

Abstract

Title of Dissertation: PROMPTING RURAL STUDENTS' USE OF
PRIOR KNOWLEDGE AND EXPERIENCE
TO SUPPORT COMPREHENSION OF
UNFAMILIAR CONTENT

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Prior knowledge activation is foundational to students' text comprehension. Yet, pedagogical techniques that teachers can use to prompt students' knowledge activation are limited and empirical data on the relative effectiveness of those techniques is scant. Thus, the purpose of this dissertation was to investigate the effectiveness of traditional and novel knowledge activation techniques for supporting rural students' comprehension of texts covering unfamiliar content. In this quasi-experimental study, 149 rural middle-school students were assigned to one of three conditions: knowledge mobilization (traditional), relational reasoning (new), or text annotation (control). Data were analyzed using structural equation modeling with text comprehension as the outcome variable and condition, relational reasoning ability, prior topic knowledge, gender, ethnicity, and grade level as predictor variables. The results demonstrated a statistically significant difference

for overall comprehension between students in the relational reasoning condition and students in both the mobilization ($\beta = 5.15, p < .00$) and control conditions ($\beta = 3.10, p < .00$). There were no significant differences between students in the mobilization versus control conditions ($\beta = -1.85, p = .07$). Further, there were no comprehension differences for ethnic background or grade level. However, female students outperformed male students, and prior topic knowledge and relational reasoning ability were significant covariates in analysis. Qualitative analysis of follow-up conversations revealed the utility of the relational reasoning condition, especially for low-performing students. The results indicate that not all prior knowledge activation techniques are equally effective for all students engaged in the processing unfamiliar textual content. Additionally, the novel activation technique of relational reasoning proved highly effective for promoting students' text comprehension.

PROMPTING RURAL STUDENTS' USE OF PRIOR KNOWLEDGE AND
EXPERIENCE TO SUPPORT COMPREHENSION OF UNFAMILIAR CONTENT

by

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TABLE OF CONTENTS

Acknowledgments.....	ii
Table of Contents.....	iv
List of Tables.....	vii
List of Figures.....	viii
 CHAPTER I: STATEMENT OF THE PROBLEM.....	 1
Limitations in the Extant Literature.....	1
Prior Knowledge Activation Throughout the Reading Process.....	2
Traditional and New Activation Techniques.....	3
Middle School Population.....	6
Rural Population.....	7
Background Knowledge in Classrooms.....	9
Conceptual Model.....	10
Purpose of the Study.....	13
Research Questions.....	13
Definition of Terms.....	15
 CHAPTER II: REVIEW OF RELEVANT LITERATURE.....	 17
Reading Comprehension and Prior Knowledge.....	17
Prior Knowledge Activation	19
Prior Knowledge Activation Definition and Techniques.....	19
Prior Knowledge Activation and Student Learning.....	21
Positive outcomes.....	21
Mixed outcomes.....	26
Negative outcomes.....	28
Limitations in the Prior Knowledge Activation Literature	30
Relational Reasoning.....	32
Overview of Relational Reasoning	32
Analogy.....	33
Anomaly.....	33
Antinomy.....	34
Antithesis.....	34
Measures of Relational Reasoning.....	35
Test of Relational Reasoning.....	35
Verbal Test of Relational Reasoning.....	36
Test of Relational Reasoning, Junior.....	37
Gaps in the Relational Reasoning Literature.....	37
Literacy in Rural Communities.....	38
Defining Rural.....	38
Quantitative Definitions of Rural Areas.....	38
Qualitative Distinctions of Rural Areas.....	39
Current Context.....	39

Rural Literacy.....	40
The Interplay Between Prior Knowledge Activation, Relational Reasoning, and Rural Populations.....	44
Summary.....	45
CHAPTER III: METHODOLOGY.....	47
Participants.....	47
Study Texts.....	49
Measures.....	52
Demographics.....	52
Test of Relational Reasoning, Junior.....	53
Comprehension Assessment.....	54
Topic Knowledge Portion.....	54
Short-Constructed Response Portion.....	56
Training Protocol.....	57
Mobilization.....	57
Relational Reasoning.....	58
Control.....	59
Procedures.....	60
Phase 1.....	60
Phase 2.....	61
Phase 3.....	61
Phase 4.....	62
Phase 5.....	63
Overview of Analyses.....	64
CHAPTER IV: RESULTS AND DISCUSSION.....	67
Differences Between Prior Knowledge Activation Conditions on Overall Reading Comprehension.....	67
Differences Between Prior Knowledge Activation Conditions by Question Type.....	85
Topic-Knowledge Portion.....	85
Short Constructed Response Portion.....	88
Qualitative Follow-Up.....	89
Recollections of the Intervention.....	90
Utility of the Prior Knowledge Activation Techniques.....	91
CHAPTER V: CONCLUSIONS, LIMITATIONS, AND IMPLICATIONS.....	95
Conclusions.....	95
Task: Prior Knowledge Activation.....	95
Reader: Rural Middle School Students.....	97
Text: Unfamiliar Expository Text.....	98
Context: Rural Middle School Classrooms.....	100
Limitations.....	100

Implications for Research.....	101
Different Populations.....	102
Text Type.....	103
Measures of Comprehension.....	103
Implications for Instructional Practice.....	104
APPENDICES.....	107
A: EXCEPRT FROM THE TRAINING TEXT.....	108
B: EXCERPT FROM THE ASSESSMENT TEXT.....	109
C: EXCEPRT FROM THE QUALITATIVE FOLLOW-UP TASK.....	110
D: DEMOGRAPHICS MEASURE.....	111
E: SAMPLE ITEMS FROM THE TEST OF RELATIONAL REASONING, JUNIOR.....	112
F: TOPIC KNOWLEDGE ASSESSMENT.....	116
G: SHORT CONSTRUCTED COMPREHENSION QUESTIONS.....	118
H: RUBRIC FOR SHORT CONSTRUCTED RESPONSE QUESTIONS.....	119
I: MOBILIZATION LESSON PLAN AND MATERIALS.....	120
J: RELATIONAL REASONING LESSON PLAN AND MATERIALS...	125
K: TEXT ANNOTATION LESSON.....	131
REFERENCES.....	133

List of Tables

Table 1 Participant Background Information.....	48
Table 2 Readability Data for the Study Passages.....	51
Table 3 Descriptive Statistics by Condition.....	80
Table 4 Comprehension Measures: Overall Comprehension, Topic Knowledge, and Short Constructed Response.....	86
Table 5 Descriptive Statistics for Eight Individual Students.....	90
Table 6 Representative Student Responses to Relational Reasoning Prompts.....	94

List of Figures

Figure 1. Conceptual Model.....	12
Figure 2. Structural Equation Model.	81

CHAPTER I

STATEMENT OF THE PROBLEM

The importance of prior knowledge to learning has been well documented in theory and empirical research for more than a century (e.g., Baldwin, Peleg-Bruckner, & McClintock, 1985; Bartlett, 1932; Bransford & Johnson, 1972; Dochy & Alexander, 1995; Pearson, Hansen, & Gordon, 1979; Wertheimer, 1912). One consistent finding within the relevant literature is that students' prior knowledge guides their understanding and comprehension of written text (Anderson, Reynolds, Schallert, & Goetz, 1977). In fact, Anderson and Pearson (1984) stated that reading comprehension entails "the interaction of new information with old knowledge" (p. 255). However, for this interaction between the text and reader to occur, readers must activate their "old knowledge," which does not necessarily occur automatically or effectively. By definition, activation of prior knowledge entails the process of calling forward from memory what one already knows relative to an experience, idea, or topic at hand. Thus, making that pre-existing knowledge accessible for instantiation orally or in writing (Förster & Liberman, 2007; Hattan, Singer, Loughlin, & Alexander, 2015).

Limitations in the Extant Literature

Despite the rich literature confirming the significance of prior knowledge and the necessity of activating that knowledge when engaging in text processing, there remains much to be learned about prior knowledge and its role in readers' comprehension. Specifically, as revealed in a systematic review (Hattan & Alexander, 2017a), the extant literature on prior knowledge activation has evident

limitations including: (a) a focus on prior knowledge activation *before* reading rather than throughout the reading process; (b) a limited number of activation techniques empirically investigated or infused in instruction; (c) examination of prior knowledge activation primarily among undergraduate and high-school students; (d) limited attention to rural populations as a unique class of readers (Irvin, Byun, Meece, Farmer, & Hutchins, 2012); (e) interventions largely conducted in laboratory settings rather than in classrooms; and, (f) the activation primarily of topic knowledge (i.e., individuals' knowledge of key topics within oral or written text; Alexander, Schallert, & Hare, 1991), rather than more personal, albeit potentially relevant, knowledge.

Given the importance of the limitations to the design of the current study, I will discuss each within the existing literature and overview how those limitations were addressed in this investigation.

Prior Knowledge Activation Throughout the Reading Process

As detailed in Chapter 2, prior knowledge activation techniques that have been empirically investigated are primarily instituted *before* reading. Consequently, less is understood about how activation of students' relevant topic or personal knowledge throughout the reading process would influence comprehension performance (Hattan & Alexander, 2017a). There is reason to assume that continuous activation through the reading process would be beneficial to readers (Schmidt, De Volder, De Grave, Moust, & Patel, 1989; Willoughby, Porter, Belsito & Yearsley, 1999). For example, Kintsch's Construction Integration Model (1998) emphasizes that comprehension requires a continuous interaction between the

textual content and the reader's knowledge and experiences. Thus, as the Construction Integration Model establishes, and empirical research supports, readers should continually activate their knowledge at all phases of reading instruction (i.e., before, during, and after) in an effort to strengthen connections between what they know and the information they are encountering in oral or written texts (Salminen, Marttunen, & Laurinen, 2010; Schmidt et al., 1989; Willoughby et al., 1999).

For this reason, the current study examined knowledge activation at multiple points in the reading process. Specifically, for students assigned to the treatment groups, prior knowledge was prompted before reading, after reading, and at various point during the reading process.

Traditional and New Activation Techniques

Within the empirical literature, only a handful of prior knowledge activation techniques, including thematic organizers (Alvarez & Risko, 1989), concept mapping (Novak & Gowan, 1984), mobilization (Alvermann, Smith & Readence, 1985), small group discussion (Schmidt et al. 1989) and teacher questioning (Pressley, Tenenbaum, McDaniel, & Wood, 1990) have been investigated. In general, these techniques have been found to be useful in priming students' existing knowledge about a given theme or topic that they will subsequently encounter in a discussion or a reading. Yet the repertoire of such techniques remains limited with apparently no new procedures introduced since the early 2000s (Biemans, Deel, & Simons, 2001).

Thus, this dissertation made a contribution to the literature by introducing a new activation technique, relational reasoning, and by comparing its effects to a traditional prior knowledge activation technique, mobilization. *Mobilization*, the process of bringing to mind everything an individual knows about a topic (e.g., Machiels-Bongaerts, Schmidt, & Boshuizen, 1995; Peeck, van den Bosch, & Kreupeling, 1982), is often used as a pre-reading strategy. Although initial studies demonstrated a positive influence of mobilization on student learning (Peeck et al., 1982), later studies have had mixed results. For example, Wetzels, Kester, and van Merriënboer (2011) found that the effect of mobilizing students' prior topic knowledge diminished for students who had an increased level of prior topic knowledge, when compared to another activation technique.

Conversely, van Loon, de Bruin, van God, and van Merriënboer (2013) found that mobilizing students' prior knowledge of *unfamiliar* concepts had a negative influence on students' text comprehension. Additionally, Kostonos and van der Werf (2015) found that mobilizing students' metacognitive knowledge before reading was beneficial for students' comprehension, but mobilizing students' prior topic knowledge was not. Despite these mixed results, asking students to mobilize their knowledge prior to learning remains a popular prior knowledge activation technique. Therefore, the current study revisited mobilization as an activation technique with two modifications. First, students in the current study were called upon to activate their knowledge before, during, and after reading. Second, students were asked to return to the initial thoughts they recorded and compare their initial prior knowledge to what they learned from the text.

Relational reasoning is the ability to derive meaningful patterns within any information stream (e.g., Alexander & the Disciplined Reading and Learning Research Laboratory [DRLRL], 2012; Dumas, Alexander, & Grossnickle, 2013). Specifically, relational reasoning can be broken down into four distinct forms—analogy (similarity), anomaly (discrepancy), antinomy (exclusivity), and antithesis (opposition). These four forms of relational reasoning would appear to have relevance to students' ability to forge an association between the content of text and their personal knowledge and experiences.

For instance, students can be prompted to look for similarities (i.e., analogies) between their own lives and experiences and any person, situation, or event in the text. Students can also be taught to discern when the information they are encountering may be different from or even in conflict with what they know or have experienced (i.e., anomalies or antitheses). Further, there will be those cases when students become aware of situations or ideas that they regard as categorically distinct from what they know or believe (i.e., antinomies).

This technique also emphasizes continual activation of students' knowledge through the reading process, as well as the critical analysis of text in relation to what they know and believe. Such approaches to prior knowledge activation have been shown to enhance comprehension and to make readers aware of contrasting arguments or evidence that might arise in texts (e.g., Kendeou & van den Broek, 2007). Although the influence of relational reasoning on learning has been examined in the literature (Dumas et al., 2013), there has been no attempt to train students to utilize all four forms relational reasoning when learning from text.

Therefore, it was the purpose of the current dissertation to examine the utility of relational reasoning as a novel prior knowledge activation technique.

For the current study, it was assumed that both mobilization and relational reasoning techniques would result in greater comprehension of text than when no activation was involved. However, given that previous studies had not investigated the overall effects of relational reasoning training, it was unknown as to whether relational reasoning, as a novel technique, would demonstrate stronger effects than the more traditional mobilization.

Middle-School Population

Another limitation of the prior knowledge activation literature is that studies have primarily examined high-school and undergraduate students (e.g., Gurlitt & Renkl, 2008), rather than younger students who developmentally may require even more support of prior knowledge activation (Carr & Thompson, 1996). For example, Hattan and Alexander (2018) investigated two prior knowledge activation techniques (i.e. mobilization and concept mapping) in comparison to a control group when undergraduate students read unfamiliar text content. When students engaged in a prior knowledge activation technique, they produced higher overall comprehension scores, as well as higher scores on integrate and interpret and critique and evaluate questions, than the control condition. However, there were no differences between the prior knowledge activation conditions and control conditions on locate and recall questions. Therefore, it is possible that younger students would also benefit from external prior knowledge activation prompts, particularly when answering integrate/interpret and critique/evaluate questions.

However, from a developmental standpoint, it cannot be assumed that those activation techniques, which work for older and more competent readers, would assist younger students in the same way. As students develop, they may need more or less guidance to assist them in activating their prior knowledge. For example, a previous study investigated third- and fifth-grade students' spontaneous knowledge activation when engaging with grade-level texts (Hattan & Dinsmore, 2017). This think-aloud study revealed that students infrequently uttered knowledge activation statements (i.e., statements that purposefully accessed prior knowledge). This finding suggests that third- and fifth-grade readers should benefit from explicit teacher modeling and guidance of how to use their existing knowledge to support their comprehension. Therefore, it seems beneficial to consider students' developmental stages or grade levels when investigating the viability of prior knowledge activation techniques. For that reason, the current study focused on middle-school students and their comprehension of unfamiliar content within the domain of world history.

Rural Population

Overall, rural students have been understudied in the literacy literature, particularly the literature pertaining to reading comprehension (Corbett & Donehower, 2017; Irvin et al., 2012; Vernon-Feagans, Gallagher, & Kainz, 2010). Previous studies on rural education have focused on early literacy (Vernon-Feagans et al., 2010), student engagement (Greenberg, Gilbert, & Fredrick, 2006), risk factors (Khattri, Riley, & Kane, 1997; Vernon-Feagans & Cox, 2013), education policy (Schafft & Biddle, 2014), teacher professional development (Peltola,

Haynes, Clymer, McMillan, & Williams, 2016), and teacher recruitment and retention (Biddle & Azano; 2016; Collins, 1999; Lazarev, Toby, Zacamy, Lin, & Newman, 2017). Further, studies that have sought to investigate rural literacy have focused predominantly on basic reading skills such as phonics, decoding, and fluency, rather than comprehension (Shippen, Miller, Patterson, Houchins, & Darch, 2014; Stockard, 2011). Yet literacy is crucial to social and economic stability in rural communities, and therefore deserves greater attention from education researchers (Donehower, Hogg, & Schell, 2007).

Despite the lack of literature on rural readers, the literature is replete with evidence that readers' sociocultural backgrounds can influence their comprehension of a text (Hayes & Tierney, 1982). Previous literature has considered cultural diversity (Opitz, 1998), as well as issues confronted by urban minority students whose lives are not well represented in school texts (Moje, Ciechanowski, Kramer, Ellis, Carrillo, & Collazo, 2004). These studies suggest that students' background knowledge may be ill-matched to the themes and topics of the texts they are called upon to read (Johnston, 1984). Moreover, literacy researchers emphasize the important role that students' identities play within the reading comprehension process (McCarthy & Moje, 2002), including the identities of rural students (Donehower et al., 2007).

However, previous investigations have not routinely considered the culture of rural America or how minority students from rural communities may be affected by significant mismatches between their own lives and the content of school texts. It is conceivable that minority students from rural communities are even more

disadvantaged when it comes to bringing their personal lives and prior knowledge to bear on text processing. For that reason, in this investigation I targeted the text processing and comprehension of middle-school students from a rural community that has a high percentage of minority students who are on free and reduced-priced lunch (FARMS)—an indicator of low socioeconomic conditions.

Background Knowledge in Classrooms

Additionally, much of the literature dealing with prior knowledge activation has focused on laboratory studies (e.g., Azevedo, Greene, & Moos, 2007), with a limited number of studies investigating knowledge activation in classroom contexts (e.g., Hattan et al., 2015). This brings into question the ecological validity of many previous studies. Situating the study of prior knowledge activation in classrooms is important because it allows researchers and educators to understand the ways in which teachers can facilitate students' activation of knowledge within the regular classroom context. For example, despite the known benefits of prior knowledge activation, there is evidence that public (Hattan et al., 2015) and private (Hattan & Alexander, 2017b) elementary-school teachers rarely prompt students' prior knowledge activation. However, when those prompts do occur, students often provide relevant responses (Hattan & Alexander, 2017b). Therefore, the current intervention took place during regular classroom time, and with intact classes to maximize similarities between the intervention and students' daily lessons.

The intervention engaged students in the reading of grade-appropriate expository texts on the subject of world history. The domain of world history was chosen in consultation with school administrators and faculty who regarded this

area as an area of need. The curricula used at the school focused primarily on United States history and current events, so students did not have substantial background knowledge in world history.

Moreover, previous research has emphasized the activation of *topic* knowledge, or knowledge that students have in relation to the content of a specific text (Alexander et al., 1991). For the current study, students in the relational reasoning condition were prompted to consider not only topic knowledge, but also domain and background knowledge. Specifically, studies should consider students' *domain* knowledge, which pertains to knowledge from a field of study, such as history (Alexander et al., 1991). For example, topic knowledge may comprise specific concepts, ideas or events mentioned directly in a text on ancient Greece, but domain knowledge encompasses a broader understanding of world history. Further, students may also be able to use their personal experiences or cultural backgrounds to better comprehend texts (Moll, Amanti, Neff, & Gonzalez, 1992). One reason for introducing relational reasoning as a prior knowledge activation technique is to guide students to go beyond their topic-specific knowledge to utilize other types of knowledge that may help them make sense of the text.

Conceptual Model

The RAND Reading Study Group proposed a heuristic for reading comprehension, where comprehension occurs at the intersection of the reader, text, and task, within a particular sociocultural context (Snow, 2002; van den Broek & Kendeou, 2017). The current study delved deeply into specific attributes of the RAND heuristic (See Figure 1). Specifically, the sociocultural context for the

current study was rural middle-school classrooms. The primary reader characteristics of interest included students' prior knowledge and experiences, as well as their relational reasoning abilities. However, demographic data such as grade level, ethnicity, and gender were also considered in the analyses.

In this study, students were prompted to read expository texts on content that had not been formally introduced within the curriculum. The task included either prior knowledge activation (i.e., mobilization or relational reasoning) or text annotation, with relational reasoning being introduced as a novel activation technique. Students were asked to demonstrate comprehension at varying levels of specificity, ranging from locate and recall multiple-choice questions to integrate and interpret and critique and evaluate questions that required written responses. Further, students were prompted to engage in prior knowledge activation or text annotation before, during, and after reading, rather than at only one time point during the reading process.

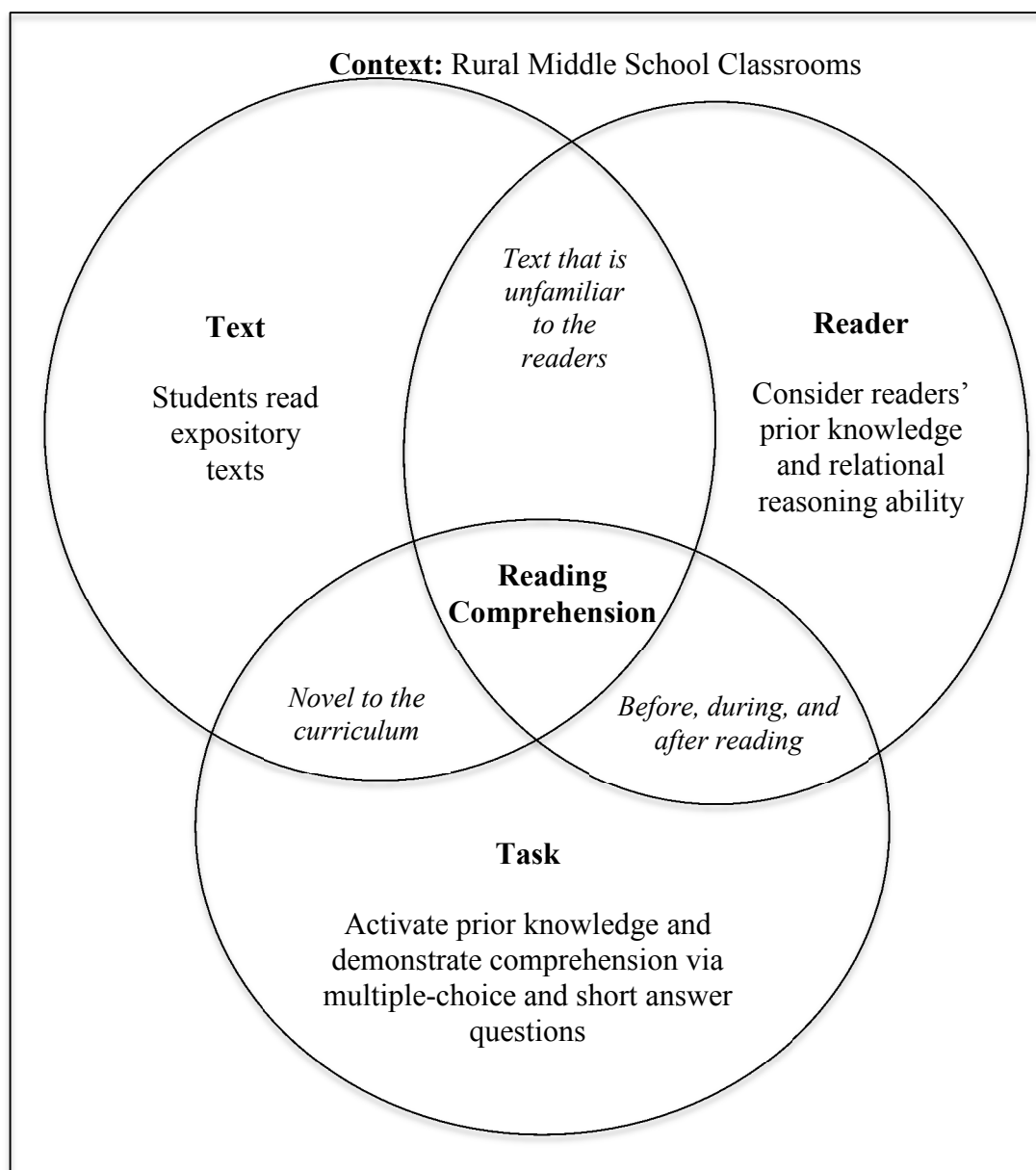


Figure 1. Conceptual model guiding the current investigation that conveys that reading comprehension arises when middle school students (readers) from a rural community (context) activate their prior knowledge (task) while reading unfamiliar expository texts.

Purpose of the Study

The principal purpose of the current study was to investigate the effects of a traditional and a novel knowledge activation technique on rural students' understanding of an unfamiliar expository text. In this quasi-experimental study, rural middle-school students were assigned to one of two treatment conditions—knowledge mobilization (traditional) or relational reasoning (new)—or to a control condition. The effects of knowledge activation techniques on rural students' comprehension of unfamiliar content from the domain of world history were examined, and implications for research and practice forwarded.

Research Questions

The overarching question guiding this research pertained to whether different knowledge activation techniques, including a new technique based on relational reasoning, would result in statistically significantly better comprehension performance for rural fifth- and sixth-graders when they were engaged in the reading of world history texts about unfamiliar topics.

Specifically, the research questions for the current study were as follows:

- (1) How do mobilization and relational reasoning knowledge activation techniques, in comparison to a control condition, predict rural fifth- and sixth-grade students' comprehension as indicated by their overall comprehension score scores?
- (2) Do the prior knowledge activation techniques or control condition differentially predict students' performance on comprehension measures

by question type (i.e., locate/recall or integrate/interpret and critique/evaluate)?

- (3) What do low- and high-performing students' general recollections of the specific intervention in which they participated (i.e., mobilization or relational reasoning) and their cued reading of a similar task reveal about the memorability and utility of the trained activation techniques?

For overall comprehension scores, as well as the scores for the integrate and interpret and the critique and evaluate question types, I hypothesized that students in the prior knowledge activation groups would outperform the control group, following the pattern found in a similar study with undergraduate participants (Hattan & Alexander, 2018). As in a previous investigation (Hattan & Alexander, 2018), I hypothesized that the prior knowledge activation techniques would result in significant differences for integrate/interpret and critique/evaluate questions, but not necessarily for the multiple-choice locate/recall questions.

Because relational reasoning is a new activation technique that has not been previously tested, there were insufficient data to predict whether one of these procedures or another would prove advantageous to these students' comprehension. Finally, for the qualitative analyses of follow-up data, I hypothesized that high-performing students in both the mobilization and relational reasoning conditions would recall more details of their trained procedures than low-performing students, and would demonstrate greater facility in the use of those procedures by their recall of background knowledge pertinent to the text.

Definition of Terms

Domain knowledge is “a realm of knowledge that broadly encompasses a field of study or thought” (Alexander et al., 1991, p. 332).

Reading encompasses the decoding of text, the understanding of language, and provides a venue for accessing the world of “art and intellect” (Walcutt, 1967, p. 362).

Reading comprehension can be defined as the process of making meaning from text (Fox & Alexander, 2011). Readers may comprehend the text at three different levels: (a) locating or recalling information directly from the text, (b) integrating and interpreting the text by making comparisons or examining relations across the text, or (c) critiquing and evaluating the content of the text through critical examination (National Assessment Governing Board [NAGB], 2010).

Mobilization is the process of bringing to mind everything an individual knows about a topic (e.g., Peeck et al., 1982).

Personal or background knowledge is the everyday experiences and world knowledge that students have prior to engaging in a learning task (Alexander et al., 1991).

Prior knowledge is the sum of one’s knowledge and experiences before engaging in a learning task (Dochy & Alexander, 1995).

Prior knowledge activation is how one uses or brings to bear what he or she knows, either explicitly through external prompts, cues, or tasks (e.g., mapping) or automatically (Hattan et al., 2015).

Relational reasoning is the ability to derive meaningful patterns within any information stream (e.g., Alexander & the DRLRL, 2012; Dumas et al., 2013).

Rural is defined as any population outside of large urban areas and their suburbs (U.S. Census Bureau, 2010). The community of interest for the current dissertation is identified as *rural remote* and *completely rural*, which means that the territory is more than 25 miles from an urban area (National Center for Education Statistics [NCES], 2006), and the population includes less than 2,500 people (United States Department of Agriculture [USDA], 2016).

Topic knowledge is “the intersection between one’s prior knowledge and the content of a specific passage or discourse” (Alexander et al., 1991, p. 333).

CHAPTER II

REVIEW OF RELEVANT LITERATURE

In this chapter, the theoretical background for this dissertation is put forward, and details regarding the constructs within the conceptual model (Figure 1) are explicated. Specifically, this review introduces theoretical frameworks related to the role of prior knowledge in learning that are the foundation for the study. Additionally, this review scrutinizes the literature on how prior knowledge activation is defined, enacted, and measured; examines how relational reasoning has been conceptualized and measured in the literature; and examines research on rural students' reading comprehension. The confluence of prior knowledge and its activation, relational reasoning, as a new area for knowledge activation, and rural populations, are discussed within the context of this dissertation study.

Reading Comprehension and Prior Knowledge

Prior knowledge, which is central to this investigation, is a key component of theories of knowledge structures, learning, and text processing such as Ausubel's Subsumption Theory (Ausubel, 1968, 2000), Anderson's Schema theory (Anderson & Pearson, 1984) and Kintsch's Construction Integration Model of Text Comprehension (Kintsch, 1998). According to Ausubel (1968), Subsumption Theory requires the active integration of new, meaningful information with old knowledge. Meaningful learning occurs when learners incorporate new information into existing cognitive structures (Ausubel, 2000), which cannot be accomplished without activating prior knowledge. In contrast to rote learning, which requires memorization and which can be isolated from prior knowledge, meaningful learning

is contextualized. It necessitates the development of connections between old knowledge and new knowledge.

Building off of Ausubel's Subsumption Theory (1968), Schema theory (Anderson & Pearson, 1984, 2002; Anderson et al., 1977) asserts that individuals organize knowledge into schemata. A schema is defined as "an abstract knowledge structure" (Anderson & Pearson, 1984, p. 260) that assists learners in identifying relations among and between various concepts. Schema theory emphasizes that these knowledge structures can change or adapt as individuals are exposed to new information, which is essential to the learning process.

In comparison to Subsumption Theory (Ausubel, 1968) and Schema theory (Anderson & Pearson, 1984), which have been applied to both general learning as well as text processing, Kintsch's (1998) Construction Integration Model of Text Comprehension focuses explicitly on the reading process. Specifically, Kintsch stresses an *interaction* between the text and the general knowledge and experiences of the reader. This bidirectional and continuous interaction between texts and readers is dependent on the authors' ability to convey messages to their readers, as well as the readers' recognition of authors' arguments and messages.

As these theories suggest, readers continuously activate their prior knowledge throughout reading. Successful readers seek to strengthen connections between relevant knowledge and the text while setting aside activated knowledge that appear irrelevant to the context. In this way, readers use what they already know to help them make inferences and fill in the inevitable gaps in the text to support deeper text processing (Kintsch, 1998). The process of inferring and

making sense of the text allows new information to assimilate into readers' existing knowledge base, often transforming what readers know or understand about the topic at hand.

Prior Knowledge Activation

In order to address how prior knowledge activation is defined, enacted, and measured within the literature, an examination of prior knowledge activation within reading contexts was undertaken (Hattan & Alexander, 2017a). In this chapter, I overview several key outcomes of that review including: how prior knowledge activation has been conceptualized and what specific activation techniques have been studied; and, whether activation facilitates comprehension. This overview concludes with an identification of the remaining gaps in the existing literature related to the activation and readers' comprehension.

Prior Knowledge Activation Definition and Techniques

Prior knowledge activation is how one uses or brings to bear what he or she already knows (Hattan et al., 2015). Further, *prior knowledge activation* can be achieved automatically or strategically. *Automatic* activation is when students access what they already know without explicit external prompting (Hattan & Alexander, 2017a; Hattan & Dinsmore, 2017). However, prior knowledge activation does not come naturally for all students or does not happen routinely (Carr & Thompson, 1996). Instead, automatic prior knowledge activation may be different based on students' knowledge base, the difficulty of the text, or the demandingness of the task. On the other hand, *strategic* prior knowledge activation

occurs when students purposefully seek to activate their knowledge, either alone or with external guidance.

When it comes to the strategic activation of prior knowledge, various techniques have been used to unearth readers' pre-existing understandings, beliefs, or experiences. For example, a number of prior knowledge activation techniques require students to create an alternative representation of their knowledge. This was accomplished via concept maps (Gurlitt & Renkl, 2010), thematic organizers (Alvarez & Risko, 1989), advanced organizers (Gurlitt, Dummel, Schuster & Nückles, 2012), or argument diagrams (Salminen et al., 2010). Other techniques require students to write down what they knew about a topic via knowledge mobilization (Machiels-Bongaerts et al., 1995), pretests (van Loon et al., 2013), or completing word fragments (Verkoeijen, Rikers, Augustus, & Schmidt, 2005). Some techniques include teacher or computer prompting (Biemans et al., 2001), or use the textbase as a mechanism for activation of prior knowledge (Beishuizen, Asscher, Prinsen, & Elshout-Mohr, 2003). Additionally, some prior knowledge activation techniques have been introduced as pre-reading activities. These include discussion (Kiili, Laurien, Marttunen, & Leu, 2012), teacher demonstration (Guzzetti, 1990), creating self-generated questions (Taboada & Guthrie, 2006), and responses to a visual image (Alvermann & Hynd, 1989).

Hattan and Alexander (2017a) not only considered the way these techniques were implemented, but also when in the reading process (i.e., before, during, or after reading), and if the activation relied solely on the teacher and student or entailed peer interactions. Overall, prior knowledge activation techniques occurred

primarily before a learning task, with several techniques initiated during instruction. Additionally, the research mentioned techniques (e.g., thematic organizers, small group discussions) that occurred at multiple points during reading. Further, the vast majority of techniques required participants to activate their prior knowledge individually, although there were a few instances of activating knowledge in pairs or in a group setting.

Prior Knowledge Activation and Student Learning

Hattan and Alexander (2017a) examined each article on prior knowledge activation for whether or not the knowledge activation technique had a positive, negative or mixed effect on student learning. The included articles predominantly demonstrated positive, if somewhat mixed, effects for prior knowledge activation on student learning.

Positive outcomes. The articles that demonstrated positive effects on student learning varied according to the techniques used, including the use of thematic organizers (Alvarez & Risko, 1989), answering questions before reading (Pressley et al., 1990), or group discussion (Schmidt et al., 1989). For example, Alvarez and Risko (1989) used the pre-reading strategy of thematic organizers to activate students' prior knowledge and facilitate transfer of learning from one context to another. Participants were 48 low-ability readers enrolled in developmental studies classes. The students were assigned to either the thematic organizer experimental group or a comparison group, who read the same texts but did not complete the thematic organizer.

Students in the thematic organizer group were explicitly told what prior knowledge they should focus on before reading. Additionally, both groups completed the tasks individually, rather than collaboratively. The results of Alvarez and Risko's (1989) study indicated that students in the experimental group performed significantly better on the quality of text retellings and on their answers to comprehension questions as compared to the control students. These results demonstrated that low-ability readers may benefit from scaffolding via thematic organizers to activate their prior knowledge.

In contrast to the conclusions reached by Alvarez and Risko (1989), a study conducted by Pressley et al. (1990) indicated that prior knowledge activation might likewise be useful for normal-ability as well as low-ability readers. Instead of using thematic organizers, Pressley et al. (1990) investigated the use of pre-questions before reading a psychology textbook chapter. Undergraduate participants were assigned to one of three conditions: (a) answering pre-questions, (b) reading pre-questions, but not answering them, or (c) no pre-questions. Similar to the thematic organizers, the pre-question conditions were deemed to be direct in nature, and focused on an individual's activation of prior knowledge rather than group activation. The results from the study demonstrate that students in the pre-questions answered condition outperformed students in the pre-questions read and control conditions on a comprehension post-test, even when responses to the pre-questions were not correct.

In contrast to thematic organizers and pre-reading questions, Schmidt, De Volder, De Grave, Moust, and Patel (1989) investigated small group discussion as a

means to activate students' prior knowledge before reading a scientific text.

Participants were Dutch high-school students who were either in ninth grade and considered to be “novices” on biology content, or in tenth grade and considered to be “experts” on the content, having recently completed a biology course. Novices and “experts” were randomly assigned to either an experimental condition, where they participated in a group problem analysis prior to reading a text, or a control condition.

In the Schmidt et al. (1989) study, text comprehension was assessed via free recall. The results indicate that both ninth- and tenth-grade students benefited from the small group discussion as compared to students in the control groups. The authors found that even when the novices interjected inaccurate prior knowledge statements into the discussion, their text recall was significantly better than the control group. These findings suggest that students benefit from recognizing their incorrect pre-existing beliefs and knowledge in order to become aware of the gaps in their knowledge prior to reading or learning new concepts.

In addition to including a variety of prior knowledge activation techniques, the articles with positive outcomes included studies that explicitly trained students to activate their prior knowledge (Spires & Donley, 1998), or involved external prompting either by a teacher (Carr & Thompson, 1996) or computer (Biemans et al., 2001). For example, Spires and Donley (1998) conducted two experiments that investigated the effect of teaching high-school students to activate their prior knowledge while reading (i.e., treatment groups), in comparison to teaching students how to identify the main idea of a text (i.e., control groups). Students

assigned to the prior knowledge activation groups were provided with a rationale for the technique, teacher modeling, collaborative work, and both teacher and peer feedback. Those in the treatment groups then independently used the prior knowledge activation technique. Interestingly, Spires and Donley (1998) do not explicitly describe the prior knowledge activation technique. Readers are only told that participants were encouraged to activate both topic knowledge and personal experiences. Despite such a vague description, the authors concluded that students in the prior knowledge activation treatment groups outperformed students in the main idea treatment groups when answering application-level comprehension questions. Additionally, Spires and Donley (1998) determined that students in the prior knowledge activation groups had a more positive attitude toward reading.

What seems paradoxical about the positive outcomes attested to by Spires and Donley (1998) was their claim that participants benefited even though their activation of prior knowledge was “spontaneous” and not too heavily prompted. We consider this claim as paradoxical because students in the treatment groups were provided with explicit instruction on how to activate their prior knowledge. In our judgment, such a directive constitutes prompting and students’ responses would not seem spontaneous under such circumstances. Students were, in effect, doing what they were told to do.

In contrast to Spires and Donley (1998), Biemans et al. (2001) focused on continuous external support via a computer-assisted program. Fifth- and sixth-grade students were asked to activate their prior knowledge on physical geography by answering an “idea question,” but were then prompted to compare and contrast

their prior knowledge with new information that was provided in a text. The computer program continuously prompted students to apply and evaluate their understanding of the content by asking students to write down similarities and differences between their prior knowledge and concepts in the text, and then revisiting the “idea question” after reading. This process was intended to provide opportunities for students to modify their schema as they read and re-read the text.

Rather than using a computer program to prompt prior knowledge activation, Carr and Thompson (1996) conducted a study where participants were explicitly prompted to activate their prior topic knowledge during reading. Students activated knowledge by replying to the prompt, “Tell me what you know about [the topic]” (p. 53) both prior to reading, as well as two additional times during reading. Participants were 16 seventh- and eighth-grade students who had learning disabilities, 16 eighth-grade students without learning disabilities, and 16 fifth-grade students without learning disabilities. Students read a total of 16 passages, eight of which included familiar topics, and eight of which included unfamiliar topics. Additionally, students were prompted by a teacher to activate prior knowledge during eight of the sixteen passages. The students then completed five inferential comprehension questions at the end of each passage. The results of the study indicated that all students performed better on the comprehension measure when they were familiar with the text topic.

Additionally, students in all three groups benefited from external teacher prompting for prior knowledge activation when topics were unfamiliar to the students. However, when the topics were familiar to students, both the learning

disabled and non-learning disabled eighth-grade students did not seem to benefit from external prompting when reading familiar texts. This trend was different for the fifth-grade students, who performed significantly better with external prompting for both familiar and unfamiliar text topics. According to Carr and Thompson (1996), these findings suggest that the older students may have spontaneously activated prior knowledge when reading familiar texts, demonstrating a possible developmental difference between the fifth- and eighth-grade students.

Overall, the positive outcomes documented in these studies demonstrate that a variety of techniques can be used to assist students in activating their prior knowledge, from thematic organizers to pre-reading questions. Additionally, prior knowledge activation appears useful whether performed individually, in groups, or with consistent external prompting. Further, while there is evidence that explicit prior knowledge activation may be useful for both low and normal-ability readers, the potential value of these techniques for older and more skilled readers remains questionable, especially when the tasks and texts are fairly familiar to the reader allowing them to function more automatically.

Mixed outcomes. Several of the studies identified by Hattan and Alexander (2017a) reported mixed effects for prior knowledge activation. In order to understand what led to these outcomes, it becomes relevant to consider contextual elements. Specifically, as was suggested by the Carr and Thompson (1996) study, various researchers have concluded that the benefits or detriments of the prior knowledge activation may be contingent on students' initial level of knowledge of

the topic or other individual difference factor including reading ability (e.g., Gurlitt & Renkl, 2008; McNamara & McDaniel, 2004).

For example, Gurlitt and Renkl (2008) examined the instructional technique of concept maps as a means to activate students' prior knowledge before reading a hypertext. Concept maps are hierarchical, graphical tools that organize knowledge and encourage meaningful learning rather than rote learning (Novak & Gowan, 1984). Linking lines and linking words are used to demonstrate the relations between concepts. Gurlitt and Renkl (2008) reported that younger students (i.e., high-school students) with lower levels of content knowledge benefited from labeling the lines provided, while older students (i.e., university students) with higher levels of content knowledge benefited from drawing and labeling lines. Thus, students who have higher initial levels of knowledge may require surface-level support when compared to students with lower levels of knowledge, who need deeper support.

Further, several of the articles with mixed outcomes compared two different prior knowledge activation techniques without the use of a control group, making it difficult to determine whether or not the techniques enhanced student learning when compared to an alternative condition (e.g., Wetzels et al, 2011). Specifically, Wetzels et al. (2011) examined the effectiveness of two activation techniques on high-school and university students who were considered to have lower or higher levels of prior knowledge about the circulatory system. The first technique, mobilization, required participants to bring to mind everything they know about a topic (e.g., Machiels-Bongaerts et al., 1995; Peeck et al., 1982). Mobilization allows

students to “freely activate a set of concepts that are only loosely connected and have not yet developed into a coherent knowledge structure” (Wetzels et al., 2011, p. 17). For that reason, the authors predicted that students with lower levels of initial prior knowledge would benefit from the mobilization strategy.

The second technique, perspective taking, asked students to examine a picture of a heart from the perspective of a blood vessel (e.g., Pichert & Anderson, 1977). Since perspective taking requires the activation of a particular schema, the authors hypothesized that students with higher levels of initial prior knowledge would benefit from this activation technique. Although the analyses supported the researchers’ hypotheses, the two activation techniques were not compared to a control group, making it difficult to determine whether or not the participants would have been better off without either of the two activation techniques.

Negative outcomes. The articles that had negative effects found that *inaccurate* prior knowledge activation hindered student learning (e.g., Alvermann et al., 1985). The results of Alvermann et al.’s study, as well as similar subsequent studies (e.g., Hynd & Alvermann, 1986), suggest that activating inaccurate knowledge hinders undergraduate students’ reading comprehension, rather than enhancing it. In other words, students were better off when they did not activate their prior knowledge than when they made connections to incorrect prior knowledge, which is contrary to results found by Pressley et al. (1990) and Schmidt et al. (1989).

With the finding of detrimental effects for prior knowledge activation when students’ bring inaccurate information to bear in comprehension (Alvermann et al.,

1985), Alvermann and Hague (1989) explored the issue of inaccurate knowledge activation further. They hypothesized that making students aware of the fact that their current understanding of or experiences with the topic of a text may well be wrong. They label this intervention *augmented activation*. Specifically, Alvermann and Hague told the undergraduates in their study to “be sure to pay attention to those ideas presented that may be different from your own” (1989, p. 199). The comprehension performance of students in the augmented activation group was then compared to outcomes for those in an activation only group. Participants in the augmented activation group outperformed students in the activation only group. These findings suggest that augmented activation highlights the possibility of encountering incongruent information, which seemingly aids readers in dealing with potential conflict between old and new knowledge throughout the reading process, leading to positive rather than negative comprehension outcomes for students.

In addition to the work of Alvermann et al. (e.g., Alvermann et al., 1985), other researchers have reported significant negative performance outcomes when students are prompted to bring forward their existing knowledge and experiences prior to or during reading. For example, van Loon et al. (2013) sought to mobilize elementary students’ knowledge of *unfamiliar* concepts via mobilization before reading. The results demonstrated that students who activated incorrect prior knowledge were overconfident during reading, and were less likely to learn from the text. These results seem consistent with Alvermann et al.’s (1985) early work with middle-school students. However, van Loon et al. (2013) specifically intended

for students to activate inaccurate prior knowledge, without the benefit of augmenting that activation prior to reading.

Another article that demonstrated negative effects for prior knowledge activation involved Dutch middle-school students who had severe problems in reading comprehension, and were labeled as learning disabled (Walraven & Reitsma, 1993). These students were assigned to either a prior knowledge activation condition or a control condition, which included instruction in reading strategies other than prior knowledge activation. Students in both conditions benefited from the intervention, but students in the prior knowledge activation condition struggled to activate their prior knowledge independently.

In reviewing this study, I would posit two potential explanations for the findings reported by Walraven and Reitsma (1993). First, I might surmise that students with severe learning disabilities may lack the requisite abilities to function independently and require external prompting to activate their prior knowledge. Alternatively, it seems conceivable that simply answering the question—“What do I know already about the subject prior to reading?”—was not the most beneficial activation technique for learning disabled students of this age level. Other more explicit or structured techniques may have produced more positive outcomes.

Limitations in the Prior Knowledge Activation Literature

There were several shortcomings in the literature that are addressed by the current study. First, many of the articles implemented a prior knowledge activation technique either prior to reading or during reading (e.g. Schmidt et al., 1989). However, prior knowledge activation has been conceived as a bidirectional and

continuous process that should occur throughout reading, rather than solely before or during reading (Kintsch, 1998). Therefore, as outlined in Chapter 3, the current study adapted the traditional pre-reading strategy of mobilization so that students were prompted to activate their prior knowledge before, during, and after reading. Similarly, the novel prior knowledge activation technique of relational reasoning prompted students to determine relations between what they knew and what was in the text throughout the reading process.

Second, participants targeted in the literature were primarily high-school and undergraduate students, leaving researchers to speculate about which prior knowledge activation techniques would be most beneficial during various developmental stages. Therefore, the current study examined prior knowledge activation at the middle-school level. Third, as discussed, many studies investigated prior knowledge activation within laboratory contexts. Instead, the current study investigated prior knowledge activation within the students' classrooms. Doing so will provide researchers and educators insight into ways in which teachers can guide students to activate their knowledge within regular classroom settings.

Overall, what I learned from this review is that prior knowledge activation matters, even if researchers and practitioners do not fully grasp how, when, and for whom that activation translates into optimal learning and comprehension. Therefore, it was the purpose of this dissertation to address these limitations in the literature in order to better understand how a modified traditional or entirely new

activation technique may assist rural students with low levels of topic knowledge to better comprehend informational texts from the domain of history.

Relational Reasoning

In addition to focusing on prior knowledge activation, this review seeks to determine how relational reasoning has been conceptualized and measured in the literature. An overview of relational reasoning is presented, including definitions and forms of relational reasoning. Then, measures of relational reasoning are described, and gaps in the literature are discussed.

Overview of Relational Reasoning

As far back as William James (1890), Max Wertheimer (1900), Charles Spearman (1927), and Raymond Cattell (1940), there has been the acknowledgment that humans' capacity to perceive patterns within the world around them—to recognize similarities and differences in any body of information—is foundational to cognitive performance and development. It is this ability to derive meaningful patterns within any information stream that has been labeled *relational reasoning* (e.g., Alexander & Baggetta, 2014; Alexander & the DRLRL, 2012; Dumas et al., 2013). These patterns, and the information upon which they are based, encompass all manner of symbolic representations, including numeric, figural, and linguistic (e.g., Crone, van Leijenhorst, Honomichl, Christoff, & Bunge, 2009; Holyoak, 2012).

Historically, relational reasoning has been described as a singular ability to discern similarities through the use of analogies (Goswami, 1992; James, 1890). Recently however, researchers have suggested that relational reasoning may be a

multidimensional construct, rather than a unitary one. Specifically, Alexander and the Disciplined Reading and Learning Research Laboratory (DRLRL; 2012) have proposed that relational reasoning may refer to a family of relations that can arise when otherwise seemingly unrelated or fragmented information is encountered. This family of relations includes at least four forms of relational reasoning—analogy (i.e. similarity), anomaly (i.e. discrepancy), antinomy (i.e. exclusivity), and antithesis (i.e. opposition).

Analogy. Analogical reasoning involves the recognition of relational similarity between two seemingly disparate ideas, objects, or events (Hesse, 1959). The ability to reason through analogy has been empirically connected to learning in many domains including mathematics (White, Alexander & Daugherty, 1998), reading (Goswami & Mead, 1992), and science (Braasch & Goldman, 2010). Analogical thought was also found to be essential for understanding language and organizing memory (Hofstadter, 2001). For example, after reading about ancient Rome and its famous structures, middle-school students like those in the current study may find similarities between the Roman Coliseum and today's- sports stadiums.

Anomaly. An anomaly can be any occurrence or object that is unusual or unexpected (Chinn & Brewer, 1993). The detection of anomalous sentences has been used as a test of intelligence, especially in children (Binet, Simon, & Town, 1913). Attending to anomalies is perceived as critical for conceptual change (Chinn & Malhotra, 2002), as it is principally during the process of anomaly resolution that individuals come to understand implicit assumptions and logical mistakes (Darden,

1995). Students in the current study might notice that Roman roads and bridges have been standing for almost 2,000 years. This fact may seem like an anomaly in comparison to today's roads and bridges, which are often re-paved or re-built.

Antinomy. Antinomous reasoning allows an individual to understand what something *is* by ascertaining what it *is not*. An antinomy is a paradoxical situation in which two conditions cannot both be true (Sorsensen, 2003). Antinomous reasoning can also include the ability to reason with mutual exclusivity among categories and recognize and resolve the paradox that consequently arises. The identification and consideration of antinomies has led to new discoveries in fields such as mathematics (Russell, 1973), child development (Cook, 1996), reading (Mosenthal & Na, 1980), psycholinguistics (Shaumyan, 1987), and intelligence (Gardner, 1995). After reading about various Romance languages, students might notice that English is not a Romance language. However, this may seem paradoxical to students, since the text mentions that English encompasses many words that were originally Latin terms.

Antithesis. An antithesis is a directly oppositional relation between two mental representations (Kreezer & Dallenbach, 1929). Antitheses are important for argument and persuasion (Kuhn & Udell, 2007) and may be one of the main ways in which human thought and language are organized (de Saussure, 1916; Kjeldergaard & Higa, 1962; Markova, 1987). In a discussion of ancient Greece, the students might come to see Athens and Sparta as two very different cultures. While Sparta was known for its fierce warriors, Athens was defined by its pursuit of knowledge and culture.

Measures of Relational Reasoning

Various manifestations of relational reasoning have been woven into early (Binet et al., 1913) and contemporary measures of intelligence and cognitive capability (Sternberg, 1999). However, despite its pivotal role in individuals' lives and learning, relational reasoning has rarely been the primary focus of assessment, and then in only limited or constrained ways (Dumas et al., 2013). Previous measures of relational reasoning, such as the well-established Ravens Matrices (Raven, 1938), only draw attention to one form of this complex patterning ability. In recent years, however, Alexander and the DRLRL have developed three assessments of relational reasoning that are constructed around the four proposed forms of relational reasoning: (a) the Test of Relational Reasoning (TORR; 2012); (b) the Verbal Test of Relational Reasoning (vTORR; 2014); (c) and the Test of Relational Reasoning, Junior (TORRjr; 2015). Although all three assessments are described below, only the TORRjr was utilized in the current study, as it is the only assessment that is appropriate for middle school students.

Test of Relational Reasoning. The TORR is a 32-item measure composed entirely of novel figural items organized into four scales of eight items each (Alexander & the DRLRL, 2012; Alexander, Dumas, Grossnickle, List & Firetto, 2015). This measure was developed for use with adolescents and adults. Data have shown the TORR to be a highly reliable and valid indicator of relational reasoning ability (Dumas & Alexander, 2016). Each of the TORR's four scales is constructed around one of the four forms of relational reasoning—analogy, anomaly, antinomy,

and antithesis—signifying a distinct process of discerning patterns of similarity and difference.

The TORR was designed to remove potential confounds in the discernment of underlying patterns of similarity and dissimilarity that might arise as a consequence of the apparent sociocultural influence; influences that are often attributed to more language-based assessments (Bourdieu & Passeron, 1990; Connell & Connell, 1993; Sutherland & Sharp, 1984). The TORR, as with the Ravens, was developed to be more culturally fair in that preexisting knowledge of item content was not considered a factor in performance. Additionally, as a more fluid versus crystallized ability measure, the TORR captures more novel performance as opposed to performance that is more schooled in nature. In other words, with the exception of analogical reasoning, it is assumed that students are rarely systematically exposed to the processes underlying anomalous, antinomial, or antithetical reasoning.

Verbal Test of Relational Reasoning. Similar to the TORR, the vTORR is a 32-item measure (Alexander & the DRLRL, 2014), with each of the four scales constructed around a particular form of relational reasoning. The vTORR was developed as a parallel assessment to the TORR in terms of relational reasoning forms, scales, number of items, and the target population (i.e., late adolescents and adults). However, the vTORR is a linguistic, rather than a figural, measure of relational reasoning. Data have shown that the vTORR is a valid and reliable measure for those adolescents and adults that provides a mechanism for assessing

relational reasoning using language rather than figures (Alexander, Singer, Jablansky & Hattan, 2016)

Test of Relational Reasoning, Junior. Similar to both the TORR and vTORR, the TORRjr is a 32-item domain-general measure designed to gauge individuals' relational reasoning abilities (Alexander & the DRLRL, 2015). The measure includes eight items per scale corresponding to the relational reasoning forms of analogy, anomaly, antinomy, and antithesis. Additionally, similar to the TORR, the TORRjr was constructed to be a novel, non-linguistic, figural measure, with the exception of written directions. However, unlike its predecessors that were designed for older adolescents and adults, the TORRjr was developed for elementary to middle school students (i.e., approximately 8-15 years old).

Gaps in the Relational Reasoning Literature

One of the primary gaps in the relational reasoning literature is the question of whether or not students can be trained to reason relationally when engaged in the reading of texts. Specifically, will content-specific training of the four forms of relational reasoning assist students in activating their prior knowledge while reading? Although relational reasoning is not solely a prior knowledge activation technique, these four forms of relational reasoning may assist middle-school students from a rural community to activate their prior knowledge during the reading process. Targeted training in the forms of relational reasoning may guide rural middle school students to not only see similarities between their knowledge and the text at hand, but also help them discern how “new information” may be different from or even in conflict with their “old knowledge.” Such approaches to

prior knowledge activation would seem worthwhile both in enhancing comprehension per se, and in dealing with contrasting arguments or evidence that might arise in texts (e.g., Kendeou & van den Broek, 2007). In this dissertation, I will examine whether or not relational reasoning, as a novel activation technique, will improve students' reading comprehension when compared to mobilization, a more traditional knowledge activation technique, and a control group.

Literacy in Rural Communities

The third component to be examined in this literature review is that of rural literacy. Definitions of *rural* are presented, as well as an overview of research on rural literacy.

Defining Rural

Quantitative Definitions of Rural Areas. Rural areas are often defined as that which is not urban, or nonmetropolitan. According to the U.S. Census Bureau, rural populations include any population outside of large urban areas and their suburbs (2010). Therefore, rural areas range from densely settled towns to more remote areas (Ratcliffe, Burd, Holder, & Fields, 2016). Quantitative definitions of *rural* include consideration for the community's distance from an urban area, as well as the population density of the area.

The National Center for Education Statistics provides a school locale classification system, which categorizes territories as being located in a city, suburb, town, or rural area (2006). Rural locales are further broken down into subcategories according to the territory's distance from an urban area. *Rural fringe* includes any territory that is less than or equal to five miles from an urbanized area,

rural distant includes territory that is more than five miles but less than or equal to 25 miles from an urbanized area, and *rural remote* includes rural territory that is more than 25 miles from an urban area (NCES, 2006).

The United States Department of Agriculture (2016) defines rural areas according to their population density by using Rural-Urban Continuum Codes. These codes were originally developed in 1974, and were most recently updated in 2013. There are three categories for metropolitan counties, and an additional six categories for nonmetropolitan counties. Rural counties are rated on a spectrum from 20,000 people or more and adjacent to a metropolitan area, to 2,500 people or less and not adjacent to a metropolitan area (USDA, 2016).

Qualitative Distinctions of Rural Areas. In addition to considering distance from urban areas and population density, it is helpful to understand the qualitative characteristics of rural communities. Although rural communities are diverse, spanning the country from the southwest to the northeast, Vernon-Feagans et al. (2010) suggest that there are several characteristics common among rural communities. These characteristics include historical ties to agrarian culture; access to fewer resources; smaller, community-based schools; willing to meet the needs of the community by cooperating with various sectors of the local economy; and rooted in a sense of place.

Current Context. The community of interest in the current dissertation is considered *rural remote* and *completely rural*, as it is located more than 25 miles from an urban area, is not adjacent to a metropolitan area, and has a population of less than 2,500 people (USDA, 2016). Further, when considering the state as a

whole, a policy report on rural education found that North Carolina was ranked as a high-need state (Johnson & Strange, 2007). Specifically, the report noted that the performance of rural schools in North Carolina is *crucial* to the overall educational performance of the state, and, given North Carolina's performance on NAEP assessments, it is *urgent* that policymakers address the particular needs of rural schools in that state (Johnson & Strange, 2007). Although it is not the purpose of this dissertation to address education policies for rural schools in North Carolina, it should be noted that the school site was chosen specifically due to its location and its commitment to serve students from low-income, rural communities.

Rural Literacy

Rural literacy is an emerging field of research (Corbett & Donehower, 2017), meaning that rural students have been understudied in the literature, specifically with regard to their reading comprehension needs (Corbett & Donehower, 2017; Irvin et al., 2012; Vernon-Feagans et al., 2010). Yet, literacy is essential to the sustainability and survival of rural communities (Edmondson, 2003). One important aspect to consider with regard to rural literacy is that of students' identities (Donehower et al., 2007; Moje & Luke, 2009). Students from rural communities have valuable experiences that they bring with them to the classroom, allowing students to approach reading tasks with unique personal experiences and background knowledge.

Despite students' distinct prior knowledge and experiences, previous investigations have shown how differences in cultural backgrounds can contribute to difficulties in text comprehension (e.g., Hayes & Tierney, 1982). A number of

those investigations have focused on this experience mismatch as a result of readers' cultural background (Pritchard, 1990; Reynolds, Taylor, Steffensen, Shirey, & Anderson, 1982). Other researchers have focused on the comprehension struggles of inner-city minority students whose language and experiences are not mirrored in school readings (Moje et al., 2004). Although the experiences of rural students differ from those of urban students, both rural and urban students often face a mismatch between the content that may be valued in academic texts and the rich experiences that they have in their every-day lives.

One example of different cultural schema leading to different reading strategies is found in Pritchard's (1990) study comparing the reading strategies of students from the United States versus students from the Pacific island nation of Palau. In the study, eleventh-grade students read texts that were both culturally familiar and culturally unfamiliar to them. Pritchard examined students' verbal reports of their reading strategies and found that, when reading familiar text, students relied on their background knowledge to understand the text. Students also relied on extrapolating information from the text, confirming/disconfirming an inference, and relating a sentence back to what they already read. However, when reading unfamiliar texts, students demonstrated awareness of the task by referring to the experimental task, recognizing loss of concentration, or stating failure to understand part of the text. Students also sought to gather information, re-read, paraphrase, use context clues, and react to the author's style or the text structure.

Further, another example of differing cultural schema leading to different text comprehension is found in Reynolds et al.'s (1982) article on black and white

eighth-grade students' text comprehension. Participants read a text on "sounding" or "playing the dozens," which is a form of verbal insult found in black communities. While black participants interpreted the text as being about verbal play, white participants thought the text was about physical aggression. The researchers found that students' particular cultural background led them to a different understanding of the text. Further, the authors suggested the possibility that minority children may struggle to comprehend text not due to their reading abilities, but instead due to the mismatch between their own culture and the culture of those who write textbooks or develop school curricula.

Heath (1983) also focused on the mismatch between students' backgrounds and the school expectations. From 1969 to 1978, Heath conducted an ethnographic study in the Piedmont region of the Carolinas. She concluded that families from white versus black working class backgrounds had differing habits and values, which influenced children's language development. When working with teachers in the Carolinas, Heath emphasized the importance of understanding students' unique histories and backgrounds that they bring to the classroom, rather than demeaning students because of where they came from.

Given students' diverse experiences and prior knowledge, students with varying levels of prior topic knowledge but similar reading comprehension abilities may perform differently on the same assessment (Johnston, 1984; Pearson & Hamm, 2005). This point has been an ongoing struggle for assessment developers, who sometimes work to diminish the role of prior knowledge in assessments of reading comprehension (Johnston, 1984). Despite test-developers' best intentions

to construct unbiased assessments, they often ignore the integral role that prior knowledge has to reading. As a result, assessment developers have attempted to diminish the role of prior knowledge by creating tests that cover broad topics or use text-dependent questions, feats that were ultimately unsuccessful (Johnston, 1984).

Therefore, the current study investigated knowledge activation techniques that might assist students in activating prior knowledge and personal experiences that initially seem irrelevant, but can help students make sense of the text. Rather than attempting to diminish the role of prior knowledge in comprehension assessments, techniques such as relational reasoning may provide the necessary support for students with limited prior topic knowledge. Introducing students to strategies that may assist them in recognizing similarities and dissimilarities between their prior knowledge and the text is particularly important for rural students, whose backgrounds may not afford adequate exposure to text topics.

However, previous research on rural literacy education primarily focused on populations outside of the United States (e.g., Ferguson, Currie, Paul, & Topping, 2011; Izquierdo Castillo & Jimenez Bonilla, 2014; Zhang, 2006) students with disabilities (e.g., Collins et al. 2005; Hitchcock, Prater, & Dowrick, 2004), or early literacy (Vernon-Feagans et al., 2010). Although these studies provide insight into the reading abilities of rural students from around the world, as well as students with specific needs or those just learning to read, they are not necessarily generalizable to the unique challenges faced by normally developing, rural middle-school students within the United States.

Further, a handful of studies investigated motivational aspects of rural students' literacy education (Qian & Alvermann, 1995) or their metacognitive strategies (Kragler & Martin, 2009). Specifically, a comparison of rural versus inner-city middle-school students' reading interest and behavior found that inner-city students reported higher interest in reading than their rural counterparts (Greenberg et al., 2006). Additionally, inner-city students more frequently engaged in reading activities than their rural peers, although overall engagement was relatively low for both groups of students (Greenberg et al., 2006). Given rural students' low interest and engagement in reading tasks, as well as a lack of information regarding rural students' literacy abilities, rural middle-school students are the targeted population for the proposed study.

The Interplay Between Prior Knowledge Activation, Relational Reasoning and Rural Populations

The current dissertation sits at the intersection between prior knowledge activation, relational reasoning, and rural populations. As previously established, prior knowledge activation is crucial for text processing (Kintsch, 1998). Yet, students may activate irrelevant or inaccurate knowledge, or they may not have content-specific knowledge on which to draw. Of interest in the current study were ways in which teachers can guide students' prior knowledge activation, especially through the explicit training of relational reasoning.

Training students to identify analogies, anomalies, antinomies, and antitheses between their own background knowledge and the text may assist them in recognizing connections between what they already know and the text in front of

them, but also may guide students in noticing when the text content does not necessarily fit into their existing schema. In this way, students may be encouraged to seek out additional patterns, rather than relying too heavily on similarities between their prior knowledge and the text. Further, by emphasizing that students can draw on knowledge formally learned in the classroom context, as well as their personal experiences outside of the classroom, students can recognize when their experiences are valued and relevant during the reading process, or when the text content does not fit with what they have previously learned.

Using relational reasoning as a prior knowledge activation technique may be particularly useful for rural students. Students from rural communities come to the classroom with a wealth of knowledge and experiences, yet that knowledge may not match that which is taught in academic contexts. With the help of relational reasoning as a prior knowledge activation technique, rural middle school students can draw on their unique perspectives to seek out additional patterns and connections between their background knowledge and the text content.

Summary

This literature review identified pertinent theories related to the role of prior knowledge activation within learning and text processing, and highlighted specific gaps within the prior knowledge activation literature that are addressed in this dissertation. Further, understanding the potential need for alternative techniques to guide students in their activation of prior knowledge, this review examined how relational reasoning has been conceptualized and measured. One of the primary goals of the current dissertation was to train students in relational reasoning as a

means to activate their prior knowledge during reading, and to compare this novel technique to the more traditional technique of mobilization.

CHAPTER III

METHODOLOGY

This chapter describes the participants, materials (i.e. text passages), measures (i.e. demographics, topic knowledge measure, comprehension assessment) and training protocol utilized in the current dissertation. These are followed by the procedures, as well as an overview of the data analysis to address the research questions pertaining to the effects of prior knowledge activation on rural fifth- and sixth-grade students' comprehension.

Participants

Participants for this investigation were 78 fifth- and 71 sixth-grade students from a public charter school in rural North Carolina. These grades levels were selected because students in these grades were anticipated to be readers who could independently glean information from text. The coeducational school primarily serves students who are eligible for free or reduced-price lunch. Students were primarily Black (73.8%), with White (10.7%), Multi-ethnic (6.7%), Hispanic (2%), Native American (2%), and Asian (0.7%) ethnicities represented as well. Students who attend the school reside in the surrounding counties and were chosen for enrollment by a lottery system. Additional participant information can be found in Table 1.

All normally developing (e.g. non-LD) fifth- and sixth-grade students were invited to participate in the study. Participants' parents or guardians were provided a letter informing them that the study would take place at the school site. Parents or

guardians were asked to sign and return a form letter describing the planned study if they did not want their child to participate in the study. Additionally, students assented to their participation. One student did not elect to participate in the study, and his or her information has been removed from the sample.

Table 1

Participant Background Information

Participant Data		
	Frequency	Percent
Condition		
Mobilization	58	38.9
Relational Reasoning	49	32.9
Control	42	28.2
Grade Level		
Fifth	78	52.3
Sixth	71	47.7
Gender		
Female	74	49.7
Male	69	46.3
Missing	6	4.0
Ethnicity		
Black	110	73.8
White	16	10.7
Multi-Ethnic	10	6.7
Hispanic	3	2.0
Native American	3	2.0
Asian	1	0.7
Missing	6	4.0

This school site was chosen due to its location and commitment to serving students from low-income, rural communities. Founded in 2001, the school serves students in fifth- through eighth-grades with the mission to prepare students for college and with a stated commitment to the surrounding communities and to social justice. Since 2009, the high school associated with the school site has sent 100%

of its students to college. However, according to the North Carolina school report cards (State Board of Education, 2016), the school's overall reading performance earned it a "C." Therefore, despite the schools' commitment to the communities it serves, the school has room to grow academically. One potential way to help students and teachers move forward is to provide reading strategies that may help students with limited background knowledge better comprehend the expository texts they encounter in their core subjects (e.g., history).

Study Texts

The National Assessment of Educational Progress (NAEP; NAGB, 2010) and the Common Core State Standards (CCSS, 2017) recommend that fourth-grade students read 50% fiction, or literary texts and 50% nonfiction, or informational texts. The percentage changes to 45% literary and 55% informational by eighth grade, and 30% literary and 70% informational by twelfth grade. Given the increased focus on informational texts, the current study investigated students' reading comprehension of history texts dealing with ancient civilizations.

NAEP identified three categories of informational text including exposition, argumentation and persuasive text, and procedural text and documents (NCES, 2016). The materials for the current study included expository text passages, which are texts that attempt to convey accurate information (Dreher & Kletzien, 2015). Additional characteristics of expository texts include those that are written with timeless verbs and generic nouns, follow typical expository text-structures, and include essays, descriptions, explanations, reports, procedural text, or chronological accounts (Dreher & Kletzien, 2015).

In an effort to ensure that the fifth- and sixth-grade students would not have received formal instruction in the text topic, the passage topics were chosen in collaboration with school leaders and teachers. Fifth- and sixth-grade Language Arts and Social Studies teachers made their curricula and sample lessons available for inspection. After reviewing the materials and engaging in discussions with teachers and administrators, it was determined that world history would be the most appropriate domain from which the study reading materials should be chosen.

Further conversations with the principal revealed that ancient Greek and Roman history might be particularly beneficial for students for several reasons. First, students in the study would not have had exposure to these topics within the curriculum. Second, the history of ancient Greece and Rome were viewed as important topics that should be covered within the school curriculum. Third, according to the principal, the topics of ancient civilizations appeared difficult for the students to grasp.

With the topic for the reading decided, various samples of grade appropriate texts dealing with ancient civilizations were examined. The source ultimately chosen for this study was a sixth-grade history textbook, *World History: Ancient Civilizations* (Burstein & Shek, 2006). The readability and structure of this textbook, as well as the topical areas presented for the ancient civilizations covered, were judged as appropriate for the fifth- and sixth-graders in this study. One selection on achievements made by ancient Greeks (Appendix A) was used in the training phase of the study, and another selection on the legacy of ancient Rome (Appendix B) was employed in the assessment phase. Further, for the qualitative

follow-up conversations, a third text was used on Roman government (Appendix C).

The training and assessment texts were six pages in length and included headings, subheadings, and graphics when appropriate. However, only the first two pages of the text on Roman government were used for the qualitative follow-up. Additionally, all three texts were identified as being approximately at a sixth-grade reading level (Table 2). Texts at a sixth-grade reading level were deemed appropriate given that the intervention took place near the end of the school year, and therefore should be accessible to both fifth- and sixth-grade students.

Table 2

Readability Data for the Study Passages

Readability	Greek Achievements	Rome's Legacy	Government and Society
Flesch-Kincaid Grade Level	5.8	6.5	6.8
Automated Readability Index	7.4	6.4	5.6
Linsear Write Formula	5.3	5.6	6.8
Average	6.2	6.2	6.4

In an effort to determine how long it might take students to read the texts, a small pilot study was conducted. Participants included one fourth-grader, two fifth-graders, two sixth-graders, and one seventh-grader from local elementary and middle schools. Students took between 4 and 12 minutes to read the text *Rome's*

Legacy. All reported that they found the text comprehensible. Therefore, it was determined that these texts should function well in the study.

Measures

Measures for the study included a demographics measure, which was used to provide descriptive data on the participants. Prior to the intervention, students completed the Test of Relational Reasoning-Junior or TORRjr (Alexander & the DRLRL, 2015) and a topic knowledge pre-assessment. The comprehension outcome measures in this study included two portions: (a) topic knowledge post-assessment and (b) short constructed responses.

Demographics

The demographics measure (Appendix D) consisted of questions pertaining to participants' grade level, ethnicity, and gender. These data were utilized in statistical analyses to determine whether there were differences based on students' background information. Given that fifth- and sixth-grades are fairly close together, it was hypothesized that there would not be significant developmental differences on the comprehension assessments between these two grade levels. However, according to the Nation's Report Card (2015), Black and Hispanic fourth-grade students in North Carolina did not perform as well as their White counterparts on the NAEP reading assessment, and female students earned higher scores than their male peers. Therefore, it was important to include students' demographic information as covariates in the analyses.

Test of Relational Reasoning, Junior

As described in Chapter 2, the Test of Relational Reasoning, Junior (TORRjr) is a 32-item domain-general measure devised to assess relational reasoning ability in grades three through eight (see sample items in Appendix E). The TORRjr is the preferred relational reasoning assessment, as it is developmentally appropriate for fifth- and sixth-grade students, whereas the TORR and vTORR are more appropriate for older students and adults. The TORRjr is comprised of four scales of eight items each that correspond to the four forms of relational reasoning (i.e., analogy, anomaly, antinomy, and antithesis). The TORRjr was constructed to be a novel, non-linguistic, figural measure of relational reasoning that can be delivered online or in print. All information needed to answer each problem is provided within the assessment, allowing the measure to assess fluid, rather than crystallized, cognitive abilities. Previous studies have determined that the TORRjr is a psychometrically sound measure of relational reasoning (Jablansky & Alexander, 2017). Specifically, the item difficulty was deemed within an acceptable range, and the correlations between subscales ranged from .77 to .96. Cronbach's alpha for the TORRjr was $\alpha=.83$, which indicates very good internal consistency (Jablansky & Alexander, 2017). For the current sample, the $\alpha=.75$, indicating acceptable internal consistency, and $M = 15.20$ ($SD = 5.32$) out of 32 possible points.

In the current study, 113 of 149 students completed the TORRjr online using school computers at least two weeks before the prior knowledge activation intervention or control lessons. Previous testing (Jablansky, Alexander, & Singer,

2016) yielded an estimate of about 24 minutes to complete the TORRjr. Although performance of the TORRjr was not timed in the current study, all but a few students had completed the measure in under 50 minutes. The TORRjr was used in statistical analyses to determine whether relational reasoning ability significantly effected students' comprehension scores.

Comprehension Assessment

The overall comprehension assessment included the combined topic knowledge multiple-choice portion that assessed students' ability to recall specific information and a short-constructed response portion that focused on integrate/interpret and critique/evaluate items. Cronbach's alpha for the comprehension assessment was 0.69, which demonstrates acceptable internal reliability for research purposes (Cronbach, 1951).

Topic-Knowledge Portion. The topic knowledge portion of the comprehension measure (Appendix F) was designed to quantify participants' passage-specific knowledge. This measure consisted of eight multiple-choice items that assessed vocabulary and topic knowledge from the text *Rome's Legacy* (Burstein & Shek, 2006). Using the NAEP framework (NAGB, 2010), all items in the topic knowledge assessment were designed as *locate and recall* questions; that is, the answers to each is directly stated in the text.

The topic-knowledge questions were adapted from items included in the *Rome's Legacy* chapter (Burstein & Shek, 2006). Questions from the book were edited to ensure the answer choices were of similar length and focused on locate and recall information. Then, the questions were presented to a group of six experts

in educational psychology, literacy or assessment. These experts were asked to read the text and questions, and then verify the appropriateness of the questions according to the NAEP framework. These experts ensured that the questions touched upon important topics in the text, that they were of appropriate length, and that the language was clear for a middle-school audience. After questions were refined, they were then administered to a group of students in a pilot study.

In a small pilot study with the six students described, the topic knowledge assessment took between one and three minutes to complete. The pilot participants answered between one and four of the eight questions correctly. After reading *Rome's Legacy*, students completed the topic knowledge assessment a second time, but were not permitted to use the text when answering the questions. Students took between one and two minutes to answer the questions, and answered between four and seven questions correctly.

Students initially completed the topic-knowledge assessment as a pre-assessment at least two weeks before reading *Rome's Legacy*. The purpose of the pre-assessment was to determine if, indeed, the text content was unfamiliar to students. Similar to the TORRjr, 113 of 149 total students completed the topic knowledge pre-assessment ($M = 2.77$, $SD = 1.45$, range = 0 to 7). Following the intervention, students completed the topic-knowledge assessment a second time in the absence of text. The purpose of the post-assessment was to ascertain how much specific information the students in the treatment and control groups retained from reading the text. After the intervention, 149 students completed the post assessment ($M = 4.51$, $SD = 1.74$, range = 0 to 8).

Short-Constructed Response Portion. As a complement to the topic knowledge measure, which consisted entirely of locate and recall information answered in the absence of text, the short constructed response portion encompassed questions that students answered with the text available. This measure assessed students' ability to delve more deeply into passage content (NAGB, 2010). Specifically, students completed three short-constructed responses, two of which were *integrate and interpret* questions. In effect, these questions required students to use information from several points in the text to respond fully. An additional item in the assessment was classified as a *critique and evaluate* question (Appendix G). In accordance with the NAEP framework (NAGB, 2010), critique and evaluate items require students to formulate an opinion or take a stance regarding the content, and then to support that opinion or stance with reference to passage-specific information.

Similar to the topic-knowledge questions, the short constructed response comprehension assessment was adapted from short-answer questions included at the end of the *Rome's Legacy* (Burstein & Shek, 2006) chapter. The questions and topics were revised to ensure that they represented integrate/interpret and critique/evaluate questions, as previously described. The questions were presented to a group of experts, and revised according to their suggestions.

Students in the pilot study took between 5 and 20 minutes to reply to the constructed response questions. Students' responses on both integrate and interpret items, as well as the critique and evaluate item, earned between 0 and 2 points.

For these three comprehension questions, students were given the opportunity to look back at the text when responding. These constructed questions were scored on a 0 to 2 scale. The students' answers were scored as 0, or *unsatisfactory*, if the response was incorrect or unrelated; as 1, or *partially correct*, if a relevant but incomplete response was given; as 2, or *fully correct*, if an accurate and complete response was provided (Appendix H). The short-constructed responses underwent a blind scoring process, and 90% interrater agreement on 22% of total answers was established.

Training Protocol

A total of six intact classrooms, three fifth-grade classrooms and three sixth-grade classrooms, participated in the study. At each grade level, classrooms were randomly assigned to one of two treatment conditions (i.e., mobilization or relational reasoning), or to the control group (text annotation). During training, which is detailed in the subsequent section, all students read *Greek Achievements* (Burstein & Shek, 2006).

Mobilization

Mobilization is an activation technique in which students are asked to bring forth everything they know about a topic prior to reading (e.g., Peeck et al., 1982). Traditionally, mobilization has occurred prior to reading. In the current study, however, mobilization was prompted prior to, during, and after reading in order to ensure comparability to the other treatment technique, relational reasoning. Paralleling K-W-L (Ogle, 1986), a well-known procedure, students in the mobilization group were initially asked to write down everything they knew about

ancient Greece. Then, after reading each section of the text, students were prompted to list important, new information that they learned from that section. For the texts used in the current study, a section is determined by the major subheadings (see those subheadings printed in red in Appendix A). When all sections of the text have been read, and new information added to their list, students then completed the topic knowledge and comprehension assessments. See Appendix I for the mobilization lesson plan.

Relational Reasoning

Students in the relational reasoning condition were trained to activate their prior knowledge through specific prompts that correspond to each of the four forms of relational reasoning. For this technique, students were not only asked to activate their passage-specific knowledge, but whatever subject-matter knowledge or personal experiences they found relevant.

Before reading, students were trained to activate knowledge that is analogous and anomalous to the text content. Specifically, students were asked, “What have you ever seen, read, or heard that might help you understand the topic of ancient Greece?” as well as, “What about the topic of ancient Greece do you think will be different from anything you have seen, read or heard before?”

During reading, students stopped at the end of each section to answer four relational reasoning questions.

1. *Analogy*: How is the text content **similar** to something you have seen, read, or heard in school or out of school?

2. *Anomaly*: How is the text content **unusual** or **unexpected** in comparison to something you have seen, read, or heard in school or out of school?
3. *Antithesis*: What about the text content is completely **opposite** of something you have seen, read, or heard in school or out of school?
4. *Antinomy*: What about the text could **not** be seen, read, or heard today?

After all sections were read, students completed the topic knowledge and comprehension assessment.

Training on the four forms of relational reasoning in general, or as a prior knowledge activation technique specifically, has not been attempted before. Therefore, a small pilot test of the training materials was implemented before data-collection. The relational reasoning materials were taught to one fourth-grade and one sixth-grade student, and changes were subsequently made to the materials. The primary change was in reference to the relational reasoning graphic organizer. This organizer includes four boxes, one box for each form of relational reasoning. Initially, students were provided with one copy of the graphic organizer for the entire text. However, students in the pilot study suggested having one graphic organizer for each section of the text, rather than the text as a whole. This change seemed particularly beneficial for students who had large handwriting, and allowed students to write down as much information as they wanted for each section of the text. See Appendix J for the relational reasoning lesson plan.

Control

Students in the control group annotated the text to enhance attention to the textbase (Kintsch, 1998). Text annotation is a tool that is frequently used at the

school site, and with which the students are familiar. Both fifth- and sixth-grade students utilized text annotation on a fairly regular basis, with sixth-grade students using this technique on nearly every text that was read, and fifth-grade students utilizing the technique at least once per week. Specifically, text annotation at the school site entailed: (a) identifying the text's genre and author's purpose; (b) creating a short summary for each section of the text; (c) circling unknown vocabulary words and using a squiggly line to identify context clues; and (d) ending with a one sentence summary of the entire passage.

Students were reminded of the expectations for text annotation, and then prompted to annotate the text while reading. Similar to the two treatment conditions, students answered the topic knowledge and comprehension questions after all text sections were read and annotated. See Appendix K for the text annotation lesson plan.

Procedures

The procedures for the current dissertation are described in five phases.

Phase 1

In the first phase of the study, a letter and waived consent form was sent home with students. The purpose of the letter was to inform the students' families that the study would take place, and to provide them with an opportunity to contact the researcher should they have any questions about the study. Students' parents or guardians had one week to sign the waived consent form if they did not want their student to participate in the study.

Once families were given the appropriate time to opt their child out of the study, the school provided supplementary student demographic data for participating fifth- and sixth-graders. To protect confidentiality, students were provided with an individual code, which allowed me to link participants to their data.

Phase 2

Participants were first asked to sign the assent form. Specifically, the following text was visible on students' computer screens:

We are doing a study to learn about fifth- and sixth-grade students' reading comprehension. If you agree to be in our study, please type your name in the box below and hit continue.

Next, participants completed the demographic measure, TORRjr, and the topic knowledge pre-assessment. All measures were completed during the school day at a time deemed convenient by the school site. The measures took approximately 50 minutes to complete, and were completed online using computers in the classroom.

Phase 3

Approximately two weeks after students completed Phase 2, students participated in the training procedure previously described. Phase 3 took place during two, one-hour classes. All training was provided by the researcher. To accommodate this condition, fifth- and sixth-grades were trained on alternative days during the week. During training, participants read the *Greek Achievements* text and completed learning activities appropriate to their treatment or control

designation. The classroom teacher was in the room throughout the training, and completed a fidelity check to ensure the researcher implemented each section of the lessons as planned. To do this, the classroom teacher was provided with a copy of each lesson plan. He or she was asked to mark a check for each section that was completed according to plan, and provide an X for each section of the lesson that was not implemented according to the plan. It should be noted that there were no instances when teachers provided an X, indicating that the lesson plans were implemented with full fidelity.

Phase 4

For the final assessment phase of the study, students read the text *Rome's Legacy*. While students read, they were prompted section by section to implement whichever training they received earlier in the week (i.e., mobilization, relational reasoning, or control). Students were given approximately 20 minutes to read the text. Then, students were asked to remove the text by placing it under their chair before completing the topic knowledge post assessment. Then, the researcher or a teacher collected students' answers to the topic knowledge assessment.

Students were then directed to retrieve their texts and to answer the constructed response questions. They were given approximately 20 minutes for this task. All work in this phase was completed via paper and pencil. The researcher oversaw the fifth-grade assessments, while a teacher at the school administered the assessments to the sixth-graders.

Phase 5

About two weeks after the completion of Phase 4, a subset of students participated in a follow-up case study. For each treatment condition (i.e. mobilization and relational reasoning), one fifth- and one sixth-grade student who performed around one standard deviation above or below the mean were chosen to participate in follow-up conversations, for a total of eight students. Each student was seated in a small room, conversations were recorded, and the researcher wrote down responses to prompted questions. The conversations lasted between 24 and 30 minutes.

Each student was first asked: “What do you remember about the lessons that I did with you about two weeks ago?” Additional follow-up prompts and questions were provided, as needed. After responding, students were prompted to verbally complete the steps for either mobilization or relational reasoning as they read three to five sub-sections of a new text on Government and Society (Burstein & Shek, 2006; Appendix C).

In an effort to mirror the techniques taught during training, students in the mobilization group answered the following question before reading: “What do you already know about Rome?” During reading, they were asked, “What did you learn?” for each section that was read. Finally, students were asked, “How is what you learned similar to what you already knew? How is it different?”

Before reading, students in the relational reasoning condition were asked, “What have you ever seen read, or heard that might help you understand the topic of ancient Rome?” and “What about the topic of ancient Rome do you think will be

different from anything you have seen, read, or heard before?” During and after reading, students were prompted with the four relational reasoning questions for each sub-section (see training protocol above).

Overview of Analyses

A priori, I confirmed that a sample size of 130 would be appropriate to evaluate my research questions with a power analysis using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). I conducted a sensitivity analysis to explore power, because I knew my estimated sample size and wanted to determine what the detectable effect size would be given that sample size. I determined that with seven predictors (i.e., two conditions, topic knowledge, TORRjr, ethnicity, grade, and gender), power = 0.9, $\alpha = 0.05$, and Cohen’s $f^2 = 0.15$, a total sample size of 130 would be sufficient. The effect size is equal to the value that is typically interpreted as a small effect (0.15; Cohen, 1988) and well below the value that is typically interpreted as a large effect (0.35; Cohen, 1988).

Although students were randomly assigned to conditions at the classroom level, it was determined that a nested model was not required for analysis for several reasons. Primarily, the school was organized in a unique way such that there was only one teacher for each content area at each grade level, and teachers at each grade leveled worked together as a team. Also, within this organizational model, students rotated among the grade level teachers every quarter. Thus, all students at each grade level experienced the same teachers, eliminating the potential for teacher or class effects. Additionally, there were no significant differences between group means on the prior topic knowledge assessment as determined by

one-way ANOVA ($F(2,110) = 0.55, p = 0.58$) or on TORRjr scores ($F(2, 110) = 0.12, p = 0.89$).

Initially, I planned to run a multivariate analysis of covariance (MANCOVA) to determine if there was an overall significant effect of condition on the three outcome variables (i.e. overall comprehension, topic knowledge and short-constructed responses), using prior topic knowledge, TORRjr, ethnicity, grade, and gender as covariates. Then, if the MANCOVA demonstrated statistically significant differences between the three conditions on any of the comprehension outcome measures, I planned to conduct follow-up analyses to determine the effect of each condition on the outcome measures. However, due to missing data during Phase 2 (i.e. topic knowledge, TORRjr), these analyses were not appropriate. After running Little's (1988) missing completely at random (MCAR) test to confirm that the data were missing at random, as indicated by a nonsignificant result ($p=.327$), I proceeded to utilize a structural equation modeling (SEM) analysis approach which is able to appropriately handle missing data via full information maximum likelihood (FIML) estimation. FIML is available in the SEM format, but is not appropriate to use in multiple regression analyses, which utilize ordinary least squares instead of maximum likelihood assumptions. Further, FIML is preferred to other techniques such as mean imputation (Enders, 2016). Additionally, the decision was made to utilize SEM rather than eliminate students who had missing data in order to ensure sufficient power when running analyses. All analyses were conducted using the *lavaan* package (Rosseel, 2012) in the freely available statistical computing software R (R Core Team, 2017).

My research questions concerned the effects of the two treatment conditions (i.e. mobilization and relational reasoning) and control condition on locate/recall, integrate/interpret, and critique/evaluate questions. To answer the research questions, I ran structural equation models with (a) overall comprehension, (b) post-reading topic knowledge and (c) short-constructed responses as the endogenous variables. Conditions were dummy coded so that the control group was the reference group, allowing comparisons between each treatment and the control group. Conditions were further dummy coded so that mobilization was the reference group, allowing comparison between mobilization and relational reasoning groups. Grade level, ethnicity, gender, prior topic knowledge, and TORRjr scores were also included as exogenous variables in the analyses.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this dissertation was to investigate whether different prior knowledge activation techniques would result in significantly different comprehension performance for rural fifth- and sixth-grade students. Descriptive statistics can be found in Table 3. Structural equation modeling was employed to analyze data relevant to the first two questions in the study, and follow up conversations were utilized to discern qualitative differences between high- and low-performers in each treatment condition. The data met assumptions necessary for structural models in that the presumed cause (i.e., treatment or condition) occurred before the presumed effect (i.e., reading comprehension), other confounding variables were considered (e.g., grade level, ethnicity), and the causal relation was correctly specified (i.e., the intervention causes the outcome measures, and not the other way around; Kline, 2012). The results of statistical analyses for each research question follow, along with a discussion of those results.

Differences Between Prior Knowledge Activation Conditions on Overall

Reading Comprehension

The first research question investigated whether the two prior knowledge activation conditions (i.e. mobilization or relational reasoning) or a control condition resulted in statistically significant differences on overall comprehension. To answer the research question, structural equation modeling (SEM) analyses were

utilized with full information maximum likelihood to account for the missing data at pre-assessment. I excluded from my analyses students who did not provide

Table 3

Descriptive Statistics by Condition

Measures	Conditions											
	Mobilization				Relational Reasoning				Control			
	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>Max</i>
Prior Knowledge	2.72	1.36	0-6	8	2.65	1.57	0-7	8	3.00	1.41	1-7	8
TORR Jr	14.97	2.72	4-28	32	15.14	4.63	6-24	32	15.58	6.50	2-28	32
Topic Knowledge	3.91	1.53	1-7	8	5.08	1.66	2-8	8	4.67	1.90	0-8	8
Constructed Response	3.35	1.70	0-6	6	4.86	1.27	2-6	6	3.71	1.92	0-6	6
Comprehension	7.33	2.85	2-12	14	9.90	2.15	5-14	14	8.38	3.13	2-14	14

waived consent, or those who did not complete Phase 4 because no comprehension data were available for those students, yielding a total sample size of 149. Further, 36 students were absent during Phase 2 when pre-assessment data were collected. Overall reading comprehension was designated as the endogenous variable, with condition, grade level, ethnicity, gender, prior topic knowledge, and TORRjr scores as the exogenous variables. Conditions were first dummy coded so that the control group was the reference group (i.e., mobilization v. control, relational reasoning v. control). A second analysis was conducted with mobilization as the reference group (i.e., relational reasoning v. mobilization, control v. mobilization). For both analyses, the additional categorical variables were dummy coded with fifth-grade as the reference variable for grade level, Black as the reference variable for ethnicity, and female as the reference variable for gender.

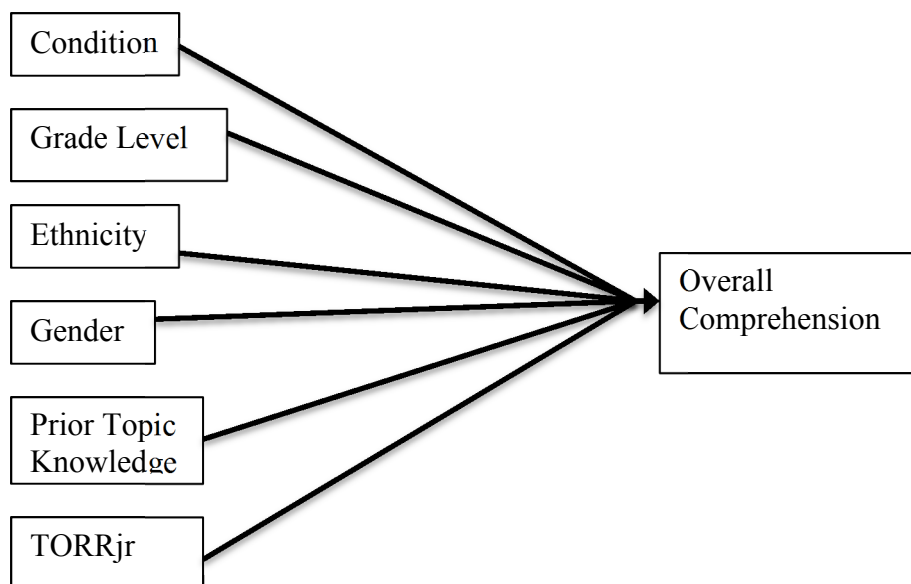


Figure 2. Graphic depiction of the structural equation model testing the influence of condition, grade level, ethnicity, gender, prior topic knowledge, and TORRjr on students' overall comprehension.

As predicted, condition was a significant predictor, indicating there was a positive statistically significant difference between the relational reasoning ($M=9.90$, $SD=2.15$) and control conditions ($M=8.38$, $SD=3.13$; $\beta = 3.10$, $p < .00$). In other words, a participant in the relational reasoning group scored, on average, 3.10 standardized units higher than a participant in the control condition. Further, there was a statistically significant difference between the relational reasoning and mobilization conditions ($M=7.33$, $SD=2.85$; $\beta = 5.15$, $p < .00$), meaning that a participant in the relational reasoning group scored, on average, 5.15 standardized units higher than a participant in the mobilization condition. However, there were no statistically significant differences between the mobilization and control conditions ($\beta = -1.85$, $p = .07$).

Additionally, there were no significant differences on overall comprehension scores for fifth- versus sixth-grade students ($\beta = 1.39$, $p = .17$) or for students with different ethnic backgrounds ($\beta = 1.64$, $p = .10$). However, female students outperformed male students ($\beta = -3.02$, $p < 0.01$), while students with higher scores on the prior topic knowledge ($\beta = 2.38$, $p = 0.02$) and TORRjr ($\beta = 4.25$, $p < 0.00$) measures also earned higher scores on overall comprehension. Overall, the exogenous variables combined to explain 38.7% of the variability in fifth- and sixth-grade students' overall comprehension.

These results are contrary to the hypothesis that students in both prior knowledge activation conditions would outperform students in the control condition on overall text comprehension. Although the relational reasoning treatment condition resulted in statistically significantly higher comprehension scores than the

control group, there were no differences between the mobilization and control group. Further, students in the relational reasoning condition produced significantly higher comprehension scores than students in the mobilization condition.

Previous investigations into prior knowledge activation and text comprehension have provided mixed results as to the effectiveness of various activation techniques (Hattan & Alexander, 2017a). Therefore, the finding that one prior knowledge activation technique resulted in higher overall comprehension scores in comparison to another technique can be rationalized. One potential explanation as to why students in the relational reasoning treatment condition earned higher scores on overall comprehension, in comparison to the mobilization condition, is that relational reasoning provides a structure that guides students to think critically about the text. Relational reasoning supports students in not only identifying analogous information, but also considering how the text content might be different from or not quite fit in with what they already know. Further, relational reasoning encourages students to find a direct association between the textual content and their life experiences, both in terms of similarities and dissimilarities. On the other hand, mobilization puts more emphasis on the learners' knowledge without repeated association to the textual content. This technique can be particularly challenging when students have limited topic knowledge to bring to bear. Additionally, text annotation, as the control condition, provided a structure to keep students focused on the text, but did not guide students to make connections between the text and their prior knowledge and experiences.

It was surprising to find that there were no differences in overall comprehension for students in the mobilization versus control condition, especially since these two techniques provide very different types of prompted support for students. As mentioned, the mobilization condition encouraged students to consider their existing topic knowledge during reading, while the text annotation condition kept students in the text, without explicitly prompting prior knowledge activation. Although research on mobilization as a prior knowledge activation technique has provided mixed results in the literature (Alvermann et al., 1985; Kostonos & van der Werf, 2015; Peeck et al., 1982), it was hypothesized that the introduction of this technique would offer additional support for students given that text annotation was a fairly routinized procedure for students in the current study.

However, in reference to question two, additional analyses were conducted to determine group differences based on the level of text comprehension (i.e., *locate/recall* or *critique/evaluate* and *integrate/interpret*), which provided some additional insight into students' comprehension performance.

Further, it is important to note that gender, prior topic knowledge, and TORRjr scores affected students' overall comprehension. When considering gender, previous research has demonstrated that girls tend to have better reading comprehension than boys (Logan & Johnston, 2009), so the finding that girls performed better than boys in the current study is not surprising. Although the influence of prior knowledge on text comprehension has a long history (e.g., Anderson et al., 1977), participants in the current study had low prior-topic knowledge by design. In other words, the texts and topics were chosen specifically

based on a gap in students' prior learning. Yet these data show that even relatively low prior topic knowledge has a significant influence on students' comprehension. Finally, scores on the TORRjr also influenced overall comprehension.

Differences Between Prior Knowledge Activation Conditions by Question Type

The second research question investigated whether the two prior knowledge activation conditions (i.e., mobilization or relational reasoning) versus the control condition resulted in statistically significantly different comprehension outcomes by question type (i.e., topic knowledge and short constructed response). Similar to question one, structural equation modeling analyses were utilized with full information maximum likelihood to account for the missing data. Separately, the topic knowledge portion and the short constructed response portion of the comprehension assessment were designated as endogenous variables. As with question one, condition, grade level, ethnicity, gender, prior topic knowledge, and TORRjr scores were included as exogenous variables. For all analyses, conditions were first dummy coded so that the control group was the reference variable (i.e., mobilization v. control, relational reasoning v. control), and then analyses were re-run with mobilization as the reference variable (i.e., relational reasoning v. mobilization, control v. mobilization). Grade level, ethnicity, and gender were also dummy coded.

Topic-Knowledge Portion

For the topic knowledge locate/recall questions, results show that there was a statistically significant difference between the mobilization ($M=3.91$, $SD=1.53$)

Table 4

Comprehension Measures: Overall Comprehension, Topic Knowledge, and Short Constructed Response

<i>Predictors</i>	<i>Overall Comprehension</i>			<i>Topic Knowledge</i>			<i>Short Constructed Response</i>		
	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β
Mobilization v. Control	-0.90	0.49	-1.85	-0.67*	0.31	-2.13*	-0.21	0.30	-0.70
Relational Reasoning v. Control	1.54**	0.49	3.10**	0.43	0.33	1.33	1.18***	0.31	3.79***
Relational Reasoning v. Mobilization	2.43***	0.47	5.15***	1.10***	0.31	2.13***	1.39***	0.29	4.76***
Prior Knowledge	0.36*	0.15	2.38*	0.14	0.10	1.43	0.18*	0.09	1.97*
TORRjr	0.18***	0.04	4.25***	0.11***	0.03	3.86***	0.07**	0.03	2.66**
Grade Level	0.57	0.41	1.39	0.14	0.27	0.52	0.50	0.26	1.93
Ethnicity	0.35	0.21	1.64	0.21	0.14	1.54	0.12	0.13	0.89
Gender	-1.21**	0.40	-3.02**	-0.39	0.26	-1.47	-0.79**	0.25	-3.20**
R^2		0.39			0.26			0.32	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

and control conditions ($M=4.67$, $SD=1.90$; $\beta = -2.13$, $p < .03$) in favor of controls. In other words, a participant in the mobilization group scored, on average, 2.13 standardized units lower than a participant in the control condition. There was a statistically significant difference between the relational reasoning ($M=5.08$, $SD=1.66$) and mobilization conditions ($M=3.91$, $SD=1.53$; $\beta = 2.13$, $p < .00$), indicating that a participant in the relational reasoning group scored, on average, 2.13 standardized units higher than a participant in the mobilization condition. However, there were no statistically significant differences between the relational reasoning and control conditions ($\beta = 1.33$, $p < .18$). Additionally, grade level, gender, ethnicity, and prior topic knowledge were not significant predictors (Table 4), while the TORRjr was a significant predictor of performance on the topic knowledge assessment ($\beta = 3.86$, $p < .00$).

It was hypothesized that there would be no significant differences in students' performance on the topic knowledge locate/recall questions by condition, as was found in an earlier study involving undergraduate students (Hattan & Alexander, 2018). However, there appear to be developmental differences to consider when activating middle-school students' prior knowledge. These results suggest that, when answering locate and recall questions, fifth- and sixth-grade students benefit from text annotation in comparison to mobilization. As noted, text annotation prompts students to focus on the details in the text, which is beneficial when answering "right there" questions. However, activating prior topic knowledge via mobilization, especially for a sample of students who demonstrated

low prior knowledge, was not beneficial for recalling specific information from the text.

At the same time, the results indicate that the relational reasoning prompts led to similar outcomes in comparison to the text annotation control group for the topic knowledge portion. Although the primary purpose of the relational reasoning prompts was to guide students to make connections between the text and students' prior knowledge and experiences, relational reasoning also seems to facilitate attention to specific details within the text. Further, it appears that general relational reasoning ability, as measured by the TORRjr, led to different scores on the topic knowledge portion of comprehension assessment.

Short Constructed Response Portion

For the short constructed response portion that focused on integrate/interpret and critique/evaluate questions, there were no statistically significant differences between the mobilization ($M=3.35$, $SD=1.70$) and control conditions ($M=3.71$, $SD=1.92$; $\beta = -0.7$, $p < .48$). However, there was a statistically significant difference between the relational reasoning ($M=4.86$, $SD=1.27$) and mobilization conditions ($\beta = 4.76$, $p < .00$), and a statistically significant difference between the relational reasoning and control conditions ($\beta = 3.79$, $p < .00$). In other words, a participant in the relational reasoning group scored, on average, 4.76 standardized units higher than a participant in the mobilization condition, and 3.79 standardized units higher than a student in the control condition on the short constructed response portion. Similar to overall comprehension, grade level and ethnicity were not significant predictors, although gender, prior topic knowledge, and TORRjr scores

were significant predictors of student performance on the short constructed response portion.

Similar to overall comprehension, it was hypothesized that students in the prior knowledge activation treatments would outperform students in the control condition. Instead, results indicate that the relational reasoning intervention led to significantly higher comprehension scores in comparison to both the mobilization and control conditions, whereas there were no differences between the mobilization and control groups. The purpose of the relational reasoning prompts was to help students make sense of the text in light of what they already knew, and also figure out how the text information might not fit into their current schema. Further, the relational reasoning intervention facilitated comparisons and contrasts, guiding students to integrate the text content into their knowledge base, either by noting similarities or dissimilarities. Therefore, it is understandable why students in the relational reasoning condition would outperform students not only in the control condition but also in the mobilization treatment group.

Similar to relational reasoning, mobilization also facilitated the comparison between what students already knew and the text topic. However, mobilization was limited in that it centered on prior *topic* knowledge and not the explicit association between that knowledge and the content of the text.

Qualitative Follow-Up

The third research question examined high- and low-performing students' general recollections of the intervention in which they participated (i.e., mobilization or relational reasoning), as well as the utility of each activation

technique. On average, students across conditions scored 8.68 points on the overall comprehension measure out of 14 possible points ($SD = 2.94$). For each grade level and treatment condition, students who scored approximately one standard deviation above (12 or greater) or below (6 or less) the mean were chosen to participate in follow-up conversations. Descriptive statistics on each student can be found in Table 5.

Table 5

Raw Data for Eight Individual Students

Treatment Grade/Ability	Measures				
	Prior Topic Knowledge	TORRjr	Post Topic Knowledge	Constructed Response Items	Overall Reading
Mobilization					
5 th High	4	26	7	5	12
5 th Low	3	7	2	4	6
6 th High	2	28	7	5	12
6 th Low	2	22	3	3	6
Relational Reasoning					
5 th High	3	18	7	6	13
5 th Low	5	10	3	2	5
6 th High	3	20	8	6	14
6 th Low	5	13	4	2	6

Recollections of the Intervention

For this qualitative follow-up, the selected students were asked, “What do you remember about the lessons that I did with you about two weeks ago?” In

general, low-performing students in both mobilization and relational reasoning conditions answered this question by offering a very general recollection, such as stating that they remembered learning about topics such as Ancient Rome, or they remembered doing an activity about cups. When such a general observation was made, I prompted for more specific information on the activation procedure in which they participated: “Do you remember what strategy or technique you learned during the lesson?” Even with this very direct prompt, low-performing students were unable to elaborate further.

In contrast to the low-performing students, the recollections of students who scored a standard deviation or more above the mean were markedly different. For one, high-performing students remembered more about the specific strategy they were taught. For example, in the mobilization condition, one high-performing student responded, “We had to state what we knew before and what we learned.” In the relational reasoning condition, a high-performing student stated, “We had to say how what was in the text was opposite, similar, or weird,” and another said, “We read and then we did the four things like what’s similar to today, what’s unusual, what’s a contradiction, and then um I forget the other one.”

Utility of the Prior Knowledge Activation Techniques

After providing their recollections of the intervention, students were again provided with the mobilization or relational reasoning cues before, during, and after reading the text “Government and Society,” which is about Roman government. For the mobilization condition, both low- and high-performing students came up with qualitatively similar responses to the question “What do you already know

about Rome?” and tended to refer to the content from the prior reading. Students stated that they knew about Roman buildings with large columns; that the Romans influenced many languages; and that there were Roman artists. However, high-performing students were able to provide a larger number of statements and were more detailed in the information they offered. For example, one student stated that he specifically remembered learning about fights in the Coliseum, and another commented that the Romans copied Greek paintings, and the Romans used aqueducts to carry water, and vaults in their architecture. For example, in stating what he learned from the text, a low-performing student said that he learned about the government. However, the higher performing students spoke about the three parts of the government, division of power, and how the Roman government was similar to the United States government.

For the relational reasoning condition, students responded to the pre-reading prompts with both prior knowledge learned during the intervention, as well as outside sources of information. However, unlike the mobilization condition, both low-performing and high-performing students provided similarly elaborate responses to the pre-reading questions. To the question, “What have you ever seen, read, or heard that might help you understand the topic of ancient Rome?,” responses included: The Romans made their buildings with columns and arches; the buildings had slants so they would not look like they were leaning; Gladiators fought in the Coliseum; they worshipped more than one god; I saw a movie about Roman culture and art; they had beautiful sculptures; they did not wear shoes; they had large graves; and their language influenced the English language.

To the pre-reading question “What about the topic of ancient Rome do you think will be different from anything you have seen read or heard before?”

responses from the relational reasoning participants included: How Romans carry out their government and rules will be different; they had rulers and kings who were mean to their people; people’s daily lives; the gods could be different; they do not believe in Christianity; structures were made out of different materials; and their culture and art would be different.

During and after reading, students were again asked to respond to the four relational reasoning prompts. (See Table 6 for representative responses from all four students.) In general, students seemed more familiar with identifying content that was similar or opposite to what they had previously learned or experienced. However, when asked what about the text content was unusual or could not be seen, read, or heard today, students required more wait time and did not always provide a response. Since analogies tend to be taught more frequently than the other forms of relational reasoning, this was not surprising.

Overall, relational reasoning seemed to facilitate students’ thinking in a more productive manner than mobilization. When guided to answer the relational reasoning prompts, both high- and low-performing students were able to provide meaningful responses and demonstrated an understanding of the text. However, relational reasoning is not completely compensatory, as it cannot eliminate other factors that might separate low-performing from high-performing readers. Even though low-performing students in both the mobilization and relational reasoning conditions scored similarly on the post-reading comprehension measures, it appears

that training in relational reasoning techniques is advantageous to low-performing students guiding them to make meaningful connections and to think critically.

Table 6

Representative Student Responses to Relational Reasoning Prompts

How is the text content similar to something you have seen, read, or heard in school or out of school? • Division of power • Three branches of government • Elections • Politicians had to compromise • Laws could be vetoed • Legislative branch creates laws • There were judges • People were elected to represent the state (Senate) • There were specific laws about taxes • People were angry about some of the government's decisions • Laws can hurt or help people • Government set up to keep people from having too much power	How is the text content unusual or unexpected in comparison to something you have seen, read, or heard in school or out of school? • Unusual to call citizens plebeians • Tripartite (unusual word) • Plebeians and patricians vote for mayors • Most powerful people were consuls • There were political offices for common people, but today only important people hold political office.
What about the text content is completely opposite of something you have seen, read, or heard in school or out of school? • Some people only elected for one year • Today, you do not need to be wealthy to be in the Senate. Instead, you can be middle-class. • Other governments do not have three parts, such as monarchies. • Today, we do not elect someone new each year to lead the army • Today we have representatives for each state, but not for every city.	What about the text could not be seen, read, or heard today? • The Roman government organized games and festivals. • Today we do not have plebeians and patricians • We have judges, not magistrates. • People could not get too powerful today. • Senators originally created to advise Rome's kings. Today we do not have kings.

CHAPTER V

CONCLUSIONS, LIMITATIONS, AND IMPLICATIONS

This study was designed to investigate the effects of a traditional (mobilization) and novel (relational reasoning) knowledge activation technique, in comparison to a control condition, on rural middle-school students' understanding of unfamiliar expository texts on the topic of world history. In this chapter, the major conclusions from this investigation will be overviewed, followed by recognition of the limitations of the study against which those findings should be considered. The chapter then concludes with a discussion of the implications of this work for future research and educational practice.

Conclusions

In considering the major outcomes of this investigation, I will position what was learned about prior knowledge activation techniques for the rural students who participated in this research in relation to the conceptual model, Figure 1, which guided this research. Thus, I will overview the major findings with regard to the task, learner, text, and context, and the students' comprehension that arose from their interaction.

Task: Prior Knowledge Activation

One of the more salient findings of this investigation was the determination that *not all prior knowledge activation techniques are equally effective for all students engaged in the processing of any text*. Specifically, it was found that the use of a mobilization technique that required these rural middle-school students to call to mind all that they knew about Ancient Rome was no better at promoting

comprehension than the process of text annotation that they more routinely used in their classes. In fact, students in the text annotation condition outperformed students in the mobilization condition on the locate/recall questions. One possible reason for why this occurred is because students had fairly low topic-specific prior knowledge. Therefore, mobilization students did not have sufficient topic knowledge to draw on, whereas the text annotation students focused their attention on the specific details presented in the text, and were then able to demonstrate recollection of that information in the topic knowledge post-assessment.

In contrast to the participants in this study, mobilization proved to be useful for undergraduate students in comparison to a control group (Hattan & Alexander, 2018) and therefore should not be set aside completely. One potential explanation for these differing results is that, by virtue of being older, undergraduate students have other relevant knowledge on which they might be able to draw. Students in the undergraduate study were drawn from human development and education courses, and demonstrated low levels of prior topic knowledge on the text content (i.e., cellular biology). Yet, it is likely that undergraduate students had some previous exposure to biology through high school courses, and therefore may have been able to use mobilization to make connections between the text content and prior knowledge, despite performing poorly on a measure of prior topic knowledge.

Another significant finding of this study was that *the novel activation technique of relational reasoning devised for this investigation proved highly effective for promoting students' comprehension*. Relational reasoning allowed students to not only make connections to prior topic knowledge, but also to other

sources of relevant knowledge. Further, relational reasoning encouraged students to confront discrepancies in their prior learning, recognizing some of the distinctions or gaps in their prior knowledge or experiences throughout the reading process. Additionally, due to the nature of the relational reasoning prompts, students were more likely to make explicit connections to the text, rather than focusing predominantly on either their prior knowledge *or* the text content.

Further, the qualitative follow-up conversations suggested that relational reasoning not only facilitated comprehension for high-performing students, but also guided comprehension for low-performing students, even if their understanding of the text was not evident in a comprehension assessment. In post-assessment conversations, both high- and low-performing students provided meaningful responses to the relational reasoning prompts and demonstrated general understanding of the text, suggesting that additional training in relational reasoning may promote comprehension for low-performing students in other contexts or with other textual content.

Reader: Rural Middle School Students

A principal finding regarding rural middle school students was that *these readers have relevant experiences and knowledge to bring to bear, even if their topic-specific knowledge is not immediately apparent*. Specifically, low-performing students struggled to draw upon topic-specific knowledge via a generic mobilization prompt. This is likely due to the fact that the topic of Ancient Rome had not been formally taught, and therefore students' exposure to that subject matter was limited. However, students in the relational reasoning condition were provided

opportunities to discern how their prior topic and domain knowledge, as well as other outside experiences, might contribute to their understanding of the text by weighing both similarities and differences between what they know and what the text presents. The rural middle-school students in the current study had a wealth of knowledge and experiences, but needed appropriate prompts in order to access that knowledge and deepen their comprehension.

Another reader-related conclusion of this investigation was that *students' ability to recognize patterns of similarity, discrepancy, exclusivity, and opposition had a significant effect on their text comprehension*. Participants in this study took the Test of Relational Reasoning-Junior (TORRjr). What became evident was that students' performance on the TORRjr significantly predicted their performance on both the multiple-choice and short-constructed response portions of the comprehension test. In effect, students who could recognize analogies, anomalies, antinomies, and antitheses were able to recall vocabulary and factual information from the text, as well as think critically about the text. Therefore, it is possible that relational reasoning is a higher-order thinking capacity that merits greater consideration in literacy instruction (Alexander et al., 2011).

Text: Unfamiliar Expository Text

In terms of the text, this dissertation brings to light that *unfamiliar textual content can be problematic for students*, especially if they are not provided the tools necessary to overcome their lack of familiarity with text content. Students are often required to read texts on topics that are unfamiliar to them, or texts in which their lives are not represented (Moje et al., 2004), especially during high-stakes

standardized assessments (Johnston, 1984; Pearson & Hamm, 2005). Educators, researchers, and test developers should not only consider complexity in terms of text readability, but also the degree of topic familiarity. Moreover, when students are challenged to read texts about unfamiliar subject matter, they may require additional scaffolds, such as the careful activation of prior knowledge in terms of similarities and dissimilarities between their lives and the textual content.

Additionally, during the reading of texts, the types of comprehension questions educators pose to their students matter when prior knowledge is considered. In much of the literature addressing question types, it has been shown that requiring students to construct a response involving integration/interpretation or critique/evaluation should prove more challenging to students than multiple-choice, locate and recall questions (NAGB, 2010). Interestingly, in this investigation the significant differences between conditions emerged for both question categories, but in unexpected ways. For one, the students who received the relational reasoning training outperformed the students in the mobilization and control conditions regardless of question type.

In contrast, differences between the mobilization and control condition only manifested for the multiple choice locate/recall questions and not with the constructed response items. Moreover, it was the control condition students who did better on these locate/recall items than students in mobilization condition. This may be due to the fact that the control condition, in which students did the familiar activity of annotating the text, kept students focused on the specific details of the text, facilitating their recollection of content information, while the mobilization

technique centered more on the students' experiences. It is important to recognize that the annotation group also did better on the constructed response question than the mobilization group, just not statistically significantly so.

Context: Rural Middle School Classrooms

Findings from this dissertation should be considered in relation to the environment in which students live. The context for the current dissertation was a rural community that was also characterized as economically challenged. As was pointed out in Chapter 2 of this dissertation, rural communities in general represent an understudied population in the literacy research. That was the reason that this context was selected for study. Having conducted prior knowledge activation studies with similar-age students from a more suburban and economically advantaged area, I found that the context for the current study mattered. For one, *middle-school students from rural, economically-challenged communities have life experiences that may seem particularly foreign to the experiences represented in academic content.* The pattern of results that arose in this investigation suggested that students living and learning in this context may require qualitatively different scaffolds when engaged in text processing, if enhanced comprehension is the desired outcome. That being said, the *in-school and out-of-school experiences of those living and learning within rural contexts should not be treated as deficits to learning and comprehension but as unique and important perspectives that need to be thoughtfully connected to content of instruction.*

Limitations

Although this study provided insights into the effectiveness of different prior knowledge activation techniques on students' comprehension of unfamiliar expository texts, there were several limitations that are important to consider. First, the prior knowledge activation intervention took place over two days instead of a full week, as originally conceived. Although analyses indicated statistically significant results, it may be beneficial to conduct the intervention over the course of several weeks so that the mobilization and relational reasoning techniques could become more commonplace.

Second, I was unable to collect pre-assessment data from 36 of 149 participants. Although the data were missing at random, it would be beneficial to replicate the study with fewer missing data and a larger sample of students. Third, given the constraints of the school setting, I was not able to randomly assign students to condition and was not able to include students with disabilities. In the future, it would be beneficial to find a way to randomly assign students to condition, and to include students with disabilities in the lessons. Fourth, I had initially hoped to obtain information regarding students' standardized assessment scores, grades for students' core subjects (i.e., Language Arts, Social Studies, Math, and Science), and FARMS status as a measure of socio-economic status at the individual level. Unfortunately, these data were not available to me, and therefore could not be included in the analyses.

Implications for Research

The current study was a first step in reintroducing the importance of prior knowledge activation to the literacy community. Although previous research has established the necessity of prior knowledge and its activation to reading comprehension (e.g., Bransford & Johnson, 1984), there is still much to be learned regarding when, how, for whom and for what students' existing knowledge base needs to be primed prior to, during, and even after reading. The current investigation affords information on only one particular when, how, for whom, and for what configuration.

Different Populations

One important consideration for future research is to delve deeply into prior knowledge activation and reading comprehension with various populations of learners. For example, do mobilization and relational reasoning, or other prior knowledge activation techniques, work similarly for special education students or students who speak English as an additional language? Does the technique of relational reasoning provide an additional benefit to students who generally struggle to comprehend texts, in comparison to their higher achieving peers? Further, are there differences for students based on the context in which they live? In other words, is there something about relational reasoning that is particularly helpful for students who live in rural communities, or would the relational reasoning technique be similarly helpful for students in urban or suburban settings, or from varied sociocultural contexts?

Additionally, given that mobilization was helpful for undergraduate students but not the current sample of middle-school students (Hattan & Alexander, 2018),

future studies should examine developmental differences in prior knowledge activation and text comprehension. In what ways do various prior knowledge activation techniques facilitate students' understanding of text based on whether the students are in early elementary, upper elementary, middle-school, high-school, or are adult learners? For example, younger students may require additional scaffolding, while older learners may not require knowledge activation in all situations (i.e., on familiar topics).

Text Type

The current study examined students' text comprehension on unfamiliar expository text, but future research should also investigate the ways in which different prior knowledge activation techniques influence students' understanding of expository or narrative texts that vary in complexity. Additionally, researchers should consider whether the goal is to assist understanding of an isolated text, as is often the case for standardized assessments, or build a base of knowledge around a particular topic to facilitate comprehension. These goals may require different types of prior knowledge activation that should be investigated in future studies.

Measures of Comprehension

In the current dissertation, reading comprehension was measured using a researcher-created assessment that included locate/recall, integrate/interpret, and critique/evaluate questions. Although the current study provides interesting insight into the ways in which different prior knowledge activation techniques influence comprehension for these question types, future research should consider longer comprehension assessments that would allow for a more detailed analysis of

comprehension by question type. Additionally, researchers should consider whether targeted instruction on techniques such as relational reasoning influence students' comprehension on standardized assessments, rather than researcher-created assessments.

Implications for Instructional Practice

Previous research has shown that teachers are underutilizing prior knowledge activation, or are not using techniques that are best suited to the needs of their students (Hattan & Alexander, 2017b; Hattan et al., 2015). Teachers should be made aware that traditional techniques for prior knowledge activation do not facilitate comprehension for all students. However, this does not mean that educators should set aside prior knowledge activation altogether. Instead, educators should consider students' prior knowledge, grade level, and content of the to-be-read text when determining how to facilitate prior knowledge activation.

In an effort to bridge the gap between research and practice, professional development on the power of students' background knowledge and on specific instructional techniques should provide resources and information for teachers. In this way, they can be better equipped to help students recognize the value of linking either prior knowledge or experiences to the text content. Based on the findings of this study, educators would likely benefit from professional development that introduces the four forms of relational reasoning and demonstrates how targeted prompts that cue analogous, anomalous, antinomous, and antithetical associations can help students juxtapose their knowledge and experiences to ideas or events in the text. Techniques such as relational reasoning allow educators to facilitate

connections between what students know and other sources of information, capitalizing on students' strengths. Further, instructional materials can embed relational reasoning prompts within lessons or teacher resources, encouraging and reminding teachers to instigate students' relational reasoning during literacy lessons.

Although the utility of instructional analogies or students' ability to think analogically have been documented in the literature (e.g., Goswami & Mead, 1992), it is just as important for students to become able to identify differences or discrepancies (e.g., Crone et al., 2009; Mosenthal & Na, 1980). This aspect of relational reasoning has been less developed within literacy or other academic domains (Dumas et al., 2013). For conceptual understanding to occur as students read or listen to oral or written text, they must be alert to ideas that seem familiar to what they have seen or heard elsewhere and what does not correspond to what they had learned or experienced. In effect, to know what "cat" truly means, one must also know "what is *not* cat."

Additionally, educators should be informed that prior knowledge activation is a continuous process (Kintsch, 1998), thus it may be beneficial to encourage students to consider what they already know about a topic or subject before, during, and after reading. Even though teacher guidance is crucial, the ultimate goal of prior knowledge activation techniques is to have students develop the habit of mind of calling up their relevant knowledge and experiences automatically as they engage with text (Kintsch, 1998). Further, as students' existing knowledge is

spontaneously brought to mind, they should be alert to whatever similarities, discrepancies, exclusivities, and oppositions emerge within the text.

Finally, and perhaps most importantly, the results of the current study demonstrated that educators should work to capitalize on students' strengths, working from the perspective that learners have a wealth of knowledge upon which to draw when processing text. That knowledge may well be distinct or far removed from the topic or content being described, but it still functions as an invaluable platform from which deeper understanding of the text can emerge.

Appendices

Appendix A: Excerpt from the Training Text

Greek Achievements

If YOU were there...

Everyone in Athens has been talking about a philosopher and teacher named Socrates, so you decide to go and see him for yourself. You find him sitting under a tree, surrounded by his students. "Teach me about life," you say. But instead of answering, he asks you, "What is life?" You struggle to reply. He asks another question, and another. If he's such a great teacher, you wonder, shouldn't he have all the answers? Instead, all he seems to have are questions.

What do you think of Socrates?

BUILDING BACKGROUND Socrates was only one of the brilliant philosophers who lived in Athens in the 400s BC. The city was also home to some of the world's greatest artists and writers. In fact, all over Greece men and women made great advances in the arts and sciences. Their work inspired people for centuries.

The Arts

Among the most notable achievements of the ancient Greeks were those they made in the arts. These arts included sculpture, painting, architecture, and writings.

Statues and Paintings

The ancient Greeks were master artists. Their paintings and statues have been admired for hundreds of years. Examples of these works are still displayed in museums around the world.



Greek sculpture is admired for its realism, natural look, and details.

SECTION 4

What You Will Learn...

Main Ideas

1. The Greeks made great contributions to the arts.
2. The teachings of Socrates, Plato, and Aristotle are the basis of modern philosophy.
3. In science, the Greeks made key discoveries in math, medicine, and engineering.

The Big Idea

Ancient Greeks made lasting contributions in the arts, philosophy, and science.

Key Terms and People

Socrates, p. 307
Plato, p. 307
Aristotle, p. 307
reason, p. 307
Euclid, p. 308
Hippocrates, p. 308



HSS 6.4.8 Describe the enduring contributions of important Greek figures in the arts and sciences (e.g., Hypatia, Socrates, Plato, Aristotle, Euclid, Thucydides).

Appendix B: Excerpt from the Assessment Text

SECTION 3

Rome's Legacy

What You Will Learn...

Main Ideas

1. The Romans looked for ways to use science and engineering to improve their lives.
2. Roman architecture and art were largely based on Greek ideas.
3. Roman literature and language have influenced how people write and speak.
4. Roman law serves as a model for modern law codes around the world.

The Big Idea

Many features of Roman culture were copied by later civilizations and continue to influence our lives today.

Key Terms and People

Galen, p. 366
 aqueduct, p. 367
 vault, p. 367
 Virgil, p. 370
 Ovid, p. 370
 satire, p. 370
 Romance languages, p. 371
 civil law, p. 371

 **ISS 6.7.8** Discuss the legacies of Roman art and architecture, technology and science, literature, language, and law.

If YOU were there...

You live on a farm in Gaul but are visiting your older brother in town. You are amazed by the city's beautiful temples and towers. Another surprise is the water! At home you must draw up water from a well. But here, water bubbles out of fountains all over the city. It even runs through pipes in the public baths. One day your brother introduces you to the engineer who maintains the water system.

What questions will you ask the engineer?

BUILDING BACKGROUND Ideas of law and government spread widely. But those were not the Romans' only accomplishments. Roman scientists, engineers, artists, and writers also made contributions to life in Rome. Many of the ideas the Romans developed 2,000 years ago are still influential today.

Roman Science and Engineering

The Romans took a practical approach to their study of science and engineering. Unlike the Greeks, who studied the world just to know about it, the Romans were more concerned with finding knowledge that they could use to improve their lives.

Science

Roman scientists wanted to produce results that could benefit their society. For example, they studied the stars not just to know about them but to produce a calendar. They studied plants and animals to learn how to produce better crops and meat.

The practical Roman approach to science can also be seen in medicine. Most of the greatest doctors in the Roman Empire were Greek. One doctor in the empire was **Galen**, who lived in the AD 100s. He was a Greek surgeon who made many discoveries about the body. For example, Galen described the valves of the heart and noted differences between arteries and veins. For centuries, doctors based their ideas on Galen's teachings and writings.

366 CHAPTER 12

Appendix C: Excerpt from the Qualitative Follow-Up Task

SECTION 2

What You Will Learn...

Main Ideas

1. Roman government was made up of three parts that worked together to run the city.
2. Written laws helped keep order in Rome.
3. The Roman Forum was the heart of Roman society.

The Big Idea

Rome's tripartite government and written laws helped create a stable society.

Key Terms

magistrates, p. 333
 consuls, p. 333
 Roman Senate, p. 333
 veto, p. 334
 Latin, p. 334
 checks and balances, p. 335
 Forum, p. 335

 **HSS 6.7.2** Describe the government of the Roman Republic and its significance (e.g. written constitution and tripartite government, checks and balances, civic duty).

Government and Society

If YOU were there...

You have just been elected as a government official in Rome. Your duty is to represent the plebeians, the common people. You hold office for only one year, but you have one important power—you can stop laws from being passed. Now city leaders are proposing a law that will hurt the plebeians. If you stop the new law, it will hurt your future in politics. If you let it pass, it will hurt the people you are supposed to protect.

Will you let the new law pass? Why or why not?

BUILDING BACKGROUND Government in Rome was often a balancing act. Like the politician above, leaders had to make compromises and risk the anger of other officials to keep the people happy. To keep anyone from gaining too much power, the Roman government divided power among many different officials.

Roman Government

When the plebeians complained about Rome's government in the 400s BC, the city's leaders knew they had to do something. If the people stayed unhappy, they might rise up and overthrow the whole government.

To calm the angry plebeians, the patricians made some changes to Rome's government. For example, they created new offices that could only be held by plebeians. The people who held these offices protected the plebeians' rights and interests. Gradually, the distinctions between patricians and plebeians began to disappear, but that took a very long time.

As a result of the changes the patricians made, Rome developed a tripartite (try-PAHR-tyt) government, or a government with three parts. Each part had its own responsibilities and duties. To fulfill its duties, each part of the government had its own powers, rights, and privileges.

Appendix D: Demographics Measure

Please complete the following questions:

Grade Level:

- a) 5th
- b) 6th

Gender:

- a) female
- b) male

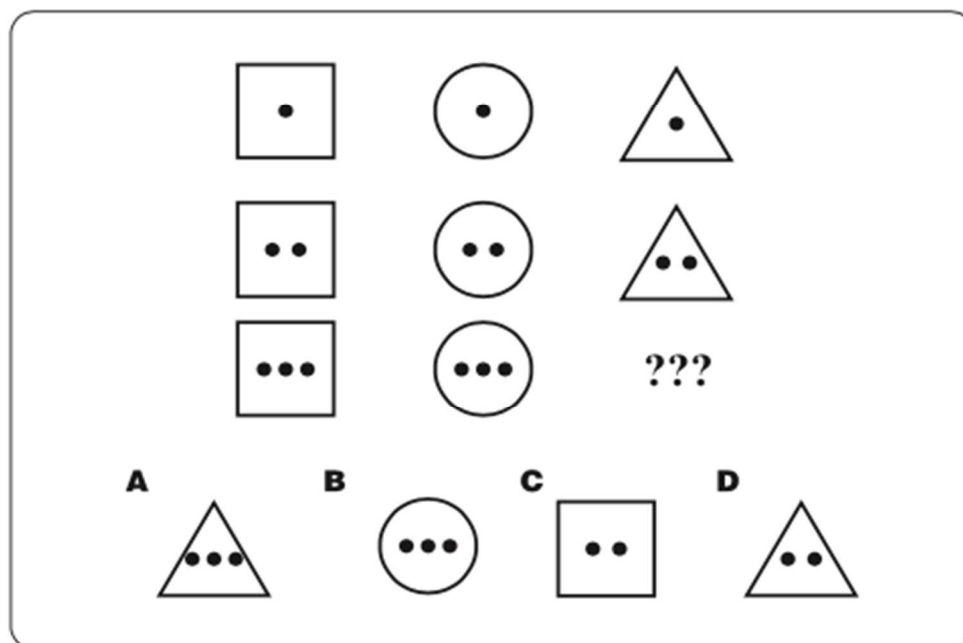
Ethnicity (mark all that apply)

- a) African American/Black
- b) American Indian
- c) Asian/Pacific Islander
- d) Caucasian/Non-Hispanic White
- e) Hispanic
- f) Other (Please Specify):

Appendix E: Sample Items from the Test of Relational Reasoning, Junior

ANALOGY SCALE

Directions: Below is a pattern that is not yet complete.
Select the shape below that completes the pattern.

Sample 1

ANOMALY SCALE**Directions:**

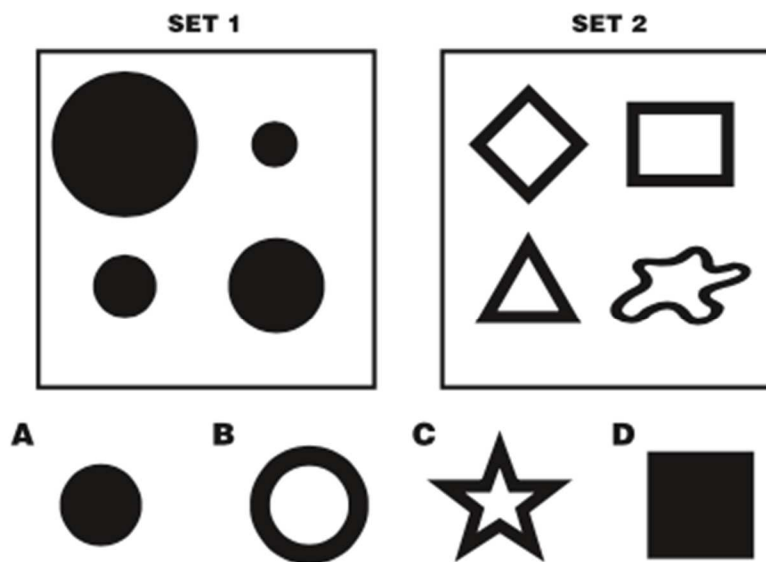
Select the shape below that does *not* belong.

Sample 1**A****B****C****D**

ANTINOMY SCALE

Directions:

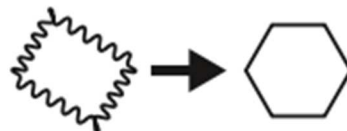
Select the shape below that could *only* be a member of Set 1, *not* Set 2.

Sample 1

ANTITHESIS SCALE

Directions:

Select the shape below that is the *opposite* of the given process.

Sample 1**GIVEN****A****B****C****D**

Appendix F: Topic Knowledge Assessment

Directions: Choose the letter of the response that best answers the question.

- 1) An *aqueduct* is a...
 - a. channel used to carry water
 - b. column used to hold up ceilings
 - c. building used for sporting events
 - d. material used to build structures
- 2) In architecture, the definition of a *vault* is...
 - a. A building built almost 2,000 years ago
 - b. Arches that support the roof of a building
 - c. A large, open room that holds many people
 - d. Walls decorated with ancient Roman mosaics
- 3) The term *satire* refers to writing that...
 - a. tells the history of a people
 - b. expresses deep emotions
 - c. informs the masses
 - d. makes fun of a group
- 4) Which of the following was inspired by Roman law?
 - a. statutory law
 - b. civil law
 - c. tort law
 - d. criminal law
- 5) Which of the following statements accurately describes Galen?
 - a. He was born in the Roman Empire
 - b. He described the valves of the heart
 - c. He was the founder of geometry
 - d. He developed a new writing system
- 6) Whose idea inspired Roman art and architecture?
 - a. Phoenicians
 - b. Greeks
 - c. Shiites
 - d. Celts

- 7) Which author wrote the *Aeneid*?
- a. Ovid
 - b. Cicero
 - c. Hannibal
 - d. Virgil
- 8) Which language came from Latin?
- a. German
 - b. Russian
 - c. Greek
 - d. Romanian

Directions: Write a paragraph to answer each of the following questions.

- 1) Describe two ways in which the Romans' contributions to science and engineering differ from the Greeks.
- 2) Explain how Roman law influenced the laws of other countries.
- 3) The Romans made several contributions to science, literature, and law. Of the contributions discussed in the text, which do you consider to be most important? Justify your response with information from the passage.

Appendix H: Rubric for Short Constructed Comprehension Questions

	0	1	2
Question 1	No answer is provided, the answer is off topic, or is incorrect	Answer discusses Romans, but not Greeks, or is only partially correct.	Answer accurately contrasts Greeks and Romans
Question 2		Answer explains civil law, but does not explain how it spread.	Answer states that Romans set the foundation for civil law, and that it spread to other countries in Europe, as well as Africa and Asia.
Question 3		Provides a justifiable answer, but does not support response with evidence from the text.	Provides a justifiable answer and supports response with evidence from the text.

Appendix I: Mobilization Lesson Plan and Materials

Day 1

Do Now: Write down everything that you know about cups.

Introduction:

Define mobilization – when you share everything you know about a topic.

Cup activity: Display cup worksheet

- What cups have you used before? In what situations?
- After discussion – what did you learn about cups from hearing your classmates discuss them?

Guided Practice:

Landmarks: Show pictures of U.S. landmarks

- Pick 1 or 2 pictures as a class – what do you know about these landmarks?
- Then pick 1 or 2 to discuss with a partner – then discuss as a class

Connect to reading...

- How might mobilizing your knowledge be helpful?
- Specifically, how might mobilizing your knowledge be helpful when reading a text?

Introduce steps for knowledge mobilization

- (1) Before you read – mobilize topic specific knowledge
- (2) Look at headings and pictures – what else do you know about the topic after browsing the headings and pictures?
- (3) During and after reading – What did you learn? How is what you learned different from what you knew before you started reading?

Greece

- (1) What do you know about the topic of ancient Greece?
- (2) Display on LCD projector text on ancient Greece (not the training text – a different chapter). Guide students to look at pictures and headings. What else comes to mind that you might know about ancient Greece?
 - a. Use the text “Geography and the Early Greeks”
- (3) We aren’t going to read the text today, but what have you learned so far about ancient Greece from the headings, pictures, and from your classmates?

Exit Ticket: What are the steps for mobilizing your knowledge?

Day 2

Do now: What does it mean to *mobilize your prior knowledge* when you read? Why might it be helpful to mobilize your knowledge while reading?

Introduction: (5 minutes)
Activating prior knowledge

When you mobilize your prior knowledge, think of what you know about the topic of the text. You can also think about how the topic might be similar to your own life.

Sometimes you will have a lot of prior knowledge, and other times you might have less. It can still be helpful to think about what you know by making connections to the topic.

Example:

Before reading a text about United States history, you might be asked to write down everything you know about U.S. history.

- Declaration of Independence signed in 1776
- 13 original colonies
- Slave trade
- Civil rights movement
- I am part of US history

Solicit ideas for additional examples

Review steps for knowledge mobilization

- (1) Before you read – mobilize topic specific knowledge
- (2) Look at headings and pictures – what else do you know about the topic after browsing the headings and pictures?
- (3) During and after reading – What did you learn? How is what you learned different from what you knew before you started reading?

Guided Practice:

Part 1 (5 minutes)

Write down everything you know about Greece or Greek history...

- Place
- People in Greece speak Greek
- Different alphabet

Solicit ideas for additional examples

Part 2 (10 minutes)

Preview the training text together (with LCD projector)

Let's look at the headings, subheadings and pictures together. What do these subheadings remind you of? What do you already know about these sub-topics?

Part 3 (15 minutes)

Read sections of the text together. Write down what you learned.

Sections include: ***If you were there...***, ***Building Background***, ***The Arts***, ***Statues and Paintings***, ***Greek Architecture***, ***New Forms of Writing***

Independent Practice (15 minutes)During Reading

Continue reading remaining sections on your own. After each section, write down what you learned about the topic.

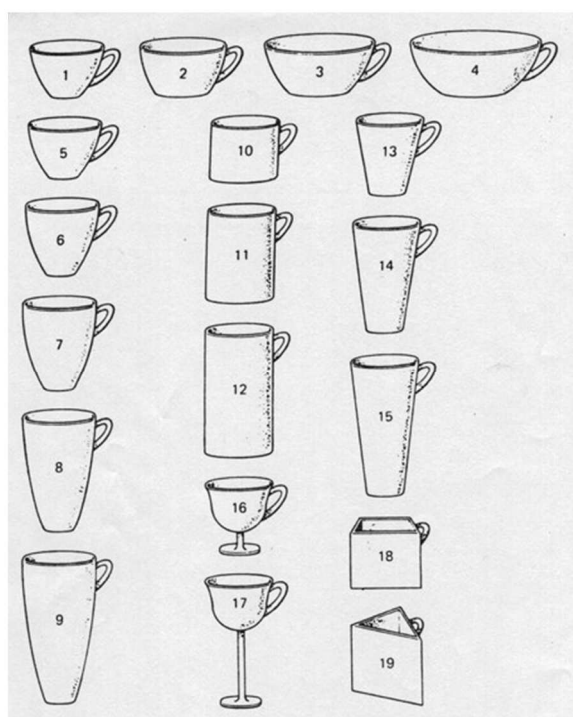
Sections include: ***Philosophy***, ***Socrates***, ***Plato***, ***Aristotle***, ***Science***, ***Mathematics***, ***Medicine and Engineering***

After Reading

Circle the most important facts that you learned during reading.

Reflection: How is what you learned similar to what you already knew? How is it different?

Exit Ticket: To what extent do you disagree or agree that mobilizing your knowledge before and during reading helps you better understand what you read? Circle your response (Likert to 6). Explain your answer.



Pick 2 of the U.S. landmarks below. Work with a partner to list everything you know about the landmarks.

Landmark 1:

Landmark 2:

Statue of Liberty



Liberty Bell



Golden Gate Bridge



Space Needle



U.S. Capitol



Grand Canyon



Appendix J: Relational Reasoning Lesson Plan and Materials

Day 1

Do Now: Draw a picture of a cup.

Introduction

Look at the handout with different cups...

- 1) Circle the cup that is most similar to the cup you drew earlier.
- 2) Put a star * next to the cup that is the most unusual or unexpected
- 3) Put an X on the pictures that you think could never be a cup
- 4) Put a squiggly line next to the the two cups that you think are the most different from each other or “opposites.”

Define relational reasoning and its forms:

Relational reasoning = thinking about how one thing or idea is or is not connected to another thing or idea

Analogy – similar

Anomaly – Unusual or unexpected

Antinomy - Contradiction

Antithesis – Opposite

Relate back to cup activity.

Guided Practice

Landmarks: Show pictures of U.S. landmarks. Solicit answers to questions.

Landmark = object or feature that is easily recognizable

- Which landmarks are most similar to each other?
- Which landmark is the most unusual or unexpected?
- Which landmark do you think could not be a landmark? (not really applicable here)
- Which two landmarks are most opposite of each other?

Connect to reading...

- How might relational reasoning help you?
- Specifically, how might relational reasoning help you when reading a text?

Introduce RR questions

Before reading:

- 1) What have you ever seen, read or heard that might help you understand the topic?

- 2) What about the topic do you think will be different from anything you have seen, read or heard before?

During and after reading:

1. How is the text content **similar** to something you have seen, read, or heard in school or out of school?
2. How is the text content **unusual** or **unexpected** in comparison to something you have seen, read, or heard in school or out of school?
3. What about the text could **not** be seen, read, or heard today?
4. What about the text content is completely **opposite** of something you have seen, read, or heard in school or out of school?

Greece

Before reading:

- 1) What have you ever seen, read, or heard that might help you understand the topic of ancient Greece?
- 2) What about the topic of ancient Greece do you think will be different from anything you have seen, read or heard before?

Display on LCD projector a text on ancient Greece (not training text). Guide students to look at the heading, pictures etc.

Students will not read the text. Instead, browse the text to answer the RR questions above

Exit Ticket:

Provide a one-word definition for each of these words: analogy, anomaly, antinomy, antithesis

How can relational reasoning help you understand a text?

Day 2

Do Now: What is *relational reasoning*? Why might it be helpful to use relational reasoning during reading?

Introduction

Review from yesterday:

One strategy that can help you better comprehend a text is by thinking about how the text relates to something you already know. We call this relational reasoning. This strategy helps you activate your prior knowledge. You can do this before, during, and after you read.

You can think about how the text content is similar to your life, unusual, the opposite of what you already know, or how it could never fit into your own life.

Before reading:

Before reading this text, let's answer the following questions to consider how what we know might be similar or different from the text content.

- 1) What have you ever seen, read, or heard that might help you understand the topic of ancient Greece?
- 2) What about the topic of ancient Greece do you think will be different from anything you have seen, read, or heard before?

During reading:

While we read, we are going to answer these four questions (show graphic organizer):

1. How is the text content **similar** to something you have seen, read, or heard in school or out of school?
2. How is the text content **unusual** or **unexpected** in comparison to something you have seen, read, or heard in school or out of school?
3. What about the text content is completely **opposite** of something you have seen, read, or heard in school or out of school?
4. What about the text could **not** be seen, read, or heard today?

Model reading the first section and answer the questions.

*Sections: **If you were there...**, Building Background,*

Guided practice

Together, read sections of the text. Stop after each section to ask students to respond to the questions.

*Sections: **The Arts**, Statues and Paintings, Greek Architecture, New Forms of Writing*

Independent practiceDuring Reading

Read the following sections of text. Stop after each section to answer the questions.

*Sections include: **Philosophy**, Socrates, Plato, Aristotle, **Science**, Mathematics, Medicine and Engineering*

After Reading

When finished, solicit answers from students.

Exit Ticket: To what extent do you disagree or agree that using relational reasoning during reading helps you better understand what you read? Circle your response. (Use Likert Scale). Explain your answer.

The Arts

How is the text content similar to something you have seen, read, or heard in school or out of school?	How is the text content unusual or unexpected in comparison to something you have seen, read, or heard in school or out of school?
What about the text content is completely opposite of something you have seen, read, or heard in school or out of school?	What about the text could not be seen, read, or heard today?

Appendix K: Text Annotation Lesson

Day 1

Do Now: What does it mean to annotate a text? How might annotating a text help you comprehend what you read?

Introduction:

Reintroduce text annotation

1. GAP (genre, author's purpose, prediction)
 - a. Pay close attention to the title and the first line
2. #hashtag summary for every paragraph
 - a. Underline evidence that support the #hashtag you created
3. Circle unknown vocabulary and use a squiggly line to identify context clues.
4. End with an OSS

Guided Practice

You teach me to annotate a paragraph (Use text on Empire State Building - not training text). Do this together on LCD projector

Independent Practice

Annotate Empire State building text by self.

Partner work: Swap your annotation with a partner. Provide feedback for your partner on text annotation.

Exit ticket: Why might annotating a text be useful?

Day 2

Do Now: What are the steps for annotating a text?

Introduction

Reintroduce text annotation

1. GAP (genre, author's purpose, prediction)
 - a. Pay close attention to the title and the first line
2. #hashtag summary for every paragraph
 - a. Underline evidence that support the #hashtag you created
3. Circle unknown vocabulary and use a squiggly line to identify context clues.
4. End with an OSS

Model reading the first section and annotate text

*Sections: **If you were there...**, Building Background*

Guided Practice

Together, read sections of the text and annotate.

*Sections: **The Arts**, Statues and Paintings, Greek Architecture, New Forms of Writing*

Independent Practice

Read and annotate the text.

*Sections include: **Philosophy**, Socrates, Plato, Aristotle, **Science**, Mathematics, Medicine and Engineering*

Extra time? Answer the comprehension questions at the end of the chapter.

Exit Ticket: To what extent do you disagree or agree that annotating a text helps you better understand what you read? Circle your response (Use Likert Scale). Explain your answer.

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