Using Multimedia-Based Instruction to Improve Teacher Knowledge about Evidence-Based Practices for Reading Comprehension

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By

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Abstract

Students with disabilities display difficulties with their ability to comprehend narrative and expository text. Yet they are often expected and to access make progress within the same curriculum as their general education peers. Therefore, it is essential that teachers possess a strong bank of practices for supporting the learning needs of all students. That said, there is evidence to suggest many teachers lack fundamental knowledge to understand and implement evidence-based reading practices. Professional development and teacher education are two important avenues to improve teacher knowledge about reading. This study investigated different approaches to providing instruction to preservice teachers (n = 146) on how to teach specific reading comprehension strategies from Collaborative Strategic Reading (CSR). Because the methods used to provide pre- and inservice teachers with instruction are often taken for granted in terms of presentation mode(s), this study seeks to answer important questions about the extent to which different learning modes results in desired outcomes. Two multimedia conditions (Content Acquisition Podcasts for Teachers, CAP-T and Content Acquisition Podcasts with embedded modeling videos, CAP-TV) were compared to a traditional lecture format. Results indicate that preservice teachers (PSTs) who watched a CAP-TV significantly outperformed PSTs who watched a CAP or heard a lecture on a measure of knowledge regarding reading comprehension. The PSTs who watched a CAP-TV also created recorded video lessons that included more components of CSR than peers that only received a lecture. PSTs from the lecture, CAP, and CAP-TV groups all reported positive feelings about the trainings and felt that they learned from them and could use the strategies in their future classroom.

Keywords: reading instruction, reading comprehension, preservice teacher training, multimedia

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APPROVAL OF THE DISSERTATION

This dissertation, (Using Multimedia-Based Instruction to Improve Teacher Knowledge about Evidence-Based Practices for Reading Comprehension) has been approved by the Graduate Faculty of the Curry School of Education in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Dedication

I dedicate this dissertation to my husband, Eric Alves, whose support and encouragement throughout my doctoral program (as well as the rest of life!) have been critical to my success. I also dedicate it to my daughter who has been a light and source of strength and motivation.

This dissertation is in memory of my stepdad, Bob Shoun, who was one of my biggest supporters and was so proud of all of my accomplishments.

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CHAPTER I: INTRODUCTION

As increasing numbers of students with disabilities and struggling readers are instructed in the general education classroom, it is critical for all teachers to be taught to provide high quality reading instruction, which includes the use of evidence-based practices for reading (Brownell, Sindelar, Kiely, & Danielson, 2010). It is no longer the case that only special education teachers or reading specialists are responsible for providing reading instruction to struggling readers, but instead all teachers take on that responsibility (Moats, 2009). In addition, with the current push towards multi-tiered models of support, classroom teachers are expected to provide reading instruction to readers of all levels (Moats, 2009). General education teachers are expected to provide high quality instruction that forms a foundation for all students, as well as to provide remediation in the classroom, while special educators must have content, literacy, and language expertise to meet the needs of students at higher tiers (Brownell et al., 2010).

There are numerous reasons why students identified with specific learning disabilities (SLD) struggle with reading comprehension, including failure to monitor their own comprehension, failure to utilize reading strategies, difficulties understanding text structure, and lack of knowledge about word forms and meanings (Gersten et al., 2001; Perfetti & Stafura, 2014). Perfetti & Stafura (2014) propose in that linguistic knowledge, orthographic knowledge, and general knowledge are all critical to reading and that breakdowns can occur due to deficits in these sources of knowledge or due to weaknesses in processes that use these knowledge sources. In other words, good readers are able to rapidly identify words and use word knowledge to build meaning while reading text (Perfetti & Stafura, 2014).

In contrast, poor readers struggle with either the knowledge or processes required for reading and this can lead to poor outcomes on high stakes testing (National Center for Educational Statistics, 2013), as well as poor long-term academic outcomes (Vaughn et el., 2015). To illustrate, students with disabilities have a high risk of reading failure, as evidenced by poor performance on the 2015 National Assessment of Educational Progress (NAEP) reading test, where 67% of all fourth grade students with disabilities and 63% of all eight grade students with disabilities performed at a *below basic* level (National Center for Educational Statistics, 2013). Although these results reflect all students with disabilities, students with SLD make up the largest category of disabilities, so NAEP scores can be considered a proxy of poor reading outcomes for this population.

Research shows that interventions that combine explicit instruction with strategy instruction produced the greatest gains in word reading and reading comprehension when compared to either type of instruction alone (Swanson, 1999). One powerful strategy that incorporates explicit instruction and strategy instruction is Collaborative Strategic Reading (CSR). This is a method to improve reading that includes multiple evidence-based strategies that are effective individually and as a package (Vaughn et al., 2011). CSR incorporates before, during, and after reading strategies, such as predicting, monitoring understanding, finding the main ideas, and questioning in order to improve reading comprehension for students (Klinger, Vaughn, Arguelles, Hughes, & Leftwich, 2004). CSR has a strong research base supporting its use in classroom (e.g., Klinger & Vaughn, 1996; Klinger et al., 2004; Klinger et al., 1998; Klinger and Vaughn, 2000; Vaughn et al., 2011). Preservice teachers should be exposed to and learn how to implement practices such as CSR prior to becoming licensed educators. Participants in the current study are expected to learn several components of CSR.

While it is possible to improve reading outcomes for struggling readers by providing instruction in reading strategies such as CSR (Wanzek et al., 2013), many teachers have insufficient knowledge about reading practices (Spear-Swerling & Cheesman, 2012) and do not display even basic knowledge of reading fundamentals (Bos, Mather, Dickson, Podhajski, & Chard, 2001; Cunningham, Perry, Stanovich, & Stanovich, 2004; Spear-Swerling, Brucker, & Alfano, 2005). In addition, many teachers report feeling unprepared to teach struggling readers in the classroom (Moats & Foorman, 2003) and spend little time on comprehension instruction (Klinger, Urbach, Golos, Brownell, & Menon, 2010). It is therefore important that we examine the methods being used to teach preservice teachers (PSTs) how to teach reading (Grossman, 2005). It is logical to expect that teacher's baseline of skills for teaching reading originate with their coursework and field experiences during preparation programs. This is evidenced in part by changes in beliefs, knowledge, and practice for PSTs after receiving instruction in the area of reading instruction (Risko et al., 2008).

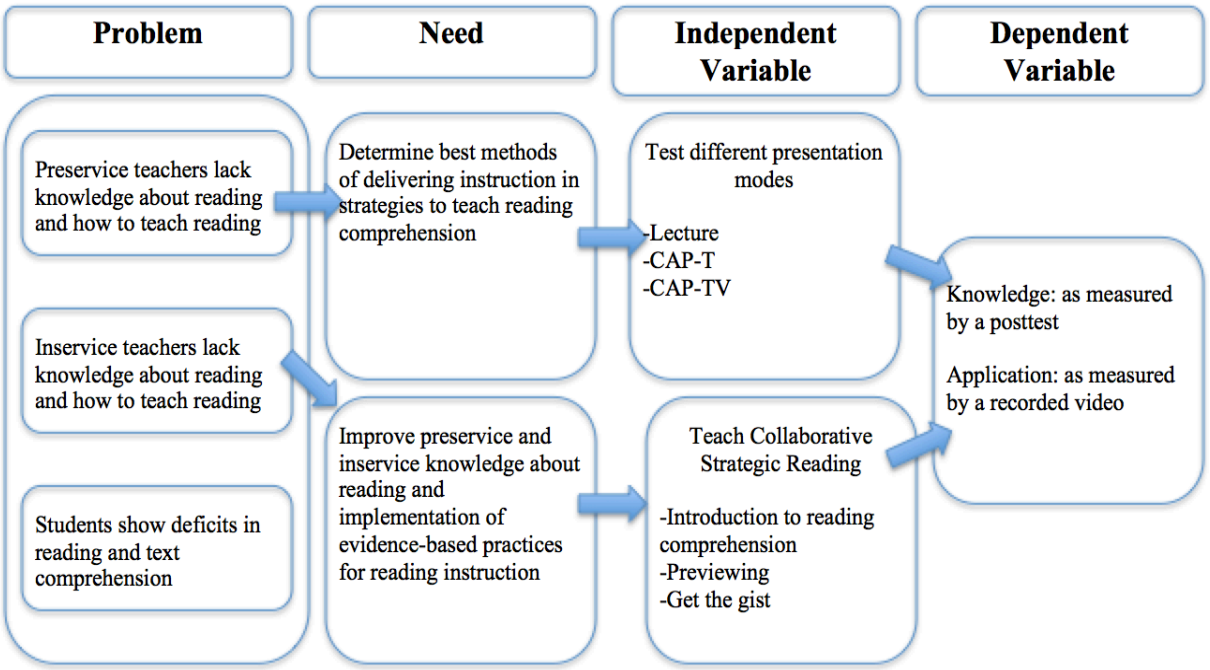
In addition to making sure teacher educators provide preservice teachers with effective methods for teaching reading, it is critical to examine the way new content is presented (Grossman, 2005). In other words, many teacher educators take for granted the methods we use to teach students about evidence-based practices (Kennedy, Thomas, Aronin, Newton, & Lloyd, 2014). While some preservice teachers (PSTs) will pick up on important aspects of evidence-based practices regardless of how content is presented (e.g., via a traditional lecture with PowerPoint), others are better prepared when instructors use more powerful methods.

Content Acquisition Podcasts for teachers (CAP-T) and the use of videos in instruction are two promising multimedia methods for preparing preservice teachers to learn new skills

(Dieker et al., 2009; Kennedy, Driver, Pullen, Ely, & Cole, 2013; Kennedy, Hirsch, Dillon, Rabideau, Alves, & Driver, 2016; Kennedy & Thomas, 2012; Nagro & Cornelius, 2013). Thus one purpose of this dissertation is to examine the use of CAP-T and videos and their impact on PST knowledge and implementation of reading comprehension strategies when compared to a traditional method of instruction.

The following introduction references the conceptual framework depicted in Figure 1.1 to set the purpose for the current study. The introduction begins with a discussion on the need to improve reading outcomes for all students, but in particular for those with disabilities who struggle with different components of reading comprehension. I then introduce Collaborative Strategic Reading (CSR), which is one evidence-based method for improving reading outcomes for struggling readers that participants in this study will learn to implement (Vaughn et al., 2011). Following is a discussion of the need to improve teacher knowledge outcomes in the area of reading instruction for both preservice and inservice teachers. The far left section of Figure 1.1 illustrates the some of the problems that I hope to address, namely the lack of preservice and inservice teacher knowledge about reading and poor student outcomes. The next section of the framework presents some of the needs that lead to my research questions. Next, I provide an overview of current practices to teach reading instruction in teacher education programs. Although providing professional development to inservice teachers is another method of improving practice, that is not the focus of the present study. The current study focuses on effective methods to support teacher readiness to teach reading by using multimedia as the delivery option. Finally, I discuss current technology used in teacher education with a focus on CAPs and video modeling and provide a brief overview of the purpose of the study.

Figure 1.1. *Conceptual Framework for the Current Study*



Need to Improve Reading Outcomes

Reading is critical in all content areas, particularly when students are asked to read textbooks and other content specific texts (Gajria, Jitendra, Sood, & Sacks, 2007). Students are also increasingly expected to read for a variety of purposes and to read increasingly complex texts (Gajria et al., 2007; Haager & Vaughn, 2013). This is especially apparent in science and social studies, which subjects where students often do not receive special education support despite being content rich and requiring reading of complex texts (Klinger et al., 2004; Klinger, Vaughn, & Schumm, 1998).

As students move from lower to upper elementary school, the purpose of reading shifts and they must begin "reading to learn" (Wanzek, Wexler, Vaughn, & Ciullo, 2010, p. 890). As students begin to spend more time reading for understanding, they often have difficulty due to the need to read complex text (Ciullo, Falcomata, & Vaughn, 2015). There is also a push to

include more expository text during instruction in addition to narrative text (Haager & Vaughn, 2013). However, students with SLD and other struggling readers typically demonstrate specific deficits in reading skills. These include reading strategically and monitoring comprehension, which limits ability to comprehend complex text (Gajria et al., 2007; Gersten et al., 2001; Vaughn et al., 2011). Students with SLD may struggle with the way text is organized and display difficulties with text structure (Gersten et al., 2001). In addition, they may have difficulties distinguishing important information from minor details, drawing inferences, or using their background knowledge to enhance understanding of the text (Gajria et al., 2007).

In contrast, good readers naturally engage in strategic reading and metacognition before, during, and after reading (Vaughn et al., 2011). Courses that require students to read a variety of complex texts can make it difficult for struggling readers to keep up in class. In many cases, struggling readers are expected to access the same text and curriculum as peers without disabilities (Klinger et al., 2004). Students who struggle with reading in early years typically continue to struggle throughout school and after graduation, require more intensive interventions in secondary school, and are at higher risk for negative long-term outcomes, such as school dropout (Joshi, Binks, Hougen, et al., 2009; Vaughn et al., 2015).

Not surprisingly, national testing indicates that not all students meet reading benchmarks. NAEP scores demonstrate that 32% of fourth grade students and 22% of eight grade students are performing at a *below basic* level in reading (NCES, 2013), which points to a need to improve reading outcomes for all struggling readers. According to NCES (2013), students that score on a *basic* level have "**partial mastery** of prerequisite knowledge and skills that are fundamental for proficient work" at that grade level. Even more compelling is the fact that 69% of fourth grade students with disabilities and 60% of eight grade students with disabilities are performing at a

below basic level. In other words, around 66% of students with disabilities do not have the requisite reading skills for success in fourth and eighth grade. Thus there is a clear need to improve reading outcomes for students by helping teachers develop skills to help students make meaning from the text in order to increase comprehension (Wanzek et al., 2010). Reading interventions that combine explicit instruction with strategy instruction have been found to produce the greatest gains in word reading and reading comprehension (Swanson, 1999). One method that combines these two approaches and has a strong research base to support its use is Collaborative Strategic Reading (Klinger & Vaughn, 1999; Klinger, Vaughn, & Schumm, 1998; Vaughn et al., 2011).

Collaborative Strategic Reading

Previewing text, finding the main idea, asking and answering questions, and summarization are some high impact strategies that have been shown to improve reading comprehension (Edmonds et al., 2009; Gersten et al., 2001; Scammacca, Roberts, Vaughn, & Stuebing, 2013; Swanson, 1999). Multi-component strategies have been found to be more effective than single strategies (Gersten et al., 2001). Approaches that combine explicit instruction with strategy instruction have also been found to more effective than approaches that only use one of those pieces (Swanson, 1999). Collaborative Strategic Reading (CSR) is a multi-component approach to teaching reading that incorporates several high-impact strategies and improves reading outcomes for students when compared to typical practice (Klinger & Vaughn, 1999; Klinger et al., 1998; Vaughn et al., 2011). CSR was designed to be effective for diverse groups of students, including those with disabilities and English Language Learners. CSR specifically includes elements that are found to be effective with students with disabilities, such as explicit instruction (Vaughn et al., 2011). CSR explicitly teaches before, during, and after

reading strategies to students. The present study proposes teaching preservice teachers portions of CSR in order to improve ability to deliver reading comprehension instruction. While there are no shortage of strategies that have demonstrated positive impact on student performance, I selected CSR because of its specific combination of explicit and strategy instruction. In addition, although teacher preparation programs may not specifically teach CSR, they do teach the individual components (e.g., prediction, main idea) because these are all effective strategies for reading comprehension.

Need to Improve Teacher Preparation

Foorman and Moats (2004) provide a review of the conclusions and recommendations of the National Reading Panel (NRP) (2000) in regards to reading instruction. They state that the NRP revealed a strong empirical base for phonological awareness and phonics, but that there were limited studies that met the criteria for fluency, vocabulary, and comprehension. Further, because the comprehension studies (n = 205) often did not include comparisons among strategies, a meta-analysis could not be conducted and few conclusions could be drawn. They also state that not only does comprehension instruction lack a strong empirical base, but that "an empirical base is lacking for how to best prepare teachers to teach reading" (p. 53). The NRP (2000) concluded that there needs to be more research in how to teach teachers how to teach comprehension. Although top researchers (e.g., Vaughn and colleagues) have spent the past 15 years immersed in programs of research to address this concern and there are innovative teacher educators doing outstanding work across the country, we are still somewhat limited in our empirical knowledge of best practices and how those are implemented on a broader level.

In addition to our limited knowledge about the best ways to prepare teachers, there is also evidence that teachers report being unprepared to teach struggling readers (Moats & Foorman,

2003). Preservice and inservice teachers often lack basic knowledge of reading and word structure (Bos et al., 2001; Cunningham et al., 2004; Spear-Swerling et al., 2005), such as knowledge of phonemes, morphemes, and sound-symbol correspondence (Moats, 1994). In addition, preservice and inservice teachers have little knowledge about fluency, vocabulary, and comprehension (Spear-Swerling & Cheesman, 2012). There is some indication that experienced teachers have greater knowledge compared to novice teachers, but these experienced teachers still demonstrated deficits in their knowledge (Bos et al., 2001). Even among beginning special education teachers who have moderate knowledge of reading instruction, this knowledge does not always immediately translate into effective practice (Brownell et al., 2009; Carlisle, Correnti, Phelps, & Zeng, 2009). One hypothesis for the lack of knowledge by inservice teachers is that the instructors responsible for teaching future teachers often lack sufficient knowledge (Joshi, Binks, Hougen, et al., 2009). This hypothesis was tested by Joshi and colleagues (2009) who found that teacher educators lack knowledge about reading fundamentals, such as phonemes and morphemes.

As struggling readers progress to middle school, they continue to need high quality instruction, but are often not provided with any specific reading instruction (Lovette, 2013). Teachers report that not only do they not feel qualified to teach reading at this level, but they also do not feel that it is their responsibility (Ness, 2009). In addition, they cite other factors (e.g., preparing for state testing, lack of instructional time) as barriers to providing reading instruction (Ness, 2009).

In an observational study of special educators, Klinger, Urbach, Golos, Brownell, and Menon (2010) found that teachers in the study spent little, if any time, on reading comprehension during literacy at the upper elementary school level. Of the 124 lessons observed, 42 contained

no comprehension instruction, 30 contained rote questions, and only 49 contained comprehension instruction. However, even in the 49 lessons that contained more instruction, most of the time, teachers simply prompted students to use a strategy. In all of the observed lessons, the researchers only noted seven occasions of a teacher providing an explanation of how to use a strategy and only four occasions of a teacher modeling the use of a strategy.

These findings beg the question; why do teachers not spend more time explicitly teaching reading comprehension? It may be because they do not have the knowledge to implement this instruction, they may not have time, or they may feel pressure to cover curriculum content (Bos et al., 2001; Cunningham et al., 2004; Ness, 2009; Spear-Swerling et al., 2005). Although there is considerable research about effective strategies for reading instruction, there is still a large gap between this research and teacher knowledge and implementation (Al Otaiba, Lake, Greulich, Folsom, & Guidry, 2010). Therefore, teacher education programs need to do a better job at preparing preservice teachers to teach reading (Joshi, Binks, Hougen, et al., 2009).

Reading Instruction in Teacher Education

Teacher education programs have a critical role in preparing high quality reading teachers to enter the classroom (International Reading Association, 2003). However, the quality of these programs varies widely, as does the amount of course time and practicum experience provided in reading (IRA, 2003). The National Commission on Excellence in Elementary Teacher Preparation for Reading Instruction (IRA, 2003) found eight critical components of effective teacher education programs and providing PSTs with sufficient content knowledge was one of these components. The current study seeks to deliver content knowledge to PSTs about evidence-based practices for reading instruction.

Risko and colleagues (2008) completed a review of research and found 82 studies that addressed teacher preparation for reading instruction. Of the 82 studies, 23 examined preservice teacher beliefs, 17 examined teacher knowledge and reflective reasoning, 36 examined improving PST knowledge, and 6 examined programmatic issues. The studies that examined PST knowledge at one point during the semester found knowledge to be lacking in areas such as terminology and comprehension tasks. However, studies that examined PST learning over time found that knowledge improved with training and instruction provided in coursework. Overall, these studies indicate that although preservice teacher knowledge about reading is lacking, it is possible to improve this knowledge through training. Although results indicate that teacher preparation programs do improve knowledge, very few studies focused on whether or not teacher preparation programs changed PST instruction. In addition, most studies did not examine student outcomes.

The specific research that examined pedagogy in teacher education used pupil data collection, case-based methodology, personal writing, and explicit teaching methods as means to enhance PST knowledge about reading (Risko et al., 2008). When researchers used explicit teaching methods (e.g., demonstrating techniques using video models, following a structured format), they were able to demonstrate positive PST outcomes on a variety of measures. In addition, they found that multimedia and video can enhance teacher learning and engagement, as well as improve retention of course information. These positive outcomes for the use of multimedia should inspire teacher educators to consider how to best incorporate technology into their instruction in order to enhance PST learning.

Technology in Teacher Preparation

Teacher education programs are expected to fully equip preservice teachers for the classroom by providing them with pedagogical knowledge, content knowledge, and many other skills in addition to allowing opportunities to practice skills in authentic contexts (Risko et al., 2008; Shulman, 1987). Teacher education programs need to find a way to maximize in class and out of class time to deliver all of the critical content needed for success in the classroom. With limited time and resources in higher education and increasing amounts of content to be covered, more and more educators are exploring how to incorporate technology into coursework (Barab, Hay, & Duffy, 1998; Risko et al., 2008). This section begins with an overview of how technology is currently being used in higher education, a description of some forms of technology being used, and then focuses on two specific methods: CAPs and video modeling.

Teacher education programs use technology to allow students a chance to engage in problem solving activities through case-based instruction (Risko et al., 2008), observe teachers in classroom (Blomberg, Sherin, Renkl, Glogger, & Seidel, 2014), and reflect on their own teaching (Laparo, Maynard, Thomason, & Scott-Little, 2012). These technology uses can be in teacher education classrooms, K-12 classrooms, in homes, and on mobile devices, extending learning past the bounds of a traditional classroom (Baran, 2014).

Current technology being used in higher education includes podcasts (Hew & Cheung, 2013), videos for teacher reflection (Santagata & Angelici, 2010; Sherin & van Es, 2009), and multimedia enhanced case-based instruction (Mitchem et al., 2009). Generic podcasts in particular are becoming prevalent in higher education (Heilesen, 2010). Podcasts can have numerous advantages, such as controlling speed of learning and portability, as well as the fact that students tend to have positive responses to them (Heilesen, 2010). Although PSTs and

instructors report positive attitudes towards podcasts (Lonn & Teasley, 2009), there is limited empirical evidence about the effectiveness of podcasts in improving academic outcomes in higher education (Heilesen, 2010). Even in the studies that have positive outcomes for podcasts, these results may be due to classroom considerations (e.g., being allowed to watch podcasts multiple times, but not lectures) rather than anything about the podcasts themselves (Heilsen, 2010; Hew & Cheung, 2013).

One issue is that podcasts and other forms of technology do not inherently reflect any instructional framework (Kennedy et al., 2014). It is assumed that using technology will lead to knowledge acquisition, but just because technology is interesting or new does not mean that it will necessary improve learning outcomes (Kennedy et al., 2014). Multimedia (like all instruction) should be carefully designed with a theoretical framework and clear instructional methods (Clark, 2009). Further, multimedia should be empirically tested to determine whether or not it is effective at delivering content (Clark, 2009; Kennedy, Deshler, & Lloyd, 2013; Mayer, 2011). The following sections describe two evidence-based methods of incorporating technology into higher education courses.

Content Acquisition Podcasts

One form of technology currently being used in higher education is Content Acquisition Podcasts for Teachers (CAP-T), which are short, multimedia-based instructional vignettes that can be used flexibly to deliver content (Kennedy et al., 2013; Kennedy & Thomas, 2012). CAP-Ts are based in Mayer's Cognitive Theory of Multimedia Learning (Mayer, 2009) and created using his 12 instructional design principles (Mayer, 2008). CAP-Ts are similar to enhanced podcasts and pair still images and narration. Still images are shown on the screen, along with key words and phrases and these images change periodically. Narration is matched in time with

the images and is used to deliver instruction. CAP-Ts range from five to twenty minutes and focus on one aspect of a topic. For example, a CAP-T on vocabulary instruction may provide information about a morphological approach or about keyword mnemonics. CAP-T that include embedded modeling videos are called CAP-TV. The base CAP approach can also be created for delivering vocabulary instruction to students with and without disabilities and are referred to as CAPs for students (CAP-S) (see Kennedy, Deshler, & Lloyd, 2015).

Although generic podcasts have shown mixed evidence of success (Hew & Cheung, 2013), research has demonstrated that CAP-Ts are an effective way to deliver content to preservice teachers on a variety of topics (Kennedy, Hart, & Kellems, 2011, Kennedy et al., 2012, Kennedy & Thomas, 2012). Beginning in 2011, and continuing to date, there are 12 published empirical studies of CAPs' effectiveness for improving teacher candidate knowledge (Driver, Pullen, Kennedy, Williams, & Ely, 2014; Ely, Kennedy, Pullen, Williams, & Hirsch, 2014; Ely, Pullen, Kennedy, Hirsch, & Williams, 2014; Hart & More, 2013; Hirsch, Kennedy, Haines, & Thomas, in press; Kennedy, et al., 2011; Kennedy & Thomas, 2012; Kennedy, Ely, et al., 2012; Kennedy, Driver, Pullen, Ely, & Cole, 2013; Kennedy, Thomas, Aronin, Newton, & Lloyd, 2014; Kennedy, Hirsch, Dillon, Rabideau, Alves, & Driver, 2016; Sayeski, Kennedy, Clinton, de Irala, & Thomas, 2015). CAPs are not really podcasts, in the way that many would think about them, but are relatively short (approximately 5-15 minutes), multimedia-based vignettes that use Mayer's cognitive theory of multimedia learning (CTML) (2009) and 12 evidence-based instructional design principles (2008) to package and deliver high-quality instruction for any topic. The term podcast because is utilized in this work because of many users' familiarity with and acceptance of podcasting as a valued instructional tool in higher education (Evans, 2008). A sample CAP-T can be seen at: https://vimeo.com/122847037. This CAP-T provides information

on teaching vocabulary using explicit instruction. It reviews using student-friendly definitions, use of examples, and use of non-examples.

In multiple studies, preservice teachers who watched a CAP-T demonstrated significantly greater improvement on knowledge measures compared to those who read a practitioner-friendly article (Kennedy et al., 2011, Kennedy et al., 2012, Kennedy & Thomas, 2012). Effect sizes were generally in the medium to large range (Kennedy, Kellems, Newton, & Thomas, 2015). This is likely due to the fact that CAP-Ts are designed using a theoretical framework and include explicit instructional practices, such as breaking content into steps. In addition, in two studies, PSTs who watched a CAP-T demonstrated significantly greater improvement on knowledge measures compared to those who heard a lecture, although effect sizes were less pronounced than CAP-T compared to reading alone (Hirsch, Kennedy, Haines, Thomas, & Alves, 2015; Kennedy, Hirsch, et al., 2016).

Video Use in Higher Education

A second strategy being used in higher education is the use of videos in instruction. Social cognitive theory posits that behavior is a result of planned action and that conceptions of action come from a variety of source, such as observation, experiences, and verbal instructions (Bandura, 1989). This theory provides a theoretical framework for the use of video modeling in the classroom, by showing that behavior can result from observing others. Preservice teachers also report higher levels of self-efficacy as a result of observing teachers (Haverback & Parualt, 2011). Video may be useful in teacher education because it allows PSTs a chance to observe a variety of practices and classrooms that they may not be able to experience otherwise (Blomberg, et al., 2014). In addition to watching and reflecting on classroom interactions, PSTs may use videos to observe and reflect on their own teaching (Laparo et al., 2012). Videos are often used

as a tool for teacher reflection (Santagata & Angelici, 2010; Sherin & van Es, 2009) and as a part of case-based instruction (Han, Eom, & Shin, 2013; Mitchem et al., 2009). Video clips used in case-based instruction demonstrate classroom practice and have been shown to improve preservice teacher knowledge (Han et al., 2013).

CAPs Plus Video Modeling (CAP-TV)

One experimental study has incorporated CAPs and video modeling and found that PSTs that watched a CAP-TV outperformed those that read a practitioner-friendly article on vocabulary instruction (Ely, Pullen, Kennedy, Williams, & Hirsch, 2014). In addition, a single-subject study ($N = 3$) has demonstrated that teachers can increase the number of vocabulary practices they use during instruction after watching a CAP-TV (Ely, Pullen, Kennedy, & Williams, 2015). This preliminary research indicates that combining CAP-T and video modeling is an effective way of delivering content to PSTs and teachers. However, more research is necessary in this promising area.

Purpose of the Present Study

The proposed study examines several methods of providing instruction on evidence-based practices to teach reading comprehension. It has been established that reading is a critical skill for students across all content areas, but that many students, particularly those with disabilities, demonstrate difficulties in reading comprehension. Further, teachers are not always adequately prepared to teach struggling readers. Therefore, it is critical for teacher education programs to explore options for preparing preservice teachers to become better teachers of reading.

An important piece of research in teacher education is to examine best methods to present content. Flipped classrooms are becoming more common in higher education across such

diverse disciples as physics, marketing, math, and business (Green, 2015; McCallum, Schultz, Sellke, & Spartz, 2015; Sun & Yu, 2016). In these classrooms, students learn content at home, typically via multimedia such as videos or recorded lectures, and come to class prepared to engage in activities, such as discussions or problem solving that can help assimilate that knowledge (Westermann, 2014). Research indicates positive attitudes towards flipped classrooms (Crews & Butterfield, 2014) and positive learning outcomes for students (Peterson, 2016). However, before utilizing multimedia such as CAP-T or CAP-TV to deliver instruction in a flipped classroom setting, it is important to empirically test these methods of instruction

In order to assess the effectiveness of CAP-T and CAP-TV to deliver instruction on reading comprehension, I will compare a traditional lecture with two multimedia conditions to see which one produces better knowledge regarding reading comprehension and application when asked to implement select segments of CSR for preservice teachers. One multimedia condition is instruction using a CAP-T and the second is instruction using a CAP-TV. The purpose is to examine which condition produces better learning and application when asked to implement select segments from CSR as measured via a posttest and a recorded teaching video. If I can show that either of the multimedia conditions produce knowledge and application outcomes equal to or greater than the lecture, then that would provide evidence that CAP-T or CAP-TV might be tools to be considered for use in higher education to deliver content. Specifically, they may be potential ways to deliver content via a service delivery model, such as a flipped classroom, that would free up class time for more authentic practice opportunities.

CHAPTER II: REVIEW OF THE LITERATURE

The following literature review begins with a description of current state of knowledge of reading instruction for preservice and inservice teachers. This section describes what teachers know about reading, whether training can improve knowledge, and how improvements may affect student outcomes. To revisit the conceptual framework presented in Figure 1.1, these sections address deficits in preservice and inservice knowledge, as well as student reading difficulties. This precedes an analysis of what teacher education programs do to prepare teachers to teach reading and the needs reflected in the figure 1.1, specifically the need to improve PST outcomes and determine the best methods to accomplish this. Next I review of the use of technology in teacher education with a specific focus on the use of CAP-T and video modeling. Multimedia is one of many effective methods to support teacher readiness. I review the theory behind the development of CAPs, as well as the research evidence to support their use in higher education. Next I discuss the use of videos in teacher preparation programs, including studies that have combined CAP-Ts and video modeling. Included in this section is a discussion of how CAP-T and CAP-TV can be used in flipped or online classrooms and in professional development. I then present an overview of the components of Collaborative Strategic Reading (CSR) and a review of the studies to support its effectiveness. Finally, I conclude with an overview of the purpose and research questions for the present study.

Teacher Knowledge of Reading Instruction

Research has shown that preservice and inservice teacher knowledge about reading is lacking (Bos et al., 2001; Moats, 1994). Not only do teachers in the classroom lack knowledge about reading skills, but they also do not always feel qualified to teach struggling readers (Moats & Foorman, 2003). Much of this research focuses on early reading instruction and teacher

knowledge of basics of the English language, such as phonological awareness, phonics, and morphology (Foorman & Moats, 2004). These building blocks are critical foundations for students as they develop comprehension skills (Duke & Carlisle, 2011). There is also evidence indicating teachers have poor knowledge about reading comprehension (Spear-Swerling & Cheesman, 2012).

In addition to lack of knowledge, teachers spend little time providing instruction around reading comprehension (Klinger et al., 2010). With the importance of reading across content areas, teacher educators need to provide training and support to teachers to improve reading outcomes for students. There is evidence that coursework and PD can improve knowledge of reading (McCutchen, 2002; Risko et al., 2008). While PD is one important approach, this study specifically seeks to examine methods of improving preservice teacher training.

The following section begins with an overview of research that examined preservice and inservice teacher knowledge around reading concepts. Next, I present results from several studies that examined the success of training provided to improve teacher reading knowledge. I conclude with a look at research that seeks to connect teacher knowledge to student reading outcomes.

The State of Teacher Knowledge about Reading Instruction

Moats (1994) conducted seminal work in this area, demonstrating that teachers lack basic concepts fundamental to understanding reading. She completed two iterations of her study, giving 52 participants an initial survey and 37 additional participants a more refined survey. The survey examined participant knowledge of terminology, phonics knowledge, and phoneme and morpheme awareness. Overall, teachers struggled with terms, such as inflection and derivation, as well as knowledge of phonics, phonemes, and morphemes. Moats (1994) concluded that

teachers struggle with these linguistic concepts and would therefore struggle with teaching them to beginning readers. She further recommends the study of basic linguistics, as well as opportunities to practice, should be a part of every teacher education program.

Bos and colleagues (2001) extended the work of Moats (1994) by surveying preservice ($N = 252$) and inservice ($N = 286$) teachers about their perceptions and knowledge around reading and spelling. This study found that teachers are lacking in knowledge of phonological awareness, phonics, and how language is structured. More than half of preservice teachers (53%) and inservice teachers (60%) were unable to answer even half of the knowledge items correctly. Researchers concluded that teachers need improvement in basic reading knowledge.

Moats and Foorman (2003) report details from the Early Interventions Project, which is a five-year study that involved multiple interventions and many measures to examine outcomes for at-risk students. Throughout three phases of surveying elementary school teachers, they found consistent weaknesses in teacher knowledge of reading instruction. Moats and Foorman (2003) propose that these findings help explain why some teachers do not utilize effective instructional strategies to teach reading in their classrooms.

Cunningham and colleagues (2004) focused their investigation on teacher knowledge of children's literature, phonics, and phonological awareness. There were 722 early elementary (kindergarten through third grade) teachers from a large, urban school district in Northern California that completed the survey, which examined knowledge of book titles, ability to determine the number of phonemes in a word, identifying regular and irregular spelling patterns, and ability to answer explicit questions about the rules of the English language. Teachers also self-reported perceived knowledge about each of these domains. Although the average experience was 12 years, results demonstrated that 90% of teachers were unable to recognize

even half of the book titles on the list. Fewer than 1% of teachers could identify the phonemes correctly in all 11 words and fewer than 1% could correctly answer all seven explicit knowledge questions. In general, teachers who reported higher knowledge of children's literature were able to identify more book titles. However, teachers that reported higher levels of knowledge on phonological awareness tasks actually performed lower on knowledge of phonological awareness. In the domain of phonics, no differences were found between the teachers that reported high knowledge versus those that reported low knowledge. This study once again demonstrates that teachers involved in providing reading instruction to students lack fundamental knowledge of reading. In addition, it suggests that teachers are not always aware of their lack of knowledge. This leads to the question of whether teacher knowledge of reading affects their instruction or if it affects student outcomes.

Improving Teacher Knowledge of Reading Instruction

Carlisle and colleagues (2009, 2011a, 2011b) attempted to establish a connection between teacher knowledge and instruction in reading and student outcomes. Carlisle and colleagues (2009) conducted a study to explore whether teacher ($N = 977$) knowledge affected word analysis and reading comprehension outcomes for students in first through third grades. Using survey data from the evaluation of Reading First in Michigan, they gathered information about teacher knowledge (using an instrument called Language and Reading Concepts), teacher education and prior teaching experience, student performance on the word analysis and reading comprehension subtests of the Iowa Test of Basic Skills (ITBS), and student demographic information. Teachers all received PD in reading through Reading First. Although they did not find any significant relationships between teacher knowledge and student reading outcomes, they cite two possible reasons for this; (a) the measurement used might not accurately represent the

knowledge teachers are using in classroom instruction and (b) the fact that the IBTS test was not aligned with curriculum being implemented in the schools. The authors propose that a measure of the actual instructional practices used in the classroom may be a better indicator of teacher knowledge and application.

Carlisle Kelcey, Rowan, and Phelps (2011) examined how teacher knowledge related to reading outcomes for students in first through third grades. They developed a measure called Teachers' Knowledge of Reading and Reading Practices that sought to assess teacher knowledge of reading in context by providing situations to analyze, rather than asking about decontextualized knowledge. Results of the teacher knowledge measure were compared to student outcomes, as measured by the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) and by the word analysis and reading comprehension subtests of the Iowa Test of Basic Skills (ITBS). After running several analytic models, they found that the only significant result was the effect of teacher knowledge on reading comprehension outcomes in first grade. There were not significant results for the effect of teacher knowledge on reading comprehension in second or third grade and no effects on word analysis in any grade. However, the researchers caution that their measure may not effectively evaluate teacher knowledge or that it may have been beneficial to focus it more on reading comprehension skills (rather than early literacy skills) because many second and third grade teachers are focusing on comprehension instruction. The two Carlisle studies cited above (Carlisle et al., 2009; Carlisle, Kelcey, Rowan, et al. 2011) both indicate that more generic measures of teacher knowledge failed to show results, perhaps because of the misalignment between the measure and the knowledge being used in the classroom. The current study proposes to address this by designing a knowledge measure to specifically reflect the intervention.

Carlisle, Kelcey, Berebitsky, and Phelps (2011) examined how teacher instruction related to reading outcomes in third grade. They looked specifically at pedagogical structure (i.e., how teachers help students understand the purpose of the lesson), teacher-directed instruction (i.e., how teachers present content to ensure learning), and support for student learning (i.e., how teachers engage students and assess learning). Researchers conducted four observations each on 88 second and third grade teachers across six districts. Results showed that teacher emphasis on teacher-directed instruction and support for student learning led to gains in reading comprehension outcomes for students, even when controlling for prior knowledge and teacher and student characteristics.

Although teacher knowledge of reading can be deficient, research has demonstrated that PD can improve teachers' knowledge of different aspects of reading (Bos, Mather, Narr, & Babur, 1999; McCutchen et al., 2002). Although some studies found that teacher knowledge of reading does seem to affect reading instruction and student outcomes (Bos et al., 1999; McCutchen et al., 2002), others found no connection (Carlisle et al., 2009). However, those researchers proposed that the difficulty connecting teacher knowledge to student outcomes may be related to issues with measuring the constructs being studied (Carlisle et al., 2009).

Bos and colleagues (1999) created a PD course to enhance teacher knowledge of reading and spelling, specifically in the areas of phonological awareness and spelling-sound correspondence. They included videos as part of this course that demonstrated teachers implementing effective instruction in reading and spelling. Participating teachers (n = 11) met monthly to receive training and engage in discussions, while comparison teachers (n = 17) simply completed the teacher assessments and collected student data. Results show that teachers reported positive attitudes about the PD model, that they improved their attitudes about explicit

code-based instruction and knowledge of basic reading fundamentals. Overall student outcomes showed that students taught by teachers who received PD made more gains in sound identification and spelling than those taught by comparison teachers.

McCutchen and colleagues (2002) conducted a two-week summer institute that taught teachers to focus on phonological and orthographic components of reading instruction. They also provided several coaching sessions during the year where they worked with teachers to review assessment data and plan instruction. Although this study focused on phonology and orthography, first grade teachers were still able to increase the amount of explicit comprehension instruction provided. McCutchen and colleagues (2002) provide evidence that training and feedback to teachers also leads to positive comprehension outcomes for students.

Sailor (2006) provided PD and coaching to second through eighth grade teachers on cognitive strategies, including comprehension and fix-up strategies. She found that teachers who received the PD and coaching engaged students in significantly more uses of comprehension strategies, although no significant differences were found for other cognitive strategies. In addition, students who were taught by the teachers in the treatment group made significantly progress on the Group Reading Assessment Diagnostic Evaluation from pretest to posttest.

The conclusion of this research is that inservice teachers do not have sufficient knowledge about teaching reading, but that this knowledge can be improved with PD (Bos et al., 1999; McCutchen et al., 2002). In addition, much remains unknown about the relationship between teacher knowledge and implementation of evidence-based practices (Carlisle et al., 2011). Though there is research that has connected teacher knowledge to student outcomes (Bos et al., 1999; McCutchen et al., 2002), some of this research demonstrates limited evidence of the effects of teacher knowledge on student reading outcomes (Carlisle et al., 2009). Although

research shows that PD can improve *teacher* knowledge and the application of this knowledge in the form of increased levels of explicit instruction (Carlisle, Kelcey, Rowan, et al., 2011), results are mixed about whether PD translates into increased *student* knowledge and outcomes (Carlisle et al., 2009). This is due, in part, to the difficulties with measuring teacher knowledge, as well as the complexities of connecting this knowledge to student outcomes (Carlisle, Kelcey, Rowan, et al., 2011). One avenue to improve teacher reading knowledge and application of skills is to examine teacher preparation programs and examine ways to improve delivery of this knowledge by teacher educators.

Teacher Education

Effective reading instruction requires skilled teachers and one goal of teacher education programs is to provide PSTs with the pedagogical content knowledge (Shulman, 1987) necessary to teach reading (Spear-Swerling, 2009). The section begins with an overview of what is being taught in teacher education programs and the lack of knowledge demonstrated by teacher educators about reading instruction. Next is evidence that providing instruction about reading to preservice teachers can improve their knowledge, as well as some evidence that it can also improve outcomes for students.

Preservice Teacher Preparation

The National Commission on Excellence in Elementary Teacher Preparation for Reading Instruction (IRA, 2003) examined eight teacher preparation programs over three years, following their graduates out into the field. The commission found that teachers that attended high quality programs report feeling more prepared when they entered the classrooms, are more effective at creating a rich literacy environment, engage students with quality texts leading to student gains

in reading comprehension. However, there is generally little empirical evidence about what is necessary for high quality teacher preparation (Risko et al., 2008).

The National Council on Teacher Quality (NCTQ) (Walsh, Glaser, & Wilcox, 2006) collected syllabi ($N = 223$) and textbooks ($N = 227$) from required reading courses at 72 education schools. Although this report on examined syllabi and textbooks and did not look at course instruction or measure student outcomes, it can still be viewed as informative about what teacher educators are teaching about reading. The NCTQ looked at whether syllabi devoted time to teaching about the five components of reading (phonological awareness, phonics, fluency, vocabulary, reading comprehension) and whether there were assignments that asked PSTs to demonstrate their knowledge of reading instruction. Two lectures on one component allowed it to receive the maximum score. There was no examination of the quality of the lecture or whether the lecture occurred, simplify if the topic was present on the syllabus. Scores from multiple classes at a university were combined under the assumption that students may have to take multiple classes as a part of their program and may not learn about all five components in one course. Textbooks were also evaluated to determine whether or not they thoroughly covered the five components. Results show that only 11 of the 72 schools taught all five components in their reading courses and only four textbooks adequately covered all five components. According to the NCTQ, these low numbers show that teacher education programs should reevaluate their instruction and materials in order to ensure PSTs are receiving instruction in all areas of reading. This report has provoked considerable controversy, specifically about the methodology used to determine findings (Fuller, 2013), so further work should be done to examine what exactly is being taught to our preservice teachers. Although the NCTQ results

should be interpreted with caution due to concerns, other researchers have also found inconsistencies with teacher preparation programs.

Joshi, Binks, Hougen, and colleagues (2009) hypothesized that poor inservice teacher knowledge may be linked to poor knowledge of teacher educators. They conducted two studies to examine this hypothesis. In the first study, 78 teacher educators who taught reading courses were surveyed on their knowledge of reading concepts. The first part of the survey asked educators to rate their abilities to teach a variety of reading concepts from 1 (minimal) to 4 (expert) and the average score for self-perceptions of teaching comprehension was 3.056, which was the highest of all eight areas. However, on a test of knowledge, the average score on comprehension items was 57.50%. Although teacher educators rate themselves as having high knowledge on reading comprehension, they performed poorly on a knowledge test. Similar results were seen across all areas of reading: Teacher educators feel prepared to teach reading, but in fact, lack necessary knowledge. In addition, Joshi, Binks, Graham, and colleagues (2009) found that of 17 textbooks commonly used in reading education, only 13 included all 5 components of reading, and of these, only 10 correctly defined all five components. Of the textbooks that correctly define each component, some textbooks devoted only small space (4% to 10%) to these five components. When combining the results of these two studies, it is clear teacher educators who provide instruction in reading need to take a close look at their knowledge and materials. Only by improving in these areas, can the field expect to improve outcomes for preservice teachers graduating from teacher education programs.

In a follow-up analysis to her review of the research on teacher education in reading, Risko (2009) further delved into what is happening in these programs. She found a pattern of learning by doing in the research that indicates that PSTs often take an active role in their own

learning. In the current analysis, she attempted to identify specific features of instruction that led to strong effects. She found a set of explicit instructional practices to be effective, including explicit explanations, use of examples, demonstrating/modeling, guided practice in the classroom, and guided practice in the field. Teacher education programs should take note and plan to incorporate these practices into instruction.

Improving Preservice Teacher Knowledge

Spear-Swerling and Brucker (2003, 2004, 2006) have conducted a series of studies to examine whether teaching PSTs about word structure improves knowledge. In the first study (Spear-Swerling & Brucker, 2003), the researchers assessed participant ($N = 90$) knowledge of graphophonemic segmentation, classifying pseudowords by syllable type, and distinguishing irregular words from regular words using the Test of Word Structure Knowledge. They found that the group that received instruction in word structure (e.g., common syllable types, terminology) outperformed those that did not receive this instruction, indicating the important of teaching this content. The researchers caution that the group that received the instruction did not reach ceiling levels on the measures, which may indicate more extensive training is necessary to improve teacher knowledge to sufficient levels.

In a follow up study, Spear-Swerling and Brucker (2004) not only analyzed preservice teacher ($N = 147$) knowledge before and after instruction in word structure, but they also measured student outcomes for students being tutored by the preservice teachers. Using the same measures as above, they found that again, PST knowledge improved after receiving instruction. In addition, tutored students improved reading and spelling skills from pretest to posttest. This study demonstrates that improvements in teacher knowledge can lead to better reading outcomes for students. However, this was a treatment only study and did not specifically

examine which methods of instruction might lead to better outcomes for PSTs and students. Finally, Spear-Swerling and Brucker (2006) assessed the relationship between preservice teacher's own reading abilities and their knowledge acquisition and found that regardless of their own reading skills, instruction in word structure improved knowledge. This study again shows the importance of providing appropriate training to preservice teachers about reading instruction.

Spear-Swerling (2009) replicated her 2004 study, but in the latter study, she also examined PST perceptions of knowledge, added measures to assess morphology and general knowledge about reading development, and also assessing student phonic knowledge. This study examined knowledge and perceptions of 45 PSTs and reading outcomes for the 45 tutored students. PSTs received eight hours of coursework on reading related topics and also completed associated activities. Results demonstrate that PSTs did not have an accurate perception of their reading knowledge at pretest, but that they were able to significantly improve knowledge in all five areas (including general reading knowledge) after receiving course instruction. Tutored students also significantly improved skills on reading and spelling measures, however the measures of PST knowledge did not predict this growth. This series of studies demonstrates that PSTs can grow in their knowledge of reading after receiving instruction and provides some support for increased student outcomes as a result of gains in knowledge. One possible avenue for delivering knowledge to PSTs is through the use of technology.

Technology in Teacher Education

Much of the current research in teacher education deals with *what* is being taught, rather than *how* it is being taught (Grossman, 2005). This is logical, however, it is also critical to examine the methods being used in higher education to ensure that we, as teacher educators, are providing appropriate instruction to preservice teachers (Kennedy et al., 2014). Instead of

continuing to use the ever popular PowerPoint lecture, which can have disadvantages if not created with learning in mind (Gier & Kreiner, 2009), it is important to examine whether other methods might be as effective (or more effective) for teaching PSTs. In addition, the flipped classroom approach is becoming more popular in higher education (Dove & Dove, 2015). In this approach, students learn at home through the use of recorded lectures or videos and then class time can be used more flexibly for activities that include group work and student-centered learning (Dove & Dove, 2015). Technology is often used to provide the instruction in flipped classrooms, but this multimedia should be examined to determine whether it leads to positive learning outcomes.

As technology becomes increasingly prevalent in higher education (Barab et al., 1998, Heilesen, 2010), research can and should examine the effectiveness of this instruction and the conditions and content under which instruction leads to improvements in PST knowledge. Two forms of technology being used in higher education with strong empirical records are Content Acquisition Podcasts and videos. These two forms of technology are being incorporated into traditional classrooms and being used to help flip the classroom. These two technologies will be explained in the following sections, along with evidence of effectiveness.

Content Acquisition Podcasts for Teachers (CAP-T)

Content Acquisition Podcasts (CAPs) are one form of technology being used in higher education that have strong evidence of effectiveness. The version of CAPs used in higher education is referred to as CAPs for teachers (CAP-T), while the version used for K-12 students is referred to as CAPs for students (CAP-S). CAPs for teachers that include embedded modeling videos are referred to as CAP-TV. This section begins by reviewing Mayer's Cognitive Theory of Multimedia Learning and associated theories of learning, which provide the framework for

CAP creation. In addition, there is a thorough overview of research supporting the use of CAP-T in preservice teacher education.

Theoretical framework. Generic multimedia or podcasts created for higher education lack a theoretical framework to support their use (Clark, 2009). In other words, this technology is not designed in a way that will results in specific enhancements of learning. In a review of podcasting, Heilsen (2010) found that generic podcasts do not seem to enhance academic outcomes in higher education. This may be, in part, due to the fact that students have a limited amount of cognitive resources available for learning and if they are overloaded, new learning cannot occur (Chandler & Sweller, 1991). This could be because podcasts may be long and full of content and may not be organized in a way that is easy to follow. If generic podcasts are not designed with student cognitive load in mind, they can easily overload the resources of users. However, multimedia created with Mayer's Cognitive Theory of Multimedia Learning (CTML; 2009) and 12 principles of instructional design (2008) can support learning by helping users manage their cognitive load.

Mayer (2009) drew from several theories of learning including Paivio's dual processing principle (1986) and Baddeley's (1986) model of working memory when developing his CTML. Simply put, Paivio's dual processing principle states that learners can take in auditory information (language) and visual information (images) and information from these two channels, and stimuli is then combined in the central executive. Baddeley (1986) expands this idea by starting that information taken in through the phonological loop or visiospatial sketchpad will only remain for three seconds unless rehearsed or practiced. This explicit cognitive action will help information move from working memory to short-term memory. These two theories

provide understanding for the importance of both visual and auditory support in learning, particularly in multimedia instruction.

Mayer used these theories to develop his Cognitive Theory of Multimedia Learning (CTML; 2009), which explains people learn best when multimedia-based instruction provides a blend of visuals and audio in complimentary modes, which are used to create meaning within long-term memory (Mayer, 2009). In addition, Mayer (2008) has developed and experimentally tested 12 principles of instructional design that allow educators to design high quality multimedia that helps users manage their cognitive load and maximize learning. The principles are pre-training, coherence, signaling, segmenting, spatial contiguity, temporal contiguity, redundancy, multimedia, modality, personalization, voice, and image (see Appendix A). A sample CAP-T that demonstrates what a CAP is, and also introduces the 12 instructional design principles is available at: https://vimeo.com/89716786. This CAP-T explains each of the 12 design principles and gives examples of each in the design of multimedia.

Mayer's principles in CAP design. This section discusses Mayer's principles in overall CAP design and is applicable to CAPs created for teachers and for students. To address the risk of cognitive overload, instructors who create CAPs utilize Mayer's principles in combination to shape the look and sound of each video. The coherence principle states that multimedia should provide only essential content to the exclusion of potentially interesting, but ultimately unnecessary details (Mayer, Heiser, & Lonn, 2001). Therefore, CAPs are scripted to include essential content for the topic as judged by the creating instructor, and extraneous details are omitted. The signaling principle specifies that instructional designers explicitly highlight essential content within a presentation (Mayer, 2008). A generic, audio-only or enhanced podcast may or may not contain such explicit cues. The segmenting principle suggests

instructional designers should chop instruction into learner-size bites. This principle is logical given the aforementioned coherence and segmenting principles, and is again often violated by long lectures and other forms of instruction that continue on for extended stretches without breaks. Depending on length, CAPs contain explicit pause points and embedded comprehension or discussion questions. Even if the user does not actually pause the video or record answers to the questions, they are still taking a de facto cognitive break.

The principle most often violated in higher education instruction, multimedia or not, is the redundancy principle (Clark, 2009; Mayer, 2008). This principle holds that instruction using redundant modes (e.g., visuals in the form of on-screen text and audio together) can overwhelm learners' limited cognitive resources, and backfire in terms of learning (Mayer & Johnson, 2008). This is most often seen during lectures with PowerPoint and enhanced podcasts where the audio track is paired with bulleted slides. The only text included within CAPs helps to reinforce key content, and learners are explicitly taught to pay special attention when text is used as it signals information likely to appear on a test or quiz. The temporal and spatial contiguity principles guide the person creating a CAP to ensure the end user's eyes are not constantly darting around the screen to find information, and there is a good match between content on the screen and audio being presented.

Finally, the personalization, image, and voice principles help illustrate the need to create multimedia that a learner sees value in (e.g. my professor made this for my class), and is free of distractions by way of blurry or abstract images, and unwanted noises during the recording (including a speaker saying "um" or otherwise pausing unnecessarily). A sample CAP-T that introduces and models Mayer's principles can be seen at https://vimeo.com/89716786. This CAP-T explains each of Mayer's instructional design principles and gives examples of how each

is used in designing multimedia. In summary, the use of Mayer's principles to carefully shape multimedia may positively impact a user's motivation to learn stemming from the learner-centric features of the model. The extent to which this is true is explored in this study.

Evidence of effectiveness. In Kennedy and colleagues (2011), two groups of preservice teachers ($N = 79$) were given training on No Child Left Behind (NCLB) and on Traumatic Brain Injuries (TBI). One group received enhanced podcasts created utilizing Mayer's principles, while the other group used audio-only podcasts. The CAP-T group outperformed the audio-only group on both topics, with an effect size of $d = 0.64$ on NCLB and $d = 0.82$ on TBI. These results demonstrate that adding visual elements to the CAP-T improves the learning of PSTs when compared to audio-only podcasts.

Kennedy and colleagues (2012) conducted an experiment with three groups of preservice teachers ($N = 168$). All groups read text on learning disabilities and high-functioning Autism and took a pretest and posttest on this content. One group watched a CAP-T on this content before reading, as an advance organizer. A second group watched a CAP-T on this content after reading, as a review tool. The third group used a graphic organizer while reading. Both CAP-T groups outperformed the text only group on knowledge of learning disabilities ($d = 1.09$) and autism ($d = 0.79$). However, there were no significant differences between the two CAP-T conditions, indicating that the time when the CAP-T is viewed may not make an impact on learning.

Much of the empirical research on CAPs has compared preservice teachers who watch a CAP-T to those who read a practitioner-friendly article. In each experiment, both groups receive the same content (via different modes) and are then tested on retention of this content. For example, Kennedy and Thomas (2012) conducted an experiment where preservice teachers ($N =$

164) were either given a CAP-T or an article on Positive Behavior Interventions and Supports (PBIS). All participants were given a pretest, posttest, and maintenance measure. The CAP-T group outperformed the text-only group at posttest ($d = 0.98$) and at maintenance ($d = 0.97$).

In Kennedy and colleagues (2013), preservice teachers ($N = 148$) learned about phonological awareness via a CAP-T or a practitioner-friendly article. All participants took a pretest, posttest, and maintenance measure. Once again, the CAP-T group outperformed the text-only group at posttest ($d = 0.86$) and maintenance ($d = 0.97$). Kennedy, Thomas, Aronin, Newton, and Lloyd (2014) examined preservice teacher ($N = 164$) learning about learning disabilities and autism by comparing a CAP-T condition and a text condition. The CAP-T group outperformed the text-only group at posttest (LD, $d = 1.09$; autism, $d = 1.21$) and maintenance (LD, $d = 0.81$; autism, $d = 1.33$). Each of these studies demonstrated that PSTs that watch a CAP-T outperform those that read an article with strong effect sizes.

Driver, Pullen, Kennedy, Williams, and Ely (2014) examined preservice teacher ($N = 103$) learning about phonological awareness via an experimental design with a pretest, posttest, and maintenance measure. One group watched a CAP-T about phonological awareness, while the other read a practitioner-friendly article. This study examined PST knowledge via questions about defining language terms, assessing instructional strategies, and applying knowledge (e.g., identifying the number of phonemes in a word). Results showed that the group that watched a CAP-T significantly outperformed the text group at posttest, $F(1,97) = 14.0$, $p < .001$, $d = .76$. The CAP-T group also significantly outperformed the text group at maintenance, $F(1,97) = 23.1$, $p < .001$, $d = .98$.

Kennedy, Wagner, and colleagues (2015) conducted a study comparing participants ($N = 270$) who learned about curriculum-based measurement (CBM) from either a CAP-T or a

practitioner-friendly article. This study examined knowledge via multiple-choice questions and application via open-ended questions. The open-ended questions asked participants to do tasks, such as create and interpret a CBM graph. On the knowledge measure, the CAP-T condition scored significantly higher than the text condition at posttest, $F(1,268) = 131.24$, $p < .001$, $d = 1.39$ and at maintenance, $F(1,268) = 112.55$, $p < .001$, $d = 1.29$. Similar results were found on the application measure, with the CAP-T condition scoring significantly higher than the text condition at posttest, $F(1,268) = 183.04$, $p < .001$, $d = 1.65$ and at maintenance, $F(1,268) = 222.51$, $p < .001$, $d = 1.75$. Participants in the CAP-T condition also reported higher levels of motivation than those in the text condition.

Sayeski and colleagues (2015) conducted a study examining PST ($N = 76$) knowledge about basic reading knowledge. PSTs in the intervention condition watched five multimedia modules that taught them about phonological awareness, phonemic awareness, and phonics, as well as receiving a learning packet that included space for notes and questions on each module. PSTs in the control group received general instruction on students with reading disabilities. Results show statistically significant differences between the CAP-T ($M = 24.47$, $SD = 5.04$) and control ($M = 19.74$, $SD = 5.34$) groups at posttest $F(1, 75) = 27.0$, $p < .001$, $d = 0.91$. In addition, the CAP-T group ($M = 25.23$, $SD = 4.78$) outperformed the control group ($M = 20.00$, $SD = 6.41$) at maintenance, $F(1, 67) = 14.7$, $p < .001$, $d = 0.93$.

The next phase in CAP-T research is comparing performance of PSTs that watch a lecture versus those that watch a CAP-T. To date, two experimental studies have examined PST learning about Functional Behavioral Assessment via a CAP-T versus a lecture. In the first study, Kennedy, Hirsch, and colleagues (2016) found that PSTs ($N = 56$) who watched a CAP-T had significantly higher scores on a posttest than those that watched a lecture, $F(1, 53) = 8.3$, p

= .006, *d* = .26. In addition, PSTs in the CAP-T group had lower reported cognitive load levels. In a follow up study, Hirsch, Kennedy, Haines, Thomas, and Alves (2015) found that PSTs (*N* = 199) that watched a CAP-T on FBA did significantly better on a posttest than those who learned via a live lecture, with a moderate effect size (*d* = .45). Although these effect sizes are smaller than those found in the text-comparison experiments, they still show strong evidence of the effectiveness of CAP-T. The current study intends to further this line of research by comparing lecture to CAP-T, but also adding in a third condition, CAP with embedded modeling videos (CAP-TV).

Videos in Teacher Education

The following section includes a description of studies that examine the use of videos in teacher education. These videos are used for a variety of purpose, such as for teacher reflection, case-based instruction, and in conjunction with CAP-T. Videos may show an exemplar teacher modeling a reading strategy, or be recordings of teachers or students used for lesson reflection. Research in using video in teacher education is limited, but shows promising results (Dieker et al., 2009; Nagro & Cornelius, 2013). Preliminary evidence has shown that videos modeling reading strategies can help improve teacher practice (Dieker et al., 2009) and that preservice teachers felt that modeling teacher techniques during videos was helpful to their practice (Kurz & Batarelo, 2010).

Videos for teacher reflection. Videos can be used for teacher reflection in the classroom (Sherin & van Es, 2009) as well as in teacher education programs (Santagata & Angelici, 2010). Observing videos in teacher preparation programs can help preservice teachers become more reflective about their practice, focus on student thinking, and observe current practices in education (Santagata & Angelici, 2010). However, PSTs need guidance when

viewing videotaped lessons so they know what to focus on, otherwise they have a hard time making use of the videos (Santagata & Angelici, 2010). It is important to provide this support and scaffolding to maximize learning while watching videos (Blomberg et al., 2014).

Sherin and van Es (2009) had teachers form video clubs at the elementary and middle school level. These teachers met once or twice a month and viewed brief video clips that demonstrated students displaying mathematical thinking during a recent lesson in one of their classrooms. Teachers then discussed what they noticed about what was going on in the video, with specific emphasis on student thinking. Based on an analysis of the discussions that occurred during video club, teachers were able to increase the amount of attention they paid to mathematical thinking and to improve their ability to analyze student ideas and student reasoning.

Case-based instruction. Videos are also often used as part of the multimedia in case-based instruction (CBI) (Han et al., 2013; Mitchem et al., 2009). CBI is situated in the idea of practice fields (Senge, 1994), which provide authentic contexts for solving problems (Barab & Duffy, 2000). CBI allows PSTs a chance to analyze and solve problems in teaching providing authentic opportunities to practice what they have learned during class. Adding multimedia can allow PSTs more opportunities for observation and interaction while doing this problem solving (Mitchem et al., 2009). Instead of simply reading about a case, they can watch teachers or students in action and problem-solve a real-life situation. It is important to provide learners an opportunity to practice their skills in authentic contexts before going out into a real world setting (Barab & Duffy, 2000). In teacher education, this can be authentic opportunities for classroom practice before moving out into a classroom.

Recently research has examined the effects of adding multimedia, such as videos and online discussion forums to CBI (Han et al., 2013; Mitchem et al., 2009). Mitchem and

colleagues (2009) used videos and other multimedia in case-based instruction across multiple university classes and found improvements in knowledge, as well as PSTs reporting that they liked the real world aspects of the cases. PSTs reported that the videos included in the cases were beneficial to their learning. This is support for the use of videos in instructional contexts in higher education.

Han and colleagues (2013) also used multimedia in case based learning to examine growth in technological, pedagogical, and content knowledge. In this study, one group received videos of model teachers engaging in classroom instruction and the other group reviewed the PowerPoints used in the same classroom instruction. The video group outperformed the PowerPoint group in their perceptions of their technological and pedagogical knowledge. This indicates that incorporating video cases into instruction is a good way to improve preservice teacher knowledge.

Other video uses. Moreno and Ortegano-Layne (2008) examined the idea that classroom exemplars improve learning for preservice teachers. They cite evidence that experiences play a role in learning and that observing models can improve learning. These researchers wanted to see if the use of classroom exemplars affected learning and attitudes and if the mode of these exemplars made a difference. They randomly assigned participants to one of four groups (a) video exemplar; (b) animation exemplar; (c) text exemplar; and (d) control (no exemplar). Across two experiments, the participants in the video and animation groups outperformed the control group on learning tasks. The text group however did not show significant improvements over the control group. These results indicate that video or animation conditions can improve learning of preservice teachers.

Dieker and colleagues (2009) developed videos on a reading strategy called Text Talk (Beck & McKeon, 2001) and used these videos with preservice and inservice teachers. Although the results of this field-testing are preliminary, they show support for the use of videos in teaching about reading strategies. Preservice teachers either watched a video of a Text Talk lesson (n = 12) or read a description of the lesson (n = 11), which included a transcript of the video. Although both groups improved from pretest, the video group demonstrated greater understanding of the strategy and remembered more details. The students in the video group did a better job including the six elements of the Text Talk strategy in their written descriptions. Inservice teachers improved some elements of their lessons after watching the video, including increasing the levels of student engagement.

Blomberg and colleagues (2014) embedded video into two different instructional strategies to compare the two conditions. They compared a situated learning (SL) approach (which emphasized complex situations and the use of collaboration) with a four-component instruction design (4C/ID) system (which emphasized managing user cognitive load in order not to overwhelm learners). Videos in SL are used as complex problem situations for users to observe and discuss, while videos in 4C/ID are used to review previously taught concepts. The level of guidance and support provided by 4C/ID allowed PSTs to initially engage in "expert-like" reflections on provided videos, while it took the SL group longer to develop their skills. However, the SL group was able to sustain these high-quality reflections for longer periods of time. The authors suggest matching instructional strategies with outcomes in order to maximize the use of videos in the classroom.

Video use with CAPs. Incorporating modeling videos into CAP-T may be one way to enhance PST learning and their ability to apply this knowledge. The use of these videos may

enhance learning by showing PSTs how to use the strategies that were previously taught during the CAP-T. Instead of just learning about a teaching strategy, the PSTs can also see it in action. To date, one experimental CAP study has included the use of video modeling (Ely et al., 2014) to examine PST learning. This study compared participant (N = 101) learning about the Intensified Vocabulary Intervention (Maynard, Pullen, & Coyne, 2010) in a CAP-TV modeling condition and a text-only condition. The two groups learned the same material, but the mode of presentation was different. Although no differences were found at pretest, the CAP-TV group (M = 15.4, SD = 1.63) significantly outperformed the text group (M = 13.7, SD = 2.30) at posttest, $F(1,99) = 18.2$, $p < .001$, $d = .85$. Similarly, the CAP-TV group (M = 14.0, SD = 1.66) outperformed the text group (M = 12.0, SD = 2.47) at maintenance, $F(1,99) = 21.7$, $p < .001$, $d = .95$. In a multiple baseline across participants study (Ely et al., 2015), three elementary school teachers were shown the same CAP-TV on Intensified Vocabulary Instruction (IVI). They were observed multiple times before and after viewing the CAP using a fidelity checklist that included principles of IVI. All three teachers were found to increase their use of vocabulary principles after viewing the CAP-TV.

In addition, another experimental CAP study used video modeling in training modules on vocabulary instruction (Alves, Kennedy, Rodgers, & Romig, in progress). In this study, both groups watched three CAP-Ts with embedded video models to learn about a variety of evidence-based practices to teach vocabulary. After training, one group created a short CAP for students (CAP-S) to teach a vocabulary word while the other completed a worksheet about planning for vocabulary instruction. These CAPs are different from the ones used in teacher education and are instead one to two minute presentations to teach a specific vocabulary word. Preliminary results indicate that the CAP-S production group slightly outperformed the worksheet group on a

knowledge measure. However, both groups demonstrated improvements from pretest to posttest, indicating the effectiveness of instruction using CAP-TV.

Videos are currently being used for a variety of purposes in higher education, including to promote teacher reflection, in case-based instruction, and in conjunction with CAP-T. Although research is still in the early phases, there is evidence that the use of videos in higher education can result in improved learning outcomes for PSTs. There is also evidence that combining CAP-T and video modeling can lead to positive outcomes for PSTs, but to date, no study has compared a CAP to a CAP-TV to see whether including a modeling video enhances learning above and beyond that of the CAP. If multimedia, such as CAPs and CAP-TV are going to be used in teacher preparation courses, it is important to compare learning in these modes to a more traditional lecture. The present study explores this question by providing PSTs instruction in evidence-based practices for teaching reading comprehension using three different presentation conditions.

Effective Reading Instruction for Students with Disabilities

Reading is an important skill across subjects and students are required to read and comprehend narrative and expository text (Haager & Vaughn, 2013). Students with disabilities are often expected to read the same complex text as peers without disabilities (Klinger et al., 2004). However, research has found many explicit strategies that help improve reading comprehension skills for students with disabilities and other struggling readers. Major findings in this area come from a meta-analysis conducted by Swanson (1999) who determined that a combination of explicit and strategy instruction provide the greatest benefits to students. Specifically, critical components of reading comprehension instruction are directed

response/questioning, controlling the level of difficulty of tasks, elaborating on concepts, teacher modeling of steps, small group instruction, and prompts for the use of strategies in reading.

Gersten and colleagues (2001) conducted a review of research and found that successful strategies for reading narrative text include comprehension monitoring, story grammar, and peer-mediated instruction. In a synthesis of empirical studies, Edmonds et al. (2009) found that questioning, summarizing, graphic organizers, finding the main idea, and story maps can all improve reading comprehension. In addition, in a recent review of interventions for students with reading difficulties, Scammacca and colleagues (2013) found an overall effect size of 0.74 for reading comprehension strategies. Although there are many individual strategies that can help improve reading outcomes for students, multi-component strategies show some of the strongest effects (Gersten et al., 2001). CSR is one such strategy that includes many effective components and has a strong evidence base to support its use. The current study taught PSTs some of the components of CSR using three different treatment conditions in order to examine PST learning and application of this strategy.

Collaborative Strategic Reading

Collaborative Strategic Reading has roots in cognitive psychology and sociocultural theory (Vygotsky, 1978), and incorporates reciprocal teaching (Palincsar & Brown, 1984) into an explicit multicomponent reading strategy (Vaughn et al., 2011). The three main goals of CSR are to (a) successfully incorporate students with disabilities or those who are English language learners in content-rich classrooms that include reading text; (b) teach comprehension strategies that students can use on expository text; (c) give students with disabilities a chance to work with peers (Klinger et al., 2004). Previous students of CSR have indicated that the use of CSR

improves reading outcomes for all students, including those with disabilities and English Language Learners (Klinger & Vaughn, 1996; Klinger & Vaughn, 2000).

Components. CSR includes before, during, and after strategies for reading text (Klinger, Vaughn, Boardman, & Swanson, 2012). Before reading, students *preview* the text; during reading, students utilize the strategies of *click and clunk* and *get the gist*; and after reading, students utilize a *wrap up* strategy. CSR also includes a collaborative component where each student fulfills a different role (discussed below). All portions of the CSR framework will be reviewed here, although only *preview* and *get the gist* will be used for the current study (as explained below).

Before reading, the teacher should separate text into short sections (one to three paragraphs; Klinger et al., 2012). For non-fiction text, headings and subheadings would serve as natural dividers. However, if passages are longer than three paragraphs, the teacher will have to decide where to divide the passage. No more than three sections of text should be completed per class session (Klinger et al., 2012). Students *preview* the entire passage before reading, they use *get the gist* and *click and clunk* for each section, and then *wrap up* after the entire passage is completed.

Preview. Before reading a new text, the teacher leads the class in a preview of the text (Klinger et al., 2012). Students look through the passage at the title, headings, underlined words, and any other key information. The teacher preteaches any vocabulary word that she expects will be difficult for students, as well as helps activate background knowledge via pictures, charts, or diagrams. In addition, the teacher facilitates as students brainstorm what they already know about a topic. After discussion, students write a prediction about what they think the passage will be about.

Click and clunk. In this strategy, students are taught that as long as things are 'clicking' (making sense), they should keep reading (Klinger et al., 2012). However, when they hit a 'clunk' (something that stops them because it does not make sense or they can not read the word), they should stop and use one of the strategies to figure it out and fix the clunk. When students hit a clunk, they use one of four possible fix-up strategies. The first strategy is to reread the sentence to see if there are any ideas in the sentence that can help figure out the word. The second strategy is to reread the sentence, along with the sentences before and after, to look for clues. The third strategy is to use a morphological approach and look for a prefix, suffix, or root word. The final approach is to look for a cognate that would make sense in the sentence.

Get the gist. During reading, the teacher will also direct the students to stop every paragraph or two to summarize what they have read (Klinger et al., 2012). In *get the gist*, students identify the most important information in the section and restate it in their own words. They need to find out 'who' or 'what' the passage was about and the most important information about the 'who' or 'what' in order to state this in their own words (Bryant, Vaughn, Linan-Thompson, Ugel, & Hamff, 2000). *Click and clunk* and *get the gist* are both during reading strategies and by using both of them, students are able to read a text with understanding.

Wrap Up. After reading, students complete two wrap up activities; formulating questions and review (Klinger et al., 2012). Students are taught three types of question-answer relationships (QAR): right-there, think and search, and author and you. For right-there questions, students only need to turn back and find the answer in the text. For think and search questions, students need to look several places in the text to find several pieces of information that they then combine to answer the question. Finally, author and you questions require students to combine background knowledge and information in the text and typically make some kind of

inference to answer the question. After reading, students create questions using the QAR question types. They then ask and answer these questions in their cooperative groups. After reading, students work in small groups to write down what they think were important ideas from the text that they will then share with their groups.

Collaboration. Throughout the CSR process, students work in collaborative groups. Although the teacher leads the previewing portion, the students work in small groups during and after reading (Klinger et al., 2012). In these small groups, each student is given a role that they perform for the day (e.g., clunk expert, leader). During click and clunk, the leader will stop after each section and direct the clunk expert to lead the group in solving any clunks that the group had. After clunks are identified, members of the group share if they know how to solve the clunk. If not, the group works on fix up strategies and if none of these strategies work, the clunk leader asks a teacher for help.

After clunks are identified, the gist expert takes over and asks everyone to state the topic of the section (Klinger et al., 2012). Once the topic is identified, each group member writes their own gist and the gist expert allows everyone to share. After reading, each student writes questions about the text and they question expert leads students in answering these questions in small groups. Finally, the leader has each student write down what they have learned and leads a review discussion.

Evidence of effectiveness. CSR has a strong research base demonstrating the effectiveness of this strategy. In one early experimental study (Klinger & Vaughn, 1996), 26 middle school students were given 15 days of modified reciprocal teaching instruction, where they were instructed to utilize several strategies (predicting, brainstorming background knowledge, clarifying unknown words, main idea, summarizing, and asking and answering

questions) while reading social studies passages. After this initial training period, students were split into two groups for 12 more days of work. One group used the strategies to tutor younger students. The second group used the strategies to work in cooperative groups. Both groups made significant gains in their reading comprehension skills, as measured by standardized tests, although neither group outperformed the other.

In one experimental study, fourth graders in intact classrooms were taught using CSR (3 classes, $n = 85$) or given general instruction (2 classes, $n = 56$) by researchers (Klinger et al., 1998). Each group received 11 sessions about the economy of Florida that were each 45 minutes long. In the intervention group, the researcher started by modeling the strategy the first day, followed by two days of students trying the strategies and taking turns modeling them. There were then seven days of students working in small groups and following the CSR framework. The control group followed a more typical textbook approach. In this approach, the researcher began by reviewing vocabulary words and looking over pictures in the text. Students then took turns reading the text aloud. At the end were several teacher led activities, including the teacher summarizing the content, asking questions, and leading a discussion of the content. Results demonstrated that both groups made the same gains in their content knowledge, but the intervention group made significantly greater gains in reading comprehension as measured by the comprehension subtest of the Gates-MacGinitie Reading Test (MacGinitie & MacGinitie, 1989), $F(1,138) = 10.68$, $p = .001$. Overall, students did the best with the click and clunk and get the gist components of the strategy.

Klinger and Vaughn (2000) conducted a study with 37 fifth grade students. In this class, 35 of the students spoke Spanish as their first language or spoke both English and Spanish in the home. The teacher and class were trained in CSR and then implemented them in science class.

An analysis of the discussions found that almost all of the time was spent in academic dialogue, with about 20% of the time spent reading the text and approximately half of the time clearing up chunks. Most groups spent much of the remaining time on *get the gist*, with little time spent on *wrap up*. Groups varied between 5% and 21% in their use of helping behaviors. Students also used both Spanish and English in their discussions and helping behaviors. Students also demonstrated significant improvements on vocabulary from pretest to posttest for chapter 14, $t(21) = 7.28$, $p = .000$ and chapter 15, $t(27) = 6.73$, $p = .000$.

Klinger and colleagues (2004) conducted a study where they examined teachers' implementation of CSR over the course of a year. Five teachers went to a one-day training where they learned about CSR and then implemented it in their classroom twice a week over the course of a school year, receiving feedback throughout. The five control teachers conducted 'business-as-usual' instruction in their classrooms. These teachers were observed three times throughout the year and only one demonstrated any explicit instruction in reading comprehension. Students in the CSR classrooms demonstrated significantly greater reading comprehension gains on the comprehension portion of the Gates-MacGinitie Reading Test than those in the control classroom, $F(1,208) = 6.39$, $p = .01$. In general the larger gains were made in classes where teachers had higher levels of CSR implementation.

Vaughn and colleagues (2011) examined student comprehension outcomes in a large experimental study where 34 treatment classrooms used CSR twice a week and 27 comparison classrooms conducted standard English/language arts instruction. Students were in seventh or eighth grade and 11% were found to have a reading difficulty. This large-scale randomized control trial showed that students in the treatment condition did significantly better on the comprehension subtest of the Gates-MacGinitie than those in the control condition, thus

demonstrating the effectiveness of CSR. These studies all demonstrate that CSR is effective at improving reading outcomes for students and is an appropriate strategy to teach in teacher preparation programs. The current study will only be teaching previewing and get the gist because of time constraints. These two components were chosen because of their importance to the reading process and the high impact on students.

Present Study: Research Questions

The current study seeks to compare three different conditions; (a) lecture, (b) CAP alone, and (c) CAP-TV. Figure 2.1 lays out the flow for the design of this study. CAP and CAP-TV have the potential to deliver instruction as part of a flipped classroom approach as well as to provide professional development over a distance. However, it is important to examine these methods of instruction to ensure that learning is occurring. Teacher educators should not use any random method they think will result in PST learning, but should instead rigorously test new modes of instruction. Therefore this study explores use of both of these conditions against a more traditional lecture to examine how learning and application compares. The three conditions in this study all present instruction on strategies for teaching reading comprehension to students.

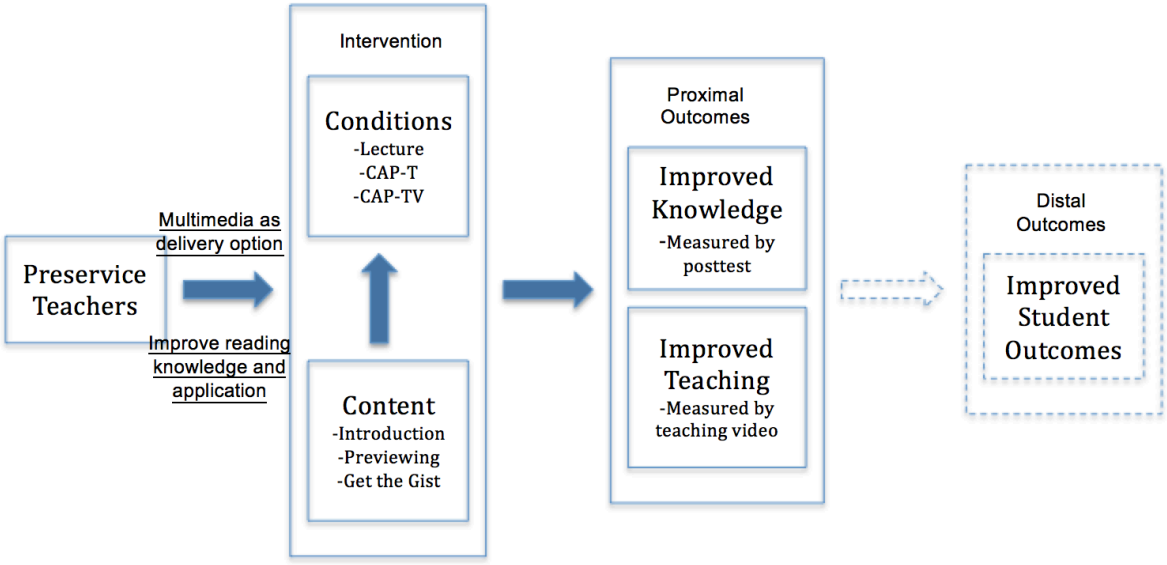
Although CSR has four components (Preview, Click and Clunk, Get the Gist, and Wrap-Up), the entire approach requires extensive training for preservice or inservice teachers. Therefore, for the purposes of this project, the time constraints limit how much instruction can be provided and only two components will be selected (*previewing* and *get the gist*). These components were selected because they require fewer steps than *click and clunk* and *wrap up,* which each have many different pieces. In addition, *get the gist* has the strongest evidence of support. There will be a series of three instructional CAPs; (a) an introduction/overview of reading comprehension instruction, (b) *previewing* (a before reading strategy), (c) *get the gist* (a

during reading, main idea strategy). Learning will be examined via scores on a pretest and posttest and application will be examined based on a recorded video of a reading lesson. In addition, social validity will be examined to determine PST thoughts about their learning. These results will have implications for delivering instruction in higher education classrooms. Specifically results will be important for alternative course structures, such as flipped, online, or hybrid courses where instruction is provided through some form of multimedia. Before using materials, such as CAP-T or CAP-TV in these types of courses, it is imperative to test them compared to more traditional modes of instruction to determine their place in higher education.

Research Questions

1. To what extent do lecture, CAP-T, or CAP-TV improve PST knowledge of strategies to teach reading comprehension as measured by a posttest?
   Hypothesis: Preservice teachers in the CAP-TV group will demonstrate the greatest levels of knowledge on the posttest.
2. To what extent are there differences in reading comprehension lessons between PSTs that receive instruction via lecture, CAP-T, or CAP-TV?
   Hypothesis: Preservice teachers in the CAP-TV group will include more CSR practices in their videos.
3. What are preservice teachers' views of the lecture, CAP-T, and CAP-TV?
   Hypothesis: PSTs will report highest levels of enjoyment for CAP-TV.

Figure 2.1. *Logic Model for Current Study*



CHAPTER III: METHODOLOGY

This study was a randomized block pretest-posttest design with two treatment arms that compared to a control group. As stated in Chapter 2, the purpose was to examine participant learning about reading comprehension strategies in three different conditions. The three conditions were lecture, CAP alone (CAP-T), and CAP with embedded video modeling (CAP-TV). Treatment fidelity procedures were in place to ensure all groups received the same information. Outcome measures consisted of a posttest measure designed to demonstrate knowledge acquisition of the strategies and a video recorded by participants to demonstrate application of knowledge. Social validity data was collected to determine PST views on the different treatment conditions.

Participants

Participants ($N = 146$) were students from Introduction to Special Education courses from universities in the northeastern and mid-Atlantic regions of the United States. The majority of participants were undergraduates enrolled in teacher preparation programs with little to no teaching experience. I chose to use PSTs in introductory classes because they are early in their education and not expected to have much knowledge about reading instruction. Participants for this study came from two classes at James Madison University (JMU), one class at University of Virginia (UVA), and one class at Binghamton University. Demographics are listed in the paragraphs below and in table 3.1.

Approval for this study was received by the Institutional Review Board at UVA. This approval letter was given to the IRB boards at JMU and at Binghamton and their review boards granted approval for this study. All PSTs completed study activities as part of regular class practices, however there was an option to withhold their information from the study without

penalty to their course grade. Course instructors were not aware of the PSTs who opted out of the study. No participants chose to have their data kept out of the study. Participant demographic data was collected during the pretest. After completing the pretest, participants were assigned an identification number to use when completing the posttest and social validity online. There was minimal attrition in this study with no attrited participants from course 1 at JMU, one from course 2 at JMU, two from the course at UVA, and one from the course at Binghamton. There was no treatment noncompliance in this study.

Course 1 at JMU (n = 65) included 63 females (97%) and 2 males (3%). In this course, there was one eighteen year old student (1%), 40 nineteen year olds (61%), 11 twenty year olds (18%), 12 twenty one year olds (19%), and one twenty two year old (1%). All participants were undergraduates with 42 sophomores (64%), 12 juniors (19%), and 11 seniors (17%). Eighteen students (28%) reported having taken a previous course on reading and seven (11%) reported some experience providing reading instruction in a practicum or field experience.

Course 2 at JMU (n = 38) included 35 females (92%) and 3 males (8%). In this course, there were two eighteen year old students (5%), 21 nineteen year olds (55%), 12 twenty year olds (32%), and three twenty one year olds (8%). All participants were undergraduates with 1 freshman (2%), 22 sophomores (58%), and 15 juniors (40%). Six students (16%) reported having some knowledge of reading comprehension strategies and two (5%) reported some experience providing reading instruction in a practicum or field experience. There was only one participant from this class that attrited from the study. This participant was a 20-year-old female with no prior reading experience who scored a 7 on the pretest and did not differ significantly from the other participants on baseline covariates.

The course at UVA (n = 27) included 22 females (82%) and 5 males (18%). In this course, there were 8 nineteen year olds (30%), 12 twenty year olds (44%), and seven twenty one year olds (26%). All participants were undergraduates with 1 freshman (4%), 8 sophomores (30%), 13 juniors (48%), and 5 seniors (18%). One student (4%) reported having some knowledge of reading comprehension strategies and one (4%) reported some experience providing reading instruction in a field placement. Two participants from this class attrited form the study. The first one was a 19-year-old female with no prior reading experience who scored an 8 on the pretest and did not differ significantly from the other participants on baseline covariates. The second one was a 21-year-old male with no prior reading experience who scored a 5 on the pretest and did not differ significantly from the other participants on baseline covariates.

The course at Binghamton (n = 16) included nine females (56%) and 7 males (44%). In this course, there was one twenty year old (6%), eight twenty two year olds (50%), two twenty three year olds (13%), one twenty four year old (6%), two twenty five year olds (13%), one twenty six year old (6%), and one thirty five year old (6%). All participants at this school were graduate students in a Masters program. Fifteen students (94%) reported having some knowledge of reading comprehension strategies and two students (12%) reported some experience providing reading instruction. One participant from this class attrited from the study. This participant was a 24-year-old female with one prior reading course and a pretest score of 9 and did not differ significantly from the other participants on baseline covariates.

The majority of participants in this study were undergraduate, females with no prior coursework or experience in teaching reading. Only four total participants attrited from this

study and none of them differed significantly from the others in their block in terms of baseline covariates and therefore there are no concerns about attrition.

Table 3.1. *Demographic Information*

	JMU 1 (*n* = 65)	**JMU 2 (*n* = 38)**	**UVA (*n* = 27)**	**Binghamton (*n* = 16)**	**Total (n = 146)**
Gender					
Female	63	35	22	9	128
Male	2	3	5	7	17
Age					
18	1	2	0	0	11
19	40	21	8	0	61
20	11	12	12	1	36
21	12	3	7	0	22
22	1	0	0	8	9
23	0	0	0	2	2
24	0	0	0	1	1
25	0	0	0	1	1
26	0	0	0	1	1
35	0	0	0	1	1
Year					
Freshman	0	1	1	0	2
Sophomore	42	22	8	0	72
Junior	12	15	13	0	40

Senior	11	0	5	0	16
Masters	0	0	0	16	16
Reading Courses					
Yes	18	6	1	15	40
No	47	32	26	1	106
Taught Reading					
Yes	7	2	1	2	12
No	58	36	26	14	134

Setting

Participants in this study came from three different universities. The majority of the participants were from two universities in Virginia, the University of Virginia and James Madison University. The remainder of the participants were from Binghamton University in New York. All locations are on the East Coast. All participants were enrolled in introductory special education course at their respective universities. UVA is a large public university in central Virginia with total enrollment of approximately 20,000 students. JMU is also a large public university in central Virginia with total enrollment of approximately 20,000 students. Binghamton University is a public university in New York with total enrollment of approximately 17,000 students.

For each course, the students took the pretest online during class in their regular classroom. They used a computer, phone, or other device to take the pretest. During the following week, the CAP group and the CAP-TV group used their computers or other devices to watch in their regular classroom, while the lecture group moved to another nearby classroom.

All three conditions took place during regularly scheduled class time in October and November 2015. Participants completed their recorded videos at home.

Experimental Design

This study was a randomized controlled trial with three conditions. Group 1 was the lecture condition. Group 2 was the CAP condition. Group 3 was the CAP-TV condition. This study was a randomized block design where the blocks were the four different classes. Participants were randomly assigned to the three groups within each class. To complete the randomization, I first split the class according to those who had reported they had prior knowledge or experience about reading and those who did not have knowledge or experience. I used this stratification procedure because I wanted to ensure that participants with previous knowledge or experience did not end up in the same condition and that they were evenly distributed across the three groups. Once I divided the blocks, I then assigned each member of the class a random number using SPSS by setting a seed number, sorting the participants by number, and then dividing the class into three groups. I followed this procedure for each class (block) in the experiment. There were no significant differences detected at pretest for any of the classes indicating that the randomization was successful.

Two weeks were needed to collect all of the data in this experiment and each university completed the study activities during October and November of 2015. During week 1, participants heard an introduction to the study (see Appendix B), received a consent form, and took the pretest online. Demographic information was also collected at this time. During week 2, students received the reading comprehension training. One group received a lecture in one location, while the other two groups watched the CAPs in a separate location. These groups received the links to their respective CAP-T and CAP-TV in an e-mail so that only members of

the groups had access to the CAPs and instructions were included in the e-mail and the same for each group (see Appendix C for both e-mails). As group 1 watched the lecture, they had access to the PowerPoint and were able to take notes as they listened. I provided the lecture at UVA and at both classes at JMU and took attendance. The classroom instructor provided the lecture at Binghamton University. All lectures used the same PowerPoint and were recorded for the purposes of establishing treatment fidelity to ensure the same content was covered in each lecture and that this was the same content that was covered in the CAP-T and CAP-TV.

Participants in groups 2 and 3 brought laptops and headphones to watch the appropriate CAP-T and CAP-TV in a separate location. These sessions were moderated by a research assistant, teaching assistant, or professor. The training took approximately thirty minutes. Participants then heard a lecture from their primary instructor on an unrelated topic for approximately 45 minutes. They then had about twenty minutes at the end of class to take the posttest (see Appendix D for scripts for the posttest and homework). Their homework assignment for the week was to record a video of themselves teaching a mini-reading lesson at home. This video was a required class assignment and the completion of the video was included as part of PST's participation grades, but their videos were not assigned a letter grade. However, due to communication and distance issues, I was only able to collect videos from the first class at JMU and the class at UVA. I had asked the other professors to set up an assignment tab to collect the videos, but was only added to the course management site at UVA and for one course at JMU and those were the only blocks that I could monitor video submission. Despite follow up e-mails and requests, the other two professors did not set up assignments tabs or monitor video submission as requested. With only a week to record and submit videos, the time for submission passed rapidly and I was only able to collect videos from the two courses.

Treatment Conditions

Returning to Risko's (2008, 2009) review and analysis of studies in reading teacher education, five important components of explicit instruction were associated with strong effects; explicit explanations, use of examples, demonstrating/modeling, guided practice in the classroom, and guided practice in the field. The CAP-T, CAP-TV, and the lecture all included explicit explanations and the use of examples. The CAP-TV additionally included a demonstration/modeling component. All participants were allowed an opportunity to practice these skills by recording a video of themselves at home. In the current study, there were not opportunities to practice in the field since the study took place in introductory classes where students were not yet placed in field placements. However, each of these conditions contained several of the explicit instructional practices that were associated with positive outcomes for PSTs.

Training CAPs

Three CAP-T were developed to provide training to PSTs on reading comprehension strategies. To review, CAP-T are multimedia-based instructional materials that are essentially enhanced podcasts that pair still images with narration (Kennedy et al., 2010). CAP-T are developed using Mayer's (2009) instructional design principles in order to manage user cognitive load so that users do not become overloaded while watching the CAP.

In order to create the CAP-T, I began by creating slides using Microsoft PowerPoint. I created these slides using Mayer's (2008) principles. Each slide had a picture that clearly represented the relevant content, along with a key word or phrase. Slides were arranged in a logical order to build understanding and included periodic questions where users could pause and answer questions to ensure understanding. As I created the presentation, I wrote a script for each

slide in the notes section along the bottom of the PowerPoint slide. Dr. Kennedy reviewed the slides and the script for content, as well as adherence to Mayer's principles. Dr. Solis reviewed the slides and script to ensure that the information about reading comprehension and the specific CSR information was correct. The CAP-T were then recorded into a movie format and uploaded to qmediaplayer.com.

The three training CAP-T were on (a) overview of reading comprehension, (b) *previewing* text, (c) *get the gist*. The overview CAP-T was the same for both conditions. Two different versions of the previewing and get the gist CAPs were created. The CAPs for the CAP-T group contained the typical narration and visuals, and also included a written example using a short piece of text and a description about how it could be used to teach previewing and get the gist. The CAPs for the CAP-TV group contained the same narration and visuals, but also included embedded modeling videos. The videos demonstrated the strategies being explained in the CAPs. A script was written that demonstrated a teacher previewing the text and modeling the get the gist strategy. I read the script and modeled the strategies in the videos. Links to all of the training CAPs are presented in Table 3.2.

Training CAP content. The first CAP-T (overview of reading comprehension) began with a description of the skills required for reading comprehension. Specifically there was a brief description of some of the things that good readers do before, during, and after reading text, such as making predictions and summarizing text to monitor their own comprehension. For example, before reading, good readers may look at the title, pictures, and other text features or make predictions about the text. Following was a description of some of the difficulties that struggling readers display when attempting to make sense of new text. Next, there was a presentation of some of the instructional strategies that teachers can use to help students improve

their comprehension of text, such as making predictions and finding the main idea. This CAP-T was the same in both the CAP-T and CAP-TV condition and was five minutes and thirty seconds long.

The second CAP taught the *previewing* strategy. This CAP began with a description of why previewing text is important and discussion of the purpose of previewing as a *before reading* strategy. For example, previewing can be used to activate background knowledge, preteach new vocabulary, and make predictions. Second was a description of all of the six steps for previewing a new text according to CSR. The steps included in the CAP were (a) introduce the topic; (b) introduce new vocabulary; (c) preview the text; (d) brainstorm what is already known about the text to activate background knowledge; (e) make a prediction; and (f) set a purpose for reading. This CAP detailed exactly what happens during each of the six steps of the previewing process. Next, the CAP discussed the teacher's role during the previewing strategy. This portion of the CAP was the only piece that differed in the CAP and CAP-TV condition. In the CAP-T condition, a short piece of text was shown as an example and the CAP went through how a teacher could teach each of the six steps using that text. In the CAP-TV condition, instead of a written example, the CAP included the modeling video demonstrating how this strategy could be used. Finally, the CAP concluded with a description of the student's role during the process and how students were expected to practice the steps in order to learn to do them on their own. The CAP used in the CAP-T condition was ten minutes long and the one used in the CAP-TV condition was eleven minutes and fifty four seconds long.

The third CAP taught the *get the gist* strategy. The CAP began with a description of why get the gist text is important and discussion of the purpose of get the gist as a *during reading* strategy. Specifically the CAP stated that the purpose of get the gist was the get the main idea of

a section of text. Get the gist is important because it ensures understanding before moving on. Second was a description of all of the three steps for getting the gist of a text according to CSR. The steps included in the CAP were (a) find the main who or what; (b) find the most important thing about the who or what; and (c) write a short, complete sentence that states the main idea. This CAP detailed exactly what happens during each of the three steps of the get the gist process. Next, the CAP discussed the teacher's role during the get the gist strategy. This portion of the CAP was the only piece that differed in the CAP-T and CAP-TV condition. In the CAP-T condition, a short piece of text was shown as an example and the CAP went through how a teacher could teach each of the three steps using that text. In the CAP-TV condition, instead of a written example, the CAP included the modeling video demonstrating how get the gist could be used. Finally, the CAP concluded with a description of the student's role during the process and how students were expected to practice the steps in order to learn to do them on their own. This CAP was six minutes and thirty seconds long in the CAP-T condition and seven minutes and fifty two seconds long in the CAP-TV condition. The CAP-T condition had a total of 22 minutes of training provided via the CAPs. The CAP-TV condition had a total of 25 minutes and 16 seconds of training provided.

Table 3.2. *Links to CAPs*

	Topic and Links
CAP-T Group	*Introduction to Reading Comprehension CAP:* *http://qmediaplayer.com/show.htm?645* *Previewing CAP:* *http://qmediaplayer.com/show.htm?646* *Get the Gist CAP:*

	http://qmediaplayer.com/show.htm?647
CAP-TV Group	*Introduction to Reading Comprehension CAP:* *http://qmediaplayer.com/show.htm?645* *Previewing CAP-TV:* *http://qmediaplayer.com/show.htm?648* *Get the Gist CAP-TV:* *http://qmediaplayer.com/show.htm?649*

Lecture PowerPoint

A corresponding script (that matched the information in the CAPs) was developed for the group receiving the lecture. All of the content from each slide from the CAPs was also included in the lecture to ensure the content being presented was the same for each group. However, the lecture slides were prepared more in the manner of a traditional PowerPoint, with more words on the screen (e.g., a title followed by several bullet points). The lecture included pictures and examples to support learning, as well as places to pause and ask questions to PSTs. I delivered the lecture at UVA and at both classes at JMU and the course instructor delivered it at Binghamton. The first lecture at JMU was 25 minutes, 46 seconds; the second lecture at JMU was 23 minutes, 40 seconds; the lecture at UVA was 24 minutes, 43 seconds; and the lecture at Binghamton was 23 minutes and 15 seconds. Therefore the lecture groups received an average of 24 minutes, 21 seconds of instruction. All lectures were assessed for treatment fidelity using a rubric to ensure that all of the content on each slide was presented. All lectures were implemented with 100% fidelity indicating that they included all of the content from each of the slides.

Homework Assignment Sheet

In order to ensure consistency, all participants were given the same homework sheet (see Appendix E). This sheet instructed participants to use the taught strategies to teach the assigned reading passage. They were allowed to use their notes, but were instructed not to use the CAPs and not to look anything up online. Everyone was given a three paragraph fourth grade level passage about Mt. Rushmore (retrieved from http://www.ncsu.edu/project/lancet/fourth.htm) that included several bold words and a picture. Participants were asked to use this passage to teach using the previewing and get the gist strategies. They were asked to record this video at home and submit the video to their class course management site.

Dependent Measures

This study used the following measures to answer each of the research questions: pretest/posttest, video scoring rubric, and social validity study. A pretest and posttest measured participant knowledge before and after the training. Demographic questions were added to the pretest. The recorded lessons were scored using a researcher created video scoring rubric and used to assess PST application of the reading strategies. In addition, a social validity measure was added to the posttest to examine participant's thoughts and feelings about the training materials.

Pretest/Posttest

In order to answer research question 1, a pretest (see appendix F) and posttest (see appendix G) were given to assess participant knowledge about reading comprehension, previewing, and get the gist. This measure included 10 multiple-choice questions about reading comprehension. Of these ten questions, one question addressed general reading comprehension knowledge, three questions addressed previewing, four questions addressed get the gist, one

question addressed the teacher's role, and one question addressed the student's role. Each multiple-choice question was worth one point.

There were eight open-ended questions to examine knowledge and use of CSR. Each question was scored on a rubric (see Appendix H). Following are the lists of questions, expected answers, and point values. The first question asked for the steps of the previewing process and was worth six points, one point each for state the topic, preteach vocabulary, preview text features, brainstorm/activate background knowledge, create a prediction, and set a purpose for reading. The second question asked for the steps of the get the gist process and was worth three points, one point each for state the most important who or what, state what is important about the who or what, and write a short complete gist sentence. The third question asked when the previewing process took place and one point was awarded for answers that stated it took place *before reading*. The fourth question asked when the get the gist process took place and one point was awarded for answers that stated it took place *during* or *while reading*. The fifth question asked for one purpose of previewing and one point was awarded for answers, such as *to prepare for reading text, to activate background knowledge,* or *to make a prediction.* The sixth question asked for one purpose of get the gist and one point was awarded for answers, such as *to find the main* idea or *to ensure understanding*. Only one possible point each was allowed for questions five and six.

After the first six open-ended questions, students had to answer the ten multiple-choice questions. For the final two questions, participants were given a short passage and asked to write what they would say to a class to teach previewing and get the gist using that passage. Question 17 asked about previewing and participants were awarded one point for a statement that addressed each step of the previewing process for up to six points total. Question 18 asked about

get the gist and participants were awarded one point for a statement that addressed each step of the get the gist process for up to three points total. This measure was worth 31 points total, 10 points for the multiple-choice portion and 21 points for the open-ended portion. A total score was calculated on this measure to examine knowledge of CSR strategies.

This measure was piloted in another course that included preservice teachers. Each student answered each of the questions, wrote notes about any questions that were confusing or unclear, and made suggestions. I used this information to rewrite some of the questions to make them clearer. In addition, I examined their answers to the multiple-choice questions and adjusted any that a majority of these students answered correctly. After this pilot testing, the measure was put online on QuestionPro for ease of administration. The pretest also included demographic information and asked participants to answer questions about their gender, age, whether they had previously taken a course on reading, and whether they had experience teaching reading in a classroom setting. The items in the measure were the same at posttest, although the items were reordered to guard against order effects. At posttest, the social validity questions were also included on QuestionPro (see Social Validity section below for details on these questions). Cronbach's alpha was found to be .76 for this measure. Interscorer agreement was calculated on 20% of pretests and posttests and initial agreement was 95%. All discrepancies were discussed and resolved and final agreement was 100%.

Video Scoring Rubric

In order to answer research question 2 and explore differences between teaching between participants from each condition, PSTs were asked to record a video of them teaching a short reading comprehension lesson and were scored using a researcher created rubric. I developed the rubric (see Appendix I) based on the CAPs and a task analysis of each step of previewing and

get the gist. Each of the six steps of Previewing was worth one point total on the rubric, but each step was broken down into individual components and partial points were awarded for each portion of the step completed. One bonus point could be awarded if PSTs included all of the components of the step. For example, one point total could be earned for the *make a prediction* step, which broke into .25 points possible for each of the following (a) use clues from text preview, (b) use clues from brainstorm; (c) incorporate clues; (d) make an educated guess of what you might learn. PSTs could additionally earn one bonus point for including all four of these steps. This was an attempt to include a quality rating by more heavily weighting correct application of each piece of the steps. Although this scoring system is ultimately an arbitrary scale, the use of this weighted scoring system reflects calls in the literature for interventions to be implemented with fidelity to ensure maximum effectiveness (Stein et al., 2008). Each step of Get the Gist was similarly worth one point and broken down into its components with the possibility of a bonus point for each step. The rubric also included a half point each for an introductory statement, explaining previewing, explaining get the gist, and a closing statement. PSTs could earn a base score of 11 on the rubric with the possibility for bonus points for complete implementation of the steps.

Social Validity Survey

All participants took a survey after the completion of study activities (see Appendix J). The purpose of this survey was to assess PST thoughts and feelings about their learning and about the different training conditions. This 18-item researcher-created survey examined PST feelings about reading comprehension strategies and whether or not they think they could implement the strategies in their classroom. The seven-item scale ranged from 1 (strongly disagree) to 7 (strongly agree). Krosnick and Fabrigar (1997) state that for bipolar scales (ones

with two opposing ends and a clear midpoint), seven is an optimal number of points. The first three questions asked if PSTs enjoyed the presentation, felt like they learned a lot, and whether they feel they have a good understanding of reading comprehension strategies. The next three questions ask specifically about the previewing strategy and whether PSTs felt like they have a good understanding of previewing, whether they feel like they could use it in the future, and whether they are likely to use it in the future. The next three questions ask specifically about the get the gist strategy and whether PSTs felt like they have a good understanding of get the gist, whether they feel like they could use it in the future, and whether they are likely to use it in the future. The next set of questions specifically asked about if PSTs would watch the presentation again, whether they would recommend these materials, and whether they learned new practices for teaching reading.

There were then two questions specifically for the CAP-T group that asked PSTs if they think CAPs are a good alternative to lecture and whether they would prefer to watch CAPs at home and then use class time for more interactive activities. The final two questions were for the CAP-TV group and asked PSTs they think CAP-TV are a good alternative to lecture and whether they would prefer to watch CAP-TV at home and then use class time for more interactive activities. In order to answer research question three, I found means for the different questions and explored the average responses. Cronbach's alpha was calculated for this measure and was found to be .95.

Analytic Models

In order to answer research questions one and two, multiple regression models will be used to examine the effects of the two different treatment groups (CAP-T, CAP-TV). These models are appropriate because I am comparing the two treatment conditions to the lecture

condition and I want to be able to examine how other factors, such as pretest scores or prior knowledge, may help predict scores on the posttest and video recording. The three different models allow me to examine the impact of this preexisting knowledge, as well as including dummy variables for the different blocks.

In this study, I compared three different models to answer research question one. For each of these models, the posttest score is the dependent variable. Model 1 includes treatment indicators for the CAP-T group and the CAP-TV group (with the lecture group being the omitted variable), as well as dummy variables for one class at JMU (JMU2), the class at UVA (UVA), and the class at Binghamton (Bing) with the other class at JMU (JMU1) being the omitted variable. This model is a way to account for the different classes (blocks) that participants are enrolled in. Model 2 includes all of the same variables as model 1, but also includes the pretest as an additional predictor. It is expected that the pretest score would predict the posttest score.

Considering Model 2 against Model 1 will allow me to examine the impact of the pretest scores. Model 3 is the final model and also includes dummy variables to indicate whether participants had taken a prior course in reading and whether they had previously had classroom experience teaching reading. Considering Model 3 against Model 2 will allow me to examine the impact of prior experience with reading on posttest scores. The purpose of these models is to see whether or not additional predictors can help explain the posttest results.

Model 1 (Base Model): $Posttest_i = \beta_0 + \beta_1 CAP\text{-}T_i + \beta_2 CAP\text{-}TV_i + \beta_3 JMU2_i + \beta_4 UVA_i + \beta_5 Bing_i + \epsilon_i$

Model 2 (Pretest Covariate Model): $Posttest_i = \beta_0 + \beta_1 CAP\text{-}T_i + \beta_2 CAP\text{-}TV_i + \beta_3 JMU2_i + \beta_4 UVA_i + \beta_5 Bing_i + \beta_6 Pretest_i + \epsilon_i$

Model 3 (Pretest and Demographic Covariate Model): $Posttest_i = \beta_0 + \beta_1 CAP\text{-}T_i + \beta_2 CAP\text{-}TV_i\, \beta_3 JMU2_i + \beta_4 UVA_i + \beta_5\, Bing_i + \beta_6 Pretest_i + \beta_7 ReadCourse_i + \beta_8 ReadExp_i + \epsilon_i$

To answer research question two, I used the same three models, but instead of using posttest scores as the dependent variable, I used the video scores. I used these same models to examine whether additional predictors help explain the results. Model 1 includes a dummy variable only for UVA because I only collected videos from one course at JMU and UVA and therefore only included these blocks in the model. Model 2 adds a pretest covariate and Model 3 adds dummy variables to indicate if PSTs previously took a course in reading or had previous experience as a classroom teacher who taught reading.

Model 1 (Base Model): $VideoScore_i = \beta_0 + \beta_1 CAP\text{-}T_i + \beta_2 CAP\text{-}TV_i + \beta_3 UVA_i + \epsilon_i$

Model 2 (Pretest Covariate Model): $VideoScore_i = \beta_0 + \beta_1 CAP\text{-}T_i + \beta_2 CAP\text{-}TV_i + \beta_3 UVA_i + \beta_4 Pretest_i + \epsilon_i$

Model 3 (Pretest and Demographic Covariate Model): $VideoScore_i = \beta_0 + \beta_1 CAP\text{-}T_i + \beta_2 CAP\text{-}TV_i + \beta_3 UVA_i + \beta_4 Pretest_i + \beta_5 ReadCourse_i + \beta_6 ReadExp_i + \epsilon_i$

CHAPTER IV: RESULTS

This study examined preservice teacher knowledge and application of strategies from CSR after receiving instruction in one of three conditions; lecture, CAP-T, and CAP-TV. There were one hundred forty-six teachers across the four classes (blocks) and within each block, PSTs were randomly assigned to one of the three treatment conditions. All PSTs took a pretest to assess their knowledge. For each of the four blocks, I checked to ensure that there were no significant differences at pretest. There were no significant differences detected at pretest for any of the blocks. This was expected due to the random assignment of PSTs to treatment groups.

In this dissertation, I examined PST knowledge of the CSR strategies through the use of a posttest. I use regression analysis to investigate the differences in posttest outcomes in the three different conditions. I examined PST application of CSR strategies by asking them to record a video of themselves teaching the lesson and I scored this video using a rubric. I used regression analysis to explore differences in video score outcomes for the three different conditions. Finally, I evaluated PST thoughts and feelings about the training materials and self-reports of learning and future use of the strategies. In this chapter, I answer each of my three research questions by presenting the results of each of the dependent measures.

Overall Results

Overall all participants showed a significant improvement in knowledge from pretest (M = 5.21, SD = 2.48) to posttest (M = 17.78, SD = 5.71), $t(145) = -26.41$, $p < .01$. All three conditions also demonstrated significant growth from pretest to posttest. The lecture group showed a significant improvement in knowledge from pretest (M = 6.02, SD = 2.58) to posttest (M = 17.26, SD = 5.09), $t(46) = -13.88$, $p < .01$. The CAP-T group showed a significant improvement in knowledge from pretest (M = 4.54, SD = 2.05) to posttest (M = 16.92, SD =

5.80), $t(47) = -14.78$, $p < .01$. The CAP-TV group showed a significant improvement in knowledge from pretest ($M = 5.21$, $SD = 2.48$) to posttest ($M = 17.78$, $SD = 5.71$), $t(50) = -17.59$, $p < .01$. Even with a Bonferroni correction because of multiple comparisons, all groups demonstrated significant growth in their knowledge as a result of the training. Table 4.1 reports pretest and posttest means and standard deviations for each group, as well as the mean video score for each group.

Table 4.1. *Group Means on Outcome Measures*

	Pretest Scores	**Posttest Scores**	**Video Scores**
Lecture Group	$M = 6.02$	$M = 17.26$	$M = 6.84$
($n = 47$)	$SD = 2.58$	$SD = 5.09$	$SD = 2.84$
CAP-T Group	$M = 4.54$	$M = 16.92$	$M = 5.31$
($n = 48$)	$SD = 2.05$	$SD = 5.80$	$SD = 3.32$
CAP-TV group	$M = 5.10$	$M = 19.08$	$M = 7.95$
($n = 51$)	$SD = 2.57$	$SD = 6.03$	$SD = 3.06$
Total Scores	$M = 5.21$	$M = 17.78$	$M = 6.82$
($n = 146$)	$SD = 2.48$	$SD = 5.71$	$SD = 3.24$

Participants from each block demonstrated significant growth from pretest to posttest. Table 4.2 reports the outcomes for each block. The blocks at JMU and UVA all demonstrated similar pretest and posttest scores, as well as similar overall growth from pretest to posttest. The block at Binghamton demonstrated more knowledge at pretest (likely because many of these participants reported prior coursework in reading) and had much higher scores at posttest.

Table 4.2. *Block Means on Outcome Measures*

	Pretest Scores	Posttest Scores	Video Scores
JMU1	*M* = 4.57	*M* = 17.05	*M* = 6.42
(*n* = 65)	*SD* = 1.88	*SD* = 4.41	*SD* = 3.06
JMU2	*M* = 5.63	*M* = 16.45	-
(*n* = 38)	*SD* = 2.61	*SD* = 5.48	
UVA	*M* = 4.96	*M* = 17.85	*M* = 7.50
(*n* = 27)	*SD* = 1.63	*SD* = 6.81	*SD* = 3.02
Binghamton	*M* = 7.25	*M* = 23.81	-
(*n* = 16)	*SD* = 3.99	*SD* = 5.66	

Preservice Teacher Knowledge

Research question one asked to what extent did each of the three conditions improve preservice teachers knowledge strategies to teach reading comprehension? To answer this question, I used the results from the posttest. All PSTs completed the posttest and all data was used in this analysis.

In order to answer the first research question, I ran three different multiple regression models. Table 4.3 presents the results from the three regression models and reports the coefficients and the standard errors for each. In addition, table 4.2 also reports the R^2 and adjusted R^2. In examining each of the models, I explored whether or not there were differences between the lecture group and the other treatment conditions and what affect other covariates had on the models. In each model, the lecture group for the first class at JMU (JMU1) was the control condition.

Model 1 included variables for the two treatment arms and covariates for the different blocks. In this model, there were no significant differences between posttest scores for the lecture and CAP-T groups, b = -.40, t(145) = -.35, p = .72, or between posttest scores for the lecture and CAP-TV group, b = 1.65, t(145) = 1.49 p = .14. In this case the model indicated a small difference between the posttest scores for the lecture and the CAP-T group, but the differences between the lecture and CAP-TV group were larger and approached significance. Specifically, the CAP-TV group outperformed the lecture group by 1.65 points. There were also no significant differences between the first block at JMU and the second block at JMU, b = -.40, t(145) = -.35, p = .73 or between the first block at JMU and the block at UVA, b = .81, t(145) = .67, p = .51. The Binghamton block did display significantly greater posttest scores than the first block at JMU, b = 6.77, t(145) = 4.57 p < .01. This result is likely because of the prior reading knowledge reported by the majority of participants in this block. This model explained 17% of the variation in posttest scores.

In model 2, I added a covariate for the pretest and again there were no significant differences between posttest scores for the lecture and CAP-T groups, b = -.06, t(145) = -.05, p = .96. In this model, there are virtually no differences between the lecture group and CAP-T group when accounting for prior knowledge via the pretest. This model did show a significant difference at the .10 level between posttest scores for the lecture and CAP-TV group, b = 1.85, t(145) = 1.66 p = .09. Again, in this case the model indicated almost no difference between the posttest scores for the lecture and the CAP-T group, but the differences between the lecture and CAP-TV group were larger and significant at a .10 level. The CAP-TV group outperformed the lecture group by almost two points. There were also no significant differences between the first block at JMU and the second block at JMU, b = -.60, t(145) = -.52, p = .61 or between the first

block at JMU and the block at UVA, $b = .75$, $t(145) = .62$, $p = .54$. The Binghamton block again displayed significantly greater results than the first block at JMU, $b = 6.10$, $t(145) = 3.92$ $p < .01$. Although the pretest coefficient was not significant, $b = .26$, $t(145) = 1.37$, $p = .17$, these results do approach significance. The addition of the pretest covariate did change the intercept value and the coefficients for the CAP-T and CAP-TV group, which are the coefficients of interest. This model also explains 18% of the variation in posttest scores, which is slightly more than model 1. The standard errors are virtually the same between models 1 and 2. Since the coefficients became more precise and the amount of variance did increase slightly, model 2 is a better fit for the data than model 1.

Model 3 added variables that indicated whether or not participants had previously taken a course in reading or if they had taught reading in the past. Again there were no significant differences between posttest scores for the lecture and CAP-T groups, $b = -.06$, $t(145) = -.05$, $p = .96$. In this model, there are again virtually no differences between the lecture group and CAP-T group when accounting for prior knowledge via the pretest and prior reading experience. This model did show a significant difference at the .10 level between posttest scores for the lecture and CAP-TV group, $b = 1.85$, $t(145) = 1.65$ $p = .10$. Again, in this case the model indicated almost no difference between the posttest scores for the lecture and the CAP-T group, but the differences between the lecture and CAP-TV group were larger and significant at a .10 level. The addition of the reading knowledge and experience variables did not change the coefficients of interest (CAP-T, CAP-TV) at all. There were also no changes in the coefficients for the blocks or for the pretest. In addition, the R^2 values were the same for models 2 and 3. The standard errors also increased from model 2 to model 3. Therefore, adding the two additional

variables to this model did not improve the precision of our coefficients, but did increase the standard errors, therefore this model is not an improvement over model 2.

Using all of this data, I determined that model 2 is the best fit for this data. Adding the pretest covariate explains the most variation in the posttest scores. In addition, adding these variables added more precision to the coefficients for the CAP-T group and the CAP-TV group, which were my variables of interest. In this model, the only significant coefficients were for the CAP-TV group and the Binghamton class. These results indicate that the CAP-TV group did significantly outperform the lecture group, although there were no significant differences between the CAP-T group and the lecture group. However, since there are two comparisons, if I make a Bonferroni correction, these results would no longer be statistically significant for the CAP-TV group. Results also indicate that the Binghamton group performed significantly better than the first class from JMU, which is likely because the majority of the students from the Binghamton class had previous reading experience. This model says that 18% of variation in the posttest scores can be explained by the treatment condition, block, and pretest scores.

Table 4.3. *Regression Models for Teacher Knowledge*

	Model 1	**Model 2**	**Model 3**
Constant	16.55**	15.12**	15.14**
	(1.02)	(1.46)	(1.49)
Treatment Arms[+]			
CAP-T (n = 48)	-.40	-.06	-.06
	(1.12)	(1.15)	(1.15)
CAP-TV (n = 51)	1.65	1.85*	1.85*
	(1.11)	(1.11)	(1.21)
Group[++]			
JMU2	-.40	-.59	-.59
	(1.12)	(1.13)	(1.16)
UVA	.81	.75	.76
	(1.22)	(1.21)	(1.27)

Binghamton	6.77** (1.49)	6.10** (1.55)	6.19** (1.73)
Pretest		.26 (.19)	.26 (.20)
Reading Course			-.10 (1.20)
Experience **Teaching Reading**			.43 (1.64)
R^2	.17	.18	.18
Adjusted R^2	.14	.15	.13

[+] = Lecture group (n = 47) was the omitted variable
[++] = JMU1 was the omitted variable
* = significant at the .10 level
** = significant at the .01 level

Effect Sizes for Teacher Knowledge

For model 2, the lecture group for the first class at JMU (JMU1) is the control group. Effect sizes (Cohen's d) were calculated for the CAP-T groups and CAP-TV groups at each university using the coefficient values from model 2 (see Table 4.4). The CAP-T group had very low effects for both classes at JMU and the class at UVA, indicating this treatment resulted in equal learning as a lecture. However, there was a strong effect size for the class at Binghamton. The majority of participants from Binghamton reported that they had previous experience with reading, either having taken a course or in the classroom. This may indicate a differential treatment effect for participants who already have knowledge of reading strategies.

Effect sizes are much stronger for the CAP-TV group and are in the moderate to high range for both classes at JMU and the class at UVA. In addition, there is a very strong effect size for the CAP-TV group for the class at Binghamton. This indicates that the CAP-TV treatment is

an effective way to deliver instruction. It again appears that this treatment may be more effective for participants who have previous experience with reading instruction.

Table 4.4. *Effect Sizes for Teacher Knowledge*

	JMU1	JMU2	UVA	Binghamton
CAP-T	.00	-.11	.15	1.2**
CAP-TV	.41*	.30*	.56*	1.56**

*Significant at the .10 level
**Significant at the .01 level

Teacher Application of Strategies

Research question two asked to what extent are there differences in reading comprehension lessons from PSTs from each of the three different conditions? To answer this question, I used the results from the recorded videos. I only collected videos from UVA and the first block JMU, so there were 55 scored videos used in this analysis. Most students of the students from these two classes turned in videos, but not all of them. Therefore, these results should be interpreted with caution for two reasons. First, this portion of the study does not have enough participants in each group to draw solid conclusions or to be able to generalize. Second, there may be some self-selection bias in the results because it is possible that the students that turned in videos were students that were likely to try to do a good job and put more effort into their work. My research question sought to explore differences and not make any solid conclusions, so this data is still appropriate to answer this research question. However, these results should be considered preliminary and more of a pilot testing of this portion of the experiment. I scored all videos that were submitted to answer this research question.

Before analyzing the video data, I explored whether there appeared to be bias in the results by comparing baseline covariates for the subgroup that submitted videos and the whole class for both JMU and UVA. For JMU, 33 of 65 students submitted videos and for UVA, 22 of 27 students submitted videos. Figure 4.5 compares baseline covariates for the partial sample and the full sample and the percentages of individuals represented from each group are similar. In addition, there is almost no difference between pretest or posttest means between the partial sample and full sample. After exploring these differences, I can say that the samples of students that submitted videos from both classes at JMU and UVA do not appear to be significantly different from the full sample on any of the baseline covariates or on pretest or posttest scores and appear to be an unbiased estimate of the true sample.

Table 4.5. *Comparison of Baseline Covariates for Attrited Sample*

	JMU 1 Sample (*n* = 33)	**JMU 1 Full Class (*n* = 65)**	**UVA Sample (*n* = 22)**	**UVA Full Class (*n* = 27)**
Gender				
Female	94%	97%	86%	82%
Male	6%	3%	14%	18%
Age				
18	3%	1%	-	-
19	67%	61%	27%	30%
20	12%	18%	50%	44%
21	18%	19%	12%	26%
22	-	1%	-	-

Year				
Freshman	-	-	5%	4%
Sophomore	70%	64%	23%	30%
Junior	15%	19%	50%	48%
Senior	15%	17%	22%	18%
Reading Courses				
Yes	27%	28%	5%	4%
No	73%	72%	95%	96%
Taught Reading				
Yes	3%	11%	0%	4%
No	97%	89%	100%	96%
Pretest Means	4.73	4.57	4.82	4.96
	(1.86)	(1.88)	(1.26)	(1.63)
Posttest Means	16.70	17.05	17.91	17.85
	(4.20)	(4.41)	(7.09)	(6.81)

In order to answer the second research question, I ran three different multiple regression models. Table 4.6 presents the results from the three regression models and reports the coefficients and the standard errors for each. In addition, table 4.6 also reports the R^2 and adjusted R^2. In examining each of the models, I explored whether or not there were differences between the lecture group and the other treatment conditions and what affect other covariates have on the models.

In model 1, I used terms for the CAP-T group and CAP-TV group and also included a dummy variable for the UVA block. In this model, there were no significant differences

between video scores for the lecture and CAP-T groups, b = -1.01, $t(54)$ = -.96, p = .34, or between video scores for the lecture and CAP-TV group, b = 1.02, $t(54)$ = .96, p = .34. However, although the model indicated no significant difference between the video scores for the lecture and the CAP-T group or between the lecture and CAP-TV group, it showed the CAP-T group performed lower than the lecture group by about a point and the CAP-TV group performed higher than the lecture group by about a point. There were also no significant differences between the first block at JMU and the block at UVA, b = .77, $t(54)$ = .92, p = .36. This model explained 12% of the variation in video scores.

In model 2, I added a covariate for the pretest and again there were no significant differences between video scores for the lecture and CAP-T groups, b = -1.07, $t(54)$ = -.95, p = .35, or between video scores for the lecture and CAP-TV group, b = 1.02, $t(54)$ = .95 p = .35. Again, in this case the model indicated no significant difference between the video scores for the lecture and the CAP-T group or between the lecture and CAP-TV group. There were also no significant differences between the first block at JMU and the block at UVA, b = .77, $t(54)$ = .91, p = .37. Adding the pretest did not provide much change in this model and this coefficient was not significant, b = .03, $t(54)$ = .14, p = .89. In this model, the coefficients of interest for the CAP-T group and CAP-TV group did not change from model 1. In addition, the standard errors did not change drastically between models 1 and 2. This model also explains 12% of the variance, which is the same amount as model 1. In this model, adding the pretest did not make estimates more precise, did not change standard errors, and did not explain any more variation in video scores. Therefore adding the pretest did not do anything to change the model and there is no reason to select this model over model 1.

Model 3 added variables that indicated whether or not participants had previously taken a course in reading or if they had taught reading in the past. Again there were no significant differences between video scores for the lecture and CAP-T groups, $b = -.91$, $t(54) = -.79$, $p = .44$, or between video scores for the lecture and CAP-TV group, $b = 1.11$, $t(54) = 1.02$, $p = .31$. Again, in this case the model indicated no significant difference between the video scores for the lecture and the CAP-T group or between the lecture and CAP-TV group. There were also no significant differences between the first block at JMU and the block at UVA, $b = .50$, $t(54) = .55$, $p = .59$. The coefficient for the pretest was not significant, $b = .13$, $t(54) = .44$, $p = .66$. Adding the reading course experience and reading teaching experience did not significantly change any of the coefficients in this model. In this model, the coefficients of interest for the CAP-T group and CAP-TV group did not change drastically from models 1 or 2. In addition, the standard errors did not change drastically between this model and previous models. This model explains 14% of the variation in video scores, which is slightly more than model 2. Therefore, adding the two additional variables to this model did not significantly change anything and they do not add anything to the model.

Using all of this data, I determined that model 1 is the best fit for this data. Using variables for the treatment arms and the block made the most precise model. Adding the pretest or the variables to indicate reading experience did not make the models more precise, which is why I did not select models 2 or 3 over model 1. In this model, there were no significant coefficients. This is likely because of the small number of videos used and the fact that this part of the study was underpowered. However, results do indicate that the CAP-T group had a lower score than the lecture group and that the CAP-TV group outperformed the lecture group by just

over a point. Therefore, exploratory results do support continuing to examine the use of modeling videos.

Table 4.6. *Regression Models for Teacher Application*

	Model 1	Model 2	Model 3
Constant	6.51** (.99)	6.35** (1.80)	6.14** (1.67)
Treatment Arms[+]			
CAP-T (n = 20)	-1.08 (1.16)	-1.07 (1.13)	-.91 (1.16)
CAP-TV (n = 23)	1.02 (1.06)	1.02 (1.08)	1.11 (1.08)
Group[++]			
UVA	.77 (.84)	.77 (.85)	.50 (.90)
Pretest		.03 (.25)	.13 (.29)
Reading Course			-1.01 (1.19)
Experience Teaching Reading			-2.18 (3.53)
R^2	.12	.12	.14
Adjusted R^2	.07	.05	.03

[+] = Lecture group (n = 12) was the omitted variable
[++] = JMU1 was the omitted variable
** = significant at the .01 level

Effect Sizes for Teacher Application

For model 1, the lecture group for the first class at JMU (JMU1) is the control group. Effect sizes (Cohen's d) were calculated for the CAP-T groups and CAP-TV groups at each JMU and UVA using the coefficient values from model 1 (see Table 4.7). The CAP group had

negative effects for the class at JMU and the class at UVA, indicating this was not an effective treatment when compared to the lecture. Effect sizes are much stronger for the CAP-TV group and are in the moderate range for JMU and large for the class at UVA. This indicates that the CAP-TV treatment is an effective way to deliver instruction. Results indicate that CAP-T alone may not improve teaching results, but that including the modeling videos does improve teaching outcomes.

Table 4.7. *Effect Sizes for Recorded Videos*

	JMU1	**UVA**
CAP-T	-.38	-.10
CAP-TV	.36	.63

Further Exploration of Video Quality

In order to explore some of the qualitative differences in the videos produced, I explored the number of bonus points earned by each PST in their videos as well as the practices included in PST videos. A bonus point could be earned for including every component of one of the steps of previewing or of get the gist. For example, step 3 of get the gist was to write a short, complete sentence and was broken down into (a) write a complete sentence; (b) sentence is main idea; (c) sentence is ten words or less. PSTs could earn partial points for completing each of these components of step 3 and a possible bonus point for including all of them. This was one preliminary way to examine quality of implementation under the assumption that if PSTs include all portions of the step, this part of the lesson would have a higher quality than PSTs that included only one or two components of the step. Later in this section, I also further explore differences in implemented components for each group. Table 4.8 shows the spread of bonus points for the three conditions.

In the lecture condition, a fourth of the videos did not receive any bonus points, while 41% only received one bonus point. This indicates that across the videos in the lecture condition, the majority of participants did not show a high degree of full implementation of the steps. Two thirds of the PSTs in this condition earned either 0 or 1 bonus point. In the CAP-T group, half of the videos did not receive any bonus points, while the other half did receive between one and four bonus points. Approximately 2/3 of the participants in the CAP-T condition earned either zero or one bonus points indicating a low degree of full implementation of the steps of the strategies. For the CAP-TV group, only 17% of the videos did not receive any bonus points, while 83% did receive between one and five bonus points, with over half receiving two to three bonus points. Although this is preliminary data, it does seem to indicate that viewing the modeling videos allowed PSTs in the CAP-TV condition to more fully implement components of the strategies. The majority of PSTs in the CAP-TV condition were able to earn at least one bonus point, which shows better implementation of the steps.

Table 4.8. *Percentage of Bonus Points Scored by Group*

	0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
Lecture	25%	41%	17%	17%	-	-
CAP-T	53%	16%	21%	5%	5%	-
CAP-TV	17%	22%	35%	17%	-	9%

I also explored differences between individual components that were implemented by the three different conditions (see table 4.9). In the lecture group, I examined how many participants implemented part of each of the steps. For previewing; almost all of the participants began by stating the topic, approximately half of the participants spent some time preteaching vocabulary, most looked over the passage, approximately half did some brainstorming, a little over half made

a prediction, and most stated the purpose for reading. For get the gist, about ¾ of the participants from the lecture group attempted the three steps of get the gist. Very few participants in this group did any sort of introduction to the lesson, explanation of the strategies, or provided a closing statement. These results demonstrate that PSTs in the lecture group implemented some parts of previewing, but most did not implement all six steps. In addition, most did attempt all three steps in get the gist.

I completed the same descriptive analysis for participants in the CAP-T group. For previewing; all participants began by stating the topic, approximately 70% of the participants spent some time preteaching vocabulary, half looked over the passage, half did some brainstorming, half made a prediction, and half stated the purpose for reading. For get the gist, about 2/3 of the participants from the CAP-T group attempted the three steps of get the gist. Some of the participants in this group did an introduction to the lesson, explanation of the strategies, or provided a closing statement. The lessons for the CAP-T group and the lecture group looked similar and most participants in these two groups implemented some (but not all) of the previewing components and most made an attempt at the three steps to get the gist.

I saw some descriptive differences between the CAP-TV group and the lecture and CAP-T groups. For previewing; almost all participants began by stating the topic, almost all of the participants spent some time preteaching vocabulary, most looked over the passage, most did some brainstorming, most made a prediction, and most stated the purpose for reading. In this group, the majority of participants attempted all six steps of the previewing process, while most of the participants in the other two conditions only attempted a few of the six steps. For get the gist, almost all of the participants from the CAP-TV group attempted the three steps of get the gist. In addition, about half of the participants in this group did an introduction to the lesson,

explanation of the strategies, or provided a closing statement. Overall, the majority of the participants in the CAP-TV group attempted all steps of both previewing and get the gist and many also included an introduction and closing. Taken with the bonus point data, this is another preliminary indication that the videos produced by the CAP-TV group were of better quality than those of the lecture and CAP-T groups.

Figure 4.9. *Percentage of PSTs in each Group that Included Reading Practices*

	Lecture	**CAP-T**	**CAP-TV**
States purpose of lesson	54%	35%	46%
Explains previewing	38%	20%	30%
Previewing	-	-	-
States Topic	84%	100%	92%
Selects 2-3 words	54%	70%	71%
Selects words that are likely to be difficult/unknown	60%	75%	83%
Uses clear language	50%	55%	83%
Defines words using simple vocabulary	50%	55%	80%
Shows visual representation	8%	0%	12%
Explains how visual is an example of word	8%	0%	12%
Look over passage	92%	60%	67%
Look at text features	62%	50%	58%
Use title to give clues	70%	40%	50%
Use picture to give clues	77%	35%	38%

Think aloud brainstorm	62%	50%	71%
State brainstorm	50%	45%	71%
Ask students to brainstorm	62%	40%	17%
Ask students to share what they know	46%	35%	17%
Use clues from text preview	62%	40%	71%
Use clues from brainstorm	50%	50%	71%
Incorporate clues	46%	35%	58%
Write prediction	70%	60%	84%
State purpose for reading	70%	55%	67%
Purpose incorporates topic	62%	50%	67%
Purpose incorporates predictions	23%	15%	50%
Explains Get the Gist	50%	30%	30%
Get the Gist	-	-	-
States who or what	75%	60%	88%
Explains why this is most important who or what	8%	5%	0%
States what is important about who or what	75%	60%	88%
Explains why this is important	8%	0%	0%
Writes a complete sentence	75%	70%	88%
Sentence is main idea	75%	75%	88%
Sentence is concise	8%	10%	25%
Closing statement	25%	10%	42%

Social Validity

All social validity questions were answered on a seven-point scale, which ranged from 1 (strongly disagree) to 7 (strongly agree) with 4 as the midpoint (neutral). The group means for each question were all around 5 and ranged from 4.52 to 5.56, which indicates a small degree of agreement to each of the questions. Using a one-way ANOVA for questions one through thirteen, there were no significant differences in responses between the three conditions for any of the questions. Therefore, I discuss the results using the total mean response for each question. See Table 4.10 for means and standard deviations for each group for each question.

The scores indicate that PSTs agreed with the statements that they enjoyed the presentation ($M = 4.67$, $SD = 1.39$) and they felt like they learned a lot from the presentation ($M = 4.90$, $SD = 1.36$). They reported slightly higher agreement with the statement that they feel like they have a general understanding of the importance of reading comprehension ($M = 5.38$, $SD = 1.21$). For the questions specifically about the previewing strategy, PSTs reported that they agreed that they understand the importance of previewing ($M = 5.14$, $SD = 1.30$), they feel like they could use previewing in the future ($M = 5.12$, $SD = 1.42$), and they feel like they are likely to use it in the future ($M = 5.01$, $SD = 1.45$). For the questions specifically about the get the gist strategy, PSTs reported that they agreed that they understand the importance of get the gist ($M = 5.19$, $SD = 1.40$), they feel like they could use get the gist in the future ($M = 5.12$, $SD = 1.57$), and they feel like they are likely to use it in the future ($M = 4.97$, $SD = 1.59$).

PSTs agreed that they would watch this presentation again before teaching reading in the future ($M = 5.03$, $SD = 1.65$) and that they learned new evidence-based practices by teaching reading ($M = 5.30$, $SD = 1.32$). PSTs agreed that they would recommend these materials to a peer ($M = 5.17$, $SD = 1.42$) and that they could teach a lesson that contained appropriate

practices for reading ($M = 4.79$, $SD = 1.54$). Overall, PSTs reported the strongest agreement for the statements that they have a general understanding of the importance of reading comprehension, as well as the fact that they learned new evidence-based practices for teaching reading.

Table 4.10. *Social Validity Results*

	Lecture (n = 47)	**CAP-T (n = 48)**	**CAP-TV (n = 51)**	**Total (n = 146)**
1. I enjoyed the presentation on reading comprehension strategies	4.79 (1.33)	4.52 (1.50)	4.71 (1.33)	4.67 (1.39)
2. I feel like I learned a lot from the presentation on reading comprehension strategies	4.98 (1.26)	4.94 (1.54)	4.81 (1.30)	4.90 (1.36)
3. I feel like I have a general understanding of the importance of reading comprehension	5.43 (1.23)	5.23 (1.32)	5.47 (1.08)	5.38 (1.21)
4. I feel like I have an understanding of the importance of the previewing strategy	5.19 (1.42)	5.00 (1.25)	5.22 (1.24)	5.14 (1.30)
5. I feel like I could use the previewing strategy in my future instruction	5.11 (1.65)	5.00 (1.43)	5.26 (1.18)	5.12 (1.42)
6. I am likely to use the previewing strategy in my future instruction	5.09 (1.60)	5.04 (1.37)	4.92 (1.41)	5.01 (1.45)

7. I feel like I have an understanding of the importance of the get the gist strategy	5.21 (1.40)	4.98 (1.48)	5.37 (1.31)	5.19 (1.40)
8. I feel like I could use the get the gist strategy in my future instruction	5.15 (1.71)	4.98 (1.62)	5.24 (1.39)	5.12 (1.57)
9. I am likely to use the get the gist strategy in my future instruction	5.02 (1.62)	4.85 (1.60)	5.04 (1.57)	4.97 (1.59)
10. I would watch this presentation again before teaching reading in the future	5.06 (1.53)	5.35 (1.67)	4.70 (1.71)	5.03 (1.65)
11. I learned new evidence-based practices for teaching reading by participating in this project	5.38 (1.31)	5.56 (1.13)	5.24 (1.51)	5.39 (1.32)
12. I would recommend these materials to peers to learn about these strategies	5.19 (1.50)	5.31 (1.31)	5.02 (1.46)	5.17 (1.42)
13. I think I could teach a lesson that contained appropriate practices for teaching reading given this instruction	4.66 (1.77)	4.80 (1.52)	4.72 (1.31)	4.79 (1.54)

The social validity survey also included two questions specifically for the CAP-T group and three questions specifically for the CAP-TV group (see table 4.11 for specifics). PSTs from

the CAP-T group reported that they agreed that CAPs are a good alternative to lecture (*M* = 4.60, *SD* = 1.53) and that they would prefer to watch a CAP-T at home and then use class time for more interactive activities (*M* = 4.64, *SD* = 1.71). The CAP-TV group reported that they agreed that CAP-TV are a good alternative to lecture (*M* = 4.75, *SD* = 1.69), that they would prefer to watch a CAP-TV at home and then use class time for more interactive activities (*M* = 4.46, *SD* = 1.76). They also reported slightly higher agreement to the statement that the video enhanced my learning over and above what I got from just the CAP-T (*M* = 4.85, *SD* = 1.35).

Table 4.11. *Social Validity Results for CAP-T and CAP-TV group*

	CAP-T	**CAP-TV**
14. I think CAP-T are a good alternative to lecture	4.60 (1.53)	
15. I would prefer to watch a CAP-T at home and then use class time for more interactive activities	4.64 (1.71)	
16. I think CAP-TV are a good alternative to lecture		4.75 (1.69)
17. I would prefer to watch a CAP-TV at home and then use class time for more interactive activities		4.46 (1.76)
18. I think the video enhanced my learning over and above what I got from just the CAP-T		4.85 (1.35)

Summary of Results

Overall results indicate that the CAP-TV group significantly outperformed the lecture group on the posttest, with no significant differences between the CAP-T and lecture groups on the posttest. The CAP-TV group scored almost two points higher on the posttest than both the CAP-T and lecture groups. This means that they answered about two more questions correctly on the posttest than either the CAP-T or the lecture groups. Effect sizes also indicate that there were not substantive differences between the lecture and CAP-T groups, but the CAP-TV groups did demonstrate large effects on the knowledge measure. In addition, the groups at Binghamton demonstrated significantly higher posttest results, which may indicate a stronger treatment effect for participants who already had reading knowledge. Although the video scores were not significant, the CAP-TV group did perform about a point higher on the videos than the lecture group and also showed a large effect size. Taken together, these results indicate that including modeling videos in CAP-T produces stronger knowledge outcomes and may improve application outcomes. In addition, the CAP-TV group was able to do a better job implementing the components of CSR than either the lecture or the CAP-T groups as measured by bonus points scored for implementation.

CHAPTER V: DISCUSSION

In teacher preparation programs, preservice teachers are required to gain knowledge and expertise in a wide variety of topics. Special education teachers in particular should develop an understanding of (a) content and how to teach it; (b) teaching content to students with disabilities who may struggle in specific areas; (c) the role of technology in instruction; (d) interventions and assessments to address student needs (Brownell, 2010). General educators are required to develop expertise in content knowledge, in addition to how to teach this knowledge (Brownell, 2010).

Effective teacher education programs include a number of components, including "blending of theory, disciplinary knowledge, subject-specific pedagogical knowledge and practice;" carefully crafted field experiences; and active pedagogy (Brownell, Ross, Colon, & McCallum, 2005). These are among the numerous components that teacher educators should include in their instruction and with all of the content that needs to be covered in teacher preparation programs, teacher educators need to carefully consider how to deliver all of this content.

The International Dyslexia Association (IDA) (2010) has developed a set of standards for all teachers who will be providing instruction in reading and suggest that teacher education programs follow these standards to ensure their preservice teachers are prepared to teach reading. The IDA (2010) standards include both content knowledge necessary to teach reading, as well as information about effective interventions. The specific content knowledge standard being taught in the current study is that teachers should "be familiar with teaching strategies that are appropriate before, during, and after reading that promote reflective reading" and application includes components of CSR, such as setting a purpose for reading, exploring background

knowledge, and preteaching key vocabulary (p. 12). Teacher education programs need to include not only content knowledge, but also the knowledge of how to implement instructional strategies and in order to meet the needs of our preservice teachers, teacher educators need to determine the best ways to deliver this content (Sayeski, Gormley Budin, & Bennett, 2015).

Teacher educators are incorporating multimedia in classrooms in many ways and studies generally report positive outcomes for PSTs (Baran, 2014; Dove & Dove, 2015). Multimedia and explicit instruction have both been found to be promising practices to improve PST knowledge of reading (Sayeski et al., 2015). Flipped, online, and hybrid classes are one such way of incorporating multimedia and these types of courses are becoming more prevalent in higher education (Green, 2015). Flipped classrooms are a way to deliver content at home while allowing for more class time spent engaged in authentic activities that will enhance learning (Baran, 2014). In flipped classrooms, content is delivered at home via readings or multimedia, such as videos or recorded lectures (Green, 2015). Flipped classrooms can free up class time for activities such as discussion and applied practice and have been found to stimulate higher order thinking and improve interactions between instructors and students (Sun & Yu, 2016). The challenge in these courses is to deliver high quality instruction that allows PSTs to learn the content and then to develop corresponding practice activities that will allow them to practice their skills.

In this study, I investigated whether two multimedia conditions (CAP-T and CAP-TV) would produce learning that was equal to or greater than a lecture condition. The purpose of this was to determine if CAP-T or CAP-TV would produce similar learning outcomes as lecture and therefore if these multimedia materials could potentially be used in a flipped classroom approach to deliver content. I also made some preliminary explorations into whether there were

differences in recorded lessons for PSTs who learned from each of these conditions. Finally, I also examined social validity to see whether PSTs enjoyed learning from the alternate presentation conditions. In this section, I discuss the results of each research question, discuss limitations related to the study, present implications for the field of higher education, and end with concluding remarks.

Discussion of Study Results

This section presents a discussion of the results of the three research questions. Specifically, the first section describes the results of the multiple regression to examine predictors of posttest scores and whether the different conditions led to differences in learning outcomes of PSTs. The second section describes the results of the multiple regression to examine video scores and whether there were differences in recorded videos from students in each of the three conditions. Finally, the third section describes the results of a social validity survey that examined PST thoughts and feelings about the training they received in reading comprehension strategies.

Preservice Teacher Knowledge

To answer research question one, I used three different multiple regression models to examine the difference in learning outcomes between the lecture group and the two different treatment arms, the CAP-T treatment and the CAP-TV group. In my final model, I found no significant differences between posttest scores for the lecture group and the CAP-T group when using the block and the pretest as covariates. In fact, the posttest scores were virtually identical indicating that CAP-T are equally effective and providing instruction as a lecture. Effect sizes were small to non-existent for the two courses at JMU and the course at UVA. However, an unexpected finding was that there was a large effect size for the CAP-T group for the class at

Binghamton, which may be an indication that the CAP-T instruction is more effective for those who already have some prior knowledge of reading.

I found that the CAP-TV group did significantly outperform the lecture group on the posttest. I found medium to large effect sizes for the CAP-TV groups for both courses at JMU and the course at UVA. There was a very large effect size for the class at Binghamton. These results indicate that the CAP-TV treatment does improve knowledge outcomes and may be even more effective for those who have prior reading knowledge. This is perhaps because those with prior knowledge were able to incorporate this new knowledge into their existing schema.

The lack of significant differences between the CAP-T and lecture groups is surprising, since a previous study (Hirsch et al., 2015) indicated that PSTs in the CAP-T condition outperform those in the lecture condition on knowledge measures. However, in the previous study (Hirsch et al., 2015), the lecture was not designed using Mayer's principles and included some extraneous information and unrelated details. The lecture in that study included slides with a title and two to three bullet points and did not consider Mayer's principles in their design. In addition, the lectures in the previously cited study were an average of 44 minutes, compared to 25 minutes of instruction via the CAP-T, which may indicate that they included extra irrelevant content.

In my study, I designed the lectures to be more streamlined to better reflect Mayer's principles, in order to provide a more equivalent comparison. For example, my lectures did not include a lot of extraneous information or unrelated material. The average lecture time was 24 minutes in my study, which was in line with both the CAP-T and CAP-TV conditions. This is likely why the scores for the lecture and CAP-T groups were virtually the same and they demonstrated the same amount of learning and growth. However, both groups did significantly

increase their knowledge from pretest to posttest indicating that both training conditions are an effective way to improve PST knowledge about reading comprehension strategies. The fact that there we no significant differences between the CAP-T and lecture conditions means that a CAP-T is equally effective at teaching this content and therefore could be used to deliver this instruction instead of a lecture with similar learning outcomes. In considering the use of CAP-T in a flipped classroom setting, these results still provide support for the use of CAP-T to deliver instruction.

Previous work has not yet compared CAP-TV to lecture or to the use of a basic CAP-T to see if adding the modeling videos enhances PST learning. The results of this study do indicate that adding the modeling videos does improve learning when compared to both lectures and CAP-T. The CAP-TV group did learn significantly more than the other groups and their posttest scores were almost two points higher than both the lecture group and the CAP-T group. These results indicate that including modeling videos in CAP-T seems to be a way to enhance knowledge.

Preservice Teacher Application of Strategies

To answer research question two, I used three different models in order to examine the difference between teaching videos for the lecture group and the two treatment arms, the CAP-T group and the CAP-TV group. Due to the smaller number of videos included in this analysis, these results are only preliminary. None of the models showed any significant differences between the lecture group and the CAP-T group or the lecture group and the CAP-TV group. The lack of significant differences could be a result of the smaller number of videos scored and the fact that this part of the study was underpowered. In addition, the nature of recording videos at home may not have provided PSTs a thorough opportunity to demonstrate their knowledge.

Asking PSTs to record videos in a more authentic setting, such as tutoring or a classroom field placement might allow for more clear differences to be observed because of the more meaningful nature of the activity. Although results were not significant, there were medium to large effect sizes for the CAP-TV group, which did indicate this was an effective treatment.

Despite the lack of significant results, the CAP-TV group did outperform the lecture group by about one point, which indicates that they did include an additional few practices in their videos. A descriptive analysis also reflected this because most PSTs in the CAP-TV group did attempt all of the steps of the previewing strategy. In contrast, most of the PSTs in the lecture and CAP-T groups only attempted some of the previewing steps. The majority of PSTs in all groups did attempt all three steps in get the gist, but this percentage was about 90% in the CAP-TV group, while it was approximately 66% in the CAP-T group and 75% in the lecture group. Therefore, the majority of PSTs in the CAP-TV group did attempt to implement all steps of both strategies, while participants in the other groups attempted to implement some, but not all of the steps. Looking at each individual step, in almost every case, there was a higher percentage of implementation in the CAP-TV group than in the CAP-T group. In addition, the CAP-TV group was more likely to fully implement individual steps of previewing and get the gist, so the quality of their videos was greater than those of the lecture and CAP-T groups.

Social Validity Results

To answer research question three, I examined PST thoughts and feelings about their learning via the three different presentation modes. There were no significant differences between the three different groups for any of the questions. The means showed agreement to all of the questions indicating that PSTs reported positive feelings towards the training and reported that they learned from the training and could use the information in their future classrooms.

PSTs in the CAP-T and CAP-TV groups also reported that they enjoyed those presentations and that they would like to use materials at home and then use class time for more interactive activities. Since PSTs report equal levels of support for CAP-T and CAP-TV as they do for lectures, this indicates that these would be other viable options that teacher educators could use to deliver instruction.

Previous research has explored what higher education students report as the best characteristics of face-to-face and online courses (Crews & Butterfield, 2014). Students report interaction is the top characteristic of face-to-face courses with instructor, class structure, and materials reported at lower levels. Similarly, they reported that class structure was the top characteristic of online courses, specifically the organization and flexibility accorded by online courses. It appears that there are positives to both in-person and online courses and this data should be considered in the design of a flipped classroom.

Overview of Results

The results of this study indicate that CAP-T and CAP-TV are a good alternative to lecture. The lecture group and CAP-T group performed equally well on the posttest and the CAP-TV group outperformed the lecture group on the posttest. These results indicate that both CAP-T and CAP-TV are viable instruction alternatives to a lecture. With flipped classrooms, students learn via web delivered instruction and the instructor does not spend much time on teaching, but instead time is spent interacting with classmates or working on projects (Crews & Butterfield, 2014). In addition, the results indicate that including modeling videos does seem to improve PST knowledge of reading comprehension strategies. Han and colleagues (2013) similarly found that including videos in instruction improved PST learning compared to instruction that did not include these video cases.

Although the results were not statistically significant for the recorded videos, the CAP-TV group did have a higher score and included more correctly implemented CSR practices, indicating that using the modeling videos may also help improve PST application of these comprehension strategies. The large effect sizes suggest that with a fully powered study, there would be significant differences in instruction for the CAP-TV group. Similarly Dieker and colleagues (2009) created videos that demonstrated evidence-based instruction in reading (Text Talk) and found that PSTs that watched the videos demonstrated improved knowledge of the strategy while inservice teachers that watched the same videos were better able to implement elements of the strategy in their instruction. Therefore including modeling videos in instruction does seem to improve preservice and inservice knowledge and application of strategies to teach reading.

Limitations

There were several limitations to the study in several different areas, including with the participants, dependent measures, and video outcomes.

Participants

One limitation to this study was that I used a convenience sample of participants, rather than a random sample. Three groups of PSTs were from schools in central Virginia with similar characteristics, while the fourth group was in New York and had slightly different characteristics (older, more reading coursework). With a limited participant pool and a convenience sample, there are limitations to the generalizations that I can make from this data.

Dependent Measures

Another limitation is the use of researcher created instruments for the pretest/posttest and video scoring rubric. There were not established measures to examine knowledge of CSR and so

I had to create the pretest/posttest. I piloted the measure in order to get feedback on all of the questions and to look at patterns of answers for the multiple-choice questions. In addition, I conducted internal consistency on the measure. I also had a second scorer double code twenty percent of the pretests and posttests. I did all of these steps in order to help make this measure more reliable and valid, but it still does not have the same psychometric properties as an established measure.

For the video scoring rubric, I did a task analysis of each step of Collaborative Strategic Reading using the book written by the creators of CSR. I did not validate this measure with other videos prior to this study because of the exploratory nature of this research question. This rubric was intended to explore differences in the videos, but not to make any firm conclusions about the instruction in the videos. However, in the future, perhaps a similar rubric could be used in conjunction with a more established measure to examine reading instruction.

Video Recordings

In this study, I asked PSTs to record a video of themselves teaching the CSR strategies to a peer at home. In watching the videos, I saw that some people put a lot of time and effort into their videos and some put minimal effort in. There was really a wide range in effort and therefore in lessons and I think the artificial nature of teaching it to a peer was not the best way to demonstrate practices. The participants in this study were not in practicum placements, so there was no way to include that in the current study, but I think that was a significant limitation of the video recordings.

Another limitation around the video recordings is that I ended up only being able to collect recordings from one class at JMU and the class at UVA. Despite clear directions and phone conversations with the other professors and a homework assignment distributed to all

participants, I was unable to collect videos on time from the other two courses. I was not added to the course management site for these courses (although I was for the classes at JMU and UVA) and I could not access the videos or see whether or not they were being turned in. I think this had a lot to do with the issues with data collection and in the future, I need to establish a central server for video submission. This further limits the conclusions that can be drawn from the video recordings because I only had 55 to score. In my proposal, I had never intended to score all 150 videos, but instead proposed randomly selected 20 per group to score, so I still scored about the same number of videos, but they were not randomly selected. Therefore only tentative conclusions can be made from the video recordings. My second research question was only intended to be exploratory, so I feel that I was still able to explore the videos and make some preliminary conclusions.

Implications

This study has several implications for providing instruction in reading in teacher education programs. In a review of research by Risko and colleagues (2008), they found that much research examining PST knowledge of reading assessed knowledge at one time period and found PST reading knowledge to be lacking in a variety of literacy areas. However, many of these studies did not provide efforts to improve that knowledge or connect learning to courses. In their review, Brownell and colleagues (2005) report that teachers that graduate from exemplary reading programs feel more prepared to teach, are viewed better by their supervisors, use a greater variety of children's literature, provide more active engagement for students, and have better student reading outcomes than graduates from comparison programs. Research needs to carefully examine teacher education programs to determine the best way to provide instruction in reading and ways to maximize PST learning.

It is imperative for teacher educators to consider not just what we are teaching, but how we are teaching it (Grossman, 2005). Specifically as multimedia becomes more common in higher education and as higher education continues to incorporate flipped classrooms, teacher educators need to ensure that new modes of instruction are carefully tested. In a review of research, Risko and colleagues (2008) found that using videos and other multimedia can enhance PST learning and engagement, aid in retention of content, and enhance understandings of procedural knowledge. Therefore, exploring multimedia and how it affects PST learning and application of strategies is an important piece of on-going research in teacher education.

The results of this study indicate that providing instruction via CAP-T leads to equal learning as instruction via lectures and that adding video modeling to CAP-T improves learning when compared to lectures. When talking about alternative class setups, such as flipped, online, or hybrid classes, CAP-T and CAP-TV may be one alternate way to provide instruction that leads to high levels of teacher learning. The use of CAP-T and CAP-TV to provide instruction at home may free up course time for discussions and other interactive activities. Although results for recorded videos are underpowered and preliminary, tentative results indicate that using CAP-TV may improve PSTs ability to teach lessons that include more components of CSR.

Risko (2009) proposed a *learning by doing* pattern in teacher education research and identified five components to what they term explicit instruction in teacher education. The five components were "explicit explanations, use of examples, demonstrating/modeling, guided practice within the university classroom, and guided practice with pupils in field settings" (p. 5). Each of the three conditions in this study made use of explicit explanations and use of examples in the instruction. This could be one reason that all of the PSTs in this study demonstrated gains in their knowledge of reading comprehension strategies because they all received explicit

explanations of the strategies and were given examples of the strategies. The CAP-TV group additionally included the demonstrating/modeling component, which could be why this group demonstrated greater knowledge gains than the other two groups. These results indicate that finding a way to incorporate modeling into instruction leads to gains in knowledge outcomes.

If instruction can be delivered at home, class time can be used for more interactive activities, such as discussions that can help enhance knowledge (Westermann, 2014). Class time in flipped classroom also involves more student interaction time and a greater chance to build relationships with peers (McCallum et al., 2015). McCallum and colleagues (2015) also report student reactions about professors include that they felt professors had more insight into student knowledge, and that professors were more approachable and more accessible. If flipped classrooms allow for students to develop strong relationships with peers and allow for more access to professors, flipping classrooms in education courses could be a successful way of delivering content. Although this preliminary research is positive, more research on flipped classrooms needs to be conducted and researchers should explore for what content and under what conditions flipped classrooms are successful.

By delivering content at home, class time could also be an opportunity for PSTs to engage in guided practice within the university classroom, one component put forth by Risko (2009). This type of guided practice would also be considered practice fields (Barab & Duffy, 2000), which is an opportunity to practice skills and receive feedback in a real-world manner before going out into a real-world setting. Teacher educators should strive to allow PSTs chances to have these authentic opportunities for practice in their higher education classrooms. Learning theories have moved from an acquisition model to a participatory model that requires learners to participate in their learning process (Barab & Duffy, 2000). Allowing PSTs to

practice skills in higher education classrooms and later in field placements allows for them to hone their skills and move from apprentices towards becoming experts (Barab & Duffy, 2000). Flipped classrooms may be one way of allowing more time for these experiences and CAP-T and CAP-TV seem to be one effective way of providing instruction to PSTs.

Future Directions

Future research could continue this line of research in several ways. All of the participants did significantly improve their knowledge of CSR practices and their ability to improve their instruction. However, the differences between groups were not significant in all cases. Some previous CAP-T research has indicated that the CAP-T group outperforms the lecture group on knowledge measures (Hirsch et al., 2015), but this study indicated no differences between the CAP-T and lecture groups. Therefore it is be important to replicate these studies to gain a clearer picture of the differences between presentation conditions and perhaps whether it depends on the content being taught or under what other conditions there might be differences between CAP-T and lecture groups. Whether or not the lecture follows Mayer's instructional design principles may also play a role in results.

This study provides some preliminary support that adding modeling videos to the CAP-T does increase teacher knowledge and may improve their ability to include CSR practices in their instruction, but this evidence did not show strong significance and should be replicated with more participants. In addition, the data from the recorded videos did not show significant differences, so in the future, it would be important to replicate this out in the field in a more authentic teaching context in order to see if there are actual differences in teaching as a result of the different training conditions. In the future, I plan to continue to examine PST teaching in a more authentic context. Two of the other components mentioned by Risko (2009) were guided

practice in the classroom and guided practice in a field placement, so future studies could perhaps include practice in the classroom as another training component and practice in a field placement as an outcome measure.

In the future, I think that conducting a similar study in a course with a field experience or tutoring component would provide much better results. If PSTs are working with a student out in the field, they will prepare better for their lesson and will be likely to include more components in their lesson. An authentic opportunity like providing instruction in a classroom setting, would likely produce stronger results on the video scoring rubric. This would also allow me to collect student outcome data, which is another important outcome measure that can provide information about which PSTs learned more from the training. Video analysis has also been found to improve reading outcomes (Nagro & Cornelius, 2013) and may be another way to incorporate videos into a more meaningful and authentic teaching activity.

Conclusions

There are many students who display difficulties in reading and this can affect them across content areas. Research has shown that both preservice and inservice teachers lack knowledge of reading content, as well as how to teach reading. Therefore, it is important to examine instruction for preservice and inservice teachers and attempt to improve the delivery of this instruction. The use of CAPs with embedded modeling videos (CAP-TV) seems to be one way to improve teaching knowledge about reading strategies, as well as teacher ability to apply these strategies in a recorded video. Based on these findings, further research should examine preservice teacher learning and teaching using CAP-TV.

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Appendix A. Mayer's Instructional Design Principles

Research-Based Instructional Design Principles (Mayer, 2009)	Brief description of Mayer's instructional design principles (Mayer, 2009)
Coherence Principle	Instructional materials are enhanced when irrelevant or extraneous information is excluded
Signaling Principle	Learning is enhanced when explicit cues are provided that signal the beginning of major headings or elements of the material being covered
Redundancy Principle	Inclusion of extensive text (transcription) on screen along with spoken words and pictures hinders learning. Carefully selected words or short phrases, however, augment retention
Spatial Contiguity Principle	On screen text and pictures should be presented in close proximity to one another to limit eye shifting during instructional presentations
Temporal Contiguity Principle	Pictures and text shown on screen should correspond to the audio presentation
Modality Principle	People learn better from spoken words and pictures than they do from pictures and text alone
Segmenting Principle	People learn better when multimedia presentations are divided into short bursts as opposed to longer modules
Pretraining Principle	People learn better when there is an advance organizer that highlights and reviews key content prior to instruction
Multimedia Principle	People learn better from pictures and spoken words than from words alone
Personalization, Voice, and Image Principles	Narration presented in a conversational style result in better engagement and learning than more formal audio presentations. Images should be non-abstract, and clearly represent the content being presented.

Appendix B. Script for Introducing Study

Good evening students
I want to give you a brief introduction to a research study about the use of different modes of presentation in higher education. The activities involved in this research are a part of the course and the content will be useful to your future careers. We are asking for your help to determine if the different interventions are beneficial to other students like you. Next week you will be split into different groups and will learn the content in different ways. You will take a pretest and a posttest, but your data will be represented by an ID number and not your name. You will also be asked to record a video. Your scores on these tests and your participation in the study will have no bearing on your final grade in this course. In fact, your instructor will not have access to the data until after grades have been submitted. In addition, you may decide not to include your data in our project, although you will still complete the activities in the study as part of your coursework. These activities fall under the participation portion of the class. There is no risk to participating. If you decide not to participate, you need to sign the appropriate line on the consent form. Your instructor will be blinded to which of you choose to participate or decline to participate in this study. You are receiving a consent form that also covers this information about the study.

You will be sent a link to a pretest in a few minutes. Please complete it before you leave class tonight. It should take no more than 15 minutes. It is very important to our data that you not use any materials, such as textbooks or the internet, while taking the pretest. It is simply to get an idea about what information you might already know about the topic.

Please make sure to bring a laptop or tablet to class next week and headphones. Thank you.

Appendix C. E-mails sent to CAP-T and CAT-TV Groups

Group 2: CAP-T group

Greetings students,

Here are the three CAPs that you are to watch tonight. Please watch them in order. Feel free to pause as needed and we encourage you to take notes. It should take approximately 30 minutes to watch all three CAPs. At the end of class, you will take a posttest on this information.

Introduction to Reading Comprehension: http://qmediaplayer.com/show.htm?645

Previewing CAP: http://qmediaplayer.com/show.htm?646

Get the Gist CAP: http://qmediaplayer.com/show.htm?647

Group 3: CAP-TV group

Greetings students,

Here are the three CAPs that you are to watch tonight. Please watch them in order. Feel free to pause as needed and we encourage you to take notes. It should take approximately 30 minutes to watch all three CAPs. At the end of class, you will take a posttest on this information.

Introduction to Reading Comprehension: http://qmediaplayer.com/show.htm?645

Previewing with Video: http://qmediaplayer.com/show.htm?648

Get the Gist with Video: http://qmediaplayer.com/show.htm?649

Appendix D. Script for Introducing Posttest and Homework

You will be receiving an e-mail momentarily with a posttest that will ask questions about what you learned today. Please **do not use your notes** or any information online to take this posttest. Although it will not be graded for the purposes of this course, the data will help answer the project's research questions. Before you leave today, you will also receive a homework assignment. You will be asked to use the strategies you learned today to teach a mini-lesson to a peer. You will be recording the video and then uploading it to your course management site. You may use your notes, but please do not watch the CAPs again or look anything up online. Your video will not be graded for the purposes of this course, but will help answer the project's research questions. Any questions?

Appendix E. Homework Sheet

Video Homework Assignment

Your task for this assignment is to record a video of yourself teaching the *previewing* strategy and the *get the gis*t strategy to a peer. You may use your notes from class this week, but please do not watch the CAPs again or look anything up online before recording your video. We are asking you to record the video based only on your memory and your notes. The video will be scored for the purposes of the study, but how you do on the video will not affect your course grade (although the completion of this video is part of your participation grade).

You will use the following passage (Mount Rushmore) and model the *previewing* and *get the gist* strategies to a peer. Pretend like you are classroom teacher and you are showing your class how to use both of these strategies with the passage.

Begin the lesson by stating your name, university, and instructor. After that, you will teach your lesson. Please record yourself teaching this lesson and save it in a file with your name. Upload the video to the appropriate tab on your course site. This video should be completed and uploaded before class next week.

You can e-mail me at katalves@virginia.edu with any questions. Thank you!

Mount Rushmore

Mount Rushmore is a national monument located in the Black Hills of South Dakota. Carved into the side of the large mountain are the faces of four men who were United States presidents. These men were chosen because all four played important roles in American history. The four faces carved onto Mount Rushmore are those of George Washington, Thomas Jefferson, Abraham Lincoln and Theodore Roosevelt. Each face carved into the mountain is about 60 feet tall.

George Washington was chosen for this monument because of his role in the Revolutionary War and his fight for American independence. He was the first United States president and is often called the father of our country. **Thomas Jefferson** was picked because he believed that people should be allowed to govern themselves, which is the basis for democracy. **Abraham Lincoln** was added because he believed that all people are equal, and he helped end slavery in the United States. **Theodore Roosevelt** was chosen because he was such an influential president and world leader.

The man who carved Mount Rushmore was named Gutzon Borglum, and he worked on the monument until his death in 1941. After Gutzon Borglum died, his son Lincoln Borglum worked on the mountain until there was no money left to continue. Fourteen years were spent creating the faces on Mount Rushmore. Dynamite was used to blast the tough granite rock off the mountain to make a smooth surface for the faces. George Washington was carved first, and his face began as an egg-shaped piece of granite. Thomas Jefferson was added to the right of George Washington, but his face cracked and had to be blasted off the mountain. Jefferson was then re-carved to the left of George Washington. Lincoln and then Roosevelt were added to the mountain. Snow and a dearth of money slowed down the work, and all work on the monument ended when there was no money left to continue.

Appendix F. Pretest

1. Write the steps to the *previewing* strategy.

2. Write the steps to the *get the gist* strategy.

3. When is the *previewing* strategy used?

4. When is the *get the gist* strategy used?

5. What is one purpose of the *previewing* strategy?

6. What is one purpose of the *get the gist* strategy?

7. What is the *biggest* problem faced by struggling readers?
   a. They do not engage in metacognition
   b. They have poor reading vocabularies
   c. They do not know how to answer questions about text
   d. They have trouble understanding sentence structure

8. Which is *not* a strategy that good readers use to ensure comprehension *during* reading?

   a. Reread sections to ensure understanding
   b. Try to figure out unknown words
   c. Draw conclusions about the text
   d. Make connections between concepts

9. Which is *not* an effective way to preview a text?

   a. Make a guess about what the passage will be about
   b. Look at headers and subheaders in the passage
   c. Think about questions you have about the topic
   d. Look up every unknown word in the passage

10. Before reading the text, it is *most* important to….

    a. Understand how the title connects to the plot
    b. Think about connections you might have to text
    c. Brainstorm what you already know about the topic
    d. Make sure you know what every word means

11. What is *not* a good way to choose vocabulary to preteach before reading a text?

    a. Pick words that have multiple meanings
    b. Pick words that are unknown
    c. Pick words that may be difficult
    d. Pick words that are multisyllabic

12. After completing *get the gist*, you should be able to?

a. Answer questions about the passage
b. Write a sentence with the main idea
c. State the topic of the passage
d. Draw conclusions about the topic

13. What is the *best* thing to do while reading?

a. Read slowly to ensure understanding
b. Make sure that you understand what the title means
c. Reread sections to check understanding
d. Look up all multisyllabic words

14. How can you find the main idea of a passage?

a. Look for the most important who or what
b. Look at headings and words in bold
c. Make connections to other content
d. Look for the key words and phrases

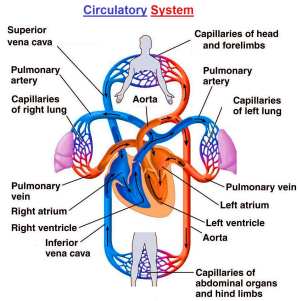
15. What statement *best* describes the teacher's role in introducing reading comprehension strategies?

a. Letting students figure the strategies out in groups
b. Demonstrating the use of strategies to students
c. Leading students through the use of the strategies
d. Assessing students as they use the strategies

16. What statement *best* describes the student's role during an introduction to using reading comprehension strategies?

a. Watching as the teacher models the strategies
b. Using the strategies in small groups
c. Implementing the strategies while reading
d. Reading about how to use the strategies

17. Blood is the fluid that flows through our bodies and gives us life. Without blood, vertebrates would not be able to live. It is imperative for our existence. Blood carries nutrients and oxygen to our body cells. Arteries, veins, and capillaries supply blood throughout our bodies. The blood system is similar to a system in which small streams become bigger streams. Big streams then feed into even bigger rivers.



Imagine you had this paragraph and picture of the circulatory system. Using the paragraph and picture, write what you would say to the class while modeling the previewing strategy (one sentence per step).

18. Using the previous paragraph and picture, what would you say to a class while modeling the get the gist strategy (one sentence per step)

Appendix G. Posttest

1. When is the *previewing* strategy used?

2. When is the *get the gist* strategy used?

3. What is one purpose of the *previewing* strategy?

4. What is one purpose of the *get the gist* strategy?

5. Write the steps to the *previewing* strategy.

6. Write the steps to the *get the gist* strategy.

7. Which is *not* an effective way to preview a text?

    e. Make a guess about what the passage will be about
    f. Look at headers and subheaders in the passage
    g. Think about questions you have about the topic
    h. Look up every unknown word in the passage

8. After completing *get the gist*, you should be able to?

    e. Answer questions about the passage
    f. Write a sentence with the main idea
    g. State the topic of the passage
    h. Draw conclusions about the topic

9. What is the *biggest* problem faced by struggling readers?
    e. They do not engage in metacognition
    f. They have poor reading vocabularies
    g. They do not know how to answer questions about text
    h. They have trouble understanding sentence structure

10. Before reading the text, it is *most* important to….

    e. Understand how the title connects to the plot
    f. Think about connections you might have to text
    g. Brainstorm what you already know about the topic
    h. Make sure you know what every word means

11. How can you find the main idea of a passage?

    e. Look for the most important who or what
    f. Look at headings and words in bold
    g. Make connections to other content
    h. Look for the key words and phrases

12. What is *not* a good way to choose vocabulary to preteach before reading a text?

e. Pick words that have multiple meanings
f. Pick words that are unknown
g. Pick words that may be difficult
h. Pick words that are multisyllabic

13. What statement *best* describes the teacher's role in introducing reading comprehension strategies?

e. Letting students figure the strategies out in groups
f. Demonstrating the use of strategies to students
g. Leading students through the use of the strategies
h. Assessing students as they use the strategies

14. What is the *best* thing to do while reading?

e. Read slowly to ensure understanding
f. Make sure that you understand what the title means
g. Reread sections to check understanding
h. Look up all multisyllabic words

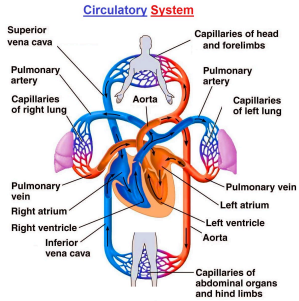
15. Which is *not* a strategy that good readers use to ensure comprehension *during* reading?

e. Reread sections to ensure understanding
f. Try to figure out unknown words
g. Draw conclusions about the text
h. Make connections between concepts

16. What statement *best* describes the student's role during an introduction to using reading comprehension strategies?

e. Watching as the teacher models the strategies
f. Using the strategies in small groups
g. Implementing the strategies while reading
h. Reading about how to use the strategies

17. Blood is the fluid that flows through our bodies and gives us life. Without blood, vertebrates would not be able to live. It is imperative for our existence. Blood carries nutrients and oxygen to our body cells. Arteries, veins, and capillaries supply blood throughout our bodies. The blood system is similar to a system in which small streams become bigger streams. Big streams then feed into even bigger rivers.



Imagine you had this paragraph and picture of the circulatory system. Using the paragraph and picture, write what you would say to the class while modeling the previewing strategy (one sentence per step).

18. Using the previous paragraph and picture, what would you say to a class while modeling the get the gist strategy (one sentence per step)

Appendix H. Pretest/Posttest Scoring Rubric

Question	Points	No points
1. Write the steps to the *previewing* strategy. (6 points)	*1 point each (6 possible points)* *-Introduce/State the topic* *-Preteach/introduce vocabulary words* *-Preview text features (look at title, picture, charts), glance at passage (can only earn one point here even if they list each separately)* *-Activate background knowledge/brainstorm* *-Create a prediction* *-Set purpose for reading/ask questions*	Inferences Connections Previewing before reading Becoming familiar with a text/passage Skimming the passage
2. Write the steps to the *get the gist* strategy. (3 points)	*1 point each (3 possible points)* *-State the 'who' or 'what'* *-Decide what is important about the 'who' or 'what'* *-Writes the gist in 10 words or less*	Identify Write Find the main idea
3. When is the *previewing* strategy used? (1 point)	*1 point possible for any of the following* *Before reading* *Prior to reading* *Before new topic/material*	Before the lesson To teach strategies for reading/to teach students how to read
4. When is the *get the gist* strategy used? (1 point)	*1 point possible for any of the following* *During reading* *When reading/while reading/throughout reading*	To get the main idea after reading
5. What is one purpose of the *previewing* strategy?	*1 point for any of the following (can only earn ONE point)* *Prepare for reading text/get ready to read/get an idea for reading or what the book is about/get info about reading/preview text* *Become familiar with the text* *Introduce the topic* *Preteach vocab words*	Ensure understanding of what you are reading Get the gist Learn to read

	Activate background knowledge/think about what they already know *Make a prediction*	
6. What is one purpose of the *get the gist* strategy?	*1 point for any of the following (can only earn ONE point)* *To find the main idea of each section before moving on* *Check comprehension* *Ensure understanding/ensure understanding before moving on*	Make connections Get/collect information
Imagine you had this paragraph and a picture of the circulatory system. Using the paragraph and picture, write what you would say to the class while modeling the previewing strategy (one sentence per step).	*1 point each (6 possible points)* *-Today we are going to be talking about blood (State the topic)* *-Before, we begin I am going to teach you about a few of the words (e.g., imperative, nutrients) (Preteach/introduce vocabulary words)* *-Let's look at the title and the picture to see what we can learn about the passage before we begin reading (Preview text features, use picture to explain)* *-Hmm… what do I already know about blood? I know it circulates through my body (Activate background knowledge, brainstorm, ask students what they already know, connect to what they already know, explain blood or circulatory system)* *-Based on the title and on my background knowledge, I think this passage is going to talk about how blood moves through the body (Create a prediction)* *-While I read, I would like to learn about the different uses for blood (Set purpose for*	

	reading – ask what they want to learn, this will teach us…)	
Using the previous paragraph and picture, what would you say to a class while modeling the get the gist strategy (one sentence per step	*1 point each (3 possible points)* *-The most important thing in this passage is blood (State the most important 'who' or 'what')* *-The most important thing about blood in this passage is that it is carried through our bodies and helps us survive (Decide what is important about the 'who' or 'what')* *-Blood moves through our body and helps us survive (Writes the gist in 10 words or less – any summary sentence)*	

Appendix I. Video Scoring Rubric

Teaching Practice		Steps	Possible points for step	Score
Introduces lesson				
States purpose of the lesson		States purpose/rationale of lesson	.5	
Explains previewing		Explains the purpose of the strategy	.5	
Previewing				
State the topic		State the topic of the passage	1	
Preteach vocabulary words			+1 bonus point for all components	
	-Selects appropriate words	Selects 2 to 3 words that appear in the text	.166	
		Selects words that are likely to be difficult/unknown	.166	
	-Gives student friendly definition	Uses clear, developmentally appropriate language	.166	
		Defines word using simple vocabulary	.166	
	-Gives example	Show visual representation	.166	
		Explain how visual is an example of the word	.166	
Preview text features			+1 bonus point	
	Preview title	Read the title	.25	
		Think aloud about how the title can give you clues to what the passage is about	.25	
	Preview pictures	Look at the picture	.25	
		Think aloud about how the picture can give clues to what the passage is about	.25	
Activate background knowledge/brainstorm			+1 bonus point	
	Introduce brainstorm	Think aloud about your brainstorm	.25	
		Write 1 to 2 sentences about the topic on the board	.25	
	Guide students through	Tell students to brainstorm about topic	.25	

	brainstorming	Ask students to share brainstorms	.25	
Create a prediction			+1 bonus point	
	Use clues to help create prediction	Use clues from the text preview	.25	
		Use clues from your brainstorm	.25	
	Write prediction	Incorporate clues	.25	
		Write an educated guess of what you might learn	.25	
Set purpose for reading			+1 bonus point	
	Set purpose	State purpose for reading	.33	
		Purpose incorporates the topic	.33	
		Purpose incorporates predictions	.33	
Get the Gist				
Explains get the gist		Explains purpose of get the gist	.5	
State the most important 'who' or 'what'			+1 bonus point	
	States who or what	States who or what	.5	
		Explains why this is the most important who or what	.5	
Decide what is important about the 'who' or 'what'			+1 bonus point	
	What is important?	States what is important about who or what	.5	
		Explains why this is the most important thing about the who or what	.5	
Writes the gist			+1 bonus point	
	Write gist	Writes a complete sentence	.33	
		Sentence is the main idea of the passage	.33	
		Sentence is 10 words or less	.33	
Closes the lesson		Includes closing statement	.5	
			11 points (+ bonus)	Total: _____

Appendix J. Social Validity Survey

1. I enjoyed the presentation on reading comprehension strategies

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

2. I feel like I learned a lot from the presentation on reading comprehension strategies

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

3. I feel like I have a general understanding of the importance of reading comprehension

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

4. I feel like I have a general understanding of the importance of the *previewing* strategy

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

5. I feel like I could use the *previewing* strategy in my future instruction

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

6. I am likely to use the *previewing* strategy in my future instruction

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

7. I feel like I have a general understanding of the importance of the *get the gist* strategy

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

8. I feel like I could use the *get the gist* strategy in my future instruction

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

9. I am likely to use the *get the gist* strategy in my future instruction

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

10. I would watch this presentation again before teaching reading in the future

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

11. I would recommend these materials to peers to learn about these strategies

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

12. I learned new evidence-based practices for teaching reading comprehension by participating in this project

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

13. I taught a lesson that contained appropriate evidence-based practices for teaching reading comprehension given the passage I was assigned

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

Only answer the following questions if you watched a CAP

14. I think CAPs are a good alternative to lecture

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

15. I would prefer to watch a CAP at home and then use class time for more interactive learning activities

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

Only answer the following questions if you watched a CAP with a video

16. I think CAP+video is a good alternative to lecture

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

17. I would prefer to watch a CAP+video at home and then use class time for more interactive learning activities

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree

18. I think the video enhanced my learning over and above what I got from just the CAP

1	2	3	4	5	6	7
Strongly Disagree			Neutral			Strongly Agree