeling sample change: 0-1 (Scale: 0-3)	"I think there is a certain *vulnerability* to it especially, maybe not when you do it with the video, although You always wonder what the people like you Michelle might be thinking about when you see us do it." "I would feel a little *vulnerable* you know like are they getting this, do they see what the point is? But there is certainly an empowerment, an empowering quality to it as well to say this is a way of modeling metacognition. "There is a little bit of both to that *vulnerability* and *empowerment."* "That's part of the *vulnerability*. You open yourself up for that. That could lead to a really fruitful discussion."
Eugenie	Confidence score change: 7-7 (Scale: 0-7) Modeling sample change: 0-3 (Scale: 0-3)	"I feel like I was doing an impoverished version of think-alouds prior to this and now I feel really *strengthened and empowered*."
John	Confidence score change: 6 – 5 (Scale: 1-7) Modeling sample change: 1-3 (Scale: 0-3)	"I think that it is possible to feel *vulnerable*, because you feel maybe like you're not that you, that you are an expert. But I don't think it is a legitimate concern. Personally, I'm not really bothered by being in front of people, or feeling humiliated."

Table 20 (continued)

Kate	Confidence score change: 5.4-7 (Scale: 1-7) Modeling sample change: 0-0 (Scale: 0-3)	"Now, I'm more confident in my approach." "As mentioned before, I used this before in my teaching without really knowing what it was. Now I am doubling down on it and using it with a lot more confidence."
Ivy	Confidence score change: 4.8-6.4 (Scale: 1-7) Modeling sample change: 0-3 (Scale: 0-3)	"Would I feel *vulnerable*? Um, yeah possibly I would. But, through the online course I did some of those things and I plan to use them."
Sam	Confidence score change: 6.4-5.4 (Scale: 1-7) Modeling sample change: 3-3 (Scale: 0-3)	"I think it definitely makes me self-conscious and so to that degree somewhat *vulnerable,* but I think the only way you get over that because you're basically putting yourself out there as a performer you're modeling what you want them to do and anytime you do that you know you are putting yourself out there and of course you want to be a good model and I think the only way that you master any of the types of fear that you have about things like that is to do it, get practice at it, get good at it because it is so necessary that they see how the practice is supposed to look I think." "That makes you look like you're still more *vulnerable*, because you are put on the spot that way, but that is the kinds of discussion you want to have with your students. You want to put it out there. I can also see a scenario where you might go up and do some things wrong and see if they critique you, and pick that out, and say no that is really the you shouldn't have done it. Sometimes giving an anti-model is

Table 20 (continued)

		helpful, but definitely, you want to get up there and show them the right way to do it. "But I think in the end, when you have success with it, it is definitely *empowering*."
Sarah	Confidence score change: 3.8-6.0 (Scale: 1-7) Modeling sample change: 0-3 (Scale: 0-3)	"I feel somewhat *self-conscious and embarrassed* when modeling metacognitive strategies to my students. I'm not sure why, and I hope that these feelings will dissipate after practicing this over time."
Susan	Confidence score change: 5.4-5.6 (Scale: 1-7) Modeling sample change: 1-3 (Scale: 0-3)	"I wasn't afraid to show my confusion you know." "I think that like on a very personal level I find it very *freeing*, I guess. I find that it's those moments when I'm showing them that this is a complex, that when I'm taking the curtain away, and I'm saying like this is complicated and its complicated for me as well and let me show you where I stumble and where I have challenges. I find it to be extremely *freeing*."
Victoria	Confidence score change: 5.8-6.4 (Scale: 1-7) Modeling sample change: 1-3 (Scale: 0-3)	"I think was it does is create a mind frame that says I can do this. I can do what she did in the think-alouds, I can understand this, I can master this one. "

Plans for classroom change

Participants were asked how many times they planned to incorporate metacognitive skill development and disciplinary literacy concepts in their classes, and how they would do so (see Table 21). They planned to incorporate metacognitive modeling through think-aloud from zero times to 5-10 in each class taught. Many immediately incorporated metacognitive modeling as they finished the professional development.

Table 21

Participants' Immediate Incorporation and Stated Plans for Integrating Metacognitive Think-Aloud Instructional

Participant	Immediate incorporation?	Anticipated # of times to use in upcoming academic semester	Plans
Aaron	Yes (think-alouds in creating a lesson plan)	3-5x/each (3 Pre-service, 1 graduate course)	Wants to use this with his online courses using tools used in this PD including VoiceThread and Google. Show 5-minute clips, and have students share their own clips. Wants to discuss how students can use this in their teaching practices, and use it to launch discussions.
Eugenie	Yes (has students explain their thinking & talks about her decisions in class) and increased her number of think-alouds in the classroom.	5-10x (undergraduate, English I, unknown pre-service teachers)	Plans to use with ESL students in having them speak their thoughts aloud. Wants her students to read more and practice being aware of their metacognition.
John	Yes (modeled in in-service professional development)	N/A (He won't be teaching.)	Plans to incorporate with in-service teachers through his university position in the reading center.

Table 21 (continued)

Kate	Yes	5-10x (undergraduate with identified pre-service teachers)	Will use modeling through think-aloud, and will "let the education students know more about the process involved."
Ivy	No	2x	Plans to use modeling with her online pre-service teachers (ESL).
Rachel	Yes (not for reading, but has done a think-aloud using metacognition in writing)	1x (English, Pre-Service teachers)	Plans to use this in her future linguistics classes because she gets frustrated at their lack of understanding but as realized, "It's because they just don't know how. These are English majors; they are used to reading novels all the time. They don't know how to read dense scholarly work in rhetoric and compositions or in linguistics."
Sam	Yes (used it with students in his pre-PD modeling sample, continues to practice in front of students)	2x/each (Pre-service & graduate courses)	Plans to continuing modeling through think-alouds and have students work on this in pairs, practicing and providing feedback. Perhaps using scripted templates.
Sara	No (Although she planned to before the course was over.)	3-5 x (Reading in the content areas-Pre-service) and 1x (Learner-centered middle school—Pre-service)	Plans to model herself and use parts of the PD course (metacognitive modeling videos specifically) and dividing her students into their disciplines and modeling metacognition with each other with lot of opportunities for practice, "I think that lots of practice is necessary to feel comfortable doing this."
Susan	Yes	0x	In her interview, she did plan to apply this in her pedagogy class the next time she teaches it. "I think I'd like to when I teach the pedagogy class talk

Table 21 (continued)

			really explicitly about disciplinary literacy and even have a lesson where we look at various non-fiction texts from different disciplines and talk about approaches and how we would look at those differently than our literature." When asked if she would model her metacognition, she replied, "Yeah, I think I need to be more transparent with them. I need to do a think-aloud in order for you to get a think-alouds. And, so I'm excited to try that." She would also give them opportunities to practice amongst themselves, and during their mini-teach lessons.
Victoria	Yes	3-5x (undergraduates, no identified pre-service teachers)	Will continue to use what she learned in her future courses.

All the participants placed value in the use of disciplinary literacy approaches, particularly the development of metacognitive skills through think-aloud. If they had not yet used the metacognitive modeling think-aloud strategies with their students, they expressed plans, some more specific than others, to do so in the future. Sam expressed this importance:

> Well, definitely we want them [students] to know think-alouds processes, similar to the ones we worked on in the professional development, but I think it is just so foreign from the beginning, to say think about how you do things. Well, for some

> people it is not foreign, but some people are more reflective than others are. But that reflection I think is really necessary, across the board, not just for this specific example, we want all our teachers to be reflective, but within that broader spectrum, we want them to be able to reflect on how they process information and what is it they do to process that information that has been a hidden process for them, more of a subconscious process. We want to bring that out so where they can articulate it, where they are really aware of how they think through it. I think that is the first step. The second step is we have to teach them how to teach it.…To follow up, how are they going to teach their own students once they get in a classroom is to do the same thing. It is almost like a self-regulatory process they have to go through before they are going to take that next step. (Interview with Sam, 4-11-2013)

Sam references not only the nature of the change process within one's self, but a systematic change process, much like the "cosmopolite" behavior that helps to share and promote new innovation (Rogers, 2003) described earlier. This spirals from expert to novice on a continuous spectrum, much like trade skills passed from master to apprentice that spreads even further as the apprentice becomes the master and the cycle repeats.

Relationship between professional development and teacher change

Statistical correlations were used to determine possible relationships between how participants' valued the use of the metacognitive modeling example videos provided by the professional development facilitators and score/point changes in knowledge, attitude,

beliefs, and self-efficacy, and their intention to immediately implement the think-aloud instructional strategy as learned in the professional development with their own students. As noted earlier, seven out of the ten participants designated the metacognitive modeling example videos as 4 (Nearly integral) or 5 (Integral) to their learning during this professional development. Participants also ranked the metacognitive modeling example videos compared to the other design elements in the professional development. As a group, the metacognitive modeling example videos ranked third in most important professional development element in their learning.

Pearson's R and Point-Biserial correlations (see Appendix F) were run between the mean differences in scores on the various survey domains (e.g., knowledge, attitudes, beliefs, self-efficacy/confidence), their rates of how integral the metacognitive modeling example videos to their learning, and their status in regards to immediate incorporation and future plans. Five positive correlations were found:

- A positive correlation was found between how participants rated the metacognitive modeling video examples and changes in their mean scores regarding their self-efficacy to prepare others to use the think-aloud instruction strategies ($r(8)=.621$, $p=.037$). Those who rated the metacognitive modeling video examples as more integral to their learning also experienced greater degrees of increased self-efficacy in their ability to teach others how to use think-alouds as instructional strategies. The correlation measure meets the critical value for $p<.05$ at .549 at 8 degrees of freedom.

- Additionally, a positive correlation was found between changes in participants' attitude scores and changes in their confidence scores to teach others how to use and incorporate metacognitive modeling instructional strategies ($r(8)=.618$, $p=.029$***).*** The correlation measure meets the critical value for $p<.05$ at .549 at 8 degrees of freedom. As attitude scores increased, so did their confidence to teach others about the strategy.
- Near-perfect correlations was found between participants' ranking and rating scores ($r(7)=.888$, $p=.001$) for value of the metacognitive modeling example videos provided by the professional development facilitators; this suggests fidelity to answers given regarding the importance of the professional development instructional element.
- A significant, strong correlation was determined between the changes in their classroom beliefs for themselves and their students ($r(8)=.886$, $p<.001$), pre- to post- professional development. This indicates the probability that as they increased their beliefs towards learner-centeredness in their own classrooms, they did so for their students' future classrooms as well.
- Finally, another significant, strong correlation was found between the changes pre- to post- professional development between confidence to integrate the strategies into their own classes and teach others to do so ($r(8)=.956$, $p=<.001$). This correlation signifies the likelihood that as the participants themselves learned about and experimented with the think-aloud instructional

strategy, thus increasing their own confidence to use the strategy in teaching, they became more confident that they could teach their students to do the same thing.

Two negative correlations also existed.

- First, a negative correlation was identified between changes in participants' attitudes and the difference in their pre- and post- professional development video sample scores ($r(8)= -.585$, $p=.038$). The negative correlation measure meets the absolute critical value set for $p<.05$ at .549 at 8 degrees of freedom, suggesting a potential relationship between degrees of attitude change and performance.
- Second, there was a negative correlational relationship between the participants' difference in pre/post professional development mean for confidence in using metacognitive modeling think-alouds in the classroom and their immediate use (yes or no) within or just following the professional development event ($r(8) = -.659$, $p=.019$). The correlation measure meets the absolute critical value set for $p< .025$ at .632 at 8 degrees of freedom and suggests the possibility that those who had larger increases in their confidence levels pre- to post- professional development were less likely to immediately incorporate their knew knowledge in their classes.

Summary

Change, specifically teacher change, is the predominant goal and theme of this study, like any professional development (Guskey, 2000, 2002a, 2002b; Mezirow, 1991; Cranton, 1994, 2002). Participants were asked a series of questions related to their knowledge, attitudes, beliefs, and self-efficacy about disciplinary literacy and metacognitive modeling through think-aloud, along with plans to incorporate their newfound knowledge in the classroom. They were then asked to rate the importance of metacognitive modeling examples provided by the professional development facilitators to their learning on a scale of (1) Not at all important to (5) Integral to my learning. As a group, they rated the video examples a "4, Nearly integral" to their learning. Finally, they were asked to rank the value of the metacognitive modeling examples against the other present design elements in the professional development (e.g., record own sample, readings, PowerPoint video lectures, asynchronous discussions, partnered activities, Bright Ideas, journaling, whole group activities). On average, the group ranked the metacognitive modeling video examples as the third most important professional development design element to their learning.

Throughout analysis, changes were revealed in both qualitative and quantitative data. Comments denoting change were found throughout interviews in regards to all aspects of teacher change under review in this study, including general knowledge, attitudes, beliefs, and self-efficacy, but primarily in the development of how-to or procedural knowledge and classroom application. However, these comments did not

always match their answer selections to survey questions on the same topics or their performance scores on the post-professional development metacognitive modeling samples. Moreover, pre- and post-professional development survey results also showed that change, some more slight than others, did occur for everyone in one or more of the domains. Knowledge, both conceptual and procedural, increased for all but two participants. Additionally, self-efficacy scores for using the think-aloud strategy in their own classes and teaching others how to do so increased for most.

Correlations between the mean differences in their scores and the participants' ranking and rating on the importance of the metacognitive modeling video examples to their changes in knowledge, beliefs, self-efficacy, and classroom practice were not significant with a few exceptions. Several near perfect correlations were found between related constructs (e.g., beliefs for self and students' classrooms; self-efficacy for using the strategy in their own courses and teaching others to do so; rating and rankings of the metacognitive modeling video examples.) Another positive correlation was found between participants' ratings of the metacognitive modeling video examples provided by the professional development facilitators and their reported self-efficacy to teach others the metacognitive strategies endorsed by the professional development facilitators. Additionally, a positive correlation was found between the difference in attitude scores pre- to post- professional development and the difference in participants' confidence to teach others. Finally, two negative correlations suggested inverse relationships between two variables: 1) differences in participants' attitude scores pre- to post- professional

development and the difference in their pre- and post metacognitive modeling sample video scores, and 2) in the difference in the participants' confidence to use the instructional strategy in their own classes and their immediate plans to implement. While the sample is very small, statistically the possibility exists that the use of metacognitive modeling video examples was not a significant factor alone in their changes despite the majority participant opinion that they were "Nearly integral" to their learning.

Chapter 5 further discusses the interpretations, connections to prior research, and implications for these findings in regards to professional development design and research. Additionally, limitations and research rigor are addressed.

Chapter 5: Discussion

Well-designed professional development holds the power to change teachers' beliefs, attitudes, and practice (Guskey & Yoon, 2009; Guskey, 1986, 2000, 2002a, 2002b). The purpose of this research was to examine the use of metacognitive modeling example videos provided by professional development facilitators for participants and its impact on participants' changes in their knowledge, attitudes, beliefs, self-efficacy, and classroom practice. A mixed methodology in the form of surveys, the collection of metacognitive modeling sample videos, and interviews were used to determine any change in these domains. This chapter focuses on the interpretation from the findings, limitations within the study, recommendations for future professional development and research, and needed change in professional development goals. While the results of this study should be of interest for professional development designers at any level of education, PK-20, its findings contribute directly to the limited body of research (Smith, 2003) surrounding the faculty development of teacher educators while also contributing to both online professional development research and professional development in literacy research.

Discussion of findings

The following section discusses the findings from this study and focuses on three specific issues: understanding the reality of teacher change, the value of the

metacognitive modeling example videos in this professional development, and the use of cognitive apprenticeship as an underlying philosophy in professional development.

Understanding the reality of teacher change

The purpose of this study was to answer questions related to teacher change due to professional development and specifically as a result of the use of metacognitive modeling example videos as a conduit to learning and change. Assumptions, or propositions (Yin, 2009), included that not only would this modeling by experts lead to knowledge gain, but that knowledge gain would lead to changes in attitudes, beliefs, self-efficacy, and intentions for classroom implementation. In reality, gains were seen in both conceptual and procedural knowledge and self-efficacy, and evidence suggested classroom implementation would occur at some point following professional development. However, less change was observed statistically in attitudes and beliefs.

Overall, this online professional development was successful. Changes were evident through surveys and performance indicating knowledge gain for all but two participants, increased self-efficacy and confidence to implement the strategies themselves in their classrooms, and teach pre-service and/or in-service teachers to do the same with secondary students. All research participants had plans, some more specific than others, to incorporate the disciplinary literacy ideals and the modeling of metacognition via think-alouds specifically.

While, statistically, attitudes and beliefs as measured by the surveys changed only slightly for most, change was evident through interviews. Most of the participants taught

courses related to reading and language arts, all-level special education, and/or ESL and had a special long-term, interest in literacy instruction. Attitudes toward reading instruction in the disciplines were already strong and tended to get stronger. As their attitudes became more positive, so did their confidence to teach others about the instructional strategy according to the Pearson's correlation test (See Appendix F) run on the data and reported in Chapter 4. Changes in attitudes were seen in the interviews as participants began to speak as strong advocates of the methods and approaches they learned. Many planned to share and teach think-aloud instructional strategies to their colleagues.

The slight variations in belief scores may be due to the demographics of the participants and what beliefs they likely held in common, which already paralleled the concepts within the topic of disciplinary literacies and metacognitive skill development, thus attracting them to the professional development in the first place. Therefore, the professional development reinforced their beliefs, such as in John's case, regarding learner-centeredness and the importance of reading instruction specific to the discipline. The professional development seemingly promoted a sage-on-the-stage strategy, a more traditionalist concept, at first glance, but the methods moved toward a more constructivist and socio-constructivist paradigmatic approach when adding discussions, reflection, student practice, and feedback with peers. It involved active learning and learning through experience (Dewey, 1933). Most of the participants entered the professional development with medial positions in learner-centered vs. non learner-centered classroom

beliefs and overall general teaching philosophies, and most left the same way. As a group, however, the beliefs became somewhat more learner-centered.

The lack of great variance in attitudes and beliefs pre- to post- professional development is likely due to the fact that the participants did not have enough opportunity to practice their new skills in the classroom to determine its effectiveness on students learning (Guskey, 1986). This is aligned with Guskey's thoughts that attitudes and beliefs cannot change until ample opportunities for practice in the classroom occurs (Guskey, 1986, 2002), and participants can place value on the innovation, strategy, or approach (Rogers, 2003; Fullan, 2007) itself. Change is not linear (Rogers, 2003; Fullan, 2007), and it takes time (Guskey, 2000, 2002a; Postareff et al., 2007). Transformation theory supports this as well (Cranton, 1994, 2002; Mezirow, 1991). Cranton (1994, 2002) and Mezirow (1991) suggest that transformation is a result of deep "critical reflection" and is brought about by outside influences including people, events, and experiences. This all takes time.

The reality of teacher change in this professional development is that it is yet to be fully understood. In Chapter 3, several propositions were offered as possible answers to the research questions that sought to determine changes in knowledge, attitudes, beliefs, self-efficacy, and ultimately practice. One of these propositions posited that increased knowledge resulted in changes to attitudes, beliefs, and self-efficacy. This not necessarily the case in this study as everyone increased their knowledge in some way,

conceptually and/or procedurally, but there was little overall change, statistically speaking, in terms of attitudes and beliefs.

Self-efficacy, however, did improve and could be attributed to increased procedural knowledge. However, Kate's experience, for example, would counter that theory as her confidence grew a great degree, but her pre- and post- professional development metacognitive modeling sample videos scores showed no change at all.

The second proposition hypothesized that changes in attitudes, beliefs, and self-efficacy resulted in intention to change practice. Since attitudes and beliefs changed little, it is not likely that those changes influenced intention. However, changes in self-efficacy did seem to be an impetus in planning change in the classroom, as to be expected particularly in the various content areas (Cantrell & Hughes, 2008; Tschannen-Moran & Hoy, 2001). This is evidenced throughout the interviews as participants discussed their practice followed by their excitement to share with students and colleagues. However, this did not necessarily mean that the higher the self-efficacy scores, the more likely participants would integrate the think-aloud instructional strategies immediately.

In this study, knowledge change was determined by objective evaluations of knowledge gain, via pre- to post- knowledge tests and scored performance activities. The remainder of change domains (e.g., beliefs, attitudes, self-efficacy, and classroom change) was determined solely on teacher self-reports, which has been criticized in professional development literature.

Issues with self-reporting. In this study, several correlations between related constructs occurred. The changes pre- to post- professional development regarding learner-centered beliefs in the participants' own classrooms were significantly correlated to the changes in their learner-centered beliefs for their students' future classrooms. Likewise, strong correlations were found between how participants rated and ranked the value of metacognitive modeling to their learning. These correlations suggest that respondents were thoughtful in their responses in that they responded similarly to the related questions.

However, as noted in Chapter 2, the use of teacher perception or self-evaluation of his/her knowledge and growth as a tool for professional development evaluation is not ideal (Desimone, 2009; Lawless & Pellegrino, 2007; Penuel et al., 2007; Guskey, 2000). This is especially true if self-reporting is used in isolation to evaluate the success of the professional development in regards to its impact on teacher change and student learning because of potential issues with under- and over- confidence in one's knowledge, attitudes, beliefs, or self-efficacy (Ackerman, et al., 2002; Kruger & Dunning, 1999) following professional development, the participants' desire to please others or themselves (Kleitman & Stankov; 2007), or even simple fuzzy memory (Morgan, 1930/1961). This creates validity concerns.

It is important to note that faulty self-reporting can occur pre- as well as post-professional development for many of the same reasons. Additionally, false self-reports could come from previous experiences (Ackerman et al., 2002). For example, in this

study, Eugenie self-reported high and even total degrees of self-efficacy to both implement think-aloud strategies in her classroom and to teach others to do so. She also entered with a high conceptual knowledge test score of 8 (on a scale of 1-9), which increased to 8.66 post- professional development. Afterwards, she stated, "I thought I knew how to do this, but I learned quite a bit, especially about the thinking-in-action language by watching the modeling." Interestingly, her self-efficacy score to teach others declined, although not remarkably (6.91 to 6.55, on a scale of 1-7).

Because of this question of validity, the practice of using teacher self-reports of knowledge change could erroneously gauge a professional development's worthiness, particularly when used in isolation. In this study, this claim is backed up by two specific cases. Mismatches were found between objective tests of knowledge and participants' perceptions of their knowledge gain.

For example, Kate greatly increased her conceptual knowledge (5.33-7.33, on a scale of 1-9) scores along with her attitudes about reading instruction (56-75, on a scale of 16-80). She spoke of how she was already, albeit unknowingly, using these strategies and her excitement to share her newfound knowledge with others. However, Kate scored a "0" on her pre-professional development metacognitive modeling video sample and did so again on her post sample, suggesting that Kate's knowledge did not increase in her ability to apply her knowledge. When asked about her changes in the pre- and post-professional development metacognitive modeling sample videos she spoke of adding more background knowledge to her modeling. Self-awareness of her confusion becomes

more evident, though, when she attempted to explain the differences between content-area literacy instruction and disciplinary literacy instruction during her interview, "Truthfully, I still have to stop and think about it."

Additionally, Aaron, whose conceptual knowledge pretest increased (5.66 to 7.00, on a scale of 1-9) and whose confidence to implement (5.4 to 6.00 on a scale of 1-7) and to teach others to do so (4.91 to 5.64, on a scale of 1-7) also increased, expressed belief that his performance score in his metacognitive modeling sample video also increased. In fact, it went up only one point from 0-1 (on a scale of 0-3). When he compared his first and second videos, he noted, "So, I noticed a real change from the ways I approached the text from before and after the seminar." Like the first sample, he never read the text at hand, so he never modeled his metacognition in comprehending the text.

The issue of misreporting is easily applied to the participants' self-reports in their attitudes, beliefs, and self-efficacy reports, along with their claims for use in the classroom too. If Guskey's claim (2002a, 1986) that belief changes only occur after implementation and practice in the classroom, then the only true way to know change in these domains occurs is through observation of this in the classroom (Stern & Keislar, 1977). This would reflect not only classroom implementation but, particularly in ongoing observation, any changes in overall attitudes and beliefs as evidenced by displayed attitudes about teaching and learning. Observers must remember, however, that beliefs are internal, and varying beliefs may influence attitudes. Observers must also remember

that classroom implementation can be resultant of changed attitudes, beliefs, and/or self-efficacy or can be merely a show of compliance.

Evidence to a mismatch between reported belief claims was evidenced through interview. One participant in this study, Rachel, contradicted her claims of more learner-centered beliefs with her expressed feelings of needing to be an *expert*, while others understood that the act of thinking-aloud requires vulnerability and a risk of being wrong or being challenged by a student.

In regards to efficacy self reports, the majority of this study's participants, reported increased self-efficacy in both their ability to use the instructional strategies for building metacognitive skills and in teaching their teacher candidates and in-service teachers to do so with their secondary students. In fact, correlational data showed that as efficacy to use the strategy themselves increased, so did their efficacy to teach others. Guskey (1986, 2002a) supports this notion when he says practice necessitates change in several of the change domains such as self-efficacy, beliefs, and attitudes. On the other hand, skewed self-reporting could come from their observation of the facilitators' examples and the learners' perceived likelihood of being able to do the same thing (Vroom, 1964). Although this increases motivation, Schunk (1991) warns that increased self-efficacy by vicarious experiences can be jeopardized by experienced personal failures.

In this study, two participants reported great increased degrees of self-efficacy for both implementing these strategies themselves and teaching others to do so. Kate and

Aaron, whose interview responses in terms of self-efficacy or knowledge change from pre- to post- professional development suggested that they learned more than they could either explain or apply through their metacognitive modeling video samples, reported their degrees of self-efficacy to be much higher than pre- professional development. However, their video scores support the idea they are not using the think-aloud instructional strategy as prescribed by disciplinary literacy experts and the professional development facilitators specifically. These are two cases of self-reported overconfidence (Kruger & Dunning, 1999). With further professional development and/or with failed attempts on their part, they may become aware that they do not know as much as they believe, based on their scores, at this time.

Given the increased levels of self-efficacy, it would seem probable that most would move forward and at least attempt implementation in the classroom. In fact, Tschannen-Moran and Hoy (2001) and Guskey and Passaro (1994) claim it is necessary for initial and continued classroom implementation. For the majority, that probability came true. However, as previously mentioned, for some it did not, at least not for immediate implementation. One negative correlation found in this study between high self-efficacy measures and intent to implement right away validates the positions of de Laat and Watters (1995) and Collopy (2003), who claim that sometimes those with high self-efficacy will not immediately implement changes in their classroom. Two participants, Sarah and Susan, said that they had not implemented these strategies in the five months since they took the professional development because it was not something

they felt was needed in their class at the time. They both intended to do so in the fall 2013 semester. Susan did not feel this instructional strategy was appropriate for any of her fall 2013 classes but intended to use it with her pedagogy class in spring 2014. Instead of immediate implementation, these participants put away their newfound knowledge for later and appropriate use to be used as a strategy to solve a problem rather than implementation without academic reason.

Participant struggles and tensions. Teacher change is also impacted by their professional learning experiences. The purpose in professional development is to bring about change in several domains: knowledge, attitudes, beliefs, self-efficacy, and classroom practice. The most foundational of these desired changes is knowledge. Without knowledge gain, any changes in the other domains are likely not valid because they are based on lack of, or false, knowledge, as evidenced by Kate who expressed that she learned a lot and felt very confident to use the think-aloud instructional strategy but did not increase her metacognitive modeling performance score.

Barriers to professional development success, as valued by classroom implementation and related student success, is easily identified by observation and interviews with teachers, and often include time, money, resources, incongruence with needs, and lack of valued importance (Buczynski & Hansen, 2010; Yilmazel-Sahin & Oxford, 2010; Sunal et al., 2001; Ertmer, 1999; Skeff et al., 1997). Sometimes, however, the biggest barrier to change in the classroom is the aforementioned teacher learning.

Several struggles to learning were identified in this study. Three of these were directly related to the professional development design.

Outside developments. Learners of all ages have lives outside professional development, which may affect their ability to learn (Mezirow, 1991). In the case of this professional development, more than half of the original participants signed up to take the seminar failed to complete it, either dropping out all together, or simply failing to engage and interact. Some dropped due to overwhelming professional commitments at their institution, including grading and serving on committees, leading to lack of time for participation. Others noted unexpected family issues or personal illness as reasons why they dropped or became significantly behind in their work. This, itself, provided additional issues for those who stayed because of the way the professional development was designed to include collaboration and communication with colleagues.

Lack of structure. This professional development was designed based on the established guiding principles of what elements constituted best practices in both face-to-face and online professional development. Some of these included opportunities for reflection and practice, modeling example videos and discussions, and individual and whole group activities. Unfortunately, there was no accountability to complete tasks by a certain time, leaving many unprepared to participate in discussions or the paired or group activities at the same time as their assigned partners and groups. This lack of accountability was purposeful as the professional development facilitators felt that participants would possess an internal sense of accountability and not fail their colleagues

who were depending on them. This is an assumption Cranton (1994, 1996) and Candy (1991) warn is not safe. Like Lebec and Luft's (2007) study, several participants simply withdrew or participated partially. Without accountability constructs, such as a timeline for completing activities, many of the research participants felt that their learning was impeded. Participants were asked if they felt the technology impeded or helped their learning and Jacob replied, "No, my learning was impeded by the lack of a schedule." Not only could they not collaborate with others, but also peer feedback (Hunzicker, 2010) and collective reflection (Zeichner & Liston, 2010) were diminished.

Lack of Feedback. Another missing element, one identified as a best practice and a high-quality element in the professional development literature (Ingvarson et al., 2005), was facilitator oral or written feedback. Feedback provides bridges for continued thought and growth (Schunk, 2004; Brown et al., 1989) and can increase or decrease motivation (Deci & Ryan, 1985; Ryan & Deci, 2000). While discussed, the project facilitators felt that learning would/should come from within learner communication and collaboration, such as in the "Gems and Jewels" activity in which group members provided feedback to each other's video sample submissions and their moderation and facilitation of group discussions. Two additional facilitators, former professional development participants, were hired to help provide moderation and discussion facilitation. However, one of these facilitators herself became inactive due to a family crisis. The other admitted not understanding fully what her job function entailed. All became bogged down by their outside developments and the lack of structure issues which caused disjointed discussions

that simultaneously stretched across several modules. Knowledge feedback was given at the end of the post- conceptual knowledge survey, in which the participants received feedback to each question answered incorrectly and their total scores. However, several commented on their wish that the facilitators provide feedback to their video samples.

On the other hand, as noted, opportunity for peer feedback was provided and for those who were able to participate with assigned peers and groups, it was often used and appreciated. This was noted by several, including Aaron, "It would have been challenging if my partner hadn't been here." Another participant, who was not as fortunate stated, "The challenge I found was the partner work. That was really frustrating for me. The woman I was partnered with initially decided to withdraw. That was a source of anxiety." This collaborative activity is important for participant learning success, as learning is strengthened by opportunities to learn from each other (Hunzicker, 2010).

Technology. Because this was an online professional development, the use of technology was inherent and unavoidable. However, technology can present barriers for success (Treacy et al., 2002; The National Research Council, 2007; Reeves & Li, 2013). Some enjoyed using and learning about the technology tools, stating plans to use them in their classes; while others added they simply were not "a video person" or inclined to like technology. Common issues and frustrations reported by the participants at the beginning of the professional development included access to the 3rd party applications used, such as VoiceThread and Google Docs. Once these issues were resolved, most participants felt the technology in and of itself did not interfere with their learning. Some notable

exceptions include one participant, Kate, who could only provide audio samples and not video samples of her metacognitive modeling because she did not have access to a webcam. The facilitators deemed this issue unimportant. Kate noted that she could also only get 2-3 of the 23 videos provided in the professional development to download or stream onto her computer, although she did not report this until after the professional development was concluded. Because of this, she rated the metacognitive modeling video examples as only a 2-3 in their impact on her learning. This fact alone likely played a large role in the discrepancy between Kate believing she knew what she was doing when her metacognitive modeling samples, which received scores of zero both pre- and post-professional development, suggest otherwise. Similar technology issues were reported in Reeves and Li's (2013) study.

Misalignment of professional development philosophies with existing beliefs and attitudes. Most participants came into the professional development with mostly balanced beliefs between learner-centered and non learner-centered beliefs. Most ended with slightly more learner-centered beliefs, but overall change was not significant. This possible misalignment of their beliefs and attitudes with the underlying professional development philosophies may have interfered in their knowledge growth as evidenced with contradictory statements such as "I feel I need to be an expert," "One needs to a have a great deal of background knowledge," and confessions such as,

> I probably wasn't supposed to do this, but because I am a professor I had to go in with huge background knowledge and I did a lot of research for both of them. For

> one thing, I didn't remember any of the dates for the Stamp Act and I don't know, I probably spent 30 minutes trying to figure out who on earth John Hughes was. (Interview with Eugenie, 3/29/14)

Statements such as these show that these participants did not absorb the truest tenets of metacognitive modeling via think-aloud instructional strategies because proponents of this strategy in disciplinary literacies would embrace the idea of going in without a great deal of background and expert knowledge with the particular text, or concepts within the text, in order to show their metacognition using reading strategies in an truly authentic way (Schoenbach et al., 2012). Rather, discipline experts would use their expertise to attack the unfamiliar text and its content from their specific discipline perspective.

Modeling, by itself, is believed to be sage-on-the-stage act and goes counter to any facilitator role beliefs and attitudes. This is believed by students, and often by the teachers themselves, such as seen through the comments above thus creating a tension between one's beliefs and what one is learning. By making the modeling as authentic as possible and enhancing it with cycles of student practice and feedback and general discussion, including opportunities for challenge, this proposed instructional strategy does play an integral part in a facilitator's role. This tension will only be reconciled with additional knowledge, practice, and an understanding that the use of direct, explicit instruction is not always counter to constructivist and learner-centered beliefs (Mayer, 1999).

Original levels of self-efficacy. Levels of self-efficacy and confidence can be a result of knowledge gain. However, it can also prevent knowledge gain and the development of even higher levels of self-efficacy via experience, particularly when learning relies on the experience. In this study, one participant, Victoria, responded, while comparing her pre- and post- professional development metacognitive modeling video samples, that she did not feel she did as well because she was intimidated by the webcam and just does not "do well performing on video." This was not a technological issue, as she encountered no problems using the technology, but rather she simply felt uncomfortable performing on video. She did feel, however, that she did better in front of her students. In Victoria's case, tension due to her fear of the webcam, or recording herself, did not interfere with her knowledge gain. Her video score increased from 0 to 3 (on a scale of 0-3), and her conceptual knowledge score increased from 6 to 8.33 (on a scale of 1-9). Many reported a sense of vulnerability in modeling either on video or in person. One worried about my opinion in viewing the videos, while others worried about student reaction, and the potential to be *wrong*. However, all reported the need to move past their fear. Although self-efficacy did not become problematic in participant learning in this study, the statements illustrate the potential if one was so self-conscious they simply could not attempt practice or implementation.

Acceptance or rejection. Roger's (2003) general change theory, along with Fullan (2007), Guskey (2002a), Cranton (2002), and others all express that change is not linear, but rather a cyclical process. Everyone facing change has to go through a process of

acceptance or rejection, and may do so several times changing their viewpoints as more information is learned and opportunities to practice yield favorable or undesirable results. Originally formed for understanding the learning development of children, the Piagetian theories of assimilation and/or accommodation apply to adult learners as well, in this case higher education instructors, as they go through a process of "equilibration" (Piaget, Brown, & Thampy, 1985). Each time a learner is faced with new knowledge, their cognitive equilibrium on the subject is upset, and "the cycle of equilibrium, disequilibrium, and reequilibration thus goes on" (Kamii, 1986). It is likely that the participants in the professional development moved through this cycle multiple times, and will continue to do so if/when they attempt to integrate the use of the metacognitive modeling think-aloud instructional strategy in their classrooms.

A-Ha *moments*. Transformative learning theories (Cranton, 2002; 1994) suggest true change is transformative and necessitates the transformation of beliefs and attitudes. It is often not a singular event, but a series of small a-ha moments combined to create a singular, big a-ha moment of change. Cranton (2002) and Veletsianos (2011) warn that transformation cannot be imposed via professional development. As mentioned, Guskey (2002a, 2000, 1986) and others believe these do not change until some time after professional development.

While lasting, significant change cannot be predicted following this singular professional development event (Veletsianos, 2011), little a-ha moments for some of the participants did occur as evidenced through interviews, providing hope that these might

build to bigger and truly transformative change in attitudes, beliefs, self-efficacy, and classroom implementation. These a-ha moments come from deep, critical reflection (Cranton, 1996) of experience. One participant, when asked what plans she had developed for implementation of the instructional strategy with her students, realized while answering that she had not considered the necessity of using the approach with her pedagogy class "of all classes." She had used the strategy with English I students and planned to teach the strategy to her pre-service teachers but until that moment had not planned to model it for them. She added her understanding that in order for them to successfully do a think-aloud, she needed to show them one.

Another participant changed her value of metacognitive skill development when she used her own metacognitive awareness to comprehend a dense legal document. In recognizing the strategy worked for her, she was adamant that the development of metacognitive skills was critical for all readers.

Finally, several of the participants who felt somewhat self-conscious or vulnerable when modeling their metacognition in front of their students, realized that for this task dropping their preconceived notions of *being the expert* had to change. "You have to just put yourself out there," said Sam. It was not something they would normally feel comfortable doing, but for the purposes of this instructional strategy, they realized the importance of letting their expert identities go. This was certainly not true of all of the participants, particularly the three who mentioned specifically the needs to have "an

arsenal of background information" or become an expert before they modeled by doing extensive research on the topic from the reading they planned to model.

The reality of teacher change as a result of this professional development is still unfolding as to be expected (Cranton, 2002; Veletsianos, 2011). It is not yet clear whether these little a-ha moments will lead to bigger, truly transformative change. It is not yet clear whether the self-reported changes will withstand the test of time, implementation, and reflection. As in the case of most professional development, the full story will likely never be known. To come close to knowing the full story, extensive, long-term follow-up would be needed including continuous observations, reports, and analysis of student performance for both the teachers as learners, their students, and ultimately the secondary students as the final recipients of this knowledge and metacognitive skill development.

The value of metacognitive modeling in this professional development

All participants experienced growth in knowledge, either in their conceptual understanding through the pre- and post- knowledge surveys, and/or in their application as evidenced by performance in their post- professional development modeling samples. Additionally, although only one correlation was found between participants' perceptions regarding the value of the metacognitive modeling video examples provided by the professional development facilitators and their changes in knowledge, beliefs, attitudes, self-efficacy, and classroom implementation plans, 7/10 participants rated the videos a 4 or 5, "Nearly integral" or "Integral to learning." Eight of the ten participants ranked the videos

at “4” or higher of the nine design elements in terms of effectiveness, often falling behind the readings and activities, provided their partners had kept up or not quit.

One participant, Eugenie, considered them somewhat “elementary,” but later admitted that they at least provided examples of what she did not want to do in her classroom. Additionally, Rachel rated them the lowest giving them a “2” and ranking them as 8/9 in importance to her learning. Her complaint was that the same texts used in the metacognitive modeling videos were used for participant sampling and this made it too easy for the learners. On the other hand, participants such as Sam and Ivy discussed how they liked that they could rewind and watch the videos again. Victoria stated, “Personally I found it very effective, because I could re-watch the videos.”

One correlation found was between the rate given metacognitive modeling example videos as integral to learning and participants’ increased self-efficacy to teach others the same strategy. In all cases, regardless of how they rated or ranked the example videos, participants repeatedly referred back to them suggesting that the video samples were an important element in their learning whether they chose to acknowledge it directly or not. According to cognitive apprenticeship theorists this is because they were shown how to model metacognition, not simply told how to do so (Brown et al., 1989; Collins et al., 1991).

In Chapter 3, I identified three main propositions to my questions. The first, that metacognitive modeling would help facilitate movement through the change process is accurate. The metacognitive modeling provided opportunities for observation of practice. Three participants placed additional value on the video platform in that they could rewind and replay the videos, providing repeated observations. By providing opportunities for observation, participants gain valuable vicarious experience (Bandura, 1971/2006, 1977,

1986). Experience leads to learning (Dewey, 1933). Observation, as a professional development design element, is considered to be a *high-quality* component (Darling-Hammond & McLaughlin, 1995; Wei et al., 2010).

The potential for cognitive apprenticeship in professional development

The results of this study support the findings from previous studies that look at cognitive modeling as instructional strategies in professional development. Cognitive apprenticeship, as an underlying learning theory in professional development, is not new. Nichol and Turner-Bisset (2006), Gorrell (1993), Gorrell and Capron (1990) used the ideas of cognitive apprenticeship (e.g., modeling via think-alouds) in their professional development studies. Glazer and Hannafin (2006) and Browne and Ritchie (1991) put forth models of professional development design grounded in cognitive apprenticeship theories. Cognitive apprenticeship as a model of professional development appears often in technology related professional development (Glazer, Hannafin, Polly, & Rich, 2009; Collins, Beranek, & Newman, 1991; Shrum, 1999; Browne & Ritchie, 1991). Vrasidas and Glass (2004) discuss the success of cognitive apprenticeship frameworks in their online professional development design. Original cognitive apprenticeship proponents and theorists suggest a cycle of modeling, coaching, scaffolding, articulation, reflection, and exploration, and rely on learner collaboration and communication (Collins et al., 1989). In the case of this professional development topic, modeling metacognition

through think-aloud strategies provided a primary way for participants to learn to think in a discipline-specific way (Jetton & Shanahan, 2012).

Earlier, several high-quality professional development characteristics or elements were identified from the literature. The following table shows these characteristics, which ones are embedded within cognitive apprenticeship frameworks, and how they were addressed in this professional development design.

Table 22

Relationship Between Identified HQ PD Design Elements, Alignment With Cognitive Apprenticeship, and Alignment Activities

Identified HQ Professional development design elements	**Cognitive apprenticeship embedded element?**	**Professional development activities**
Intensity		
Reflective	✓	Participants kept journal and Bright Ideas lists for individual reflection opportunities; discussions allowed for group reflection.
Collaborative	✓	Partnered and whole group activities were provided in each module, along with opportunities for discussion around video examples and selected topics.
Ongoing		The anticipated time for participant completion was forty hours over a 3-4 week period.
Collective Participation		
Follow-up (mentoring, coaching)	✓	
Active learning	✓	Several individual, partnered, and whole group activities were provided along with opportunities for practice.
Opportunities for observation	✓	Metacognitive modeling videos and observation of group members' sample videos.
Coherence with standards	✓	The concepts within this professional development were explicitly aligned with the CCRI
Feedback	✓	While not provided by the PD facilitators, participants were provided feedback by each other. Ideally, however, the experts should also provide this.

Table 22 (continued)

Modeling	✓	Metacognitive modeling videos. These examples showed both good and not so good examples of practice.
Participant ownership		
Content-focus		Participants were often encouraged to answer, contribute, and interact based on their own discipline-specific needs.

In this study, metacognitive modeling was not offered in isolation. The other elements of this professional development that are aligned with cognitive apprenticeship theories include opportunities for practice, discussion, collaboration, and reflection (See Table 22). These other elements ranked high, sometimes higher than the metacognitive example modeling videos, especially among those with opportunities to engage in collaboration with colleagues. The videos provided both the modeling and observation opportunities.

Ideally, any professional development is going to offer several of these high-quality design elements. Like any good teacher, a teacher educator is going to consider the context and needs of his/her learners as they consider learning theories and activities to include in their professional development. By blending or using a complementary set of learning theories as foundations to professional development design (Couros, 2010), educators can reach a larger number of learners. Cognitive apprenticeship naturally

blends theories as it stems from social cognitive theory, constructivist, and socio-constructivist paradigms.

Identified professional development limitations included a lack of feedback by the professional development facilitators, lack of structure, and technology related issues. Feedback was only provided to the post- professional development knowledge survey when it was critical to provide expert feedback on participants' performance in the post-professional development metacognitive modeling sample. The lack of structure, or a timeline for activity completion interfered with participants' abilities to collaborate with peers and learn from each other. It is imperative to include consideration of these elements in future professional development design.

Limitations and Rigor

As often the case, this study encountered a few limitations. This section highlights these limitations and the ways in which qualitative rigor was ensured.

As already identified, the use of instructor self-reporting of changes to knowledge, attitudes, beliefs, self-efficacy, and classroom implementation is problematic for a variety of reasons. To further validate those self-reports, objective scores were applied to knowledge surveys and scored metacognitive modeling samples submitted by the research participants. Correct answers, feedback based on given answers, and rubrics for scoring were provided by the professional development facilitators. Additionally, interviews were used to verify and expound on the change trends observed and reported.

Another limitation was defining the term, metacognitive modeling. The term is somewhat ambiguous in most literature in terms of observable behavior. The use of the

rubric provided by the professional development facilitators helped provide schema to better understand the expectations of these teacher educators. Through discussion between facilitators, it became apparent that the majority of those who were modeling metacognition best were those who were consistently using "I" statements, modeling the use of, not teaching about, various reading strategies, in a true, authentic way. For many of the participants there was a duality to the metacognitive component. Not only were they thinking about their reading processes, developing their own metacognitive skills, but they were thinking about their practice of elucidating those processes, a kind of reflection-in-action (Schön, 1983) opportunity. During interviews, there was oft-mentioned concern whether they were doing it correctly and awareness that the thought was constant while they were modeling.

Incomplete participation and resulting small group size was a third limitation. Originally, 23 people of the 32 signed up to take the disciplinary literacy seminar agreed to participate in the study. Due to various factors, seminar participants dropped out, many of who were also research participants. Like the participants in the Lebec and Loft (2007) study, participants who notified the facilitators they would not complete the seminar often cited lack of time as a barrier, and the professional development facilitators often suspected lack of accountability, particularly for those participants who quit without notice. Of the thirteen remaining participants, only ten completed all of the research requirements. This small group size made finding any correlations difficult and entirely un-generalizable. On the other hand, the small group size made it possible to conduct interviews with each participant and gather rich data from each to tell their individual and group stories of learning and change.

Finally, the goal of this study was to determine the impact of the metacognitive modeling video examples provided by the professional development facilitators on participants' changes in knowledge, attitudes, beliefs, self-efficacy, and classroom application. However, professional development cannot and should not, contain a single design element, making testing of an isolated variable rather difficult. Regardless of the study's goal, the design of the professional development needed to include best practices already highlighted in the literature, as the ultimate goal of professional development is to ensure learning for participants. It would be inappropriate to jeopardize learning for research. Between the small number of participants and the inclusion of several elements in addition to the one being studied, a reliance on participant perception of element importance to learning was necessary.

Future Research Recommendations

This study examined the experiences of eight teacher educators and two non-teacher educator higher education instructors as they journey through an online professional development event which utilized several previously identified high-quality professional development design elements with special attention to the use of metacognitive modeling as an instructional strategy to teach metacognitive skill development. Findings suggested that metacognitive modeling via think-aloud instructional strategies delivered via pre-recorded video could be effective and integral to learning, but with such a small sample, further investigation is warranted.

As a case study, it looked at both the individual and group experiences in an authentic setting. It was also, though, an evaluation of a singular professional

development event, which critics say differs from true research (Lawless & Pellegrino, 2007; Borko, 2004; Guskey, 2000). Primarily this critique is concerned with research stopping at mere evaluation. Evaluation is an important aspect of professional development research (Guskey, 2000), but it must go further (Lawless & Pellegrino, 2007; Borko, 2004). This study endeavored to go further by providing rich, contextualized narratives about each participants' experience as a learner in this professional development and their initial use, or plans for use, of the learned instructional strategies in their courses.

The three-stage approach to professional development research (Borko, 2004) would be a good approach in any continued research to this initial study. To apply Borko's (2004) 3-stage research approach to a study such as this, the same professional development would be repeated and evaluated across multiple instances for the 2nd level. For purposes of generalization, this professional development would be further evaluated across multiple instances *and* contexts with particular attention given to the audience itself. It is difficult to predict success of any given professional development characteristic and its impact on consequential change when different audiences come from varying backgrounds with varying preconceived notions (Veletsianos, 2011). Particularly in the case of attitudes and beliefs, as seen in this study, beliefs and attitudes maybe validated rather than changed (Veletsianos, 2011) or may simply have yet to develop (Guskey, 2000).

In the third stage, the use of metacognitive modeling should be applied in a different contexts and learning goals. For example, in this professional development, the learning goal included participants learning how to illustrate their metacognitive reading processes through think-aloud modeling. In other professional development, metacognitive modeling could be used to illustrate how one should think during the act of reading legal documents, for example, or any other desired objective.

However, varying contexts should not include change of professional development delivery platform. In this study, the use of metacognitive modeling as an instructional strategy was delivered via pre-recorded video and relied on participants' choice to use those videos. As reported by participants, the ability to rewind and re-watch those videos was critical to their learning. In a face-to-face setting, the use of live modeling, would remove that ability, but provide opportunities for the facilitator to make changes based on participant reaction, or allow for participant questioning.

On the other hand, an evaluative comparison of professional development events by delivery platform could be an interesting contribution to research. While the Fishman et al. (2013) study did a similar comparison, it was not specified if any changes in the execution or delivery of the other things varied by modality as well. In other words, in this study, a face-to-face group would still embark on discussions around videos but it would likely be conducted at the table they all sit at rather than on VoiceThread. A comparison of effectiveness by modality would be interesting and contribute greatly to

the body of research, but must consider all the inherent aspects of the two modalities including how activities and discussions would be carried out.

Finally, as previously noted, many of the desired changes are not likely to appear until ample opportunity for practice, implementation, and reflection-on-practice (Schön, 1983) have occurred, specifically attitudes and beliefs change (Guskey, 2000, 2002a). Observations in the classroom can validate or contradict reported claims of attitude and belief change. In addition to the 3-phase evaluation process, with consideration to varying context and audience, professional development research should look beyond the professional development event and the immediate aftermath, and look at changes several months later after implementation and reflection have occurred. In addition to contradiction, it may be discovered that a participant's feelings simply changed after a period of time because another innovation or strategy came along that seemed to be a better fit, or because the implementation was a failure during its confirmation period (Rogers, 2003).

Needed Change in Professional Development Design and Goals

Literature has already identified and promoted the need for *change* in professional development design and, in particular, delivery. We also know that while most providers seek change (Guskey, 2000) and transformation (Cranton, 2002) as their primary goal, it is neither easy to establish (Cranton, 2002; Veletsianos, 2011) nor easy to measure because *change* can be cyclical, rather than linear (Rogers, 2003; Fullan, 2007), and takes much longer than most professional development events last (Guskey, 2000, 2002a,

Postareff et al., 2007). Practice and time to fully assimilate or accommodate (Wiske et al., 2006) is needed to complete transformation (Cranton, 1994). We also know that professional development must address not only CK knowledge, but PK knowledge as well (Shulman, 1986). In the case of professional development focused on technology integration, Mishra and Koehler (2007) add the additional elements of TCK and TPK. On top of this, professional development needs to provide activities and experiences that either validates the beliefs and attitudes that are foundational to the content being taught, while knowing that these activities and experiences will only be a start. Any validation or transformation will occur sometime after participants have had time to go through a confirmation period (Rogers, 2003).

A great amount of professional development today, regardless of platform, tends to provide basic content knowledge in a lecture or presentation format, rather than utilize and consider any of the andragogical or adult motivation considerations found throughout literature. Perhaps this is because a number of professional development providers are K12 teachers themselves or come from a K12 teaching background, and they are teaching their colleagues in much the same way they taught their children. In truth, most professional development providers likely do not give much thought to the design of professional development, which explains why so many teachers are still encountering the 45-minute after-school specials (Wei et al., 2010).

In this professional development, several andragogical and motivational considerations were taken. Realistic goals were set and built-in, concrete experiences

with consideration to diversity in interest, via choice of reading material in the last metacognitive modeling video sample, was embedded, along with peer support, through feedback and discussion, and small group activities. Additionally, participants were given information in a variety of ways including reading materials, videotaped lecture, and metacognitive modeling example videos. The inclusions of these considerations fulfill Speck's (1996) suggestions. Meanwhile, there was ample opportunity for reflection (Zeichner & Liston, 2010; Tate 2009; Dennin, 2007; Collins et al., 1991; Darling-Hammond & McLaughlin, 1995, Schön, 1983; Dewey, 1933) through the Bright Ideas and Journaling activities. The use of the instructional strategy, metacognitive modeling via think-alouds, attempted to solve the identified problems in which adolescents were struggling to accurately and deeply comprehend text from various disciplines, thus meeting Knowles and colleagues (1998) "Need to know," "Orientation," and "Readiness" domains.

Critical missing pieces to the design of this professional development include lack of feedback from the facilitators, lack of coaching/mentoring after the professional development event (Speck, 1996), lack of consideration for prior experiences (Knowles et al., 1998), and the assumption that "Self-concept" and "Motivation" (Knowles et al., 1998) was already established.

Post- professional development coaching/mentoring was not planned due to monetary constraints of the CCRI. However, facilitator feedback was planned. Facilitators did attempt to facilitate discussion, but feedback for activities and practice

fell through and several participants noted this. The assumption that "Self-concept" and "Motivation" were already inherent in the participants was likely the biggest issue to the degree of success of the overall professional development in terms of participant retention.

Participants who lost their partners due to drop-out and incompletes were vocal about their issues with one participant, in particular, noting that losing her partner "was a source of anxiety" for her. The professional development providers felt that university-level faculty were autodidaxical (Cranton, 1996; Candy, 1991) in their choice to sign up for the professional development. They assumed that the participants were driven by their individual desires and internal motivation to learn, and thus their degree of personal accountability, or their "Self-concept" (Knowles et al., 1998) was high. Over half of the original registrants either never began the professional development sequence or dropped out during the ensuing weeks, some citing barriers such as time and personal matters, and others providing no communication at all. Many of these barriers are well documented in professional development literature (Ertmer, 1999; Sunal et al., 2001; Smith, 2003; Skeff et al., 2007; The National Research Council, 2007; Buczynski and Hansen, 2010). These issues are examples for the "problem of complexity" discussed by Hammerness et al. (2005). While some of these cited reasons might be true, it might also be that the participants came into the professional development with low self-efficacy, which Schunk (1991) and Bandura (1986) would contend suggested a lesser degree of motivation. On the other hand, those who stayed may not only have come in with strong

self-efficacy, but with increasing Expectancy Value for the concepts as they realized, "this is doable" (Vroom, 1964). In fact, one participant, Victoria, said about metacognitive modeling in terms of expectancy value for her students, "I think what it does is create a mind frame that says I can do this. I can do what she did in the think aloud, I can understand this, I can master this." She added that that was what the metacognitive modeling example videos did for her as she worked her way through the professional development.

Research has begun to identify effective professional development elements, or characteristics. This study contributes to that research base specifically for online professional development and literacy focused professional development by showing that metacognitive modeling via think-alouds delivered through pre-recorded video can be done effectively in an online platform.

Knowing that both content and pedagogical knowledge is needed, along with addressed andragogical and motivational considerations, perhaps the ultimate goal of professional development should not be just the conveyance of an innovation, program, technology tool, or instructional strategy and how to use it, but how to use it in context relative to theirs' and their students' specific needs. Understanding of pedagogical applications of an innovative tool or practice help to ensure that the innovation is being used in a way that is not disruptive to learning, but rather facilitates learning, therefore increasing chances for confirmation. Change, as Cranton (2002) states, should not be the only goal of professional development. Professional development designers should

reconsider the immediate goal of professional development to include the content, pedagogical, and, if needed, technological knowledge *and* experiences for growth needed to bring about the desired philosophical change that, if not already aligned to underlying philosophies supporting the professional development topic, is needed for permanent change in classroom practice.

Appendices

Appendix A: Knowledge Pre- and Post-Survey

*Note: In the pre-survey, participants were not given feedback to their answers. In the post-survey, they were given feedback to each question and a total score.

1. Which of the following statements best describe 'Disciplinary Literacy'?
    a. Disciplinary literacy is synonymous with content area literacy in which reading is taught within the general content delivery.
    b. Disciplinary literacy uses specialized instructional approaches and reading strategies that are effective across disciplines.
    c. ✔Disciplinary literacy is focused instruction aimed at boosting one's ability to read/write/think/listen/speak in the discourse related to a specific discipline.
    d. An advanced form of the traditional content area literacy, disciplinary literacy looks heavily at the development of discipline-specific isolated vocabulary.
2. Which of the following statements best describes the differences between approaches to develop disciplinary literacy vs. the typical approaches utilized in content area literacy?
    a. Disciplinary literacy approaches provide strategies that are specific to disciplines while content area literacy approaches are more generalizable.
    b. Disciplinary Literacy approaches increase one's ability to think like a practitioner within the field (e.g., a historian, a chemist, a mathematician), while content area literacy approaches aim to increase comprehension of reading by applying generic reading strategies
    c. Disciplinary literacy involves the use of discipline-specific literature, whereas content area literacy utilizes the use of remedial reading materials to improve reading skills.
    d. ✔Content area literacy addresses general, basic reading skills needed to remediate reading difficulties, while disciplinary literacy is aimed at improving discipline-specific comprehension skills.
3. Which statement best differentiates reading strategies and instructional strategies?
    a. Instructional strategies, such as the use of graphic organizers, are those used to guide students to use various reading strategies.
    b. Instructional strategies are those used to explicitly explain, illustrate, and develop reading strategies and include such strategies modeling, scaffolding, use of graphic organizers, etc.

c. ✔ Reading strategies are those learners use when reading, while instructional strategies are those instructors use to teach.
d. Reading strategies are instructional strategies and vice versa.

4. Which of the following is an example of an instructional strategy?
    a. Ask questions
    b. Think-alouds
    c. Rereading
    d. ✔Summarizing
5. Which best defines cognitive modeling?
    a. Cognitive modeling is the act of performing a task in front of the students.
    b. Cognitive modeling is the act of making audible your thinking processes specific to the task while performing the task in front of the students.
    c. ✔Cognitive modeling is the act of describing actions while performing a task in front of the students.
    d. Cognitive modeling is the act of describing the actions/tasks needed to complete a final product while providing an example of the final product in front of the students.
    e. Cognitive modeling is the act of behaving in a way consistent with desired behavioral outcomes for the student.
6. Which of the following best defines instructional scaffolding?
    a. ✔Instructional scaffolding is the practice of creating structured steps to learning that should be mastered before advancement.
    b. Instructional scaffolding is the preparation of easy to most difficult materials designed to advance learning to ultimate objectives.
    c. Instructional scaffolding is the temporary support of an individual student as he/she progresses in learning towards mastery of an objective
    d. Instructional scaffolding is the creation of tiered and individualized expectations in the development of knowledge/performance objectives for individual learners.
7. Which of the following scenarios best illustrates an example of cognitive modeling?
    a. A horse farrier and his young apprentice are preparing to shoe a horse. The horse farrier says “Do what I do, kid” and begins the process of shoeing the horse’s front right leg, while expecting the apprentice to begin shoeing the front left leg of the nearby horse. The farrier whispers gently to the horse reassuring her as he begins at her withers and moves down her leg toward her fetlock to lift her leg. He commands, “up.” He puts her leg between his thighs and grabs a tool to remove a rock he’s found. When that doesn’t work, he grabs another tool. Then he finds a tool to begin taking away the nails from the horseshoe.
    b. A horse farrier and his young apprentice are preparing to shoe a horse. The horse farrier says while he is working, “Watch and learn, kid. Unlike

Prince, Sally is a temperamental horse. You know how with Prince, you can just grab his leg? She doesn't like it when you grab her leg. You must talk to her gently (softening his voice but still addressing his apprentice) and pet her beginning at her withers down her shoulder and leg until you reach her fetlock, else she will kick you. Gently lift her hoof and say "up" and place her leg between your thighs like this. Then use this tool to remove any rocks, like this one here. If that doesn't work, use this tool. Next, use this tool to remove the nails from the horseshoe. You have to do it like this to get the folded over nails out."

c. ✔A horse farrier and his young apprentice are preparing to shoe a horse. The horse farrier says, "Just sit back and watch and listen to a pro." He snickers and then begins talking to himself while he pets her. "I need to make sure Sally is going to be okay with this. She can be a bit temperamental and tends to kick. Unlike Prince, who is used to having people touch his hooves. Is she thinking about kicking? Is she swishing her tail? Is she trying to sidestep me? All looks calm. OK Sally. I know you are a bit fearful of me touching your hooves. I promise to be gentle. I know you love me petting your withers, your mane. I'm going to move my hands softly down her leg to her fetlock just above her hoof and gently lift her hoof. I need to remember to stabilize her leg by putting the leg between my thighs. I need to keep my back straight and make my feet a bit pigeon-toed for a firmer grip. Gives me leverage too. And it is much harder for her to kick me that way! Oh, I see I have a rock to deal with, let's use this hoof pick tool to remove it. Hmm. This rock is really stuck. This hoof pick is too small for the job. I think I need to use a different, stronger hoof pick. That does it. Now I need to use a clinch cutter and hammer to loosen the horseshoe nails that are folded-over to hold the shoe in place."

8. What are the differences between the farrier's modeling approaches? (Text entry)

9. Read the following scenarios. Mark them as either A) a disciplinary literacy approach, or B) a content area literacy approach.

a) (CA) Dr. Smith asks his history class to read and listen to a selection of materials related to the America's Eugenics movement of the early 20th century. The students, in pairs, are then asked to synthesize the information presented by the materials to find commonalities and to prepare a visual that illustrates their conclusions.

b) (DL) Mr. Jones is preparing his high school students to read a dense article on a new topic—metamorphosis. Knowing that his students studied metamorphosis in earlier grades, he has his students individually fill out the first two columns of a KWL chart. (What I know, what I want to Know, and What I learned.) When they are done reading, they fill out the last column.
c) (DL) Mrs. Anderson is the middle-school geometry teacher. Every year her students seem to initially confuse words like "plane," "axes," "yard," "degree," and "coordinate." To begin her first day of school, she reads an elementary level book on homographs to her students, explaining that students may run into homographs throughout the course. She proceeds to explicitly teach the meaning of the words, using numerous examples from geometry.

Appendix B: Beliefs, Attitudes, Efficacy Pre- and Post-Survey

*Note: The post survey was identical minus the demographic questions

Thank you for agreeing to participate in this research study. The following questions ask basic demographic information, followed by questions regarding your beliefs, attitudes, and self-efficacy. At times, these questions ask you to reflect upon yourself and your teaching, while at other times, you are asked what you hope to transfer to your own teacher candidates.

D1 Are/Were you a certified K-12 teacher?

- Yes (1)
- No (2)

If No Is Selected, Then Skip to Have you had previous training in con...

D2 What level(s)? (You can check more than one.)

1. Early Childhood only (PK-K) (6)
2. Elementary (PK - 5th) (1)
3. Elementary (PK - 6th) (2)
4. Elementary (K-5) or (K-6) (7)
5. Elementary (1-5) or (1-6) (8)
6. Middle School (6-8) (3)
7. Middle School (7-8) (4)
8. High School (5)
9. Other (9) _____

Answer If What level(s)? (You can check more than one.) Early Childhood only (PK-K) Is Selected Or What level(s)? (You can check more than one.) Elementary (PK - 5th) Is Selected Or What level(s)? (You can check more than one.) Elementary (PK - 6th) Is Selected Or What level(s)? (You can check more than one.) Elementary (K-5) or (K-6) Is Selected Or What level(s)? (You can check more than one.) Elementary (1-5) or (1-6) Is Selected

D3 Which grade(s) have you taught?

10. Pre-K (1)
11. Kindergarten (2)
12. 1st (3)
13. 2nd (4)
14. 3rd (5)
15. 4th (6)
16. 5th (7)
17. 6th (in elementary or Intermediate setting) (8)

Answer If What level(s)? (You can check more than one.) Middle School (6-8) Is Selected Or What level(s)? (You can check more than one.) Middle School (7-8) Is Selected Or What level(s)? (You can check more than one.) High School Is Selected

D4 Which grade(s) have you taught?

18. 6th (in middle school/junior high setting) (1)
19. 7th (2)
20. 8th (3)
21. 9th (4)
22. 10th (5)
23. 11th (6)
24. 12th (7)

Answer If What level(s)? (You can check more than one.) Other Is Selected

D5 Which grade(s) have you taught?

25. Pre-K (1)
26. Kindergarten (2)
27. 1st (3)
28. 2nd (4)
29. 3rd (5)
30. 4th (6)
31. 5th (7)
32. 6th (in an elementary/intermediate setting) (8)
33. 6th (in a middle school/junior high setting) (9)
34. 7th (10)
35. 8th (11)
36. 9th (12)
37. 10th (13)
38. 11th (14)
39. 12th (15)

Answer If Which grade(s) have you taught? Is Greater Than or Equal to 1

D6 Were you ever self-contained, teaching all core subject areas? (e.g., Mathematics, Science, Reading/Language Arts, Social Studies).

- Yes (1)
- No (2)

If No Is Selected, Then Skip To Which subject(s) area?

Answer If What level(s)? (You can check more than one.) Middle School (6-8) Is Selected Or What level(s)? (You can check more than one.) Middle School (7-8) Is Selected Or What level(s)? (You can check more than one.) High School Is Selected Or What level(s)? (You can check more than one.) Other Is Selected

D7 Which subject(s) area? (You can choose more than one.)

40. Science (1)
41. Reading/Language Arts (2)
42. History/Social Studies (3)
43. Mathematics (4)
44. Arts (e.g., music, art, theater arts) (5)
45. Foreign Languages (i.e., French, German, Latin, Spanish, American Sign Language, etc.) (6)
46. Technology apps (7)
47. Special Education (12)
48. Other (9) _____
49. Other (8) _____

D8 How many years did you teach in K-12?

- None. I'm certified, but did not teach in K-12 (1)
- 1-3 years (2)
- 4-10 years (3)
- 11-15 years (4)
- 16-20 years (5)
- >20 years (6)

D9 Have you had previous training in content area literacy instruction?

- Yes (1)
- No (2)

D10 Have you ever taken an online course or online professional development?

- Yes (1)
- No (2)

D11 Gender?

- Male (1)
- Female (2)

D12 Age range?

- (1)
- 31-40 years (2)
- 41-50 years (3)
- 51-60 years (4)
- >60 years (5)

D13 How many years have you taught in university-level setting(s)?

- This is my first year. (1)
- 1-3 years (2)
- 4-10 years (3)
- 11-15 years (4)
- 16-20 years (5)
- >20 years (6)

D14 Which type of institution do you teach at presently?

- 4 year college/university (5)
- Community College (2)
- Professional Development School (3)
- Other (4) _____

Q1: For secondary discipline (e.g., history, government, civics, biology, chemistry, algebra, Theater Arts) areas, I believe strongly, AND want to pass this attitude to my teacher candidates, that:

Scale: Strongly Disagree to Strongly Agree. For negative statements, the scale is 1-5; for positive statements, the scale is 5-1. There are 16 statements.

- (-) Modeling metacognitive strategies is a waste of time.
- (-) The teaching of reading should be the responsibility of reading/language arts teachers only.

- (+) Discipline area teachers can teach reading effectively without special university courses or training in methods of teaching reading.
- (+) The teaching of reading skills can be incorporated into discipline-specific courses without interfering with the major objectives of these courses.
- (+) Any discipline-specific teacher who assigns reading should teach his or her students how to read what is assigned.
- (-) With rare exceptions, students should know what there is to know about reading before they are permitted to leave elementary, and they should know how to read in all disciplines.
- (-) Only remedial reading should be necessary in the content areas, and that should be done by remedial reading teachers in special classes.
- (-) Teaching reading is a technical process that discipline-specific teachers generally know very little about.
- (-) Discipline-specific teachers cannot teach reading without additional, special materials designed for that purpose.
- (+) Teaching reading is a necessary and legitimate part of teaching any discipline.
- (-) Teaching reading takes all the fun out of teaching at the secondary level.
- (+) Every discipline area teacher should be a teacher of reading.
- (-) In the discipline courses students need to learn discipline-specific content, not how to read.
- (+) Integrating the teaching of reading with the teaching of specific discipline related content can be as interesting for the discipline area teacher as teaching content only.
- (+) Discipline-specific teachers are probably more competent to teach the reading skills needed for their subjects than special reading teachers.
- (+) Modeling metacognitive strategies for secondary students is an important approach to teaching reading in the discipline areas.

Q2 How confident do you feel you can:

Scale: 1, Very non-confident to 7, Very confident. There are five questions.

- Model metacognition through think-aloud?
- Model and teach metacognitive skills development?
- Model effective reading strategies with your own students?
- Teach skills required to read in the disciplines?
- Model effective writing strategies with your students

Q3 How confident do you feel you can prepare your teacher candidates to:

Scale: 1, Very non-confident to 7, Very confident. There are 11 questions.

- Differentiae reading strategies instruction on ongoing informal assessments of secondary students?
- Adjust reading strategies instruction based on ongoing informal assessments of secondary students?
- To adjust writing strategies instruction based on ongoing informal assessments of secondary students?
- Help secondary students monitor their own use of reading strategies?
- Provide secondary students with opportunities to apply their prior knowledge to reading tasks?
- Model effective reading strategies with secondary students?
- Implement effective reading strategies in secondary classrooms?
- Help secondary students figure out unknown words when they are reading?
- Model effective writing strategies with secondary students?
- Teach skills required to read in the discipline?
- Model and teach metacognitive skills development with secondary students?

Q4 For each belief statement below, first mark the belief you hope your own teacher candidates take to their secondary classrooms; then answer the same question from your perspective as a teacher educator.

Scale: Strongly Disagree to Strongly Agree. Learner-centered statements are 1-4;

Non learner-centered statements are 4-1. There are sixteen statements.

- (LC) Students have more respect for instructors they see and can relate to as real people, not just teachers.
- (NLC) I can't allow myself to make mistakes with my students.
- (LC) Students achieve more in classes in which instructors encourage them to express their personal beliefs and feelings.
- (NLC) If students are not doing well, they need to go back to the basics and do more drill and skill development.
- (LC) In order to maximize learning, I need to help students feel comfortable in discussing their feelings and beliefs.
- (NLC) My most important job as an instructor is to help students meet well-established standards of what it takes to succeed.

- (NLC) If I don't prompt and provide direction for students' questions, students won't get the right answers.
- (NLC) Knowledge of the subject area is the most important part of being an effective instructor.
- (NLC) One of the most important things I can teach students is how to meet requirements and to do what is expected of them in a course.
- (NLC) Good instructors always know more than their students.
- (LC) Being willing to share who I am as a person with my students facilitates learning more than being an authority figure.
- (NLC) I know what my students need to know and what's important; students should take my word that something will be relevant to them.
- (NLC) For effective learning to occur, I need to be in control of the direction of learning.
- (NLC) I am responsible for what students learn and how they learn it.
- (LC) Seeing things from the students' point of view is the key to their good performance in school.

Q5 For the following statements, choose which statement you most align yourself in terms of teaching in a secondary environment. The proximity of your choice on the continuum to the statement reflects the strength of your support for that statement.

Scale: 5-1. There are three statements

"I mainly see my role as a facilitator. I try to provide opportunities and resources for my students to discover or construct concepts for themselves."	○ ○ ○ ○ ○	"That's all nice, but students really won't learn the subject unless you go over the material in a structured way. It's my job to explain, to show students how to do the work, and to assign specific practice."
"The most important part of instruction is that it encourage "sense-making" or thinking among students. Content is secondary."	○ ○ ○ ○ ○	"The most important part of instruction is the content of the curriculum. That content is the community's judgment about what students need to be able to know and do."
"It is better for students to master a few complex ideas and skills well, and to learn what deep understanding is all about, even if the breadth of their knowledge is limited for a time."	○ ○ ○ ○ ○	"It is useful for students to become familiar with many different ideas and skills even if their depth of understanding, for now, is limited. Later, they will learn these things in more detail."

Appendix C: Interview Protocol

1.	In reviewing your pre- and post- modeling examples, reflect on the changes you made. What were they?	
2.		Why did you make those changes?
3.	How has your definition of modeling changed as a result of taking this professional development?	
4.	What was your perception of modeling metacognitive reading strategies and think-aloud instructional strategies before this professional development? Did this change? When? Why?	
5.	Before this professional development, what was your opinion regarding reading instruction in the discipline areas? How did you approach reading instruction in other disciplines?	
6.		Has this changed? Why or why not?
7.	When asked, how would you explain the difference between content-area literacy and instruction and disciplinary literacy and instruction?	
8.	What did you experience initially when modeling metacognitive strategies with your students? How did you feel? Has that changed?	
9.		Has this PD helped you to feel more confident?
10.	How have you implemented modeling metacognition in your classroom?	
11.	What further plans have you made to begin implementing modeling of metacognitive strategies with your students?	

12.		How will you teach metacognitive strategies?
13.		How often will you use modeling of metacognitive skills?
14.	What do you want your students to know about developing metacognitive strategies for their students?	
15.	How do you want your students to teach metacognitive strategies to their students?	
16.	Before this professional development, did you routinely model a metacognitive process or practice? If not, why not?	
17.		If yes, describe how you modeled this process.
18.	If you could only choose one, facts or concepts, which would you choose?	
19.		Why?
20.		Has that changed since taking this professional development?
21.	In what ways do you believe modeling metacognitive strategies with your students will help them become better teachers of reading?	
22.	Overall, how have your teaching practices changed since you have participated in this professional development?	
23.	Did the technology in this online professional development impede or facilitate your learning in this online professional development? How?	
24.	On a scale of 1 (not at all)-5(it was integral), to what degree did the cognitive modeling examples enable or facilitate your learning?	

25.	Please rank the following 9 professional development design elements on their impact to your learning from most helpful to least helpful. (cognitive modeling, discussions, Bright Ideas collection, journaling, recording sample, partnered activities, whole group activities, module lecture videos, the readings)	

Appendix D: Observation (Metacognitive Modeling Sample Video) rubric Overall Question: How well did the instructor use Think-alouds to MODEL metacognitive strategies to support reading comprehension of an expository text?

0-No modeling of think-alouds observed that support comprehension.

Instructor is simply reading text, or solving problem. Instructor might be thinking of other things: I'm thinking about how I'm so happy it is Friday! I wonder what I'll do this weekend. What are you going to do?

1-The instructor talked about how thinking aloud can help students solve comprehension problems but no actual modeling by the instructor making his/her thinking visible was observed.

Example:

It is helpful to students if you model your thinking process. You should model before you expect the students to complete the task.

The first thing you do is to look at the words in the math problem. Do you see any words that indicate addition?

2-The instructor monitored his/her reading processes to identify comprehension problems and used think-alouds to model 1-3 important reading skills.

Example:

I notice that the text is written in short lines without punctuation. This looks like a poem to me.

So this text was written in 1765. That's after the French-Indian War when the British were in a lot of debt. I'm wondering if this is why they enacted the new tax.

3—The instructor used the think-aloud procedure appropriately, authentically articulating his/her thoughts as she/he worked through comprehension problems, modeling at least 4 reading strategies/skills.

Examples:

The first thing I'm going to do is read the source. Reads source at the bottom of the document. *I need to know who wrote it, when it was written, and what the author's purpose might have been. I also want to know who is the audience*.

Pause at the word inflammatory. *I don't know this word. I'm going to look for prefixes and suffixes I might know. OK, now I see the root word is 'flam' so maybe this has something to do with flame or fire. The prefix 'in' could mean towards, like in' include', so I think this word means towards flame. Maybe it means getting angry and red hot! I am going to reread the sentence and see if it makes sense now. (Reread the sentence). Yes, it makes sense now—I think it is saying that the paper is trying to make people angry about the Stamp Act.*

Appendix E: Research Matrix

Research Question	Data Sources	Specific data to answer this question	Analysis Required	What will this allow me to say?
RQ1: To what extent is instructor change evident after participation in a professional development series that utilizes cognitive modeling through think-aloud strategies?				
RQ1.1: How does the use of cognitive modeling during professional development impact instructors' potential for change/transformation in classroom practice?				
RQ1.1.1: How does cognitive modeling in PD impact instructor *knowledge* about literacy instruction in the content areas?	Pre/Post Test (What) Interview (How, when) Observation rubric score (How, when)	Total score. Question #: 10, 11, 12 Transcript/	SPSS— comparison of pre/post scores using One-way ANOVAs. IN VIVO (NVIVO)-- Open/initial coding SPSS--	X% of participants increased their conceptual understanding of literacy and metacognitive skill development in content area. Participant illustrated evidence of use of think-aloud for metacognitive development in her students by describing the context for planning and the outcomes from execution of the plan. X% of participants demonstrated mastery of understanding

		Interview	Words that show understanding of new concepts. Q 1, 3, 7, 13, 15, 16, 23, 24, 25	descriptive IN VIVO (NVIVO)--Open/initial coding; followed by pattern (focused) coding; examples	how and when to apply desired strategies in post PD video sample. X% participants said that the course enhanced their knowledge of how to use think-aloud strategies.
	RQ1.1.2: How does cognitive modeling in PD impact instructor *beliefs* about literacy instruction in the content areas?	Pre/Post Survey Interviews	Q4, # 1-16; Q5, # 1-3 Qs 5/6, 19/20, 22	SPSS—descriptive; pre/post comparisons. IN VIVO (NVIVO)--Open/initial coding; followed by pattern (focused) coding; examples	X% of participants indicated increased acceptance in the belief that making mistakes in front of students was acceptable. (Important because of the nature of cognitive modeling.) Three respondents commented that by teaching their students to be aware of their metacognitive processes as they read, it would be easier to teach their K-12 students the same process.
	RQ1.1.3: How does	Pre/Post	Q1, #1-16	SPSS—	70% of participants showed positively changed attitudes

	cognitive modeling in PD impact instructor *attitudes* about literacy instruction in the content areas?	Survey Interviews	 Qs 5, 19/20	descriptive; pre/post comparisons. IN VIVO (NVIVO)--Open/initial coding; followed by pattern (focused) coding; examples; examples	related to the attitude statement, "Teaching reading takes all the fun out of teaching at the secondary and/or university-level level." Participant 25 said, "I used to feel that if students had issues understanding the text that I assigned, it was due to poor general reading skills. Now I see that the context matters."
	RQ1.1.4: How does cognitive modeling in PD impact instructor *self-efficacy* in modeling literacy/ metacognitive processes in the content-area classroom?	Pre/Post Survey Interviews	Q2, #1-5; Q3; #1-11 Qs 8, 9	SPSS—descriptive; pre/post comparisons. IN VIVO (NVIVO)--Open/initial coding; followed by pattern (focused) coding; examples	Pre-PD survey results indicated that 35% of participants felt "Extremely non-confident" about their ability to "model effective reading strategies" with their students. However, post-PD survey results indicate only 5% still felt that way. Respondent 13 said, "After a couple of tries, I now feel comfortable modeling my thinking in front of students, even if I'm wrong."
RQ1.2: How do		Interview	Q's: 10, 11, 12,	IN VIVO	1/3 of the participants indicate they plan to use modeling of

instructors plan for and incorporate cognitive modeling in their courses post-professional development?		13, 14, 22	(NVIVO)--Open/initial coding; followed by pattern (focused) coding; examples	metacognitive skills in every lesson.

Appendix F: Correlation Chart

		1	2	3	4	5	6	7	8	9	10	11
1.	DIFF Knowledge (Pre/Post PD) Score	--										
2.	DIFF Attitude (Pre/Post PD) Totals	.389	--									
3.	DIFF Classroom Beliefs Student (Pre/Post PD) Mean	.020	.362	--								
4.	DIFF Classroom Beliefs Self (Pre/Post PD) Mean	-.049	.549	.886**	--							
5.	DIFF Confidence to Integrate strategies (Pre/Post PD) Mean	.200	.509	.079	.285	--						
6.	DIFF Confidence to Teach Strategies to Others (Pre/Post PD) Mean	.294	.618*	.104	.333	.956**	--					
7.	DIFF Philosophy (Pre/Post PD) Mean	-.031	-.136	-.076	-.151	.018	-.091	--				
8.	DIFF Video Sample (Pre/Post PD) Score	-.061	-.585*	-.111	-.231	-.145	-.307	.371	--			
9.	Integration	.301	.107	-.182	-.252	-.659*	-.491	-.149	-.441	--		
10.	Rank/Metacognitive Video Ex.	.167	.217	-.089	.071	.222	.344	.399	.270	-.189	--	
11.	Rate/Metacognitive Video Ex.	.212	.511	.109	.373	.449	.621*	.241	-.095	-.209	.888**	--

*Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

Appendix G: Metacognitive Modeling Example Video Transcripts

- PD Facilitator's Example 1: A Bad Example

Right. Class let's get started. Yesterday I gave you list of vocabulary words and I wanted you to look up those definitions last night. So now we could start reading this article. Get out your vocabulary words and get out the article I sent to you. Here we go. "The microcirculation of a nasal mucosa in reindeer is richly vascularized and 25% denser of that in humans. These factors explain why the nose of Rudolph, the lead flying reindeer employed by Santa Claus to pull his sleigh, is red and well adapted to carrying out his duties in extreme temperatures." Now it's your turn. Read the rest of the article and be sure to write a summary at the end.

- PD Facilitator's Example 2: A Better Example

Alright, today, I'm going to model for you a way to read and solve comprehension problems using metacognitive strategies. This is what we want our students to be able to do automatically. So, I'm going to be making my thinking visible just like you would do when you're teaching your high school students. So now, I am a teacher modeling this for you.

First, I'm going to look at the title. This says Christmas 2012. Research. Well that seems interesting why they would call it Christmas. But I think I know why. The title of the article is Why Rudolph's nose is red: An observational study. So this might be little bit

tongue-in-cheek because I know Rudolph isn't real. But this looks like a real scientific article and it's observational so it's not experimental. And look at all these people who contributed to it from various reputable universities. So it must be a serious article. I'm going to start with the discussion. Ok, aw, there are some big words here. I'm going to have to read slowly and break things apart. "The microcirculation of the nasal mucosa in reindeer is rich-ly vascularized and 25% denser than that in humans." I need to stop here and look at this. Now, microcirculation. I know micro means very small and we've been studying about the blood circulatory system. So, I, this must have something to do with that. So the very small circulation of the nasal, that's the nose, mucosa, and I know we have mucus in our nose. So, maybe we have little blood veins too. so the microcirculation of nasal mucosa in the *reindeer* is richly vascularized. That means there's lots of little vessels and things. And 25% denser than in humans. So, I think this is saying that the reindeer nose has a lot more blood vessels and is denser than in humans. "These factors explain why the nose of Rudolph," this is where it gets kind of funny, "the lead flying reindeer employed by Santa Claus to pull his sleigh, is red and well adapted to carrying out his duties in extreme temperatures." So, I think this this article talks about why Rudolph's nose is red. Let me see what else they say about this. "Intro vital video mi-cro-scopy," boy this is hard, "allowed observation of the complex architecture of the nasal microcirculation," hmm, "including the kinetics of flowing red blood cells." I need to do this again. So, intro vital. So it sounds like it's internal, in a person, or a living organism and it's vital. Video microscopy. So I guess they're taking a very small video. Kinda like

they do in, huh, Disneyland, where you can go through the blood vessels? So, “this very small vit-video allowed observation of the complex architecture of nasal microcirculation.” So it must've been some way they were taking videos of the circulation in the nose, “including the *kinetics*,” that’s kinda like the movement, “of flowing red blood cells and provided *new* insights into the adaptive behavior of vascular structures under varying clinical conditions.” So these structures in the nose, the vascular, the blood vessels and things, can *change* depending on different conditions. I wonder what conditions would cause them to change and what this has to do with Rudolph's red nose.

References

Ackerman, P. L., Beier, M. E., & Bowen, K. R. (2002). What we really know about our abilities and our knowledge. *Personality and individual differences, 33*(4), 587-605.

Ajzen, I. (2005). *Attitudes, personality, and behavior*. (2nd Ed.) Open Univ Pr.

Ajzen, I., & Fishbein, M. (1973). Attitudinal and normative variables as predictors of specific behavior. *Journal of Personality and Social Psychology, 27*, 41- 57.

Alvermann, D. E., & Moore, D. W. (1991). Secondary school reading. In R. Barr, L. Kamil, P. B. Mosenthal, & Pearson (Eds.), *Handbook of reading research* (Vol. 2, pp. 951–983). New York: Longman.

Anders, P. L., Hoffman, J. V., & Duffy, G. G. (2000). Teaching teachers to teach reading: Paradigm shifts, persistent problems, and challenges. *Handbook of reading research*, *3*, 719–742.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191.

Bandura, A. (1986). The Explanatory and Predictive Scope of Self-Efficacy Theory. *Journal of Social and Clinical Psychology*, *4*(3), 359–373. doi:10.1521/jscp.1986.4.3.359

Bandura, A. (1989). Human agency in social cognitive theory. *American psychologist*, *44*(9), 1175-1184.

Bandura, A. (1997). *The exercise of control*. New York: Freeman.

Bandura, A. (2006). *Psychological modeling: conflicting theories*. New Brunswick, N.J.: Aldine

(Original work published 1971)

Barnett, M. (2006). Using a web-based professional development system to support pre-service teachers in examining authentic classroom practice. *Journal of Technology and Teacher Education*, *14*(4), 701–729.

Berman, P., Greenwood, P., McLaughlin, M., & Pincus, J. (1975). *Federal Programs Supporting Educational Change, Vol. 5: Executive Summary.* (No. R-1589/5-HEW). RAND Corporation.

Berman, P., McLaughlin, M., Bass-Gould, G., Pauly, E., & Zellman, G. (1977). *Federal programs supporting educational change, Vol. VII: Factors affecting implementation and continuation* (No. R-1589/7-HEW). RAND Corporation.

Berman, P., & McLaughlin, M. W. (1978). *Federal programs supporting educational change, Vol. VIII: Implementing and sustaining innovations* (No. R-1589/8-HEW). RAND Corporation. Retrieved from http://www.rand.org/content/dam/rand/pubs/reports/2006/R1589.8.pdf

Black, E. W., Beck, D., Dawson, K., Jinks, S., & DiPietro, M. (2007). Considering implementation and use in the adoption of an LMS in online and blended learning environments. *TechTrends*, *51*(2), 35–53.

Bloom, B. S., Englehart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain. New York: David McKay Company*. New York: David McKay.

Blumenfeld, P. C. (1992). Classroom learning and motivation: Clarifying and expanding goal

theory. *Journal of Educational Psychology*, *84*(3), 272.

Borko, H. (2004). Professional Development and Teacher Learning: Mapping the Terrain. *Educational Researcher*, *33*(8), 3–15. doi:10.3102/0013189X033008003

Boston College. (2010). "e-Learning" report shows online professional development aids teachers and students. *ScienceDaily*. Retrieved from http://www.sciencedaily.com/releases/2010/08/100816142120.htm#

Bransford, J., Derry, S., Berliner, D., Hammerness, K., & Beckett, K. (2005). Theories of learning and their roles in teaching. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing Teachers for a Changing World: What Teachers Should Learn and Be Able To Do* (pp. 40–87). San Francisco: Jossey-Bass.

Brinkerhoff, J. (2006). Effects of a long-duration, professional development academy on technology skills, computer self-efficacy, and technology integration beliefs and practices. *Journal of Research on Technology in Education*, *39*(1), 22.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational researcher*, *18*(1), 32–42.

Brown, J. S., Collins, A., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. *Knowing, learning, and instruction: Essays in honor of Robert Glaser,* 487.

Browne, D. L., & Ritchie, D. C. (1991). Cognitive Apprenticeship: A Model of Staff Development for Implementing Technology in Schools. *Contemporary Education, 63*(1). Retrieved from

http://search.proquest.com.ezproxy.lib.utexas.edu/pao/docview/1291719352/citation/14211CB4C8718B80A12/1?accountid=7118

Brozo W., Moorman, G., Meyer C., & Stewart, T. (2013). Content area reading and disciplinary literacy. *Journal of Adolescent Literacy, 56*(5), 353-357.

Bryant, D. P., Linan-Thompson, S., Ugel, N., Hamff, A., & Hougen, M. (2001). The effects of professional development for middle school general and special education teachers on implementation of reading strategies in inclusive content area classes. *Learning Disability Quarterly*, *24*(4), 251–264.

Buckingham, D. (2010). Defining digital literacy. In *Medienbildung in neuen Kulturräumen* (pp. 59-71). VS Verlag für Sozialwissenschaften.

Burt, R. S. (2000). Decay functions. *Social networks*, *22*(1), 1–28.

Buczynski, S., & Hansen, C. B. (2010). Impact of professional development on teacher practice: Uncovering connections. *Teaching and Teacher Education*, *26*(3), 599–607.

Candy, P. C. (1991). *Self-Direction for lifelong learning. A comprehensive guide to theory and practice.* Jossey-Bass. Retrieved from http://www.eric.ed.gov/ERICWebPortal/detail?accno=ED353470

Cantrell, S. C., & Hughes, H. K. (2008). Teacher efficacy and content literacy implementation: An exploration of the effects of extended professional development with coaching. *Journal of Literacy Research*, *40*(1), 95–127.

Casale, M. (2011). *Teachers' Perceptions of Professional Development: An Exploration of*

Delivery Models (Doctoral Dissertation). Retrieved from http://search.proquest.com.ezproxy.lib.utexas.edu/pqdtft/docview/864734254/abstract/13A6D431EC54892A162/1?accountid=7118

Cazden, C., Cope, B., Fairclough, N., Gee, J., Kalantzis, M., Kress, G., Luke, A., et al. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, *66*(1), 60–92.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: Sage Publications Ltd.

Chin, R., & Benne, K. (1969). General strategies for effecting changes in human systems. In W. Bennis, K. Benne, & Chin (Eds.), *The planning of change* (2nd ed., pp. 32–59). New York: Holt, Rinehart & Winston.

Clark, A. M. (2002). The qualitative-quantitative debate: moving from positivism and confrontation to post-positivism and reconciliation. *Journal of Advanced Nursing*, *27*(6), 1242–1249.

Clayton, E. (2010). Professional development in an era of budget cuts. *District Administration: Solutions for school district management*. Retrieved August 9, 2011, from http://www.districtadministration.com/viewarticle.aspx?articleid=2475

Coladarci, T. (1992). Teachers' sense of efficacy and commitment to teaching. *The Journal of experimental education*, *60*(4), 323–337.

Collins, A., Brown, J. S., & Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. *American Educator*, *15*(3), 6–11.

Collopy, R. (2003). Curriculum materials as a professional development tool: How a mathematics textbook affected two teachers' learning. *The Elementary School Journal*, 287–311.

Cook, C., & Sorcinelli, M. D. (2002). The value of a teaching center. *The Chronicle of Higher Education*, *48*, B21.

Corbin, J. M., & Strauss, A. L. (2008). *Basics of qualitative research: techniques and procedures for developing grounded theory* (3rd ed.). Los Angeles, CA.: Sage Publications

Couros, A. (2010). Developing personal learning networks for open and social learning. In G. Veletsianos (Ed.), *Emerging Technologies in Distance Education* (pp. 109–128). Athabasca University Press. Retrieved from http://www.aupress.ca/books/120177/ebook/06_Veletsianos_2010-Emerging_Technologies_in_Distance_Education.pdf

Cranton, P. (1994). Self-directed and transformative instructional development. *The Journal of Higher Education*, *65*(6), 726–744.

Cranton, P. (1996). *Professional development as transformative learning: New perspectives for teachers of adults.* The Jossey-Bass Higher and Adult Education Series. San Francisco, CA: Jossey-Bass Publishers.

Cranton, P. (2002). Teaching for transformation. *New Directions for Adult and Continuing Education*, *93*, 63–72.

Cranton, P., & King, K. (2003). Transformative learning as a professional development goal. *New Directions for Adult and Continuing Education*, *98*, 31–37.

Creswell, J. (2003). *Research design : Qualitative, quantitative, and mixed method approaches* (2nd ed.). Thousand Oaks Calif.: Sage Publications.

Culbert, S. (2011). Give teachers autonomy - Room for debate. *The New York Times*. Retrieved from http://www.nytimes.com/roomfordebate/2011/03/27/how-to-raise-the-status-of-teachers/give-teachers-autonomy

Darling-Hammond, L. (2000). How teacher education matters. *Journal of teacher education*, *51*(3), 166–173.

Darling-Hammond, L. (2006). Securing the right to learn: Policy and practice for powerful teaching and learning. *Educational Researcher*, *35*(7), 13–24.

Darling-Hammond, L., & McLaughlin, M. W. (1995). Policies that support professional development in an era of reform. *Phi Delta Kappan*, *76*(8), 597–604.

Darling-Hammond, L., & Richardson, N. (2009). Research review/teacher learning: What Matters? *How Teachers Learn*, *66*(5), 46–53.

de Laat, J., & Watters, J. J. (1995). Science teaching self-efficacy in a primary school: A case study. *Research in Science Education*, *25*(4), 453–464.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Perspectives in Social Psychology. New York, NY: Plenum Press

Deci, E. L., & Ryan, R. M. (2000). The“ what” and“ why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological inquiry*, *11*(4), 227–268.

Dede, C. (2006). *Online professional development for teachers: Emerging models and methods*. Cambridge, MA: Harvard Education Press.

Dede, C. (2008). A seismic shift in epistemology. *Educause*, *43*(3), 80–81.

Dede, C. (2009). *Determining, developing and assessing the capabilities of "future-ready" students.* Cambridge, MA: Harvard University.

Dede, C., Fulton, K., & Rose, R. (2006, Jan. 31). *Contrasting the strengths and limits of alternative online teacher professional development models*. Presented at the annual conference of American Association of Colleges for Teacher Education (AACTE), Washington, D.C. Retrieved from: http://www.powershow.com/view/b0a13-ODhjZ/Contrasting_the_Strengths_and_Limits_of_Alternative_Online_Teacher_Professional_Development_Models_powerpoint_ppt_presentation

Dede, C., Ketelhut, D., Whitehouse, P., Breit, L., & McCloskey, E. M. (2009). A research agenda for online teacher professional development. *Journal of Teacher Education*, *60*(1), 8–19. doi:10.1177/0022487108327554

Dennen, V. P. (2007). Presence and positioning as components of online instructor persona. *Journal of Research on Technology in Education, 40*(1).

Denzin, Norman K. & Lincoln, Yvonna S. (2005). "Introduction: The discipline and practice of qualitative research". In N. K. Denzin & Y. S. Lincoln (Eds.), The Sage Handbook of Qualitative Research (3rd ed., pp. 1-33). Thousand Oaks, CA: Sage.

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, *38*(3), 181–199. doi:10.3102/0013189X08331140

Desimone, L. M., Porter, A. C., Garet, M. S., Yoon, K. S., & Birman, B. F. (2002). Effects of

professional development on teachers' instruction: Results from a three-year longitudinal study. *Educational Evaluation and Policy Analysis*, *24*(2), 81–112.

Dewey, J. (1904). *The relation of theory to practice in the education of teachers* (Vol. 3). University of Chicago.

Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. Lexington, MA: Heath.

Dewey, J. (1938). *Education and experience*. Touchstone, New York, NY.

Duffy, T. M., & Jonassen, D. H. (1992). *Constructivism and the technology of instruction: A Conversation*. Hillsdale, NJ: Lawrence Erlbaum Associates Publishers.

Dunning, D., Meyerowitz, J. A., & Holzberg, A. D. (1989). Ambiguity and self-evaluation: The role of idiosyncratic trait definitions in self-serving assessments of ability. *Journal of personality and social psychology*, *57*(6), 1082.

Ernest, P. (1989). The knowledge, beliefs and attitudes of the mathematics teacher: A model. *Journal of education for teaching*, *15*(1), 13–33.

Ertmer, P. A. (1999). Addressing first-and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*, *47*(4), 47–61.

Ertmer, P.A. (2000, Oct. 25-28). Responsive instructional design: scaffolding the adoption and change process. Presented at the annual convention of the Association for Educational Communications and Technology (AECT), Denver, CO. Retrieved from

http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED455769

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, *53*(4), 25–39.

Fang, Z. (2008). Going beyond the fab five: Helping students cope with the unique linguistic challenges of expository reading in intermediate grades. *Journal of Adolescent & Adult Literacy*, *51*(6), 476–487. doi:10.1598/JAAL.51.6.4

Fang, Z. (2012). Language correlates of disciplinary literacy. *Topics in Language Disorders*, *32*(1), 19–34. doi:10.1097/TLD.0b013e31824501de

Fang, Z, Lamme, L., Pringle, R., Patrick, J., Sanders, J., Zmach, C., Charbonnet, S., et al. (2008). Integrating reading into middle school science: What we did, found and learned. *International Journal of Science Education*, *30*(15), 2067–2089. doi:10.1080/09500690701644266

Fishbein, M. (1963). An investigation of the relationship between beliefs about an object and the attitude toward that object. *Human relations, 16*(3), 233-239. doi: 10.1177/001872676301600302

Fishbein, M. E. (1967). *Readings in attitude theory and measurement*. New York, NY: Wiley.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior : an introduction to theory and research*. Reading, Mass.: Addison-Wesley Pub.

Fisher, D., & Ivey, G. (2005). Literacy and language as learning in content-area classes: A

departure from “Every teacher a teacher of reading.” *Action in Teacher Education*, *27*(2), 3–11.

Fishman, B., Konstantopoulos, S., Kubitskey, B. W., Vath, R., Park, G., Johnson, H., & Edelson, D. C. (2013). Comparing the Impact of Online and Face-to-Face Professional Development in the Context of Curriculum Implementation. *Journal of Teacher Education 64*(5), 426-438.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, *12*(2), 219–245. doi:10.1177/1077800405284363

Flyvbjerg, B. (2011). *Case study*. In N. K. Denzin & Y. S. Lincoln (Eds.), The Sage Handbook of Qualitative Research (4th ed., pp. 301–316). Thousand Oaks, CA: Sage Publications.

Francis, J. B. (1975). How do we get there from here?: Program design for faculty development. *The Journal of Higher Education*, *XLVI* (6), 719–732.

Freire, P. (1970). The adult literacy process as cultural action for freedom. *Harvard Educational Review*, *40*(2), 205–225.

Freire, P. (1972). *Cultural action for freedom*. Harmondsworth: Penguin.

Freire, P. (2000). Pedagogy of the oppressed (30th anniversary edition) (M. Ramos, Trans.). New York: Continuum.(Original work published in 1970)

Freire, P., & Macedo, D. (1987). *Literacy: Reading the word & the world*. South Hadley, MA: Bergin & Garvey.

Fullan, M. G. (1993). Why teachers must become change agents. *Educational leadership*, *50*, 12–12.

Fullan, M. (2007). Change the terms for teacher learning. *National Staff Development Council*, *28*(3), 35–36.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American educational research journal*, *38*(4), 915.

Gee, J. P. (1998). What is literacy? In V. Zamel & R. Spack (Eds.) *Negotiating academic literacies: Teaching and learning across languages and cultures* (pp. 51–59). New York, NY: Routledge.

Gee, J. P. (2000a). The new literacy studies: From "socially situated" to the work of the social. In D. Barton, M. Hamilton, & R. Ivanic (Eds.). *Situated literacies: Reading and writing in context*, (pp. 180-196). New York, NY: Routledge.

Gee, J. P. (2000b). Teenagers in new times: A new literacy studies perspective. *Journal of Adolescent and Adult Literacy*, *43*(5), 412–423.

Gee, J. P. (2003). What video games have to teach us about learning and literacy. *Computers in Entertainment (CIE)*, *1*(1), 20–20.

Gee, J. P. (2005). Semiotic social spaces and affinity spaces: From the age of mythology. In D. B Barton & K. Tusting (Eds.) *Beyond communities of practice power and social context (pp. 214-232). New York, NY: Cambridge University Press.*

Gee, J. P. (2007). *Good video games+ good learning: Collected essays on video games, learning, and literacy (New literacies and digital epistemologies)*. New York, NY: Peter Lang Pub Inc.

Gee, J. P. (2008). Learning in semiotic domains. In M Prinsloo & M. Baynham (Eds.) *Literacies, global and local*, (pp. 137-149). Philadelphia, PN: John Benjamins North America.

Gee, J. P., Hull, G., & Lankshear, C. (1996). *The new work order: Behind the language of the new capitalism*. Boulder, CO: Westview Press.

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of educational psychology*, *76*(4), 569.

Glaser, B. G. (1965). The constant comparative method of qualitative analysis. *Social problems*, 436–445.

Glaser, B. G. (1978). *Theoretical sensitivity: Advances in the methodology of grounded theory* (Vol. 2). Mill Valley, CA: Sociology Press. Retrieved from http://www.getcited.org/pub/101904376

Glaser, B. G., & Strauss, A. L. (1967). The discovery of grounded theory. *The British Journal of Sociology*, *20*(2).

Glazer, E. M., & Hannafin, M. J. (2006). The collaborative apprenticeship model: Situated professional development within school settings. *Teaching and Teacher Education*, *22*(2), 179–193.

Glazer, E. M., Hannafin, M. J., Polly, D., & Rich, P. (2009). Factors and interactions influencing technology integration during situated professional development in an elementary school. *Computers in the Schools,* 26(1), 21–39.

Glesne, C. (2005). *Becoming qualitative researchers: An Introduction* (3rd ed.). Boston: Pearson/Allyn & Bacon.

Glesne, C. (2010). *Becoming qualitative researchers: An introduction* (4th ed.). Boston: Pearson/Allyn & Bacon.

Gorrell, J., & Capron, E. (1990). Cognitive modeling and self-efficacy: Effects on pre-service teachers' learning of teaching strategies. *Journal of Teacher Education*, *41*(5), 15–22.

Gorrell, Jeffrey. (1993). Cognitive Modeling and Implicit Rules: Effects on Problem-Solving Performance. *The American Journal of Psychology*, *106*(1), 51–65. doi:10.2307/1422865

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research*, (Vol. *2*, pp. 163–194).

Guba, E. G., & Lincoln, Y. S. (2005). Paradigmatic controversies, contradictions, and emerging influences In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (3rd ed., pp. 191-215). Thousand Oaks, CA: Sage.

Guskey, T. R. (1986). Staff development and the process of teacher change. *Educational researcher*, *15*(5), 5–12.

Guskey, T. (2000). *Evaluating professional development*. Thousand Oaks, CA: Corwin Press, Inc.

Guskey, T. R. (2002a). Professional development and teacher change. *Teachers and Teaching: Theory and Practice*, *8*(3), 381–391.

Guskey, T. R. (2002b). Redesigning professional development: Does it make a difference. *Educational Leadership*, *59*(6), 45.

Guskey, T. R., & Passaro, P. D. (1994). Teacher efficacy: A study of construct dimensions. *American Educational Research Journal*, *31*(3), 627–643.

Guskey, T. R., & Yoon, K. S. (2009). What works in professional development?. *Phi Delta Kappan*, *90*(7), 495–500.

Habermas, J. (1971). *Knowledge & human interests*. (J. J. Shapiro, Trans.). Beacon Press.

Haddad, W. D., & Draxler, A. (2002). *Technologies for education: potential, parameters, and prospects* (Vol. 20). Retrieved from http://ictlogy.net/bibliography/reports/projects.php?idp=515

Hammerness, K., Darling-Hammond, L., Bransford, J., Berliner, D., Cochran-Smith, M., McDonald, M., & Zeichner, K. (2005). How teachers learn and develop. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing Teachers for a Changing World: What Teachers Should Learn and Be Able To Do* (pp. 358–359). San Francisco: Jossey-Bass.

Hargreaves, A. (1994). *Changing teachers, changing times: Teachers' work and culture in the postmodern age*. Teachers College Press.

Hargrove, G. W. (1973). *An investigation of attitudes of secondary teachers toward reading in the content areas as measured by a modified Likert-type scale* (Doctoral Dissertation). Retrieved from WorldCat.

Hawley, W. D., & Valli, L. (1999). The essentials of effective professional development: A new consensus. In L. Darling-Hammond & G. Beauchamp (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 127–150).

Heller. R., & Greenleaf, C. (2007). Literacy instruction in the content areas: Getting to the core of middle and high school improvement. Washington, DC: Alliance for Excellent Education.

Hennessy, S. (1993). Situated cognition and cognitive apprenticeship: Implications for classroom learning. *Studies in Science Education, 22*(1), 1-41. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/03057269308560019

Holstein, J. A., & Gubrium, J. F. (2004). The active interview. In D. Silverman (Ed.), *Qualitative research: Theory, method and practice* (2nd ed., pp. 140–161). London: SAGE publications, Ltd.

Howe, K. R. (1988). Against the quantitative-qualitative incompatibility thesis or dogmas die hard. *Educational researcher*, *17*(8), 10–16.

Hoyle, E. (1982). The professionalization of teachers: a paradox. *British Journal of Educational Studies*, *30*(2), 161–171.

Hughes, J. E., Guion, J. M., Bruce, K. A., Horton, L. R., & Prescott, A. (2011). A Framework for action: Intervening to increase adoption of transformative Web 2.0 learning resources. *Educational Technology*, *51*(2), 53–61.

Hunzicker, J. (2010). Effective professional development for teachers: a checklist. *Professional development in education*, *37*(2), 177–179.

Ingvarson, L., Meiers, M., & Beavis, A. (2005). Factors affecting the impact of professional development programs on teachers' knowledge, practice, student outcomes & efficacy. *Education Policy Analysis Archives*, *13*(10), 1–28.

Jenkins, H. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century*. The MIT Press.

Jetton, T. L., & Shanahan, C. H. (2012). *Adolescent literacy in the academic disciplines: General*

principles and practical strategies. New York, NY: The Guilford Press.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, *33*(7), 14–26.

Jonassen, D. H. (1991). Objectivism versus constructivism: Do we need a new philosophical paradigm?. *Educational technology research and development, 39*(3), 5-14.

Joyce, B., & Calhoun, E. (2010). *Models of professional development: A celebration of educators*. Thousand Oaks, CA: Corwin and The National Staff Development Council.

Kamii, C. (1986). The equilibration of cognitive structures: The central problem of intellectual development by Jean Piaget, translated by Terrance Brown and Kishore Julian Thampy. Chicago: University of Chicago Press. *American Journal of Education*, *94*(4), 574–577.

Kanaya, T., Light, D., & Culp, K. (2005). Factors influencing outcomes from a technology focused professional development program. *Research on Technology in Education*, *37*(3), 313–329.

Kennedy, C., & Kennedy, J. (1996). Teacher attitudes and change implementation. *System*, *24*(3), 351–360.

Kennedy, M. (1999). The role of pre-service teacher education. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 54–85). San Francisco: Jossey-Bass.

Ketelhut, D., McCloskey, E., Dede, C., Breit, L., & Whitehouse, P. (2006). Core tensions in the

evolution of online teacher professional development. In C. Dede (Ed.), *Online professional development for teacher: Emerging models and methods*. Cambridge, MA: Harvard Education Press.

Khimm, S. (2011, August 17). How will Rick Perry's budget affect education? *The Washington Post - Blogs*. Retrieved from http://www.washingtonpost.com/blogs/ezra-klein/post/how-will-rick-perrys-budget-affect-education/2011/08/16/gIQAzjjEJJ_blog.html

Kirkpatrick, D. L. (1959). Techniques for evaluating training programs. *Journal of ASTD*, *13*(11), 3–9.

Kirkpatrick, D. (1996). Great ideas revisited. *Training and Development*, *50*(1), 54–59.

Kleitman, S., & Stankov, L. (2007). Self-confidence and metacognitive processes. *Learning and Individual Differences, 17*(2), 161-173.

Knowles, Malcolm. (1973). *The adult learner: A neglected species* Houston, TX: Gulf Publishing Company.

Knowles, M. S. (1975). *Self-Directed learning: A guide for learners and teachers.* New York, NY: Association Press.

Knowles, M., Holton, E., & Swanson, R. A. (1998). *The adult learner: The definitive classic in adult education*. Woburn, MA: Butterworth–Heinemann.

Kruger, J., & Dunning, D. (1999). Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. Journal of personality and social psychology, *77*(6), 1121.

Lanham, R. (1995). Digital literacy. *Scientific American*, *273*(3), 160-1.

Lanier, J., & Little, J. (1986). Research on teacher education. In M. Wittrock (Ed.), *Research on teacher education*, Handbook of research on teaching: A project of the American Educational Research Association (3rd ed., pp. 527–569). New York, NY: Macmillan.

Lankshear, C., & Knobel, M. (2006). *New literacies: Everyday practices and classroom learning*. Open Univ Pr.

Lankshear, C., & Knobel, M. (2007). Researching New Literacies: Web 2.0 practices and insider perspectives. *E-Learning and Digital Media*, *4*(3), 224–240.

Lankshear, C., & Knobel, M. (2008). *Digital literacies: concepts, policies and practices* (New literacies and digital epistemologies). (Vol. 30). New York, NY: Peter Lang Pub Inc.

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research*, *77*(4), 575–614. doi:10.3102/0034654307309921

Lebuc, M., & Luft, J. (2007). A mixed methods analysis of learning in online teacher professional development: A case report. *Contemporary Issues in Technology and Teacher Education*, *7*(1), 554–574.

Leu, D. J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Toward a theory of new literacies emerging from the Internet and other information and communication technologies. *Theoretical models and processes of reading, 5*(1), 1570-1613.

Lewis, K. G. (1996). Faculty development in the United States: A brief history. *The International Journal for Academic Development*, *1*(2), 26–33.

Lichtenstein, S., & Fischhoff, B. (1977). Do those who know more also know more about how much they know?. Organizational Behavior and Human Performance, *20*(2), 159-183.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (Vol. 75). Thousand Oaks, CA: Sage Publications, Inc.

Lock, J. V. (2006). A new image: Online communities to facilitate teacher professional development. *Journal of Technology and Teacher Education*, *14*(4), 663.

Lortie, D. C. (2002). *Schoolteacher: A sociological study*. University of Chicago Press. (Original work published 1975)

Loucks-Horsley, S., Stiles, K., & Hewson, P. (1996). Principles of effective professional development for mathematics and science education: A synthesis of standards. *NISE Brief*, *1*(1), 1–6.

Luke, A. (2001). Forward. In E. B. Moje & O'Brien (Eds.), *Constructions of literacy: Studies of teaching and learning in and out of secondary schools* (p. ix–xii). Mahwah N.J.: Lawrence Erlbaum Associates.

Lundeberg, M. A., Fox, P. W., Brown, A. C., & Elbedour, S. (2000). Cultural influences on confidence: Country and gender. Journal of Educational Psychology, *92*(1), 152.

Marsh, H. W. (2007). Do university teachers become more effective with experience? A multilevel growth model of students' evaluations of teaching over 13 years. *Journal of Educational Psychology*, *99*(4), 775.

Marsh, H. W., & Yeung, A. S. (1998). Longitudinal structural equation models of academic self-

concept and achievement: Gender differences in the development of math and English constructs. American Educational Research Journal, *35*(4), 705-738.

Martin, W., Strother, S., Beglau, M., Bates, L., Reitzes, T., & Culp, K. M. .(2010). Connecting instructional technology professional development to teacher and student outcomes. *Journal of Research on Technology in Education*, *43*(1), 53–74.

Marzano, R. J. (2003). *What works in schools: Translating research into action*. Alexandria, VA: Association for Supervision & Curriculum Development.

Marzano, R., Zaffron, S., Zraik, L., Robbins, S., & Yoon, L. (1995). A new paradigm for educational change. *Education*, *116*(2), 162–173.

Matzen, N. J., & Edmunds, J. A. (2007). Technology as a Catalyst for Change: The Role of Professional Development. *Journal of Research on Technology in Education, 39*(4).

Mayer, R., (1999). Designing instruction for constructivist learning. In C. Reigeluth (Ed.). *Instructional-design Theories and Models: A New Paradigm of Instructional Theory* (Vol. 2, pp. 141-159). Mahwah: NJ: Lawrence Erlbaum Associates, Inc..

Mayer, R. E. (2002). Multimedia learning. *Psychology of Learning and Motivation*, *41*, 85–139.

McConachie, S. M., Petrosky, T., Petrosky, A. R., & Resnick, L. B. (2009). *Content matters: A disciplinary literacy approach to improving student learning*. San Francisco, CA: Jossey-Bass.

McLeod, S. (2010, November 16). *Two big shifts, one big problem*. PowerPoint presented at The University of Texas at Austin, Austin, TX.

Mertens, D. (2009). *Research and evaluation in education and psychology: Integrating diversity*

with quantitative, qualitative, and mixed methods (3rd ed.). Los Angeles: Sage.

Mezirow, J. (1991). *Transformative dimensions of adult learning*. San Francisco, CA: Jossey-Bass.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: SAGE publications, Inc.

Mishra, P., & Koehler, M. J. (2007). Technological pedagogical content knowledge (TPCK): Confronting the wicked problems of teaching with technology. *Technology And Teacher Education Annual*, *18*(4), 2214.

Moje, E. B. (2007). Developing socially just subject-matter instruction: A review of the literature on disciplinary literacy teaching. *Review of Research in Education*, *31*(1), 1–44. doi:10.3102/0091732X07300046

Moje, E., Overby, M., Tysvaer, N., & Morris, K. (2008). The complex world of adolescent literacy: Myths, motivations, and mysteries. *Harvard Educational Review*, *78*(1), 107–154.

Morgan, C. L. (1961). C. Lloyd Morgan. In C. Murchison (Ed.), *History of psychology in autobiography* (Vol. 2, pp. 237-264). New York: Russell & Russell. (Original work published 1930)

Morimoto, K. (1973). Notes on the context for learning. *Harvard Educational Review*, *43*(2), 245–257.

National Commission on Excellence in Education. (1983). *A nation at risk: the imperative for*

educational reform: a report to the Nation and the Secretary of Education, United States Department of Education. The Commission.

National Research Council. (2007). *Enhancing professional development for teachers: Potential uses of information technology, report of a workshop.* Committee on Enhancing Professional Development for Teachers, National Academies Teacher Advisory Council. Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press. Retrieved April 25, 2012, from http://www.nap.edu/openbook.php?record_id=11995&page=R1

Nespor, J. (1987). The role of beliefs in the practice of teaching. *Journal of curriculum studies*, *19*(4), 317–28.

Nichol, J., & Turner-Bisset, R. (2006). Cognitive apprenticeship and teachers' professional development. *Journal of In-Service Education*, 32(2), 149–169. doi:10.1080/13674580600650831

Nisbett, R. E., & Ross, L. (1980). *Human inference: Strategies and shortcomings of social judgment*. Englewood Cliffs, NJ: Prentice-Hall.

O'Brien, D. G. (2001). "At-risk" adolescents: Redefining competence through the multiliteracies of intermediality, visual arts, and representation. *Reading Online, 4*(11), 2-8.

O'Brien, D. G., Stewart, R. A., & Moje, E. B. (1995). Why content literacy is difficult to infuse into the secondary school: Complexities of curriculum, pedagogy, and school culture. *Reading Research Quarterly*, *30*(3), 442–463. doi:10.2307/747625

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct.

Review of educational research, *62*(3), 307.

Paul, J. (1998). Instructor beliefs self-assessment. *JP-LCT: Instructor beliefs self-assessment*. Retrieved November 16, 2012, from http://www.jodypaul.com/lct/lct.pbsa.html

Peirce, C. S. (1878). Deduction, induction, and hypothesis. *Popular Science Monthly*, *13*, 470–482.

Penuel, W. R., Fishman, B. J., Yamaguchi, R., & Gallagher, L. P. (2007). What makes professional development effective? Strategies that foster curriculum implementation. *American Educational Research Journal*, *44*(4), 921–958. doi:10.3102/0002831207308221

Piaget, J., & Inhelder, B. (1969). *The psychology of the child* (Vol. 5001). New York, NY: Basic Books.

Piaget, J., Brown, T., & Thampy, K. J. (1985). *The equilibration of cognitive structures: The central problem of intellectual development* (Vol. 985). Chicago, Il: University of Chicago Press.

Pintrich, P. R., Marx, R. W., & Boyle, R. A. (1993). Beyond cold conceptual change: The role of motivational beliefs and classroom contextual factors in the process of conceptual change. *Review of Educational Research*, *63*(2), 167–199. doi:10.3102/00346543063002167

POD Network | Professional and Organizational Development Network in Higher Education | Welcome. (n.d.). Retrieved November 16, 2012, from http://www.podnetwork.org/

Polly, D., & Hannafin, M. J. (2010). Reexamining technology's role in learner-centered

professional development. *Educational Technology Research and Development*, *58*(5), 557–571.

Postareff, L., Lindblom-Ylänne, S., & Nevgi, A. (2007). The effect of pedagogical training on teaching in higher education. *Teaching and Teacher Education*, *23*(5), 557–571.

Pressley, M., & Afflerbach, P. (1995). *Verbal protocols of reading: The nature of constructively responsive reading.* New York, NY*:* Routledge.

Putnam, R. T., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher, 29*(1), 4-15.

Ravitz, J. L., Becker, H. J., & Wong, Y. (2000). Constructivist-compatible beliefs and practices among US teachers. Teaching, Learning, and Computing: 1998 Nt'l survey report #4.

Reed, D. K. (2009). A synthesis of professional development on the implementation of literacy strategies for middle school content area teachers. *RMLE Online*, *32*(10). Retrieved from https://www.nmsa.org/portals/0/pdf/publications/RMLE/rmle_vol32_no10.pdf

Reeves, T., & Li, Z. (2013). Teachers' technological readiness for online professional development: Evidence from the US e-Learning for Educators initiative. *Journal of Education for Teaching: International research and pedagogy*, *28*(4), 389–406.

Reeves, T., & Pedulla, J. (2013). Bolstering the Impact of Online Professional Development for Teachers. *The Journal of Educational Research & Policy Studies*, *1*, 50–66.

Resnick, L. B. (1987). *Education and learning to think*. National Academies Press.

Reznick, R. K. (1993). Teaching and testing technical skills. *The American journal of surgery*, *165*(3), 358–361.

Richardson, V. (1996). The role of attitudes and beliefs in learning to teach. *Handbook of research on teacher education*, (2nd Ed., pp. 102–119).

Richardson, V. (1998). How teachers change: What will lead to change that most benefits student learning? *Focus on Basics 2*(C), 1-10.

Richardson, V., Anders, P., Tidwell, D., & Lloyd, C. (1991). The relationship between teachers' beliefs and practices in reading comprehension instruction. *American Educational Research Journal*, *28*(3), 559 –586. doi:10.3102/00028312028003559

Richardson, V., & Placier, P. (2001). Teacher change. In V. Richardson (Ed.), *Handbook of Research on Teaching* (4th ed., pp. 905–947). Washington, D.C.: American Educational Research Association.

Rienties, B., Brouwer, N., & Lygo-Baker, S. (2013). The effects of online professional development on higher education teachers' beliefs and intentions towards learning facilitation and technology. *Teaching and Teacher Education*, *29*(0), 122–131. doi:10.1016/j.tate.2012.09.002

Rogers, E. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Rokeach, M. (1968). *Beliefs, attitudes and values: A theory of organization and change*. Jossey-Bass Behavioral Science Series. San Francisco, CA: Jossey-Bass.

Ruey, S. (2010). A case study of constructivist instructional strategies for adult online learning. *British Journal of Educational Technology*, *41*(5), 706–720.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, *55*(1), 68.

Saldana, J. (2009). *The Coding Manual for Qualitative Researchers*. Thousand Oaks, CA: Sage Publications Ltd.

Salo, C. (2011). *Beyond workshops: New technologies for online teacher professional d*evelopment Retrieved from http://edtechtemp.boisestate.edu/web/white-papers/Salo_White%20Paper_Final.pdf

Sawchuk, S. (2009, March 26). Teacher training goes in virtual directions. *Education Week*. Retrieved from http://www.edweek.org/ew/articles/2009/03/26/26virtual.h28.html

Schön, D. A. (1973). *Beyond the stable state: Public and private learning in a changing society*. Harmondsworth: Penguin.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic books.

Schrum, L. (1999). Technology professional development for teachers. *Educational Technology Research and Development*, *47*(4), 83–90. doi:10.1007/BF02299599

Schoenbach, R., Greenleaf C., & Murphy, L. (2012). *Reading for understanding: How reading apprenticeship improves disciplinary learning in secondary and college classrooms (*2nd ed.). San Francisco: Jossey-Bass. (Kindle version). Retrieved from Amazon.com: http://www.amazon.com/gp/product/B007ZDNCFK/ref=oh_d__o00_details_o00__i00?ie=UTF8&psc=1

Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational psychologist*, *26*(3-4), 207–231.

Schunk, D. (2004). *Learning theories: An educational perspective* (4th ed.). Upper Saddle River,

N.J: Pearson/Merrill/Prentice Hall.

Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday.

Shanahan, T., & Shanahan, C. (2012). What is disciplinary literacy and why does it matter? *Topics in Language Disorders*, *32*(1), 7.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational researcher*, *15*(2), 4.

Skeff, K. M., Stratos, G. A., Mygdal, W., DeWitt, T. A., Manfred, L., Quirk, M., Roberts, K. (1997). Faculty development. *Journal of general internal medicine*, *12*, 56–63.

Smith, E., Anthony, D., Wright, H., & Russell, J. (2011). From Congress Avenue, Austin, to your school district, Texas. Presented at the SXSW.edu, Austin, TX. Retrieved from http://audio.sxsw.com/2011/podcasts/EDU/KEYNOTE_CongresstoClassroom.mp3

Smith, K. (2003). So, what about the professional development of teacher educators? *European Journal of Teacher Education*, *26*(2), 201–215. doi:10.1080/0261976032000088738

Smith, R. J., & Otto, W. (1969). Changing teacher attitudes toward teaching reading in the content areas. *Journal of Reading*, *12*(4), 299–304.

Somekh, B. (2008). Factors affecting teachers' pedagogical adoption of ICT. In Voogt, J. & Knezek, G. (Eds). *International handbook of information technology in primary and secondary education* (pp. 449–460).

Speck, M. (1996). Best practice in professional development for sustained educational change. *ERS Spectrum*, *14*(2), 33–41.

Spicer, D., & Dede, C. (2006). Collaborative design of online professional development: Building the Milwaukee Professional Support Portal. *Journal of Technology and Teacher Education*, *14*(4), 679–699.

Sprague, D. (2006). Research agenda for online teacher professional development. *Journal of Technology and Teacher Education*, *14*(4), 657–661.

Sprinthall, R. C., Sprinthall, N. A., & Oja, S. N. (1998). *Educational psychology: A developmental approach* (7th Ed.). Boston: McGraw-Hill.

Stake, R. (2005). Qualitative case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE Handbook of Qualitative Research* (3rd ed., pp. 443–466). Thousand Oaks: Sage Publications.

Stein, M. K., & Wang, M. C. (1988). Teacher development and school improvement: The process of teacher change. *Teaching and teacher education*, *4*(2), 171–187.

Stern, C., & Keislar, E. R. (1977). Teacher attitudes and attitude change: A research review. *Journal of Research & Development in Education 10*(2), 63-76. Retrieved from http://psycnet.apa.org/psycinfo/1978-21744-001

Street, B. (2003). What's "new" in New Literacy studies? Critical approaches to literacy in theory and practice. *Current issues in comparative education*, *5*(2), 77–91.

Street, B. (2006). Autonomous and ideological models of literacy: Approaches from new literacy studies. *Media Anthropology Network*, 17-24.

Strommen, E. F., & Lincoln, B. (1992). Constructivism, technology, and the future of classroom learning. *Education and Urban Society*, *24*(4), 466–76.

Suen, H. K., & Ary, D. (1989). *Analyzing quantitative behavioral observation data*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Sunal, D. W., Hodges, J., Sunal, C. S., Whitaker, K. W., Freeman, L. M., Edwards, L., Johnston, R. A., et al. (2001). Teaching science in higher education: Faculty professional development and barriers to change. *School Science and Mathematics*, *101*(5), 246–257.

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. Thousand Oaks, CA: Sage.

Tashakkori, A., & Teddlie, C. (2003). Handbook of mixed methods in social & behavioral sciences. Thousand Oaks, Calif.: SAGE Publications.

Tate, M. L. (2009). Workshops: Extend learning beyond your presentation with these brain-friendly strategies. *Journal of Staff Development*, 30(1), 44-46.

Teddlie, C., & Tashakkori, A. (Eds.). (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*. Thousand Oaks, CA: Sage Publications Inc.

Tharp, G., & Gallimore, R. (1988). Assisting teacher performance through the ZED: A case study. In G. Tharp (Ed.) *Rousing mind to life: Teaching, learning, and schooling in social contexts (*pp. 217-248).

The No Child Left Behind (NCLB) act of 2001, § 115 (2002). Retrieved from http://www2.ed.gov/policy/elsec/leg/esea02/index.html

The Partnership for 21st Century Skills. (2011). Retrieved April 25, 2012, from http://www.p21.org/

Tolman, E. C. (1932). *Purposive behavior in animals and men*. University of California Pr.

Torres, T. (2011, Dec. 12). Higher education: Texas state universities to seek tuition hikes. *El Paso Times*. Retrieved April 25, 2012, from http://www.elpasotimes.com/news/ci_19526575

Tournaki, E., Lyublinskaya, I., & Carolan, B. (2011). An ongoing professional development program and its impact on teacher effectiveness. *The Teacher Educator*, *46*(4), 299–315.

Treacy, B; Kleiman, G; Peterson, K., (2002). Successful online professional development. *Learning and Leading with Technology*, *30*(1), 42-7

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and teacher education*, *17*(7), 783–805.

Tschannen-Moran, M., & Hoy, A. W. (2007). The differential antecedents of self-efficacy beliefs of novice and experienced teachers. *Teaching and Teacher Education*, *23*(6), 944–956.

Tschannen-Moran, M., & Johnson, D. (2011). Exploring literacy teachers' self-efficacy beliefs: Potential sources at play. *Teaching and Teacher Education*, *27*, 751-761.

Tschannen-Moran, M., & McMaster, P. (2009). Sources of self-efficacy: Four professional development formats and their relationship to self-efficacy and implementation of a new teaching strategy. *The Elementary School Journal*, *110*(2), 228–245. doi:10.1086/605771

US Dept. of Education. (2009, July 24). President Obama, U.S. Secretary of Education Duncan announce national competition to advance school reform. *Ed.gov*. Press Releases; Retrieved April 9, 2012, from http://www2.ed.gov/news/pressreleases/2009/07/07242009.html

Vacca, R. T., & Vacca, J. A. L. (2002). *Content area reading: Literacy and learning across the curriculum* (7th ed.). Boston: Allyn & Bacon.

Veletsianos, G. (2011). Designing opportunities for transformation with emerging technologies. *Educational Technology*, *51*(2), 41.

Voogt, J., Tilya, F., & Akker, J. (2009). Science teacher learning of MBL-supported student-centered science education in the context of secondary education in Tanzania. *Journal of Science Education and Technology*, *18*(5), 429–438. doi:10.1007/s10956-009-9160-8

Vrasidas, C., & Glass, G. V. (Eds.) (2004). *Current Perspectives on applied information technologies: Online professional development for teachers.* Greenwich, CT: Information Age Pub.

Vroom, V. H. (1964). *Work and motivation*. Oxford, England: Wiley.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. In M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, (Eds.) (14th ed.). Harvard University Press.

Wade, S. E. (1990). Using think-alouds to assess comprehension. *The Reading Teacher*, *43*(7), 442–451. doi:10.2307/20200438

Walsh, K. (2009). Object-oriented faculty development: Training teachers with learning objects. In H. Song, T. T. Kidd, & K. E. Amaral (Eds.), *Handbook of Research on Human Performance and Instructional Technology* (pp. 517–532). Hershey, PA: Information Science Reference, IGI Global. Retrieved from http://services.igi-global.com/resolvedoi/resolve.aspx?doi=10.4018/978-1-60566-782-9

Warschauer, M., & Grimes, D. (2007). Audience, authorship, and artifact: The emergent semiotics of Web 2.0. *Annual Review of Applied Linguistics*, *27*. doi:10.1017/S0267190508070013

Wei, R. C., Darling-Hammond, L., & Adamson, F. (2010). *Professional development in the United States: Trends and challenges*. Dallas, TX: National Staff Development Council.

Wilhelm, J. (2001). *Improving comprehension with think-alouds: Modeling what good readers do*. New York, NY: Scholastic.

Willis, J. W. (2007). *Foundations of qualitative research: Interpretive and critical approaches*. Thousand Oaks, CA: Sage Publications, Inc.

Wilson, N. S., Grisham, D. L., & Smetana, L. (2009). Investigating content area teachers understanding of a content literacy framework: A yearlong professional development initiative. *Journal of Adolescent & Adult Literacy*, *52*(8), 708–718.

Wiseman, D. L. (2012). The intersection of policy, reform, and teacher education. *Journal of Teacher Education*, *63*(2), 87–91. doi:10.1177/0022487111429128

Wiske, M., Perkins, D., & Spicer, D. (2006). Piaget goes digital. In C. Dede (Ed.), *Online Professional Development for Teacher: Emerging Models and Methods* (pp. 49–68). Cambridge, MA: Harvard Education Press.

Woolfolk, A. (1998). *Educational psychology* (7th ed.). Boston: Allyn & Bacon.

Yilmazel-Sahin, Y., & Oxford, R. (2010). A comparative analysis of teacher education faculty development models for technology integration. *Journal of Technology and Teacher Education*, *18*(4), 693–720.

Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). Thousand Oaks, CA: Sage publications, INC.

Yoon, K. S., Duncan, T., Lee, S. W.-Y., Scarloss, B., & Shapley, K. (2007). *Reviewing the evidence on how teacher professional development affects student achievement* (Issues & Answers Report, REL 2007–No. 033). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest. Retrieved from http://ies.ed.gov/ncee/edlabs

Zeichner, K. (1999). The New Scholarship in Teacher Education. *Educational Researcher*, *28*(9), 4–15. doi:10.3102/0013189X028009004

Zeichner, K. M., & Liston, D. P. (2010). *Reflective teaching: an introduction.* Mahwah, NJ: Routledge.

Zepeda, S. (2012). *Professional development, what works* (2nd ed.). New York, NY: Routledge.

Zhao, Y., Lei, J., Yan, B., Lai, C., & Tan, S. (2005). What makes the difference? A practical analysis of research on the effectiveness of distance education. *The Teachers College Record, 107*(8), 1836–1884.

Zhao, Y. (2009). *Catching up or leading the way*. Alexandria, VA: ASCD.