ABSTRACT

Title of Document: ENGAGEMENT AS A MEDIATOR OF THE ASSOCIATIONS AMONG EXPECTANCIES AND VALUES FOR READING AND READING OUTCOMES.

Jenna Cambria, Doctor of Philosophy, 2014

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Previous research studies have shown that cognitive engagement could be included in the Eccles et al. (1983) expectancy-value model as the indirect means, or mediator, by which motivational influencers drive achievement (e.g., Greene et al., 2004; Hardré et al., 2007; Skinner et al., 2008). To explore the associations between values, expectancies, cognitive engagement and reading performance, I conducted a study with 1197 seventh graders. Values, expectancies, and cognitive engagement were measured using survey data. Performance was measured using the informational text comprehension test (ITC) and Reading/Language Arts grades. The main finding of this study was that cognitive engagement was a significant mediator of both expectancies and values with reading performance. Guthrie et al. (2012) discussed

how reading requires effort and attention. Expectancies and values partially drive engagement, which is to say, they initiate engagement and not that motivation stops when a student becomes engaged in a task. When reading is valued and students believe they can be successful, students will be persistent and put in effort in deducing meaning from passages, like the ITC test. If students are more motivated, they will put in more effort and will result in better Reading/Language Arts grades.

As discussed, the indirect effects of values and expectancies, and the direct of values, expectancies, cognitive engagement, and demographic controls were the same across the ITC and Reading/Language Arts grades. One exception to this association was the effects of gender and race on the reading outcomes. For gender, girls had higher grades than boys, but boys and girls did the same on ITC. This finding replicated previous research that males and females do not differ on standardized tests at this age and girls often perform better in Reading/Language Arts grades, which are typically seen as favoring females than do other classes such as mathematics (Banks & Banks, 2010). For race, there was no difference in performance in Reading/Language Arts grades, but there was a race difference on ITC. From an expectancy-value framework, mediation may mean that through engagement, expectancies for success and values may be actualized into achievement.

ENGAGEMENT AS A MEDIATOR OF THE ASSOCIATIONS AMONG EXPECTANCIES AND VALUES FOR READING AND READING OUTCOMES.

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By

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Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2014

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Dedication

For Mom, Dad, Juliana, Alyssa, Ethan,
and Ella

Acknowledgements

First and foremost I would like to thank my family for their love and support. I am very grateful for to my father who has taught me the importance of hard work and perseverance. I also would like to acknowledge mother for her encouragement, nurturing nature, and support. Their hard work has opened many doors for me. I have also been blessed with the most loving and caring sister and brother that I could ask for. I especially would like to thank my sister, Sara, for being my confidante and sending me funny video messages of my adorable Godchildren when school got a bit stressful. My brother, Anthony, has shown me unconditional love and has been a constant source of laughter in my life. He has truly been a rock for me. I am also grateful for Samantha for her kind and calming nature during this process. I am exceptionally grateful to my two younger cousins, Juliana and Alyssa, for putting me on a pedestal. I take the special role you have given me in your life seriously and knowing that you are looking up to me has made me make better decisions than I might have otherwise. I hope to always make you proud.

I would also like to thank my dissertation committee for their suggestions that have strengthened my project. This project would not have been possible without the guidance of my advisor, Dr. Allan Wigfield. He has taught me the fundamentals of research that I will take with me throughout my career. I also would like to acknowledge Dr. John Guthrie for his support and encouragement during my years working on the REAL project and teaching me how to write items and collect data in schools. Dr. Jean Dreher has shown me the importance carefully

conceptualizing my project. Dr. Patricia Alexander was one of my first teachers at Maryland and has always encouraged me to think deeper and further about my research questions. Finally, Dr. Ann Battle has been an invaluable support in my dissertation, teaching, and with career advice.

I would also like to acknowledge Marguerite Tom-Wigfield, Ellen Kaplan, and Eileen Kramer for being a source of motherly support while I am hundreds of miles from home. My mother and I both feel so blessed that I have you in my life. Your warmth and support throughout my time at Maryland has made a difference for me. I will carry the lessons I learned from you with me.

I would also like to thank my colleagues at the University of Maryland Assessment Office as well as the Center for Educational Sciences and Psychology at the University of Tübingen. I would like to acknowledge Kathy Angeletti, Lisa Brown, Dawn Sherman, Derrick Morton, Roderick Carey, Laura Yee, Christopher Cooks, Ulrich Trautwein, Benjamin Nagengast, Anna-Lena Dicke, Barbara Flunger, Hanna Gaspard, Brigitte Schreier, and Isabelle Haefner. I have learned important lessons in data analysis and advocating for students during my work at these centers.

My friends have also been a wonderful source of support in this process. I would like to acknowledge my friends Nicole Denmark, Jennifer McInerney, Elaine Mullally and Alexis Williams. Nicole has been a wonderful source of calm and laughter throughout my time at Maryland. I cannot imagine a better friend than her. Jennifer has been a constant in my life since I was 12 years old. From the daily trips to Dunkin Donuts as soon we got our licenses to standing at the alter at her wedding to making messy pies in her kitchen, I am blessed to call her my friend. Elaine is the

most considerate and supportive friend I could ask for. She has been there to give me whatever I needed at the time, whether it is soup when I am sick, a fun night out, or just a friend to talk to. Alexis holds a place in my life that no one else can fill and I am so lucky to have a lifelong friend in her. Finally, I thank my roommates on Oglethorpe Street: Devree Lewis, Jaime Ibacache, Beth Thompson, and Courtney Lefebvre in engaging me in all night discussion, baking parties, and laughter. Their faith in me has helped to push me forward in this process.

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Chapter 1: Introduction

As most school teachers can agree, students differ greatly from one another in the extent to which they value and expect to be successful in reading. Indeed, there is a common belief that students who value and expect to be successful in reading will likely outperform students with lower reading values and expectancies for success. Furthermore, there is a body of research that has been based on the premise that students who report higher academic motivation tend to outperform students who report lower valuing and expectancies for success (e.g., Eccles et al., 1983; Eccles & Wigfield, 2002; Trautwein, Nagengast, Marsh, Gaspard, Dicke, & Lüdtke, 2013; Watt, 2004; Wigfield, Byrnes, & Eccles, 2006; Wigfield & Eccles, 2000; Wigfield & Guthrie, 1997). However, these associations do not explain if believing in the value of reading and expecting to do well will increase performance in reading or is there is a third mitigating variable that mediates these associations.

Educational psychologists have become increasingly interested in the role of engagement because of its relations with motivation, achievement, and other important outcomes such as student drop out (Eccles & Wang, 2012; Pekrun & Linnenbrink-Garcia, 2012; Reeve, 2013; Schunk & Mullen, 2012;). This work has shown positive correlations between the constructs and some have begun to discuss engagement as a mediator of values and expectancies with achievement (Eccles & Wang, 2012). In this study, I examined the role of engagement in mediating the association between values and expectancies and reading performance.

There are two primary literature bases in which work on engagement can be grouped (Eccles & Wang, 2012). One group of literature is based in the field of

achievement motivation and the other in school dropout (Eccles & Wang, 2012). The research that emerges from these two perspectives seems aimed at understanding and increasing student engagement. The research on school dropout often has a focus on students in at-risk populations and a goal of reducing school absenteeism and ultimate dropout rate (Finn, 1993; Finn, Pannozzo, & Voelkl, 1995; Finn & Rock, 1997). Although there is an overlap between the two areas, work on engagement within the achievement motivation field has focused on a broader sample of students and is often concerned with increasing engagement in order to ultimately impact performance outcomes and a variety of academic decisions, such as course selection.

There has also been an effort by researchers in the achievement motivation field to define different facets of student engagement, particularly within the frameworks proposed by Jennifer Fredricks (Fredricks, Blumenfeld, Friedel, & Paris, 2005; Fredricks, Blumenfeld, & Paris, 2004) and Ellen Skinner (Furrer & Skinner, 2003; Skinner, Kindermann, Connell, & Wellborn, 2009; Skinner, Kindermann, & Furrer, 2008). In terms of broad definitions, Skinner (Skinner et al., 2008) defined engagement as the harnessing of student motivation, while Fredricks et al. (Fredricks et al., 2004; Fredricks et al., 2005) have defined engagement as a malleable metaconstruct related to motivation and achievement that reflects multiple facets of students' commitment to academics and the school broadly. Fredricks et al. (2004) argued that engagement has affective, behavioral, and cognitive facets. Affective or emotional engagement is described as the emotions that are felt in school, often in reaction to the quality of relationships with peers, teachers, or principals, and the feelings that go along with relative identification or allegiance with school. Behavioral engagement is often described as positive conduct,

participation in classroom or school activities, behavioral effort or behavioral persistence. Fredricks et al. (2004) described cognitive engagement as including preference for challenge, cognitive effort, cognitive persistence, self-regulation or strategy use. Skinner and her colleagues defined engagement as an outcome of motivation and have also described multiple types of engagement including emotional engagement, emotional disaffection, behavioral engagement and behavioral disaffection (Furrer & Skinner, 2003). Disaffection refers to the alienation or enervation of engagement. Skinner has not discussed a cognitive component; instead, she has included behavioral and affective aspects as influencers on self-regulation and does not include cognitive engagement in the model (Skinner, Kindermann, & Furrer, 2008). Engagement researchers from the achievement motivation tradition have included all or some of these categories in their work (e.g., Appleton, Christenson, Kim, & Reschly, 2006; Wang, Willett, & Eccles, 2011).

Cognitive engagement was the central aspect of engagement examined in this dissertation. Cognitive engagement is likely a particularly relevant type of engagement when focusing on reading because it refers to the "thoughtfulness and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills" (Mahatmaya, Lohman, Matjasko, & Farb, 2012, p. 47). Therefore, cognitive engagement is likely important for decoding meaning, understanding main concepts, and drawing inferences from text. Eccles and Wang (2012) have stated that decreased cognitive engagement, "such as regulating attention and effort [to connect] new information to existing knowledge is likely to reduce the students' academic performance and educational aspiration" (p. 38). Thus, cognitive engagement is an important construct on

which to focus in the study of reading. Since this study is designed to examine the theoretical implications of expectancy-value theory I will next discuss expectancy-value theory.

Expectancy-value Theory

Eccles and her colleagues (Eccles et al., 1983; Eccles & Wigfield, 2002) developed an expectancy-value model of motivation and have studied the model's relevance for understanding to the underpinnings of engagement and performance. In this model, achievement is influenced by the person's perceived value for the task and his or her expectancies regarding performance on the task. In the model, values and expectancies are influenced by the cultural milieu, socializers' (such as parents, teachers or friends), beliefs and behaviors, the aptitude of the student, the student's previous achievement-related experiences, perceptions, interpretations of experiences, goals and self-schemata, and affective memories of previous experiences related to the task. These factors impact how important, useful, enjoyable, or costly a task may seem for the individual. Although the constructs that influence expectancies and values are important for the study of reading motivation, this study focused on students' expectancies and values because they are direct predictors of achievement (Eccles et al., 1983; Wigfield, Tonks, & Klauda, 2009).

Expectancy-value theory has often been studied with respect to student achievement and development over time (Durik, Vida, & Eccles, 2006; Eccles & Wigfield, 2002; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Simpkins, Davis-Kean, & Eccles, 2006; Wigfield & Eccles, 2000). Expectancy-value researchers have shown consistent relations of these variables to various achievement outcomes including

grades (Selkirk, Bouchey, & Eccles, 2011), test performance (Valenzuela, Nieto, & Saiz, 2011), amount and breadth of reading (Wigfield & Guthrie, 1997), and course selection (Watt, 2004). Expectancies for success and task valuing are central to a study of reading performance because these constructs are reliable predictors of reading performance (Durik, et al., 2006; Gambrell, 2011; Guthrie, Klauda & Ho, 2013; Meece & Miller, 1999; Watkins & Coffey, 2004).

Individuals' task values influence their decisions about whether they will take part in a task and how much effort they will put into completing it. (Eccles et al., 1983; Eccles, & Wigfield, 2002; Wigfield & Eccles, 2000). Task values have been defined in four ways: attainment, utility, intrinsic, and cost. Attainment value is viewed as the extent to which completing the task reinforces some salient aspect of the individual's self-understanding or identity. Utility value is defined as the extent to which the person believes that task completion will be useful in terms of accomplishing future goals or aspirations. Intrinsic value refers to performing a task because it is inherently interesting, enjoyable, or fun for the individual. Cost is often referred to as the perceived time or opportunities lost because the individual chose one task or activity over another. A more detailed discussion of these terms will follow in Chapter 2.

Expectancies for success are students' ideas about how well they will perform on a task or their ideas about how a given action will result in a given outcome (Eccles et al., 1983; Wigfield & Eccles, 2000). Wigfield and Eccles (2000) defined expectancies as "beliefs about how well they will do on upcoming tasks, either in the immediate or longer term future" (Wigfield & Eccles, 2000, p. 70). Expectancies and values have uniquely explained variance in student achievement and activity choice (Bembenutty, 2009; Gao &

Xiang, 2008; Turner & Schallert, 2001). (For an in-depth discussion of expectancy-value theory, see Eccles et al., 1983, Eccles & Wigfield, 2002, and Wigfield et al., 2009).

With respect to children's valuing of reading, Wigfield, Cambria, and Ho (2012) reviewed and discussed the associations between reading values and reading outcomes. For instance, they described a study by Durik et al. (2006) which demonstrated that intrinsic value in Reading/Language Arts fourth grade predicted the amount of leisure reading in which high school students engaged. Furthermore, attainment value for reading in the fourth grade predicted English course choice in 10th grade and career choices in which reading was emphasized in Grade 12. Other studies have found that reading values are direct predictors of informational text achievement for readers in general and also for struggling readers (Wigfield et al., 2012; Wigfield, Klauda, & Cambria, 2012). Expectancies for success in reading are also predictive of reading achievement (Marinak & Gambrell, 2010).

As educational researchers have discussed, expectancies and values are likely related to persistence during challenging parts of a task and helps students use different strategies that will ease them over individual hurdles (Eccles & Wang, 2012; Greene, Miller, Crowson, Duke, & Akey, 2004; Hardré, Crowson, Debacker, & White, 2007; Pintrich & DeGroot, 1990; Wolters & Pintrich, 1998; Wolters, Yu, & Pintrich, 1996). Students who feel that they will ultimately be successful will believe their efforts are a good use of time are theoretically expected to engage in a task. Alternatively, students who do not expect to be successful by may give up more easily and would not be expected to engage in a task. Similarly, if a student values a task, they are likely to persist and think creatively about how to complete the task and perform at a higher level

(Hardré et al., 2007; Hong et al., 2009; Pintrich & DeGroot, 1990; Pintrich & Schrauben, 1992; Sungur & Tekkaya, 2006; Wolters & Pintrich, 1998).

Previous researchers have found that engagement is positively associated with higher achievement across subjects (Bembenutty, 2009; Betts, 2012; Cambria et al., 2010; Cambria & Guthrie, 2010; Fredricks & McColskey, 2012; Fredricks et al., 2004; Greene et al., 2004; Guthrie, al., 2012; Liem et al., 2008; Lutz, Guthrie, & Davis, 2006; Newmann et al., 1992; Pintrich & DeGroot, 1990). Specifically for reading, cognitive engagement is positively associated with more reading (Wigfield, 1997).

Based on the established positive associations between expectancies for success and values with academic performance in areas such as reading, it is possible that cognitive engagement may be inserted into the expectancy-value model as the indirect path, or mediator, by which these expectancies for success and values drive achievement. Researchers such as Skinner (Furrer & Skinner, 2003; Skinner, Kindermann, Connell, & Wellborn, 2009; Skinner, Kindermann, & Furrer, 2008) and Wang and Eccles (Eccles & Wang, 2012; Wang, et al., 2011) have laid a theoretical and empirical foundation on which to base such a mediation study. Previous research has shown that motivations predict engagement and performance and that engagement also predicts performance, but there is not a clear body of research that makes clear links among these constructs. This research will be discussed further in Chapter 2.

In addition, children's motivational beliefs and values become more stable during middle school (Gottfried, Fleming, & Gottfried, 2001). This means that children whose expectancies and values regarding reading are positive are more likely to maintain these positive attributes, and children whose beliefs and values for reading are negative also are

more likely to continue to hold these negative views of reading. These beliefs then likely lead to disparate levels of cognitive engagement in reading, resulting in gaps in performance, and confirmation of positive or negative beliefs through lower reading performance. Middle school was chosen as an important time to study the processes by which in students' expectancies and values relate to their engagement, and ultimately students' reading achievement.

Reading

Another aspect of this study was to focus on reading performance both in school and in comprehending informational text. In the achievement motivation literature, there is a great deal of research in several academic domains including reading (e.g., Durik et al., 2006; Gambrell, 2011; Guthrie et al., 2013; Meece & Miller, 1999; Watkins & Coffey, 2004), and mathematics (e.g., Wang, 2012). However, for this study reading achievement was chosen as a focus because students in the United States continue to perform below satisfactory levels on national reading tests (National Assessment of Educational Progress, 2006; 2009).

Major governmental and nonprofit organizations such as the Department of Education, the Bill and Melinda Gates Foundation, and Alliance for Excellent Education have collectively contributed billions of dollars each year to fund a variety of projects designed to increase children's reading scores, but 67% of adolescents in the United States continue to read below the proficient level (National Assessment of Educational Progress, 2009). This statistic is troubling for educators and parents as well as from a larger societal perspective. The larger social impact is that low reading performance is strongly related to high school dropout, unemployment, and poverty (Fleishman, 2004).

The ability to derive factual knowledge through reading is a mandatory skill for a successful student. Informational textbooks continue to dominate science, math, history, and other subject areas, and these texts demand basic reading skills, as well as higher-order reasoning and comprehension (Guthrie & Klauda, 2012). Further, there are specific requirements for informational texts listed within the most recent Common Core State Standards Initiative (National Governors Association Center for Best Practices, 2012). Consequently, there have been several informational texts reading comprehension interventions designed to increase motivation and performance in informational book reading (e.g., Baker et al., 2011; Caverly &Mandeville, 1995; Guthrie et al., 2004;). Therefore, the association between motivation for information text and performance is important to examine.

Terminology

Broad definitions of terms such as reading and motivation are useful and commonplace for those taking part in policy discourse and communication about educational issues; however, when the goal is to compare findings as concretely as possible, such broad terminology will not lead to a clear comparison of psychological constructs (Eccles & Wang, 2012). Thus, in order to situate appropriately this study into that of the larger reading motivation research field it is necessary to clearly define what is meant by informational text. Researchers have defined informational text in a variety of ways (Maloch & Bomer, 2013. In this study informational text is used synonymously with nonfiction. Baker et al. (2011) specified informational text as including "narrative-informational, expository, and mixed texts" (p. 201). The define narrative informational text as those that use "a story or narrative format to convey factual information" and

expository text as "reports, using text structures such as cause and effect, comparison and contrast, sequence, description, and problem and solution" (p. 201). Finally, Baker et al. (2011) define mixed texts as "dual-purpose, blended, or hybrid texts, mix narrative and expository writing in the same texts" (p. 201). This definition of informational text will be used in this dissertation because it best describes the collection of trade books that were used during the intervention.

This study focused on two reading outcomes: informational text comprehension and Reading/Language Arts grades in school. Each of these described different aspects of reading performance that are important to consider. Grades may become increasingly important as students move through middle school and potentially apply for competitive high schools and offer a different perspective than informational text test performance because they reflect outcomes students receive on a variety of assignments that are given over a period of time. Additionally, exploring both test and classroom performance provides a more complete picture of different aspects of students' reading performance. Some research has also shown that comprehension test scores are more associated with IQ than grades (Neisser, 1997). For this reason, grades may be more associated with malleable psychological constructs, such as motivation and engagement. Finally, from a measurement perspective, tests are typically on an interval scale while grades are on an ordinal scale and having two different and separate models would show more generalizable results for mediation across types of outcomes and different types of models.

In this study, I tested the extent to which cognitive engagement mediated the associations between students' expectancies for success in, and task valuing for reading

and reading performance outcomes. Based on the established correlations between expectancies for success and values, engagement, and performance (e.g., Cleary & Zimmerman, 2012; Eccles & Wang, 2012; Reeve, 2013; Schunk & Mullen, 2012) it was expected that cognitive engagement would mediate relations of value and expectancies with reading performance in middle school.

Key Terms

Emotional engagement – Emotional involvement in school, often assessed as affective reactions or belongingness (Fredricks et al., 2004)

Behavioral engagement – Behavioral involvement in school, often assessed as participation

Cognitive engagement – "Thoughtfulness and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills" (Mahatmaya, Lohman, Matjasko, & Farb, 2012, p. 47).

Expectancies for success – "beliefs about how well they will do on upcoming tasks, either in the immediate or longer term future" (Wigfield & Eccles, 2000, p. 70)

Engagement – A multifaceted construct that incorporates a students' emotional, behavioral, and cognitive involvement (Fredricks et al., 2004)

Informational text – "narrative- informational, expository, and mixed texts" (p. 201). Narrative informational text are defined as those that use "a story or narrative format to convey factual information", expository text as "reports, using text structures such as "cause and effect, comparison and contrast, sequence, description, and problem and solution" and mixed texts as "dual-purpose, blended, or hybrid texts, mix narrative and expository writing in the same texts" (Baker et al., 2011, p. 201).

Reading achievement – Reading grades or test scores

Reading motivation – "An individual's personal goals, values, and beliefs with regard to the topics, processes, and outcomes of reading" (Guthrie & Wigfield, 2000, p. 405)

Reading Values – "how a task meets the needs of individuals" specifically with respect to reading (Wigfield, 1994, p.52)

Chapter 2: Literature Review

This dissertation was designed to test the extent to which cognitive engagement is a mediator of the associations between values and expectancies with reading outcomes. Researchers using the expectancy-value framework have established the association between motivation and achievement (Wigfield & Eccles, 2000; Eccles & Wigfield, 2002) and have discussed engagement as related to this association, but there is little explicit work examining the extent to which cognitive engagement might mediate the associations between expectancies and values with performance (Eccles & Wang, 2012). In this chapter, I will review relevant theory and I will discuss the relations between expectancy-value constructs, and related constructs, with performance and comment on how cognitive engagement may fit into a model of expectancies, values, and performance.

As was discussed in Chapter 1, Eccles and her colleagues (Eccles et al., 1983; Eccles & Wigfield, 2002) developed an expectancy-value model of motivation and have defined motivation as the values, beliefs, and goals that drive academic achievement (Wigfield & Eccles, 1992). As was briefly reviewed in Chapter 1 and can be seen in Figure 1, according to the expectancy-value model, achievement is driven by the individual's subjective task values and his or her expectancies regarding how well he/she will perform on the task. These values and expectancies are influenced by the cultural milieu, socializers' beliefs and behaviors (such as parents, teachers or friends), the aptitude of the student, the student's previous achievement-related experiences, perceptions, interpretations of experiences, goals and self-schemata, and affective memories of previous experiences related to the task.

Expectancy-value theory is a prominent motivational theory in educational and developmental psychology and has been used by researchers ro examine the development of achievement motivation and its connection with performance. Expectancies for success are defined as "beliefs about how well [individuals] will do on upcoming tasks, either in the immediate or longer term future" (Wigfield & Eccles, 2000, p. 70). Wigfield (1994) defined task values as "how a task meets the needs of individuals" (p.52). Wigfield and Eccles and their colleagues have defined different kinds of task values (Eccles et al., 1983; Eccles & Wigfield, 2002); these are attainment, intrinsic, utility and cost. Attainment value refers to the beliefs about the importance of a task as it relates to the individual's identity or their sense of self. Intrinsic value, sometimes referred to as interest, is concerned with the inherent enjoyment that an individual feels from performing a task. Utility value is sometimes referred to as usefulness and is concerned with how a task is perceived to fit into the person's future goals. The example that Wigfield and Cambria (2010) offered for a task with utility value is taking a class to fulfill a degree requirement. Cost refers to perceptions of what an individual loses or has to give up in order to complete a task. For instance, one might not be able to spend time with friends in order to study for a test.

Expectancy-value theory was chosen as the theoretical grounding for this study for several reasons. First, the expectancy-value model has clear task value components that have been validated across domains and countries (e.g., Trautwein et al., 2012; Wigfield, 1994) Expectancy-value theory also provided a useful framework in which to study in conjunction with engagement in the larger model because it encompasses

psychological, social, and cultural determinants, as well as theoretical and empirical outcomes (Eccles et al., 1983; Eccles & Wigfield, 2002).

Furthermore, over the past 20 years, there has been increased research on how expectancies and values may relate to engagement, particularly cognitive engagement, and a central construct in this study. Wigfield & Eccles (2000) stated that "expectancies and values are assumed to influence directly achievement choices" (p. 69), but did not explicitly explain where engagement would fall in the expectancy-value model. This gap in the expectancy-value model brings into question the extent to which expectancies and values are indeed direct predictors of achievement or whether their connection is mediated by another construct, such as cognitive engagement. Engagement may be useful to place in the expectancy-value model because it may be the process by which task values and expectancies are actualized into performance.

Distinguishing Motivation and Engagement

The distinction between motivation and engagement has been discussed in the achievement motivation literature. Fredricks et al. (2004) explicitly discussed the distinction between motivation and engagement as different constructs, and were critical of work that used these terms interchangeably. They specified that motivation work has much more fine-grained distinctions and nuances among constructs than typically occurring with engagement. They also critiqued the *Engaging Schools* (National Research Council & Institute of Medicine, 2004), a report that used motivation and engagement interchangeably. In their view, the use of motivation and engagement terminology interchangeably appeared to be an inappropriate because motivation theories

often include much more specific subconstructs, and typically, studies of engagement have not broken down into subconstructs until recently.

Wigfield and Guthrie (2010) have also commented on this debate within the domain of reading. They concur that engagement and motivation are indeed separate, but related, psychological constructs, and therefore synonymous treatment of these terms is incorrect. Specifically, Wigfield and Guthrie (Guthrie & Anderson, 1999; Wigfield & Cambria, 2010; Wigfield & Guthrie, 2010) have defined motivation as academic values, beliefs, and goals that drive performance-related activities and Skinner and Pitzer (2012) described engagement as the "manifestation" of motivation. Wigfield and Guthrie (2010) defined engagement as "interacting with text in ways that are both strategic and motivated" (p. 464). They described engagement as a multidimensional construct that is motivated, cognitively and behaviorally strategic, socially interactive, and necessary to build knowledge from text.

It is important to separate motivation and engagement because both constructs are already broad ideas and to use them synonymously would create problems for comparing results across studies. Furthermore, by combining motivation and engagement into one construct, there is no room to understand how they might be related in terms of correlation, in terms of causal order, or if they occur simultaneously. In this dissertation, I also take the perspective that many achievement motivation researchers have taken (e.g., Eccles & Wang, 2012; Skinner & Pitzner, 2012; Wigfield & Guthrie, 2012), that motivation and engagement are indeed separate.

Defining and Measuring Cognitive Engagement

Fredricks et al. (2004) described engagement as a "meta construct" that unites three related parts: cognitive, behavioral, and affective engagement and defined engagement as commitment or investment in one of these three facets, which share conceptual and empirical overlap. Behavioral engagement is defined as positive conduct in school, participation or involvement in school activities (sports teams, in class activities, etc.), and is positively associated with achievement. Emotional or affective engagement is described as the varying emotions that students feel in regard to school and people at school (peers, teachers, principals, etc.), and is associated with an allegiance or commitment to the academic institution and a desire to work hard. Fredricks et al. (2004) described cognitive engagement as the effort, strategy use, and time invested in completing tasks.

Much of the definitions and measurements of engagement are not only inconsistent within the field, but also inconsistent across studies performed by the same research group. For example, Eccles and Wang (2012) argued that value is better suited as a motivational construct. In two recent articles , however, value was used as an indicator of emotional engagement (Wang & Eccles, 2011; 2012b)., In another recent article, emotional engagement was operationalized as identification with school and value was used as an indicator of cognitive engagement. These differences make findings across studies difficult to interpret. A similar instance was discussed by Wang et al. (2011), in which Garcia-Read (2007) reported that positive peer relationships predicted emotional engagement. Particularly in this scenario, one type of indicator of emotional engagement is described as a predictor of another type of emotional engagement. Since

positive peer relationships have also been a reported indicator of emotional engagement by Fredricks and colleagues (2004), it is clear that properly defining, measuring, and interpreting will be crucial. Although the researchers reviewed have published important work on this topic, consistency will be important to move the field forward and allow clear interpretation of results. For the purpose of this dissertation, values will remain a construct of expectancy-value theory, not of engagement theory, in following the important distinction made by Betts (2012) who described motivation (e.g., values) as setting the stage for involvement, but is not involvement itself.

In this dissertation, I focus on cognitive engagement because previous researchers have reported that it is a more powerful predictor of achievement outcomes than emotional and behavioral engagement (Fredricks et al., 2004; Mahatmaya et al., 2012). Also, Fredricks and McColskey (2012) reported that many studies have examined behaviors and emotions, so including an aspect of cognitive engagement would be a useful addition to the field. Further, expectancy-value researchers have described how expectancies and values lead to effort and persistence (Wigfield & Eccles, 2000). This has laid a foundation in which to examine expectancy-value constructs with students' beliefs about effort and persistence in a cohesive model to predict performance. Finally, including multiple forms of engagement may lead to a problem of multicollinearity in which psychometric properties are misleading because of a high correlation among engagement constructs.

Below are the various definitions that Fredricks et al. (2004) have included for cognitive engagement.

Research on cognitive engagement comes from the literature on school engagement,

which stresses investment in learning, and from the literature on learning and instruction, which involves self-regulation, or being strategic. One set of definitions focuses on psychological investment in learning, a desire to go beyond the requirements, and a preference for challenge (Connell & Wellborn, 1991; Newmann, Wehlage, & Lamborn, 1992; Wehlage, Rutter, Smith, Lesko & Fernandez 1989). … Other researchers have outlined general definitions of engagement that emphasize an inner psychological quality and investment in learning, implying more than just behavioral engagement (p. 17).

Thus, cognitive engagement can be summarized as strategy use and regulating oneself with respect to schoolwork. Other researchers (e.g., Newmann et al., 1992) define cognitive engagement as effort or persistence, which is the same as some definitions of behavioral engagement. Furthermore, Fredricks et al., (2004) have also described cognitive engagement as the effort required to master a skill. Cognitive engagement has primarily been assessed using self-report measures consisting of items that measure preference for challenge and hard work, working independently, adaptively coping with failure, having learning or mastery goals, and having a commitment to the content or procedure of schoolwork. It is sometimes used interchangeably with self-regulation or strategy use (Bernacki, Byrnes & Cromley, 2012; Fredricks et al., 2004; Zimmerman, 2013).

Betts (2012) defined cognitive engagement as the investment of cognitive facilities in learning or skill mastery and discussed self-regulation and strategy use as

associated with cognitive engagement, while Wang and Eccles (2011; 2012a; 2012b) and Fredricks et al. (2004) described these constructs as aspects of cognitive engagement itself. Others have defined cognitive engagement as investment in learning, deep-level processing (Darr, 2012), "thoughtfulness and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills" (Mahatmaya et al., 2012, p. 47), and amount and types of strategies that students employ (Walker, Greene, & Mansell, 2006). Fredricks and McColskey (2012) defined cognitive engagement as "students' level of investment in learning. It includes being thoughtful, strategic, and willing to exert the necessary effort for comprehension of complex ideas or mastery of difficult skills" (Fredricks & McColskey, 2012, p. 764. For this dissertation, I will use Mahatmaya et al. (2012)'s definition of engagement because it is concerned with comprehending complex ideas which may be particularly relevant for better understanding the nature of cognitive engagement for reading informational texts.

Some definitions of self-regulation incorporate characteristics of cognitive engagement. Winne (2011) has explained that cognitive engagement is the third phase of self-regulation, actually working on the task. According to Winne (2011), phase one is the motivation to engage and define the task, phase two is setting goals and planning, phase three is engagement in the task, and phase four is evaluation of strategies, efforts, and outcomes. Self-regulation has affective, behavioral, and cognitive aspects (Boekaerts, 2010) whereas cognitive engagement, in this dissertation, refers primarily to the cognitive aspects of task involvement and is defined as "thoughtfulness and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills" (Mahatmaya et al., 2012).

In sum, in this dissertation I will explore how cognitive engagement may mediate the associations of expectancies for success and values with performance. This idea has been discussed by expectancy-value researchers, but there is little empirical work that has examined this mediation explicitly. Cognitive engagement was chosen over behavioral and affective engagements because it is a stronger predictor of performance (Mahatmaya et al., 2012) and Mahatmaya et al. (2012)'s definition was used because exerting effort to complex ideas may be particularly relevant for studying motivation for reading informational text.

Methodological Approaches to Searching the Literature

In this chapter, I reviewed research on expectancy-value theory and engagement within the academic context. Due to the limited work on expectancies for success, I also reviewed work on self-efficacy because previous work shows that beliefs about abilities and success are highly conceptually and empirically related (Bong & Clark, 1999; Skaalvik & Skaalvik, 2002). Two approaches were taken to review the research literature. The first approach involved keyword Internet searches using Academic Search Premier, Education Index Retrospective: 1929-1983 (H.W. Wilson), Education Research Complete, ERIC, PsycARTICLES, PsycCRITIQUES, Psychology and Behavioral Sciences Collection, PsycINFO, Social Sciences Full and Teacher Reference Center. Search terms included values OR expectancies for success OR self-efficacy AND engagement. Additional searches were performed using middle school, adolescence, and reading specifications. The second approach was to search the reference sections of relevant articles and chapters and taking suggestions from faculty members. Abstracts were read to determine if a study was specific to academic motivation and engagement.

Studies were deemed pertinent if items related specifically to schoolwork or a school subject. Preliminary searches were specific to middle school students; however, in an effort to maximize hits, studies of middle school and high school were included.

The studies below were chosen because the authors evaluated the associations between expectancies for success or values, self-efficacy, engagement, and achievement. I first present studies that reported bivariate correlational, regression, and factor analytic studies among these variables, and include one qualitative study. The second set of studies used structural modeling to assess the potential role of engagement as a mediator. Details on definitions and measurements are also included because they may explain discrepancies among findings.

Studies Using Regression to Examine Relations of Expectancies, Engagement, and Achievement

The studies reviewed in this section were selected because they included key information about the associations among expectancy-value constructs, academic engagement, and achievement in various academic domains. These studies did not use analyses that explicitly provided information about the potential mediating role of engagement in relations between motivation and achievement, but they did provide insight about the associations among these variables. I first present studies that reported bivariate correlational, regression, and factor analytic studies among these variables, and include one qualitative study. The second set of studies used structural modeling to assess the potential role of engagement as a mediator. Details on definitions and measurements are also included because they may explain discrepancies among findings.

Many of the studies in this section have used the MSLQ to assess motivation and regulatory, cognitive, or learning strategies and their relations to students' expectancies and values. Because one of the ways that Fredricks et al. (2004) defined cognitive engagement is strategy use and self-regulation, these studies will also be included in this review. Engagement was never explicitly defined or specified in these studies; however, as noted above, the MSLQ can be thought of as a measurement of cognitive engagement. The MSLQ is clearly a measure of cognitive engagement as evidenced by the cognitive learning strategies items. In these studies learning strategies were assessed and measured using the MSLQ's 31 items divided into nine subscales of strategies which were categorized into cognitive (rehearsal, elaboration, organization, and critical thinking), metacognitive (metacognitive self-regulation such as planning, monitoring, and regulating strategies), and resource management (time and study environment, effort regulation, peer learning, and help seeking).

Pintrich and his colleagues (Pintrich & De Groot, 1990; Pintrich, Smith, Garcia & McKeachie, 1991) developed the MSLQ to measure students' motivational beliefs and use of self-regulated learning strategies. The measure was designed to be domain specific in that instructions ask students to think about a particular class as they answer the questions. In their studies, respondents ranged in grade levels from late elementary school through college. One set of items in this measure assessed achievement values; Pintrich et al. labeled this subscale intrinsic value, but the nine items measured students' perceptions of interest, usefulness, and importance of the class (see Pintrich & De Groot, 1990, for the full set of items).

Sungur and Tekkaya (2006) examined the associations between expectancies for success, task value, and learning strategies (a form of cognitive engagement according to Fredricks et al., 2004) in a study of 10th- grade biology students. Expectancy components were measured using two scales: (1) control of learning (defined implicitly as the extent to which students are responsible for their own learning) beliefs and (2) self-efficacy for learning and performance. In their review of their constructs, Sungur and Tekkaya (2006) explicitly defined outcome expectancies as students' beliefs about their performance. Values and goals were all defined as students' reasons for completing a task. Items measuring values reflected judgments of the course content's interest, usefulness, and importance. Values, goals, and cognitive engagement were assessed using the MSLQ. Using bivariate correlations, the authors found that task value was significantly positively correlated with all of the learning strategies. Both control of learning beliefs and self-efficacy for learning and performance were significantly positively correlated with all of the learning strategies, except for help seeking.

Two studies conducted by Wolters (Wolters & Pintrich; 1998; Wolters, Yu & Pintrich, 1996) used correlational analyses to examine the associations between values, self-efficacy, and cognitive engagement in middle school students. Also using the MSLQ, Wolters et al. (1996) found that values were strongly positively associated with cognitive strategy use and regulatory strategy use, but weakly correlated with performance in mathematics. Efficacy was moderately positively correlated with strategy use in mathematics. Findings were similar for English and social studies. In another study, Wolters & Pintrich (1998) found that task values and self-efficacy for mathematics, social studies, and English predicted with cognitive and regulatory strategy use in these

subjects using a cross sectional design. Efficacy predicted performance, while task values did not.

In a qualitative observational study performed by O'Brien, Beach, and Scharber (2007), seventh- and eighth-grade readers who were the most engaged during the observations often discussed their value for reading in their interviews. For instance, the boy who made the second highest gains on the Scholastic Reading Inventory during the measurement period reported the usefulness of reading and education to get a good job as an adult. He was also highly engaged in his classroom reading project, and reported reading or behavioral engagement at home. Engagement was assessed through classroom observations; the authors noted their reading and writing behaviors and instances where the students commented that they were using specific reading practices during assignments. Another student who was consistently engaged in reading, writing, discussion, or other assignments, also discussed reading as valuable to learn about different animals. Lauren did not achieve significant gains during the measurement period because she had scored at ceiling at both data collection points. Students who did not display engaged behaviors or make comments that indicated engagement rarely discussed the value of reading in their interview. This study shed light on how value, engagement, and achievement are associated.

Hong, Peng, and Rowell (2009) examined the associations of values and metacognitive self-regulation strategies in over 800 seventh- and 11th grade Chinese students. They assessed utility value of homework, which was defined as importance and usefulness. They examined utility and intrinsic values using the Self-Assessment Questionnaire developed by O'Neil (Hong, O'Neil, & Feldon, 2005; O'Neil, Sugrue,

Abedi, Baker, & Golan, 1992), which included 34 items with four to seven items on each of the motivation and strategy scales. One sample item was "Homework provides me with more chances to learn in depth," which is a measure of usefulness of homework.

The self-regulation strategies they examined were effort, persistence, planning, and self-checking, which are forms of cognitive engagement according to Fredricks et al. (2004) using the Self-Assessment Questionnaire. Each of the six of scales included four to seven items on each of the composites. The items were conceptualized similar to previous work, but the reliabilities were somewhat low (ranging from .55 - .81 in seventh grade and .57 - .78 in 11th grade). They found that both utility and intrinsic values were significantly positively correlated with planning, persistence, self-check, and effort in both seventh and 11th grades. These coefficients are discussed further in Chapter 5.

This study provided important information about the associations of values and self-regulated strategy use and cognitive engagement, but is limited by the lower reliabilities of the scales. In addition, this study should be replicated in the United States in order to examine whether the findings are the same in different countries. Achievement groups were separated according to percentiles on a performance test. It would be beneficial if there were additional assessments pooled into creating achievement groups in order to increase the validity of the groupings. It is possible that there are additional achievement group differences in 11th grade that were nonsignificant because of the grouping procedure.

Conner (2009) studied the associations between values, engagement, and performance using cluster analysis in a sample of high school students enrolled in an International Baccalaureate's extended essay program. He did not explicitly use terms

from expectancy-value theory in defining value; instead, the researcher used the term cohort culture, which refers to "the attitudes, values, and practices that students in a particular group negotiate through interaction with one another and in reaction to the requirements and expectations placed on

them by their institutional context" (p. 9). Although there is a clear discrepancy in terminology with respect to values, previous researchers have used this same definition when describing values of a peer group (e.g., Hijzen, Boekaerts, & Vedder, 2006) and thus, this work can inform a review of relations of expectancy-value constructs with engagement. The term was used to describe the degree to which the high school students committed to success in order to describe differences in engagement clusters, which will be discussed further.

Conner (2009) also measured emotional, behavioral, and cognitive engagement separately as discussed by Fredricks et al. (2004) and the items concerned the writing task. Emotional engagement was measured as interest or enjoyment, behavioral engagement as effort, and cognitive engagement as cohort culture values. This unusual definition of cognitive engagement should be kept in mind as findings are interpreted. Items were also typical of this definition of engagement in terms of behavioral and cognitive engagement and were measured using separate scales, as suggested by Fredricks et al. (2004). These items were adapted from the Intrinsic Motivation Inventory Instrument (McAuley, Duncan, & Tammen, 1989),

Conner (2009) collected data at three time points in which the participants completed the same engagement surveys. There were 135, 131, and 140 high school students in spring of 2005, fall of 2005, and spring of 2006 respectively. Hierarchical

cluster analysis was used to divide groups into engagement profiles based on means on engagement (emotional, behavioral, and cognitive). There was a four-cluster solution of engagement with a range of about 30-40 students in each group. These four groups of students were either strongly disaffected (n = 27), mildly disaffected (n = 38, higher affect than purposefully engaged, but lower on cognitive and behavioral engagement), purposefully engaged (n = 45, high on cognitive and behavioral and low on emotional) and fully engaged (n = 30, high on all three engagements); this cluster analysis was only performed at Time 1.

Conner (2009) examined the association between groups and values by interviewing some of the students in the study. Prior to the study he had identified two schools that happened to have very different engagement clusters (one was very highly engaged and one was low) and selected students from these schools for interviews. After a series of interviews, Conner found that the crucial differences between the fully engaged students and the strongly disaffected students were differences in values, beliefs, and practices of the peer group. Conner did not provide additional details about this finding. Although these interviews were valuable in providing another type of data, I suggest that additional surveys be taken to ensure that students did indeed differ quantitatively on the motivation and engagement variables. In addition, longitudinal data across high school grades were collapsed, ignoring grade differences in the sample. If these data had remained separate by age group, developmental questions of engagement could also be addressed.

The studies reviewed in this section were selected because they include key information about the associations among expectancy-value constructs, academic

engagement, and achievement in various domains and grades. Although these studies do not use analyses that explicitly provide information about the potential mediating role of engagement, strong positive correlations among these constructs are a preliminary indicator that mediation is possible. This finding of significant correlations is the first step in conducting an investigation for a theoretical basis for testing mediation.

Comments on the regression studies. The work reviewed in this section shows that values, expectancies for success, and engagement are related; however, there are a number of important issues that need to be addressed in further studies. One is to be clear which of the engagement constructs is being measured. An issue uncovered in the current review is that studies on engagement rarely specify which type of engagement is discussed either on a theoretical or measurement level. In many of these studies, the researchers have examined at least two types of engagement, and in general, the assessments do not explicitly name a type of engagement, nor are the number of items reflecting each consistently even.

One strength of these studies is that they use different performance measures. Many studies discuss performance outcomes and generally have found that motivation and engagement are correlated with higher performance on achievement tests, final grades, and self-reported performance. The majority of the studies in this literature base use bivariate correlation or a form of regression. The use of these analyses does not allow for an examination of more complex relations among these constructs.

Given the paucity of clear theoretically-driven models, future research should use a form of modeling analysis in order to identify relations among specific constructs of expectancy-value theory along with a specific type of engagement. One potential model

is that motivation leads to engagement, as discussed within some of these studies. In addition, engagement and motivation both lead to performance outcomes. Multiple potential models, including a mediational model, should be examined to reveal the relations among these variables. Studies that used modeling to assess these relations are discussed below.

Studies Using Structural Equation Modeling to Examine Relations of Expectancies, Values, and Engagement

Structural equation modeling (SEM) is used to test causal or structural relations among variables and is an alternative method that can be used to examine potential mediation (Hancock & Mueller, 2006). It is similar to multiple regression analysis because the path coefficients in SEM are similar to partial regression weights (Hancock & Mueller, 2006). Furthermore, in modeling, the structural equations are similar to regression equations (Hancock & Mueller, 2006). These issues are discussed further in Chapter 3.

A number of studies have used SEM methods such as path analysis to test theoretical models of the relations of the constructs under investigation. These methods offer deeper insights into proposed relations among these variables because they consider multiple variables simultaneously. As will be discussed further in Chapter 3, SEM may be more useful for examining mediation than earlier methods for testing mediation such as that of Baron and Kenny (1986) that allow for one exogenous (predicting) variable, while modeling allows for as many variables as theoretically expected. Baron and Kenny (1986) described a process of testing mediation, or the examination of indirect effects, using separate regression analyses to assess the extent to which the addition of an indirect

effect decreases a direct effect. Latent and measured variable path analysis methods provide a fuller picture of what the associations between these variables might be. An additional strength of using modeling is in combining variables in ways that regression does not allow. When using Baron and Kenny's (1986) traditional method of mediation, the analysis cannot account for correlations between two exogenous variables. Instead, it is necessary to run two independent models in order to understand how motivation may influence engagement, which may in turn relate to performance. Path modeling may provide a fuller and more complete picture because it allows for multiple exogenous variables to be correlated.

Greene, Miller, and their colleagues (Greene & Miller, 1996; Miller, Behrens, Greene, & Newman, 1993; Miller, DeBacker, & Greene, 1999) assessed perceived instrumentality (a construct similar to values, see Wigfield & Cambria, 2010) and cognitive engagement in the Approaches to Learning Survey, which they have used primarily in studies with college and high school students. Instrumentality has been conceptualized as how important the learning of the material in the class is for attaining future goals (Greene, Miller, Crowson, Duke, & Akey, 2004). In some of their work they have examined the associations between perceived instrumentality and cognitive engagement in English class. They defined perceived instrumentality as importance and usefulness of a future task and measured it using items that reflected this definition.

Greene et al. (2004) assessed 220 high school students over a three-month period. Relevant surveys were administered in March (measuring self-efficacy), and April (measuring instrumentality and cognitive engagement). One sample item is "My performance is important for becoming the person I want to be." Cognitive engagement

was explicitly defined as the extent to which students are deeply processing the material and using meaningful learning strategies. One sample item is "I make sure I understand the ideas that I study." Performance was assessed using grades in an English course. Grades were reported in June. They used path analysis to examine the associations between self-efficacy, perceived instrumentality, cognitive engagement, and English grades. They found that the positive association between perceived instrumentality and achievement was mediated by strategy use. The full or partial nature of the mediation cannot be determined because they did not include a direct path.

Hardré, Crowson, Debacker, and White (2007) examined the associations of perceived ability and instrumentality as predictors of engagement. Perceived ability was defined as "feeling able to learn the content and accomplish the tasks given in the class" (p. 251), which is similar to self-efficacy and expectancies for success. Students were asked to think of a required course when responding to items. Their sample included 900 children from grades 9-12 of 18 rural public high schools and their design was cross-sectional. Engagement was implicitly defined as effort and was measured using the School Engagement and Effort Scale (Hardré & Reeve, 2003). Sample items include "I don't work very hard in this class," and "I work really hard in this class." Because these items are effort items, they can be best categorized as cognitive engagement. Using pairwise correlations, the authors reported that school engagement was positively correlated with perceived ability and instrumentality. Using path analysis, they also found that the association between instrumentality and self-efficacy with cognitive engagement was mediated by goal orientations, defined as "reasons or purposes individuals have for engaging in academic tasks" (Hardré et al., 2007, p. 249). This finding means that the

association between instrumentality and self-efficacy with cognitive engagement is explained by goal orientations.

Liem, Lau, and Nie (2008) used SEM to examine the association between behavioral engagement, cognitive engagement, task value, and achievement in a nationally representative sample of 1475 ninth-grade students in Singapore using a cross-sectional design. Task values were explicitly defined as the degree to which students believe that the academic task is worth pursuing and was measured using four items from the Motivated Strategies for Learning Questionnaire (MSLQ). The authors offered two sample items for value, one for interest and one for utility value. Past achievement was assessed using English grades and current achievement was assessed using an English test created by the researchers.

Behavioral task disengagement was defined as "students' lack of involvement in learning academic tasks and related to students' continuous effort, determination, and perseverance in learning" and was measured using the negatively worded effort regulation items in the MSLQ (p. 490). Cognitive disengagement was defined as lack of both deep and surface learning strategies and was measured using scales for each of these using the surface and deep learning items from the MSLQ. In addition, the authors examined mastery orientation, which Fredricks et al. (2004) listed as one definition of cognitive engagement. In this study, the researchers did not include this as part of cognitive engagement.

Liem et al. (2008) found that task values were positively correlated with behavioral and cognitive engagement scales, as well as achievement. SEM analyses showed that the relation of task value and English grades was mediated by cognitive

engagement (defined as mastery goals/learning strategies). In addition, the same analysis also revealed that the relation of task value and English grades was mediated by task disengagement. The cognitive engagement scales were positively associated with current achievement and behavioral task disengagement was negatively associated with this variable. The association between self-efficacy, task values, and performance was mediated by mastery goals and cognitive engagement. These results indicate that variance in the association between relations of self-efficacy and values to performance were explained by mastery goals and cognitive engagement. The association between self-efficacy and performance was mediated by performance avoidance (negatively) and cognitive engagement. These findings indicate that engagement is an essential process in connecting beliefs about one's ability to perform a task and actual achievement.

Researchers have examined how students' values predict their engagement in different activities using other measures as well. Durik et al. (2006), using data from the Childhood and Beyond study, found that intrinsic value for reading in fourth grade directly predicted intrinsic value in 10th grade and indirectly predicted amount of leisure reading in 10th grade (through 10th grade intrinsic value ratings). Additionally, the investigation revealed that attainment value for reading in fourth grade directly predicted English-related course choice in 10th grade and indirectly predicted career choices related to reading and language arts in Grade 12 (through 10th grade attainment value ratings).

Associations among cognitive engagement, values, and expectancies. Researchers have broadly discussed models of how motivation and engagement relate. Models depicting interactions between motivation, engagement, and academic achievement have received increased attention in the past 10 years (Skinner et al., 2008;

Skinner et al., 2009). Although studies testing aspects of these models have found interesting associations between motivation and engagement, few researchers have evaluated the associations between students' expectancies for success, values, engagement, and academic achievement. Some researchers have even evaluated the associations between constructs in expectancy-value theory and engagement, but they do not propose a model of this process within the context of expectancy-value theory. For my study, I propose including cognitive engagement as a mediator of expectancies for success, values, and reading outcomes.

Students' expectancies of success are likely related to their cognitive persistence during challenging parts of a task and thinking through different strategies that will help them over individual hurdles, because their confidence in their abilities will carry them through difficult aspects of the task and they will persist longer (Bandura, 1997; 2006; Bandura & Schunk, 1981). In terms of strategy use, expectancies for success are expected to be highly related to cognitive engagement. If a student believes in his or her ability to be successful at a task, he or she will use strategies to complete it (except if the task is too easy and does not require strategy use to be completed). Another definition of cognitive engagement used by Fredricks et al. (2004) was investment in learning, or to go above and beyond the work required. This is likely to be strongly associated with expectancies for success. When students feel confident in their abilities, they are likely to push their knowledge further by persisting on a task or trying more difficult, related activities (Bandura, 1997). However, students who feel challenged by a task may give up more easily.

The studies just reviewed show that values are also related to cognitive engagement (e.g., Greene et al., 2004; Hardré et al., 2007; Liem et al., 2008). In terms of strategy use, if it is particularly important for an individual to complete a task, he or she is likely to persist and strategize about the task. Similarly, students will strategize in order to complete a task that is directly or indirectly useful to completing a goal. With respect to cognitive strategy use, students are likely to continue to strategize and spend more time working to complete a valued task. If cognitive engagement is defined as investment in learning (see Fredricks et al., 2004), students who find a task valuable are likely to invest in learning by going above and beyond requirements. For a task that is useful, they will likely meet requirements until their utilitarian reason is fulfilled, and not go above and beyond.

The work reviewed in this section provides evidence that cognitive engagement is associated with expectancies, values, and performance, but further research is needed to see if it is a mediator with reading outcomes. Such work will provide additional insight into how students' motivations are harnessed by engagement to become achievement (Skinner et al., 2009). To examine these relations, the study outlined below will be performed in order to assess the extent to which engagement acts as a mediator between values, expectancies for success, and reading achievement.

The Current Study

The values construct used in this study was a combination of utility and attainment value. This values variable was chosen for the following reasons. Utility value is directly associated with an individual's perceptions of how success on a task will help achieve a future goal (Wigfield & Eccles, 2000) and attainment value is concerned

with perceptions of a sense of importance of a task or activity as related to the individual's identity; therefore, these specific aspects of task value are very likely to be associated with engagement and performance. Finally, assuming that the items measuring these two aspects of the task values factor together, these items will be included in one scale.

Cognitive engagement was chosen out of the three types of engagement discussed by Fredricks et al. (2004) because it has been frequently used in studies associated with expectancy-value theory (e.g., Liem et al., 2008) and is more highly associated with performance than affective or behavioral engagement (Mahatmaya et al., 2012). Also, both behavioral and emotional engagement have been examined less often than cognitive engagement (Fredricks et al., 2004) and thus, there is more research in which to base a study of expectancies, values, engagement, and achievement using cognitive engagement rather than emotional and behavioral engagement. An additional reason to examine cognitive engagement is the cognitive nature of reading and because I am using a reading comprehension measure and Reading/Language Arts grades, cognitive engagement is may be the most relevant type of engagement to examine.

Expectancies for success were examined in this study. As will be seen in Chapter 3, some of the items could arguably be called self-efficacy items instead of expectancies for success items. It is true that expectancies for success and self-efficacy are classified within the same "family" of motivation constructs (Pintrich, 2003; see Pintrich, Marx, & Boyle, 1993 for a previous broader categorization and Wigfield & Eccles, 2000 for a brief review). To distinguish between constructs in this "family", a thorough literature review should be performed; however for the purpose of this dissertation I will provide a

brief summary. Bandura (1997; 2006; Bandura & Schunk, 1981) defined self-efficacy as judgments about how well one can organize and execute courses of action required to deal with prospective situations containing many ambiguous, unpredictable, and often stressful elements. The distinction that is often made is that expectancies for success differ among individuals because of a future orientation based on previous sociocultural and achievement memories (Wigfield & Eccles, 2000); however, it seems that in order to make a judgment of one's self-efficacy, the individual must make a judgment of how one would perform if this task was given in the future. The items that will be introduced in Chapter 3 and analyzed in Chapter 4 do not explicitly reference the future as classical expectancy items do (Wigfield & Eccles, 2000); however, items in this "family" of constructs often are not empirically distinguished (Bong & Clark, 1999; Skaalvik & Skaalvik, 2011). Although theorists have created fine-grained conceptual distinctions in their respective fields, conceptually distinguished constructs remain empirically indistinct and one can arguably the term expectancies for success in order to have theoretical cohesion between expectancies and values in the study.

A particularly critical period of the lifespan with respect to reading is adolescence because readers are expected to extract from text information with increasing complexity (Klauda et al., 2012). Middle school is a crucial period to study reading because of the important curricular demands that are made of students in middle school and in preparation for high school coursework. First of all, many children's motivation for academic activities decreases during middle school (Wigfield, Byrnes, & Eccles, 2006). Additionally, children who have struggled with reading can become actively resistant to

reading in school; at the same time they are required to read increasingly complex informational books in many of their classes (Klauda, et al., 2012).

Grades in school and test comprehension represent different aspects of students reading. Comprehension is typically assessed during a short test and grades are given based on a variety of assignments that are given over a period of time. One offers a snapshot of comprehension specifically and grades provides an assessment of students over a more extended period of time from various assignments that might include group work, writing, or answering questions. Furthermore, some research has also shown that comprehension test scores tend to be more associated with IQ than grades (Neisser, 1997). Because of these differences grades may be more associated more with changeable psychological constructs, such as motivation or engagement.

Summary

Educational psychologists have become increasingly interested in engagement because of its relations with motivation, achievement, and other important outcomes such as student drop out (Fredricks et al., 2004). Researchers from different theories of motivation have discussed engagement (e.g., Eccles & Wang, 2012; Pekrun & Linnenbrink-Garcia, 2012; Schunk & Mullen, 2012) To date, however, there is no consensus on how engagement is related to values, expectancies for success, and reading achievement.

Expectancy-value researchers have provided evidence that expectancies and values are key predictors of performance and choices (Eccles & Wigfield, 2002; Simpkins, Davis-Kean, & Eccles, 2006; Wigfield & Eccles, 2000). These outcomes include grades (Selkirk, Bouchey, & Eccles, 2011), test performance (Valenzuela, Nieto,

& Saiz, 2011), amount and breadth of reading (Wigfield & Guthrie, 1997), and course selection (Watt, 2004). Expectancies for success and task valuing are important for inclusion in a study of reading performance because, as discussed in Chapter 1, these constructs are reliable predictors of reading performance (Gambrell, 2011; Guthrie, Klauda & Ho, 2013; Meece & Miller, 1999; Watkins & Coffey, 2004).

As discussed earlier, Fredricks et al. (2004) described engagement as a meta-construct that unites cognitive, behavioral, and affective aspects of engagement. *Behavioral engagement* was defined as positive conduct in school, participation or involvement in school activities (sports teams, in class activities, etc.), and is positively associated with achievement. *Emotional or affective engagement* was described as the varying emotions that students feel in regard to school and people at school (peers, teachers, principals, etc.), and is associated with an allegiance or commitment to the academic institution and a desire to work hard. Finally, Fredricks et al. (2004) described *cognitive engagement* as the effort, strategy use, and time invested in completing tasks and is associated with mastering difficult concepts.

There are also inconsistencies in the boundaries of what engagement is as a consequence of a lack of clear theoretical grounding in particular research teams. For example, Eccles and Wang (2012) argued that task value is better suited as a motivational construct and affective responses, which is sometimes used as a measure of affective engagement is already included in the expectancy-value model. Then, in two recent articles they used task value as an indicator of emotional engagement, and in another recent article they operationalized emotional engagement as identification with school and task value as an indicator of cognitive engagement (Wang & Eccles, 2012; Wang,

Willett, & Eccles, 2011). This was justified using rationale from Fredricks, et al. (2004), which included articles that used values as an indicator of affective engagement. These inconsistencies make findings across studies difficult to interpret. For these reasons, researchers need to introduce theoretically grounded and empirically sound measures of student engagement to move the field of achievement motivation forward.

Cognitive engagement was chosen for this study out of the three facets of engagement reviewed by Fredricks et al. (2004) because it has been examined in expectancy-value studies (e.g., Liem et al., 2008). Cognitive engagement can be measured using surveys; other types of engagement such as behavioral engagement may be measured best with observations (Fredricks et al., 2004) which would be very expensive to collect data with a large enough sample in order to perform statistical modeling. Finally, behavioral and emotional engagements have been studied less than cognitive engagement (Fredricks et al., 2004) and therefore there is a larger foundation in which to base this dissertation study.

The goal of this dissertation was to study the extent to which cognitive engagement mediated the associations between students' expectancies for success and values with performance. Previous research on expectancies for success and values, engagement, and performance (e.g., Eccles & Wang, 2012; Pekrun & Linnenbrink-Garcia, 2012; Reeve, 2013; Schunk & Mullen, 2012;) has shown that these constructs are positively correlated and it is expected that cognitive engagement will mediate the relations of value and expectancies to performance.

Chapter 3: Methods

In this chapter, I outline the research design, sample, and analyses performed in this study. The hypotheses below guided the examinations of the associations of middle school students' values, expectancies for success, and cognitive engagement for informational text with informational text comprehension and Reading/Language Arts grades. I aimed to address the following hypotheses:

Hypothesis 1: Cognitive engagement will significantly mediate the association between values and informational text comprehension.

Hypothesis 2: Cognitive engagement will significantly mediate the association between expectancies for success and informational text comprehension.

Hypothesis 3: Cognitive engagement will significantly mediate the association between values and Reading/Language Arts grades.

Hypothesis 4: Cognitive engagement will significantly mediate the association between expectancies for success and Reading/Language Arts grades.

This study was performed in compliance with APA standards including those concerning ethical reporting and ensuring the accuracy of scientific knowledge. Particularly with respect to duplicate publications and piecemealed results, the goals, theoretical underpinnings, analysis type, and data points are unique. As is recognized by the Publication Manual of the American Psychological Association (2009), it is often necessary and appropriate to have multiple studies and publications from a larger study. In this study I used data from a larger intervention study designed to increase reading motivation and performance for reading informational texts. These data were collected in April 2010, before any of the school-level stakeholders (teachers, principals, and

students) had participated in the intervention. It is possible that the students knew what the intervention was about and this note should be considered when reviewing results.

The data collected from the Reading Engagement for Adolescent Learning (REAL) study have been used in previously published materials. Guthrie, Wigfield, and Klauda (2012) wrote a technical report that described the intervention and a variety of aspects of the REAL study including the motivation and comprehension measures, findings concerning race and gender and their impact on reading motivation and achievement, and beyond. Guthrie et al. (2013) have also used these data to evaluate the effects of the Concept-Oriented Reading Instruction intervention. This dissertation study is unique in the variables it used, variables included in the model, overall research goals, and data collection points.

Participants

The study included data from 1197 seventh-grade students from four middle schools in a rural area of a mid-Atlantic state. Each child was sent home with a permission slip and parents were encouraged to reply by teachers and their school principal. Most students in the sample were 12-13 years old. The sample was comprised equally of males and females and was 78.2% European American, 19.0% African American, 2.5% Asian American, .3% Native American. Free and reduced price lunch was used as an indicator of socioeconomic status; 18.4% of students were eligible for free lunch and 5.6% were eligible for or reduced-priced lunch.

A power analysis was performed on this sample. Power is the chance of committing a Type II error. A Type II error is a defined as a failure to reject a false null hypothesis. Cohen (1962; 1988) suggested that researchers calculate power (β) as 1-

(α*4). An α of .05 will be used as a threshold and therefore power should be .80 or higher. In this study, using a sample of 1197 students and to detect a small effect of .02, β = .99, which is well over the β = .80 suggested minimum.

Procedures

Data were collected in April of 2010. Each of the participants completed measures of values, expectancies for success, cognitive engagement, and informational text comprehension. The measures were administered by the teachers with graduate student support during two Reading/Language Arts periods. Students who were absent during the assessment completed on the day they returned with a member of the research team. The focus of the items on the questionnaire used in this study was reading informational texts for school. Students were told that information books are any books that tell them real facts and knowledge, that school reading is any reading that will help them in school, and that school reading can include homework reading or studying too. These directions were read to the students and also appeared as text on their assessments. The full directions can be found in Appendix A.

Measures

The self-report survey measures contained Likert scale items designed to assess students' values, expectancies for success, and cognitive engagement. Items were written to be as clear as possible. For instance, the expectancies for success item "I can explain what I have read in information books to my classmates or friends from school" was designed to assess whether students expect that they could explain what they have read to a peer from school. A complete list of the items by construct for each of the scales can be found in Appendix A.

Steps were taken to avoid error due to students responding without carefully reading the items. During survey development items were randomized so that items for designed for distinct scales were mixed together. During the assessment, students were observed by the teacher and research staff to see if students appeared to be answering very quickly and not reading the questions. Finally, during data entry surveys were examined for potential patterns or consecutive items. If students had more than four identical consecutive responses or an unexpected pattern (e.g., 1, 2, 3, 4, 1…), they were submitted for further review. If there were five items in a row that had the same answer or another unexpected pattern, that students' survey was removed from the dataset. The Cronbach's alpha values for each of the survey measures were above .80.

Values. Valuing reading was defined as "how a task meets the needs of individuals" (Wigfield, 1994, p.52) and these items were contextualized for reading. This scale contained seven items for this construct; one example was "Reading information books for school is important to me." The response format was: Not at all true of me, Not very true of me, Somewhat true of me, and Very true of me and these responses were coded on a one to four scale, with four representing the highest score. These items contained primarily utility and attainment value. This will be further discussed in Chapter 5.

Expectancies for success. Expectancies for success were defined as the individual's "beliefs about how well they will do on upcoming tasks, either in the immediate or longer term future" (Wigfield & Eccles, 2000, p. 70) and these items were contextualized for reading. In this assessment, expectancies for success reflect beliefs about ability to successfully complete tasks related to reading school-related

informational texts (Bandura, 1997; Wigfield & Eccles, 2000). We constructed 7 items for expectancies for success such as, "I can find the main idea of a section in an information book for school." These items had the same response format as the valuing items.

Cognitive engagement. Cognitive engagement was defined as "thoughtfulness and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills" (Mahatmaya, Lohman, Matjasko, & Farb, 2012, p. 47) and these items were contextualized for reading. An example item is "I try my best on all my information book reading assignments even when they're hard." These items followed the same response format as the valuing and expectancies for success items.

Informational text comprehension. The two achievement outcomes that were examined are informational text comprehension and students' Reading/Language Arts grades. The informational text comprehension (ITC) measure consisted of 25 items based on several 250 to 300 word passages on ecology and habitats. This assessment was developed by members of the research team. Each passage was followed by five multiple choice questions that required identifying the main concept, applying understanding of subconcepts, causal reasoning, and identifying the best summary for the passage.

To assess content validity, a science content expert reviewed each passage and question for scientific merit. In previous studies using this assessment, this measure had an IRT index of reliability of .91 (Guthrie, Klauda, & Ho, 2013). The ITC correlated at r = .80 with the Gates-MacGinitie Reading Comprehension Test (Klauda & Guthrie, 2010; Klauda et al., 2012), indicating that the ITC was a valid measure. A total score was used to quantify this scale. This measure can be found in Appendix B.

Grades. Reading/Language Arts grade for marking period 3, ranging from A-F, was also used in this study. Grades were provided by the school district and were based on a series of assignments, quizzes, and tests. Course materials were based on readings from literature textbooks that include primarily fictional stories and some informational narrative text, and limited expository text before the intervention took place. The inclusion of Reading/Language Arts grades and ITC allowed for validation of the cognitive engagement mediation model across different performance indicators and provide information about the generalizability of the model. As discussed in Chapter 2, demographic variables will be included in the models to account for race, gender, and socioeconomic status on each of the performance outcomes.

Data Analysis

Survey scale construction. Confirmatory Factor Analysis (CFA) is a type of Structural Equation Modeling (SEM) that specifically deals with measurement models. Measurement models were used to estimate the associations between observed variables (e.g., items or scores) and latent factors (Brown, 2006). CFA is the first step in running a SEM and it is used to establish the scales as reliable and have discriminant validity. CFA is a psychometric test of an instrument (Brown, 2006) and can also help researchers evaluate potential dimensions of a scale from the fit indices. For example, if the CFA designed to model three subscales, (values, expectancies for success, and cognitive engagement) had acceptable fit, then the next step would be to run the SEM including these subscales.

CFA is used by researchers to establish the underlying subscales structure of an assessment of a set of variables so that an unobserved latent factors can be estimated in

subsequent structural models. Although values, cognitive engagement, and expectancies for success have been discussed as separate concepts in the literature, it remains necessary to establish that these variables indeed exist empirically in the current dataset. The CFAs will be done using MPlus software (Muthén, 1998-2011). Because it was theoretically expected that values, expectancies for success, and cognitive engagement are correlated, they were allowed to covary also within the model.

There is no one fit index that will provide with certainty the fit of a CFA or SEM model. Instead, Hancock and Mueller (2006, 2010) suggested using a variety of indices that each provide a broader perspective on the larger picture of the model. Typically four fit indices are used; these indices are holistic, incremental, parsimonious, and absolute first. First, chi squared (χ^2) is a holistic fit index and indicates the extent to which the model described is reflected within the matrices in the dataset. χ^2 is recommended by some statisticians because it is widely used and easily interpreted; however, there are serious biases in the χ^2 estimate. The primary concern is that models with sample sizes greater than 400 will consistently have a biased coefficient that indicates poor model fit regardless of actual fit (Bentler & Bonett, 1980; Bollen, 1989; Kenny, 2009; Hancock & Mueller, 2010; Hu & Bentler, 1999; Tucker & Lewis, 1973). Second, incremental fit indices such as Tucker Lewis Index (TLI), Normed Fit Index (NFI), Non-normed Fit Index (NNFI), and Confirmatory Fit Index (CFI) describe the extent to which the model fits better than the null model. That is, whether the model-implied specifications actually better reflect the matrices that exist within the dataset more so than no associations at all. Third, absolute fit indices compare the model of interest to the best possible fitting

model, and therefore, absolute fit is essentially a badness of fit index (Kenny, 2012). Options for absolute fit are the Goodness of Fit Index (GFI), the Standard Root Mean Square Residual (SRMR), and the Weighted Root Mean Square Residual (WRMR). Finally, parsimonious fit is the simplicity of the model and therefore describes how good the fit is without having a highly specified model. These final indices penalize models when they are overly complicated and include the Root Mean Square Error of Approximation (RMSEA) and Absolute Goodness of Fit Index (AGFI). Decisions concerning fit indices are discussed below.

One of each type of fit index was used, as recommended by Hancock and Mueller (2010). There were alternatives for each of the fit index choices that I made and the rationale for those decisions will be described further in Chapter 4. To summarize, the CFI is the incremental fit that will be used. The TLI, NFI, and NNFI provide similar information (Hancock & Mueller, 2007), but the CFI is more commonly used and will be understood by a larger audience. The SRMR is often used by researchers because it is not biased against large sample sizes and is a recognizable statistic within the field (Hancock & Mueller, 2007); however in this case these data included count and categorical data, therefore analyses were conducted within a weighted least squares framework and the WRMR was used instead of SRMR. This index is an experimental one and should be interpreted with caution; however, it was still included because it is the only appropriate index of absolute fit (Lu, 2002). The RMSEA will be used because it is recommended by leaders in the field of confirmatory factor analysis and structural equation modeling and because it is typically included in research studies (Hancock & Mueller, 2007). Mediation will be confirmed if the indirect paths between values and expectancies with the reading outcomes are significant.

Mediation Analysis

Baron and Kenny. Baron and Kenny (1986) described a process of testing mediation, or the examination of indirect effects, which has been cited in over 15,000 studies (Kenny, 2009). They used separate regression analyses to assess the extent to which the addition of an indirect effect decreases a direct effect. Their procedure for testing mediation is described in the following quotation:

In general, a given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion… A variable functions as a mediator when it meets the following conditions: (i) variations in levels of the independent variable significantly account for variations in the presumed mediator (i.e., path a), (ii) variations in the mediator significantly account for variations in the dependent variable (i.e., path b), and (iii) when paths a and b are controlled, a previously significant relation between independent and dependent variables is no longer significant, with the strongest demonstration of mediation occurring when path c is zero. (p. 1176)

There are three strengths of using this method. The first is its historical use in the educational psychology field. It is so widely used that researchers do not explain and report each individual step; instead they cite Baron and Kenny (1986) because the vast majority of researchers are familiar with this procedure. This process has become a common method of analyzing and reporting mediation in the educational psychology field, but has become antiquated in the past 10 years. The second strength of using multiple regression to conduct mediation is the ease with which the data can be analyzed. It is likely that beyond its high citation amount, an additional appeal of this method of investigation is that it uses a relatively simple procedure in a more sophisticated manner

in order to test for mediation. The third strength of the Baron and Kenny mediation method is that it allows the researcher to compare the differences between direct and indirect effects. In separate steps, the researcher can compare the strength of the total effect of predictor on the outcome to a separate model that includes the mediator. In the case of complete mediation, the direct effect is reduced to zero. Otherwise, the change in magnitude of the correlation can be examined with a Sobel Test (Sobel, 1982) which is a test of the F distribution. More recently researchers, including Kenny (2012), have moved towards latent variable path analysis to assess model mediation. This method is described next.

Latent variable path analysis. Latent variable path analysis (LVPA) is used to test relations among latent variables and is an alternative and more current method that can be used to examine potential mediation (Hancock & Mueller, 2006). Latent variables are unobserved factors that explain the intercorrelations between observed or measurable factors (Brown, 2006; Little, Preacher, Selig, & Card, 2007). LVPA is similar to multiple regression analysis because the path coefficients in LVPA are similar to partial regression weights (Hancock & Mueller, 2006). In addition, in a latent framework, researchers can examine the associations in a measurement model (the associations between observed variables and unobserved variables) and a latent structural model (among the unobserved variables) (Lattin, Carroll, & Green, 2003).

An additional strength of using path analysis is combining models. When using Baron and Kenny's (1986) traditional method of mediation, the analysis cannot account for correlations between two exogenous variables. Instead, it is necessary to run two independent models to understand how independent variables may influence a mediator,

which may in turn relate to a dependent variable. Path analysis provides a mechanism to examine these two models at the same time. For example, path analysis can be used to examine how both values and expectancies for success may be mediated by cognitive engagement in order to relate to reading comprehension within one model. LVPA is useful in this study because it is well-established empirically that values and expectancies for success are associated.

Assumptions of path analysis. To ensure that the correct conclusions were drawn from the analyses, it was imperative to ensure that assumptions were not violated or that the model was still robust to violations of assumptions. In examining the current dataset, it was first important to examine the data for potential outliers. A method of identifying potential outliers uses studentized deleted residuals. Studentized deleted residuals are calculated by evaluating the outcome of deleting a case from the dataset and dividing the result by its standard error. Studentized deleted residuals with an absolute value greater than three indicate cases that are outliers, as do large differences between the studentized and studentized deleted residuals for a given case (Pett et al., 2003); these cases were removed.

Path models assume that the conditional distributions of the residuals are normal. One method of determining normality is to examine a QQ plot, which is used to compare unstandardized residuals to the expected normal value. A QQ plot of residuals and predicted values suggests a normal distribution if the points fall in a scatter (Lattin et al., 2003) and therefore, there is no relationship above and beyond that predicted by the regression line. Finally, if values do not exceed the common kurtosis threshold of ± 2.00

and the skew threshold of ± 1.00 (Garson, 2010), the sample could realistically come from a population with normally distributed errors.

A homoscedastic plot shows no fanning or otherwise changing (heteroscedastic) variance. One way to analyze the data for heteroscedasticity is to compare the residual plot of e to $\hat{y}$. If a scatterplot of the residuals appear to be scattered randomly around a horizontal line near zero, we could conclude that the residuals are homoscedastic. Furthermore, as Berry and Feldman (1985) and Tabachnick and Fidell (1996) noted, slight heteroscedasticity does not influence results, and therefore, will not be concerned with minor changes in variance. Examining the data for linearity is important because the relationship between the independent and dependent variables will be underestimated if the relationship is nonlinear.

Summary

In summary, a study of the role of cognitive engagement as a potential mediator of the associations of values and expectancies for success on reading performance was conducted. Items were examined using CFA and latent scales were formed. Finally, the hypotheses were addressed by performing a LVPA. If there is a significant indirect effect of cognitive engagement on either the association between values or expectancies for success on informational text comprehension or Reading/Language Arts grades, there will be evidence that cognitive engagement is indeed a mediator of the relations of values or expectancies for success with the respective reading outcome.

Figure 2 presents the model of these relations and in the mediation analyses in this study both direct and indirect effects included in the model will be examined (Bollen,

1989; Kline, 2010; Loehlin, 1998). If the indirect effects are significant, there is evidence for mediation. If the association between either of the motivation variables and a performance outcome become nonsignificant, there is a full mediation for that motivation variable (Baron & Kenny, 1986; Lattin et al., 2003).

To summarize, the relations of value and expectancies for success to informational text comprehension and Reading/Language Arts grades and the role of cognitive engagement as a mediator was assessed in this study using a cross-sectional correlational design with survey data. The survey data was submitted to a CFA to evaluate the items. Informational text comprehension was assessed using several passages with questions that follow. Reading/Language Arts grades were provided by the school district. Finally, the direct paths of motivation on informational text comprehension and Reading/Language Arts grades were assessed for significance. The indirect paths of value and expectancies for success on informational text comprehension and Reading/Language Arts grades, as mediated by cognitive engagement, were examined for significance. Fit indices and significance of the mediation were examined.

Chapter 4: Results

The goal of this research was to explore the extent to which cognitive engagement may mediate the associations between expectancies for success and reading outcomes, as well as between achievement task values and reading outcomes. In this chapter, I first addressed issues of missing data and imputation. Then, I examined the data for statistical assumptions (normality, multicollinearity, linearity, and homoscedasticity) of Structural Equation Modeling (SEM). Next, I reported the item and scale descriptive analyses including means, standard deviations, and bivariate correlations. The validity of the motivation and engagement scales were evaluated using Confirmatory Factor Analysis (CFA) to establish the scales. Two SEMs analyses were done to assess the theoretically specified relations among the variables and the extent to which cognitive engagement was a mediator of values and reading outcomes and expectancies for success and reading outcomes. The first model was designed to examine these relations using informational text comprehension (ITC) as the outcome and the second model used Reading/Language Arts grades as the outcome. See Figures 2 and 3 for the conceptual models.

Missing Data Analysis

CFA, SEM, and other multivariate data analysis techniques require complete data in order for the analyses to converge (Carter, 2006). Because there is rarely complete data in studies within the social sciences, techniques have been developed to deal with missing data (Howell, 2007; Little & Rubin, 1987). There are two commonly used methods: deletion and imputation. When a method of deletion or imputation is not chosen, MPlus will use a listwise deletion as a default (Muthén, 1998-2011). It is important to consider what this default means so that decisions can be made about

whether or not this default is suitable for a given dataset. I ultimately decided to use multiple imputation and the rationale for this decision is below.

Data may be missing completely at random (MCAR), missing at random (MAR), or missing not at random (MNAR). Of these three types of missingness, the most ideal situation is that data will be MCAR, which means that every response of every case has the same likelihood of being missing. For the current data, Little's MCAR was nonsignificant ($\chi^2 = 18.39, p = .073$) which indicated that data were indeed MCAR (Little & Rubin, 1987; 2002). This MCAR finding is relevant because it shows that there is no pattern in the missingness of the data. In addition, no variable had greater than 4% missing data and with a study with such a large sample size, this percentage is negligible (Enders, 2008). The complete list of percentages for missing data on each variable can be seen in Table 1. It can be seen here that the percentages of missing data are minimal according Enders (2008) standards.

For this dataset multiple imputation will be used and an explanation of the benefits and consequences of multiple imputation and other available methods are discussed here. The two methods of deletion are listwise and pairwise. Listwise deletion is when any case with missing data is deleted from the analysis and pairwise deletion is when variables with missing data are not included in the analysis, but the case is otherwise included. Neither of these solutions is ideal for two reasons. First, deletion reduces the sample size, and therefore, the power of the study. Second, if the data are not MCAR, the dataset will be biased to include more participants of certain populations than others (whether based on gender, race, socioeconomic status, achievement groups, or other delineating variables). Pairwise deletion, which has been called unwise deletion

(Howell, 2007), will result in variables with differing sample sizes across items, and therefore, the strong likelihood of heteroscedastic variance. Some have said that pairwise deletion is acceptable if there are only a few cases missing; however, Howell (2012) argued that if a smaller number of cases are missing, listwise deletion is more appropriate to ensure homoscedasticity. Instead of skewing the data from deleting cases or variables, best estimates of the missing responses can be imputed.

There are several types of imputation including mean imputation, pattern matching imputation, regression, stochastic regression, and multiple imputation (Howell, 2007). Mean imputation places the mean for that variable at every case that is missing which completes the dataset, will not significantly change the bivariate correlations or regression coefficients and will not add any error. Thus, the error will be underestimated, the correlations coefficients will not change, and sample size will be larger. This method of imputation is biased because the parameters in the SEM will have a higher power value, but deflated error values leading to incorrect inferences. Another method of imputation is pattern matching imputation which operates by filling in the data with responses from an observed case that has similar responses across other variables. Both mean imputation and pattern matching imputation require that data are also MCAR or else the sample data will be biased (Byrne, 2010). Regression substitution also increases power by filling in missing data, but instead of inserting the mean or a matching observation, the imputation included are predicted values from a regression equation. This value gives a statistically perfect imputation because it is the predicted value from the regression equation that is imputed and does not include an error term. This is a problem because although the prediction is a perfect prediction from the regression line,

the calculation does not include an error term and will lead to incorrect inferences because error variance is underestimated. Stochastic regression imputation is similar, but it adds a random error term which solves the problem of a perfect imputation because there is an error variance term added into the calculations.

Multiple imputation is similar to stochastic regression imputation, with the addition that it bootstraps (that is, there are multiple rounds of imputation so that the result of multiple imputations are included in subsequent structural equations) the data and therefore provides more accurate imputations. Of each of the types of imputation, multiple imputation is the method that best predicts missing values, as shown by simulation studies (Howell, 2007; Howell, 2012; Rubin, 1987). An example of this type of simulation are those in which the researcher knows what the values of the missing data are and uses multiple methods in order to see which most accurately predicted those values. Although the values are not always exact, they have been shown to be very close to the true responses, especially with more than one round of imputation. For this reason, missing data was addressed using multiple imputations.

SEM assumptions. There are a number of assumptions that should be met in order to use SEM. These assumptions include normality, non-collinearity, linearity of variables, and homoscedasticity. Normality is the assumption that dependent variables are distributed along a bell curve. Normality is typically examined visually by looking at values of horizontal normality (skew) and vertical normality (kurtosis), as well as histograms. Non-collinearity assumes that there is not multicollinearity, which is a state of shared variance among variables in a regression equation. Multicollinearity is examined by evaluating tolerance values and variance inflation factor (VIF) in order to

safeguard against inflated coefficients and suppression effects (which inflates standard errors, parameter estimates, and confidence intervals (Pintrich, 2003; Kraha, et al., 2012). VIF is a quantification of the amount of variance that is resulted by collinear variables (Lattin et al., 2003). Tolerance is the amount of variance in the dependent variable that cannot be explained by the other independent variables in the regression equation (Lattin et al., 2003). A suppression effect is evidenced when the direct and mediated effects of an exogenous indicator on a dependent variable have opposite signs (Cliff & Earleywine, 1994; Tzelgov & Henik, 1991). Linearity of variables is important to examine because if a relationship is curvilinear the associations will be underestimated. The assumption of homoscedasticity is that the errors of the coefficient predictions are dependent, and independent variables have similar levels of variance (Lattin et al., 2003). This assumption is examined also using plots between errors and unstandardized predicted values. Each of these assumptions will be discussed in further detail below.

Normality. Normally distributed items and scales follow a bell curve. The normality assumption only applies to purely endogenous (dependent/outcome) variables in the structural equation (Wall, 2012) because independent variables can be nonnormal without affecting the accuracy of predicted coefficients and error terms. Value and expectancies for success are purely exogenous (only included as predictor variables), whereas cognitive engagement is both exogenous (predicting reading outcomes) and endogenous (an outcome of motivation). In general, serious multivariate nonnormality creates inflated chi-square estimates; however, it is expected that the chi-square values will be inflated already because the sample size is greater that 400 (Kenny, 2012). This index does not accurately estimate fit with large samples because it cannot accommodate

all the variance that exists within larger sample sizes. Therefor the effects of nonnormality on chi-square are not a big concern.

Even though from a variable perspective the primary focus of normality is the endogenous variables, for descriptive purposes, each of the individual items in all of the scales were examined for normality. The two most common statistics of normality are skew and kurtosis. Skew is an index of nonnormality due to horizontal asymmetry and kurtosis is an index of nonnormality due to vertical asymmetry (Lattin et al., 2003). That is, these indices describe how nonnormal the data are horizontally and vertically. Together, these indices provide information about how normally distributed a given item may be. These values are presented in Table 1. As can be seen, no values were close to the suggested kurtosis limit of ±2.00 (Garson, 2010) which indicated no vertical nonnormality, and therefore, are deemed within the acceptable kurtosis range. Two cognitive engagement items had skewness levels that were beyond the suggested conservative level of ±1.00, which indicates no horizontal nonnormality. These items were "I complete my information reading tasks for school even if they are difficult" ($Skew_{whendifficult} = -1.07$) and "I try my best on all my information book reading assignments even when they're hard" ($Skew_{trybest} = -1.15$), indicating that students tended to respond affirmatively on these items. Because the skew is relatively small in magnitude and because the standard error of the skewness index is less than three times the skew value, this value would not be of great concern for most methodologists (Gaskin, 2012). Essentially the skewness is not distributed beyond three standard deviations and therefore is not a problem (Gaskin, 2012). As can be seen in Table 1, there was little univariate nonnormality based on skewness and kurtosis.

Three regressions were also performed to examine the dataset for multivariate normality. The first regression examined how values and expectancies for success predicted cognitive engagement (1). The second and third regressions were cognitive engagement, values, expectancies for success, socioeconomic status, race, and gender predicting informational text comprehension (2) and predicting Reading/Language Arts grades (3). These analyses were performed to break the theoretical structural equation model into three linear regressions, as has been suggested by the creators of MPlus (Muthén, 1998-2013) in order to examine for normality. From these analyses, variables were saved for the scatter plots that will be discussed below.

For explanatory purposes, the following discussion offers background on multivariate normality statistics. It is a summary of statistics and methods for multivariate normality diagnostics from Rupp, Templin, and Henson (2010), as well as Graybill and Iyer (1994). There are several types of residuals in the literature: standardized residuals, studentized residuals, and studentized deleted residuals. Ultimately, studentized deleted residuals were used and the rationale for this decision follows, but before doing so the other types of residuals are discussed

Standardized residuals are calculated by subtracting predicted variable response from the observed variable response divided by the standard error of the estimate, or the error of the dependent variable prediction given the individual's x response

$(zresid = \frac{y - \hat{y}}{s_{y.x}})$. These residuals are expected to have equal variances before the standardization, which is typically not the case in most datasets (Rupp et al., 2010).

Studentized residuals are adjusted for heterogeneity of variance because this index is essentially the error value for that case that is corrected for heterogeneity, or differences, in variance before it is divided by a standard deviation calculation ($sresid = \frac{y - \hat{y}}{s_{e_i}}$). This adjusted standard deviation calculation essentially adjusts for leverage, or how much this case can change the regression line. This method approximates the standard deviations for the error term for each case, and a case which has a standard deviation greater than three can be identified as an outlier.

A studentized deleted residual is the same statistic as the studentized residual, with the exception that the mean is calculated without including the outlier case and accounts for how much this given case affects the magnitude of the residuals. The dataset was scanned for studentized deleted residual values with an absolute value greater than three (Lattin et al., 2003), which indicates cases that are outliers, as do large differences between the studentized and studentized deleted residuals for a given case (Pett et al., 2003). Three cases were removed because they were deemed outliers based on the studentized residual analyses.

Structural equation modeling, the analysis strategy used in this study, requires that the conditional distribution of errors be normal. One method to assess normality of errors is to use a QQ plot, which is a plot of the unstandardized residuals to the expected normal value. This method was used to determine that there is no additional relationship between the predicted values and the errors that would lead to nonnormal data. Essentially, if the points fall on a scatter this pattern would suggest a random distribution of residuals because there is no additional relationship between error and the outcome

variable (Lattin et al., 2003). As can be seen in Figures 4 - 6 these values did fall in a scatter. Given that there is univariate normality, little multivariate nonnormality, as shown from the regression analyses, and the large sample size, these data are sufficiently robust with respect to normality; there is sufficient evidence that these data will not have normality problems.

In this study, the Reading/Language Arts grades variable is categorical, and informational text comprehension variable is count data and has a Poisson distribution instead of a bell curve. Count data is data that consists of a certain number of instances of a response. This type of data may include number of jumping jacks or number of answers correct. This is different from a score or percentage correct. For these variables, a weighted least squares analysis will be utilized. For this reason, the only dependent variable of interest for multivariate normality assumption is cognitive engagement because in the mediation model it is endogenous to values and expectancies for success. A histogram of cognitive engagement was examined and there was a small amount of nonnormality that was visible, as can be seen in Figure 7.

There is an ongoing debate in the field about the point when Likert scale items form a continuous or categorical variable and four and five point scales are the most controversial (J. Harring, personal communication, April, 2013). The debate is centered on whether a scale with this amount of response choices is continuous and the counterargument is that scales with more than this amount are difficult to interpret and therefore less reliable. The reason for this is that Likert scales with 4 or 5 points or greater often have properties of continuous date even though they are an interval scale (J. Harring, personal communication, October, 2012). The way Likert scales should be used

has been debated within the methodology field and much of the current work has reported that this decision should be made by the researcher based on the nature of the data. Given that there is some multivariate nonnormality, these items were treated as categorical. Also, the subsequent analyses will use a weighted least squares analysis because cognitive engagement, grades, and informational text can be considered nonnormal endogenous variables.

Non-collinearity. Multicollinearity is a description of how much shared variance a group of variables has and addresses whether or not these variables fall into a problematic level of collinearity causing biased coefficient estimates. Recent statistical discussions explain that multicollinearity is a persistent problem in many mediation analyses and is difficult to avoid (Kenny, 2009; Preacher & Hayes, 2008). In this dataset, however, none of the VIF or tolerance values were in the problematic range. Most researchers consider tolerance values less than .2 and VIF values higher than 4 or 5 to indicate multicollinearity within in a regression framework. None of the values were close to exceeding the problematic range for VIF or tolerance values, as can be seen in Tables 2 - 4.

Another point worthy of explanation is that the bivariate association between values and cognitive engagement is high (r = .71), but the tolerance and VIF were within the acceptable range. Chennamaneni, Echambadi, Hess, and Syam (2008) offered an explanation of the associations between correlation, collinearity diagnostics, and true multicollinearity beginning with "fundamental to the central role of correlations in both collinearity diagnostics is the inappropriate belief that correlations and collinearity are synonymous" (p. 4). Correlations are based in the cosine of the vectors formed by the

mean-centered variables, while collinearity diagnostics are based on the cosine of the vectors of the raw variables, or the extent of their linear dependency (Chennamaneni et al., 2008). As can be seen in Figure 8, there are instances in which there are indeed high correlations and low collinearity values. As with most statistics, there is not one definitive index that can easily build or reduce an argument. This evidence is built by a series of visual observations when available (e.g., plots), statistics, and theoretical precedence, and from this body of evidence an informed decision can be made. In this case, the diagnostics of collinearity are within the acceptable range, but there are high bivariate correlations and other statistical and conceptual issues with these measurements that will be discussed further in Chapters 4 and 5.

Linearity. Examining the data for linearity is important because the relationship between the independent and dependent variables will be underestimated if the relationship is nonlinear and estimated using linear equations. For instance, an association with a perfect quadratic association is a perfect curve, which is a clear relationship, but would have a bivariate association of zero because it is nonlinear. The diagnostic for this type of association is a scatter plot of e (error) versus $\hat{y}$ (predicted value). A plot that is scattered would suggest that there is no relationship between the unstandardized residuals and the unstandardized predicted values, which are all good indicators of a linear relationship (Lattin et al., 2003).

In terms of multivariate linearity, plots were examined between the variables and each dependent variable and are shown in Figures 9 – 11. These plots indicate a linear association between each of the independent variables and each dependent variable. Because engagement is both exogenous (an independent variable) and endogenous (a

dependent variable), it is included as a dependent variable predicted by expectancies for success and values in the model as well as a predictor of Reading/Language Arts grades and informational text comprehension.

Homoscedasticity. Homoscedasticity is the assumption that the errors are dependent and independent variables have similar levels of variance (Lattin et al., 2003) and is important to have accurate estimates of coefficients and error terms. Homoscedasticity is often examined using Levene's test to examine whether different levels of groups (males versus females) have different levels of variance (Levene, 1960). Since demographic variables are not a focus of this study, Levene's test is an inappropriate choice. Instead, homoscedasticity was examined through error plots. When the variance of the residuals is constant, it is homoscedastic and the plot will show no fanning or otherwise changing, or heteroscedastic, variance. This association can be shown in a plot of error to predicted values (e to $\hat{y}$). Here this assumption has been shown is mostly the case, and it can be concluded that the residuals are homoscedastic as seen in Figures 9-11. Berry and Feldman (1985) and Tabachnick and Fidell (1996) noted that slight heteroscedasticity does not influence results, and therefore, are not concerned with minor changes in variance.

In sum, normality, multicollinearity, linearity of variables, and homoscedasticity were examined. With respect to normality, skew, kurtosis, studentized deleted residuals. QQ plots, and histograms were used. From these analyses, it was clear that the assumption of normality is acceptable for these data. In terms of non-collinearity, both the VIF and tolerance were not in the problematic range; however, from the results that follow it is clear that these values may be misleading. In order to test the assumption of

linearity, plots of the independent and dependent variables were examined for errors that are unrelated after the regression equation is accounted for. This should show a scattered plot, which it did. The assumption of homoscedasticity was examined using plots of error terms in relation to the predicted y from the regression equations described above. From this analysis, linearity can also be assumed.

Descriptive Analyses

Descriptive statistics were computed for each of the individual items as well as scales. The descriptive statistics include an index of central tendency (means) and variability (standard deviations). Scale descriptives can be found in Table 5. Each of the scales was worded positively so that a higher mean indicates a higher magnitude of that variable, and a lower mean indicates less of that variable. The mean and standard deviations of the items are presented in Table 1. As can be seen, the means for the motivation scales and engagement scale are slightly above the neutral point of the four-point Likert scale, which is 2.5. This value indicated that the students in general identify with the self-perception that they find reading information books important agreeing with the survey items such as "Understanding information books for school is very important to me" and useful such as "I can use the knowledge that I learn from information books for school." They also tend to believe they are good at reading informational texts and can read information books successfully as indicated by items such as "I can find the main idea of a section in an information book for school" and "I understand all the information books that I read in school." Furthermore, the positive cognitive engagement mean indicated that students identify with a thoughtfulness and willingness to exert effort into reading informational texts (Eccles & Wang, 2012) agreeing with items such as "I

devote as much time as necessary to reading my school information books" and "I don't give up on difficult information book reading assignments." The standard deviations for each of these items range from .72 to .95, which was an acceptable amount of variability on a four point Likert scale (Lattin et al., 2003). The informational text comprehension scale ranged from 0-25 with a mean of 14.91, and grades ranged from 1-5 with a mean of 3.69.

The bivariate associations between all of the scales are reported in Table 6. The association between values and cognitive engagement and values is $r = .71$ and cognitive engagement and expectancies for success is $r = .49$. These associations are large; however, as mediation researchers (e.g., Preacher & Hayes, 2008) state, such high correlations should be expected for a mediation analysis to be possible. Other noteworthy correlations was that values was not very highly correlated with either reading outcome. For informational text comprehension, the bivariate correlation was nonsignificant, and although the correlations of values for grades was significant at $p < .01$, the correlation of $r = .09$ was relatively small in magnitude. As Hancock and Mueller (2013) have noted, the direct path between the predictor variable (expectancies for success and values) and the dependent variable (either informational text comprehension or Reading/Language Arts grades) is not required in a structural equation modeling framework, as it is by Baron and Kenny (1986).

Structural equation modeling analyses: Baron and Kenny. The Baron and Kenny (1986) method of establishing a mediator has been used extensively from the late 1980s through the early 2000s until structural equation modeling, specifically latent and measured variable path analyses, gained popularity as an alternative. The Baron and

Kenny method of examining mediation recommends the use of four separate regression analyses. These analyses include establishing that the independent and outcome variables are significantly associated, that the independent variable is associated with the mediator, that the mediator is associated with the outcome variable, and that when the each of these two associations is controlled, the association between the independent and dependent variable is significantly decreased, as evidenced by a Sobel test. This indicates that the coefficient value is significantly changed (Sobel, 1982). This method became a widely used and established method and it relies on regression, which is easily understood by most quantitative researchers. Also, most researchers have access to regression software, and running separate regressions clearly establishes separate direct and indirect effects.

Latent variable path analysis. Structural equation modeling (SEM) is used to examine the simultaneously occurring relations among a set of measured or latent variables. As compared to other analyses, SEM is a factor analysis (items are pooled into a variable) with a multiple regression (path coefficients are examined simultaneously). SEM can include latent (e.g., latent variable path analysis) or measured variables (e.g., measured variable path analysis). Latent Variable Path Analysis (LVPA) is a form of SEM that is used to test causal or structural relations among variables and can be used to examine potential mediation (Hancock & Mueller, 2006). LVPA is similar to multiple regression analysis because the path coefficients in LVPA are similar to partial regression weights (Hancock & Mueller, 2006).

Like regression, LVPA is typically based in examining ordinary least squares equations (a basic regression) and is essentially a series of simultaneous latent regressions. A measured variable path analysis (MVPA) would be very similar to

multiple simultaneous regressions. LVPA adds the analysis of a measurement model in order to establish latent constructs. A measurement model is used to distinguish between scales and to estimate latent variables from observed items. A latent variable is an error-free unobserved factor that explains the intercorrelations between observed or measurable factors (Brown, 2006; Little, Preacher, Selig, & Card, 2007). In this analysis, a weighted least squares analysis was performed because of the nonnormal endogenous variables. This type of analysis is a special case of LVPA.

LVPA is typically seen as a stronger method of examining mediation than the Baron and Kenny (1986) method because LVPA can account for the correlation between two exogenous variables, instead of running a series of separate analyses. Such separate analyses can inflate *p* values, and therefore, decrease the power of the study. This feature is particularly useful in the current study so that values and expectancies for success can be examined within the same model and be allowed to correlate because they are theoretically expected to correlate. The alternative in a Baron and Kenny (1986) framework would be to run two separate analyses, which would not allow values and expectancies for success to be correlated. Both types of path analysis are stronger than the Baron and Kenny (1986) method because LVPA is a more holistic approach than the multiple regression method. Baron and Kenny's (1986) method fails to account for multiple simultaneous regressions, and cannot be used to examine several causal correlations paths at once, and models cannot be combined (to include both values and expectancies for success in one model).

LVPA and MVPA can offer two types of findings with respect to mediation. First, it provides holistic fit indices for the LVPA (described in chapter 3 and below).

These statistics provide evidence that the proposed model reflects acceptable fit to the matrices that exist within the dataset. Also, if the indirect paths are significant there is also significant evidence for mediation (Hancock & Mueller, 2006; 2010). For example, if the product of the values to cognitive engagement coefficient and the coefficient of cognitive engagement to the reading outcome variables coefficient is significant, there is evidence that cognitive engagement is a significant mediator of values and the reading outcome. Similarly, if the product of the path from expectancies for success to cognitive engagement to the reading outcome variables is significant, there is also evidence that cognitive engagement is a significant mediator of this association as well.

Model fit. Hancock and Mueller (2006; 2010) described the plethora of fit statistics that have been proposed to describe the fit of a given model. As discussed in Chapter 3, there is no one fit index that is best for every model or universally agreed upon by all researchers. Instead, it is best practice to include different types of psychometric statistics that bring together a fuller picture about the potential fit of the model. Chi-square (χ^2) statistics are often included as a general, arguably antiquated, indicator of general model fit. This fit statistic gives an estimate of how well the model described is reflected within the matrices in the dataset. This index was included here because it is commonly used in the field, although many recent method articles have discussed that this statistic is easily inflated by nonnormality, large sample size, and is not necessarily useful when other fit indices are within the acceptable range (Kenny, 2012; Hancock & Mueller, 2010). Kenny (2009) argued that chi-square can be a good fit index with sample sizes smaller than 400; however, with larger samples there is simply too much variance included in a model to have a nonsignificant chi-square statistic. Thus, models that may

be representative of the matrices within the dataset will consistently be falsely rejected using chi-square as a fit index because it is biased against samples greater than 400 (Bentler & Bonett, 1980; Bollen, 1989; Hu & Bentler, 1999; Tucker & Lewis, 1973).

Since the early 1980s, researchers have worked to resolve the problem of inflated chi-square values by creating alternate estimates that can be used with the large sample sizes required to conduct SEMs (Bentler & Bonett, 1980; Bollen, 1989,; Hu & Bentler, 1999; Tucker & Lewis, 1973). Hancock and Mueller (2010) recommended including one fit index from each of the following types of statistical fit: incremental, absolute, and parsimony. Incremental fit indices describe the extent to which the model of interest compares to the null model and offers insight into whether the model-implied specifications better reflect the matrices that exist within the dataset than no associations at all. Incremental fit is calculated by comparing the model of interest to the best possible and worst fitting models and explains where this model fits on that spectrum. Examples of this kind of fit index are Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI). The second type of fit index is the absolute index class, which assesses overall fit without considering how complicated the model is. This type of fit index essentially compares the model of interest to the best possible fitting model, and therefore, this index is essentially a "badness of fit" model (Kenny, 2012). Examples of this kind of fit index are Goodness of Fit Index (GFI) and Standardized Root Mean Square Residual (SRMR), and Weighted Root Mean Square Residual (WRMR). Third, indices of parsimony which give worse for to more highly constrained models and more complicated models are less likely to have good fit. This index is based on the assumption that the simplest model with the best fit

is likely the most accurate model. Examples of this kind of fit index are Adjusted Goodness of Fit Index (AGFI) and Root Mean Square Error of Approximation (RMSEA).

In this study, one of each type of fit index was used, as recommended by Hancock and Mueller (2010). The two most common incremental fit indices are the CFI and the TLI. Kenny (2009) recommended that only one be reported because these two indices are typically highly related and reporting both offers redundant information. The CFI was chosen because it is more commonly used than the TLI, and therefore, has a wider audience for interpretability. The CFI ranges from zero to one and in general an index greater than.95 indicates acceptable fit (Hancock & Mueller, 2006). For an index of absolute fit, the WRMR will be used in placement of the SRMR because the endogenous variables are weighted in this study. WRMR will be used instead of the SRMR because this index is most appropriate for a categorical dependent variable. In this case, the categories are weighted to deal with any potential nonnormality that is associated with a categorical dependent variable. This index is an experimental one and Yu (2002) suggested that it be interpreted with caution and disregarded if other fit indices are acceptable. Furthermore, there have not been any simulation studies that examine this index with a mixture of latent variables and categorical variables as performed in this study, so this finding should be interpreted with caution. Yu (2001) recommend that models with WRMR values less than .90 have good fit. The other commonly used absolute fit index statistic is the GFI, which is an equally useful statistic for datasets with this sample size, but it is not offered using MPlus (Muthén, 1998-2011). The RMSEA was used as an index of parsimony, and therefore, describes how good the fit is without

having a highly specified model. Typically, a RMSEA of less than .08 indicates acceptable fit (Kenny, 2012). Together, these fit indices describe how acceptable the holistic fit is from a variety of perspectives which offers a clearer picture of model fit.

Type of estimation for CFA and SEMs. MPlus includes 12 potential types of estimators to best specify data with different distributions and characteristics (Muthén, 1998-2011). The type of estimation that was applied for the CFA was weighted least squares because it is well-suited for Likert scales with at least four points (Enders & Bandalos, 2001). For the purpose of this study, weighted least squares (WLSMV) was chosen for the CFA. Because many have argued that categorical variables can be treated as continuous when there are four or more items within a scale (Enders & Bandalos, 2001), few biases in the data will arise; however, in order to be conservative, a WLS method of estimation was used for the grades SEM and an ML estimation (a default) for the continuous variable, informational text comprehension. Because the imputation was done more than two times, the results of each model will be unbiased (Little & Rubin, 1987). WLSMV is suitable for the categorical nature of the grades variable because the standard errors are weighted to account for nonnormality and also somewhat widely recognized to most quantitative researchers.

Measurement model. CFA is a type of SEM that specifically deals with measurement models, which concerns the associations between observed variables (e.g., items) and latent factors (Brown, 2006). This method is used by many researchers to examine the extent to which items fit theoretically predetermined scales and estimate errors of the observed items. This analysis is typically done to test the hypothesis that there are theoretically determined subscales representing the items, as a preliminary step

to examining the associations between subscales (Brown, 2006; Hancock & Mueller, 2006; 2010). CFA is used as a psychometric test of an instrument (Brown, 2006) and can also help researchers evaluate potential dimensions of a scale from the fit indices. For example, if a CFA including three subscales (values, expectancies for success, and cognitive engagement) has good fit, then running a model with three scales in the subsequent SEMs would be a reasonable choice.

The theoretical basis for values, cognitive engagement, and expectancies for success to be separate factors is established within the literature; however, it remains necessary to establish that these expectations are found empirically within the current dataset. As discussed above, a CFA (measurement model) allows researchers to establish the underlying structure of an assessment of a set of variables so that in subsequent structural models, unobservable latent factors can be estimated. To examine whether the items measuring values, expectancies for success, and cognitive engagement form three latent factors, a CFA positing three factors was run using MPlus software (Muthén, 1998-2011). Because it was theoretically expected that values, expectancies for success, and cognitive engagement are correlated, they were allowed to covary.

Overall, each of the items loaded at an acceptable level on each of the theoretically derived scales as can be seen in Table 7. The loadings of the items contained in the measurement models can be found in Tables 8 and 11. Furthermore, a CFA specifying three factors provided good fit to the data. The association among the latent factors ranged from b = .42 to .61. The measurement model displayed acceptable fit (χ^2 = 567.32; CFI = .960; RMSEA = .042). As discussed above, the chi-square value will be inflated with sample sizes above 400 (Hancock & Mueller, 2006) and it is

necessary to include additional fit indices. Each of these additional values is in the acceptable range for model fit. The factor correlations can be found in Table 9. It should be noted that the factor correlation for values and cognitive engagement was unacceptably high (b = .91). The analyses that were proposed were completed, but further analyses were performed to address this problem. These analyses will be discussed below.

Analyses for testing hypotheses. The four main hypotheses were addressed using LVPA, which examines the associations among latent variables and can be used to assess potential mediation. In this investigation, LVPA was used to examine both direct and indirect effects of values and expectancies for success on informational text comprehension in one model and on Reading/Language Arts grades in another. As discussed in Chapter 3, demographic variables were included in the model to control for the roles of race, gender, and socioeconomic status in order to isolate the roles of the perception variables on performance. Previous work by Voekl (1997) established racial differences in student engagement, stating that race plays a significant role in student engagement; however, as discussed in Chapter 2, Voekl (1997) may have confounded race and socioeconomic status (Wang et al., 2011). These demographic variables are discussed in greater detail by Finn (Finn, 1993; Finn, Pannozzo, & Voelkl, 1995; Finn & Rock, 1997), but for the purpose of this study, these variables were included as control variables. Demographic controls were not considered in the CFA, because no reading outcomes were included in the CFA that would require parsing out of demographic effects.

Hypothesis 1: Cognitive engagement will significantly mediate the association between values and informational text comprehension. The first research hypothesis was that cognitive engagement would significantly mediate the associations between values

and informational text comprehension. To address this hypothesis, I evaluated the model found in Figure 12. This model included values, expectancies for success, cognitive engagement, gender, race, and socioeconomic status as direct predictors of informational text comprehension, as well as values and expectancies for success indirectly predicting informational text comprehension through cognitive engagement. The goal of this analysis was to test whether the indirect path from values to cognitive engagement to informational text comprehension was significant. As can be seen in Figure 12, expectancies for success and cognitive engagement were significant and positive predictors of informational text comprehension, while values was a negative predictor. Both socioeconomic status and race were positive and significant predictors, but gender was not. The indirect path between values and informational text comprehension mediated by cognitive engagement was also significant and positive. The hypothesis that cognitive engagement will significantly mediate the association between values and informational text comprehension was confirmed ($\beta = 1.116$, $p < .05$); however, the negative path coefficient between values and ITC suggests a suppression effect, and so the meditational finding should be interpreted with caution. Model fit indices show that this model had acceptable fit, except for WRMR ($\chi^2 = 703.226$; CFI = .956; SRMR = .044; RMSEA = .038). Fit values can be found in Table 10.

Hypothesis 2: Cognitive engagement will significantly mediate the association between expectancies for success and informational text comprehension. The second research hypothesis predicted that cognitive engagement would significantly mediate the associations between values and expectancies for success and informational text comprehension. To address this hypothesis, I examined the model found in Figure 12.

Like in Hypothesis 1, this model included values, expectancies for success, cognitive engagement, expectancies, gender, race, and socioeconomic status as direct predictors of informational text comprehension, as well as values and expectancies for success indirectly predicting informational text comprehension through cognitive engagement. This analysis was performed using the same model as Hypothesis 1 so there were the same significant direct predictors. In this case, expectancies for success were also significantly mediated by cognitive engagement. As can be seen in Figure 12, expectancies for success, and cognitive engagement were significant and positive predictors of informational text comprehension while values was a negative predictor. Both socioeconomic status and race were significantly positive predictors, but gender was not. The indirect path between expectancies for success and informational text comprehension mediated by cognitive engagement was also significantly positive. The hypothesis that cognitive engagement will significantly mediate the association between expectancies for success and informational text comprehension was confirmed ($\beta = .128$, $p < .05$). Model fit indices show that this model had acceptable fit, except for WRMR ($\chi^2 = 703.226$; CFI = .956; SRMR = .044; RMSEA = .038). These fit values can be found in Table 10.

Hypothesis 3: Cognitive engagement will significantly mediate the association between values and Reading/Language Arts grades. The third research hypothesis predicted that cognitive engagement would significantly mediate the associations between values and Reading/Language Arts grades. To address this hypothesis, I evaluated the model found in Figure 13**.** This model was set up the same as the model for Hypotheses 1 and 2, but the outcome variable was Reading/Language Arts grades instead

of informational text comprehension. The goal of this analysis was to test whether the indirect path between from values to cognitive engagement to grades was significant. As can be seen in Figure 13, expectancies for success, and cognitive engagement were significant positive predictors of grades, while values was negative. Both socioeconomic status and gender were significant and positive predictors, but race was not significant. The indirect path between values and grades mediated by cognitive engagement was also significant and positive. The hypothesis that cognitive engagement will significantly mediate the association between values and grades was confirmed ($\beta = 1.217$, $p < .001$). Model fit indices show that this model had acceptable fit, except for WRMR ($\chi^2 = 768.511$; CFI = 0.979; WRMR = 1.449; RMSEA = .041). These fit values can be found in Table 10. These findings may be misleading due to a suppression effect.

Hypothesis 4: Cognitive engagement will significantly mediate the association between expectancies for success and Reading/Language Arts grades. The final research hypothesis predicted that cognitive engagement would significantly mediate the associations between expectancies for success and grades. To address this hypothesis, I evaluated the model found in Figure 13. The goal of this analysis was to test whether the indirect path from expectancies for success to cognitive engagement to grades was significant and positive. As can be seen in Figure 13, expectancies for success and cognitive engagement were significant positive predictors of grades, while values was negative. Socioeconomic status and gender were significant positive predictors, but race was not significant. Also, the indirect path between expectancies for success and grades mediated by cognitive engagement was also significant and positive. The hypothesis that cognitive engagement will significantly mediate the association between expectancies for

success and grades was confirmed (β = 0.096, $p < .01$) Model fit indices show that this model had acceptable fit, except for WRMR ($\chi^2 = 768.511$; CFI = 0.979; WRMR = 1.449; RMSEA = .041). These psychometric fit values can be found in Table 10.

The Impact of Collinearity on the Analyses Done in This Study

Worthy of noting is that the bivariate association between values and cognitive engagement was very high ($r = .71$) and the factor correlation between values and cognitive engagement was also high ($b = .91$). Some have argued that when items have similar stems, response scales, and type of measurement (measurement invariance), the bivariate association will be inflated (Kenny, 2012). This argument may be true, but the association likely is stronger than what can be explained by measurement alone. Instead, it seems likely that values and cognitive engagement may be difficult to distinguish conceptually because of the items that were used. This issue will be discussed further in Chapter 5. Judd and Kenny (2010) reported that a degree of collinearity is necessary for mediation or moderation to occur. That is, there must be shared variance for variables to interact or have causal influence; however, it is also important to note that high levels of linear dependency will cause a suppression effect and values that may be misleading because of redundancy on the independent variables. Due to the likelihood of suppression effects the meditational findings in this study must be interpreted cautiously, because suppression effects can lead to misleading results.

The discussion that follows is a summary of Chennamaneni et al. (2008) as well as work by Baron and Kenny (2013) on collinearity. First, as just noted some collinearity is necessary for mediation and moderation studies. That is, for moderation or mediation to occur, there must be shared variance among the variables. Collinearity becomes

problematic if two or more scales are linearly dependent which may cause misleading coefficients throughout the model. For instance, Chennamaneni et al. (2008) reported that from 1996-2008, 80 papers published in major marketing journals reported serious collinearity concerns. Many of these papers used potential fixes included centering, standardizing, and dropping items (Chennamaneni et al., 2008). In this study, a series of diagnostic analyses, including exploratory factor analysis, principal component analysis, biserial correlations, standardizing the items, centering the items, evaluating modification indices, and others were done to examine if there were potentially confounding items, and exploring reduced scales. Although Chennamaneni et al. (2008) have argued that high correlation is not completely associated with linear dependency, it is clear from a conceptual review of the items that the measure of values and cognitive engagement in this study are somewhat similar, which will be discussed further in Chapter 5. This is also evidenced in the suppression effect shown in the change from a nonsignificant correlation between values and informational text comprehension in bivariate association becoming a strong negative correlation between the same variables in the models. This will be discussed further in Chapter 5.

Summary of Main Findings

The goal of this study was to examine the extent to which cognitive engagement is a significant mediator of the relations of reading values and expectancies for success to two reading outcomes. The scales measuring these constructs that were used in the analyses were established using confirmatory factor analysis. Relations among these motivation variables, cognitive engagement, and the outcome variables were examined in two structural equation models. Socioeconomic status, race, and gender were also

included in these analyses as controls. The purpose of including these variables as controls was to parse out any effect of these variables and separate the influences of values, expectancies for success, and cognitive engagement on each of the two reading outcomes. The two reading outcomes examined in this study were informational text comprehension and Reading/Language Arts grades. The interpretation and contextualization of these findings will be provided in Chapter 5.

The first research hypothesis predicted that cognitive engagement would significantly mediate the associations between values for reading informational text and informational text comprehension. Structural equation modeling revealed that cognitive engagement is indeed a significant mediator of this association. In this analysis, socioeconomic status, race, and gender were entered as controls and socioeconomic status and race had significant direct paths predicting informational text comprehension, but gender did not. The result was a partial mediation because the direct path remained significant. Further, the effect must be interpreted cautiously because values and cognitive engagement may have shared overlapping explanatory power leading to misleading coefficients.

The second research hypothesis predicted that cognitive engagement would significantly mediate the associations between expectancies for success for reading informational text and informational text comprehension. The structural equation modeling performed offered evidence that cognitive engagement is also a significant mediator of this association. Because this hypothesis was tested using the same model as the one above, the same demographic variables were significant. The mediation was

partial, as shown by the remaining significant direct path of expectancies for success to ITC.

The third research hypothesis predicted that cognitive engagement would significantly mediate the associations between values for reading informational text and Reading/Language Arts grades. Structural equation modeling showed that cognitive engagement does significantly mediate this association. Similar to the analysis above, socioeconomic status, race, and gender were entered as controls; however, in this case, socioeconomic status and gender were significant predictors, but race was not. The resulting significant partial mediation effect showed that cognitive engagement does mediate the effect of values on grades. This should be interpreted with caution because multicollinearity can lead to inflated parameters and misleading results.

The final research hypothesis predicted that cognitive engagement would significantly mediate the associations between expectancies for success and Reading/Language Arts grades. The SEM analysis showed that cognitive engagement is a significant partial mediator of this association. This result was tested using the same mediation model as in Hypothesis 3; therefore, the same demographic associations were significant.

A problem that arose in the correlational analyses, confirmatory factor analysis, as well as in the two structural equation models, was an unacceptably high association between values and cognitive engagement. I attempted to resolve this issue using many analytical techniques that have been previously used in the literature including, but not limited to, exploratory factor analysis, principal component analysis, biserial correlations, standardizing items, centering the items, and evaluating modification indices. These

techniques were done to examine if there were potentially confounding items and if certain items could be removed to more clearly distinguish the constructs. None of these methods resolved the problem. This issue will be discussed further in the Chapter 5.

Chapter 5: Summary of Findings, Limitations, Discussion, Implications, and Future Research

In this chapter, I will report limitations, discuss main results, and offer implications for expectancy-value theory and suggestions for future research. In the discussion portion, I will briefly discuss the mediation by cognitive engagement of the relations of values with two reading outcomes as well as potential collinearity. Second, I will discuss the mediation of expectancies and reading outcomes by cognitive engagement. I will also examine the bidirectional association of expectancies and values followed by a discussion of expectancies and values directly predicting cognitive engagement. Then, I will summarize and interpret the associations of cognitive engagement, values, and expectancies with reading performance. Next, I will contextualize the associations between the demographic controls and reading performance. As discussed in Chapter 1, this dissertation is based on theoretically-derived research questions and is not designed to have an immediate educational application.

Summary of Study Results

Previous research studies have shown that cognitive engagement could be included in the Eccles et al. (1983) expectancy-value model as the indirect means, or mediator, by which motivational influencers drive achievement (e.g., Greene et al., 2004; Hardré et al., 2007; Skinner et al., 2008). From an expectancy-value framework, this means that through engagement, expectancies for success and values may be actualized into achievement. This study was guided by the expectancy-value model developed by Eccles and her colleagues and presented in Figure 1.

To explore the associations between values, expectancies, cognitive engagement and reading performance, I conducted a study with 1197 seventh graders. I examined the two conceptual models in Figures 12 and 13, which postulated that expectancies for success and values impact reading performance directly and also indirectly by way of cognitive engagement. These models were assessed with two structural equation modeling (SEM) analyses, which are presented in Models 1 (Figure 12) and Model 2 (Figure 13). Model 1 was used to examine these relations using informational text comprehension (ITC) as the outcome measure and Model 2 was used to examine these relations with Reading/Language Arts grades as the outcome.

In the SEM analyses, direct and indirect paths were examined. The indirect paths for Model 1 included values to cognitive engagement to ITC and expectancies for success to cognitive engagement to ITC. There were also direct paths including values, expectancies for success, race, gender, and socioeconomic status to ITC. The same paths were again tested in Model 2 using Reading/Language Arts grades as an outcome. These paths included values to cognitive engagement to Reading/Language Arts grades and expectancies for success to cognitive engagement to Reading/Language Arts grades. Again, there were also direct paths including values, expectancies for success, race, gender, and socioeconomic status to Reading/Language Arts grades.

In summary, the structural equation modeling (SEM) results provided evidence that (a) values, expectancies for success, and cognitive engagement, and demographic controls are significant direct predictors of ITC and Reading/Language Arts grades and (b) cognitive engagement is indeed a significant mediator in in both Model 1 and Model 2. This latter finding means that the association of values and each of the reading

outcomes were significantly mediated by cognitive engagement. Also, the association of expectancies and each of the reading outcomes were significantly mediated by cognitive engagement. Throughout Chapter 4 and this chapter, it is important to remember that there may have been high collinearity between values and cognitive engagement. The issue of collinearity will be discussed later in this chapter.

The main finding of this study was that cognitive engagement was a significant mediator of both expectancies and values with reading performance. Guthrie et al. (2012) discussed how reading requires effort and attention. Expectancies and values partially drive engagement, which is to say, they initiate engagement and not that motivation stops when a student becomes engaged in a task. When reading is valued and students believe they can be successful, students will be more persistent and put in more effort in deducing meaning from passages, like the ITC test. If students are more motivated, they will put in more effort and will result in better Reading/Language Arts grades.

As discussed, the indirect effects of values and expectancies, and the direct of values, expectancies, cognitive engagement, and demographic controls were the same across the ITC and Reading/Language Arts grades. One exception to this association was the effects of gender and race on the reading outcomes. For gender, girls had higher grades than boys, but boys and girls did the same on ITC. This finding replicated previous research that males and females do not differ on standardized tests at this age and girls often perform better in Reading/Language Arts grades, which are typically seen as favoring females than do other classes such as mathematics (Banks & Banks, 2010). For race, there was no difference in performance in Reading/Language Arts grades, but there was a race difference on ITC.

Limitations

In this section I will summarize the limitations of this study. There were several methodological issues including the use of observed dependent variables. Next, the measures of values and cognitive engagement were highly correlated and there may have been collinearity issue. Another issue is that there is a growing discussion in the methodological field about studies of mediation and some articles have been published that SEM is not sufficient to detecting mediation. A final limitation of the study is that only students were assessed. Future work should consider using corroborating data to triangulate multiple perspectives on motivation and engagement.

The use of observed dependent variable was a limitation of this study. Informational text comprehension was measured with a series of items and was treated as an assessment of comprehension. An alternative is a latent approach in order to move beyond measured, observable dependent variables and perhaps use latent dependent variables that account for the error associated with measured variables. This would be useful because the goal is to understand informational text comprehension ability, not a score on a test, and ability in Reading/Language Arts class, not a grade in a class. By having multiple measures for each of these assessments, these variables can be scaled as latent constructs of ability instead of scores. The associations among multiple measurements can be accounted for which would make the ultimate latent construct a more accurate estimate of ability. Also, by scaling items in a latent manner there are additional reliability indices that can be used in order to assess psychometric qualities of the items. Finally, the association between individual measures (and items) with the

latent construct can be assessed and items or scales that are not functioning coherently with the latent construct can be removed.

Another limitation is the high correlation between values and cognitive engagement. Some researchers would argue that the high correlation between values and cognitive engagement is due to collinearity that is perhaps caused by similar definitions and subsequently derived measurements. Others would argue that it is reasonable that the association between values and performance would be negative because the variance for the association between values and cognitive engagement is pulled from the association between values and performance. This would offer the interpretation that if students value reading and they become cognitively engaged, they will perform better in reading tasks. Similarly, students who value reading, but do not engage cognitively will not perform highly and this results in a significant negative association. This problem would be resolved by using a longitudinal design and more advanced methods of studying mediation which are discussed below.

An additional limitation was the use of SEM to examine mediation. There is a growing literature concerning the problematic nature of mediation analyses in general. Several methodologists in this area have argued that there is no analysis or index that definitively answers the question of whether an association is due to causal mediation or not. In fact, Green et al. (2010) suggested that most current methods of testing mediation (e.g., path analysis) are not sufficient for isolating causal effects and call current mediation methods the study of a black box. They say this because it is impossible to know if all relevant variables are included in the model, if the variables are measured well, and most importantly, to what extent the significance is due to collinearity or actual

causal mediation. Similarly, Mayer, Thoemmes, Rose, Steyer and West (submitted) have argued that most mediation models cannot produce accurate coefficient estimates because traditional methods of mediation analysis necessarily omit unknown variables that inevitably leads to systematically biased estimates of direct and indirect effects. This can occur even with longitudinal experimental data (Mayer et al., submitted). Researchers studying mediation should only attempt to make causal inferences if using the most cutting edge methodologies (e.g., such as those suggested by Imai et al., 2010a; Imai et al., 2010b, Van der Weele, 2009) and have a strong understanding of the methodological limitations of mediation analyses (Mayer et al., submitted).

Finally, an issue that is often raised is how much can we "trust" the respondents of self-report survey (Yassie-Mintz & McCormick, 2012, p. 758). One solution is to use corroborating information, or multiple informants, to triangulate perspectives among perceptions of student motivation (Alexander, 2013). Such data would be useful to see if multiple respondents share perspectives on student motivation and engagement. It would also be useful to see whether the relations change based on whose perception is measured. In this study, only student perspectives were used, but future work should include multiple informants.

Discussion

Mediation of the relations of task values to reading outcomes. The current study indicated that cognitive engagement is a significant mediator of the associations between values and ITC and with Reading/Language Arts grades; although, this finding should be interpreted with caution because of the high collinearity between values and cognitive engagement (see following discussion). Students' reading values were

significantly negatively associated with performance on the ITC test (b = -.34), as well as Reading/Language Arts grades (b = -.58). In this study, values was significantly correlated with cognitive engagement at r =.71. In the initial SEM analyses, these variables were related quite highly (b = .87). This high association could be due to the elimination of measurement error in the latent construct, due to collinearity with other variables in the model, or may be the actual correlations that exist in the data. These possibilities will be discussed further later in this chapter.

The associations between values and cognitive engagement are highly related in the relevant literature base. For instance, using the MSLQ, Pintrich and DeGroot (1990) reported that cognitive engagement (defined as effort management) correlated with values at r = .73, which is very close to the coefficient that was found in this study. Similarly, Sungur and Tekkaya (2006) reported that value and effort regulation (effort in the face of a difficult task) were correlated at .73. Hong et al. (2009) examined similar variables and reported that value was correlated with effort in seventh grade at r = .43 and in 11th grade at r = .60. Guthrie et al. (2013) reported that cognitive engagement, using the same measure that was used in this dissertation, was associated with valuing reading at .78. These high correlations should be carefully considered when developing measures because they may limit the models that can be used because of a potential for collinearity.

Conceptually, the relation between values and cognitive engagement may be explained in the following ways. If a task is particularly important or useful for an individual to complete, they are likely to persist and think creatively about how to complete the task (Pintrich & Schrauben, 1992). Similarly, students will strategize in

order to complete a task that is useful to completing a goal. If cognitive engagement is defined as investment in learning, students who find a task important are likely to invest in learning by going above and beyond requirements and this investment would lead to achievement.

Collinearity. Collinearity describes linear dependency between two explanatory variables, in this case values and cognitive engagement, causing inflated standard errors and less certainty in inferences that can be drawn from the model's parameters (Bollen, 1989). The problem of linear dependency is that when two explanatory variables that are linearly dependent are included in a model, one cannot isolate the unique effects of either variable because they are so highly associated. Further, this can also cause problems with inflated model coefficients. Collinearity does not mean that one variable is a more powerful predictor than another. Collinearity means that two variables predict redundant variance. That is, both values and cognitive engagement predict similar variance in reading achievement. Because each of these is significant predictors of similar variance, it is important that future items that are used are carefully worded so that distinctions in the variance of reaching achievement can be captured.

One question that should be raised is whether values and cognitive engagement are empirically and conceptually distinct. In future analyses, I will empirically compare the fit of the model with three factors (values, expectancies, and cognitive engagement) a two-factor solution (with values on the same factor as cognitive engagement, and expectancies as a separate factor). This will offer additional evidence about how empirically distinct the model is. The current analyses show that the three factor solution does have good fit, but there are additional thresholds to further compare models and also

examine them for measurement invariance that can be used (Cheung & Rensvold, 2002). This question can also be examined conceptually. Values is defined as "how a task meets the needs of individuals" (Wigfield, 1994, p.52) and the definition of cognitive engagement used in this dissertation was "thoughtfulness and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills" (Mahatmaya et al., 2012, p. 47). These two definitions are conceptually different; however the items were often quite similar.

In terms of the measures used in this study, there are problems with the values and cognitive engagement scales. For instance, *Value 7* reads "It is very important to me to be successful in reading information books for school" and *Cognitive Engagement 7* reads "I do everything I can to complete my information book reading." Both of these items seem to tap into an overall sense of conscientiousness more so than distinct value and cognitive engagement constructs. Since the values items are typical of expectancy-value constructs (Wigfield & Eccles, 2000), but the literature base on cognitive engagement is varying, I suggest moving away from conscientiousness-type items for future studies. Items that tap into a conscientiousness-type of latent factor are important and interesting to examine, but cannot be studied with values in a mediation analysis due to possible collinearity concerns. Based on how well they are distinguished conceptually, clearer items should be written to also distinguish empirically.

Another alternative explanation for the inflated association between values and the reading performance outcomes comes from an algebraic analysis. In recent discussions with a methodological expert, Norman Rose explained that these inflated associations may not be due to collinearity at all (personal communication December 6,

2013). Instead he argued that because the bivariate associations between values and the reading outcomes were nonsignificantly associated and then became negatively associated in the model. The altered coefficients are an effect of the very strong association between values and cognitive engagement and that variance is pulled from other associations in the model. That is, the nonsignificant association between values and reading outcomes was a reflection of a bias of omitted variables in the model and when the omitted variable (cognitive engagement) is included, this association changes.

The interpretation of this perspective is that while holding cognitive engagement constant there are differences in performance of students with the same level of values. This means that if students value reading and they become cognitively engaged, they will perform at a better level. Students who value reading highly, but do not cognitively engage will not perform well and this results in a significant negative association. This interpretation of the findings allows us to separate students who value similarly based on whether they become cognitively engaged or not. In this model when the role of cognitive engagement is accounted included, differences can be seen in students who value and engage versus those who value and do not engage.

Alternatively, Guthrie (Guthrie, Klauda, & Ho, 2013; Ho & Guthrie, 2013) has discussed the complex nature of the associations among reading values and reading performance. Ho and Guthrie (2013) reported negative bivariate correlations among intrinsic motivation for reading informational texts and reading outcomes and positive associations for the bivariate correlations among intrinsic motivation for reading literary texts and reading outcomes. They argue that students are primarily taught to read using fictional texts and are more comfortable with this type of reading and are less

comfortable with informational text because it is structurally different. Ho and Guthrie (2013)'s argument provided an alternative in that perhaps the negative association between constructs that are typically positively associated with achievement are not a suppression, but indeed an association that exists when studying informational texts. This idea should be explored in further using the same exact motivation measures contextualized for informational and literary texts, as Ho and Guthrie's (2013) were worded slightly differently.

Mediation of the relations of expectancies for success to reading outcomes by cognitive engagement. I found that cognitive engagement is a significant mediator of the associations between expectancies and ITC; although, this finding should also be interpreted carefully because of the potential collinearity between values and cognitive engagement that affects all variables in the model. The first piece of this association is between expectancies and cognitive engagement and the second piece is between cognitive engagement and performance. These associations have also been shown empirically as Greene et al. (2004) found that self-efficacy (related to expectancies) and strategy use (a form of cognitive engagement) was significant at $b = .14$ and the association between strategy use and grades was $b = .15$ in Greene et al. (2004). This finding for expectancies for success and cognitive engagement was slightly lower at $b = .08$-$.11$; however, cognitive engagement and Reading/Language Arts grades was $b = .72$, which is much higher than the Greene et al. (2004) article. This association should be further explored.

Expectancies for success were significantly related to cognitive engagement in both models. One of the definitions of cognitive engagement given by Fredricks et al.

(2004) was an investment in learning or a desire to go above and beyond the work required. When cognitive engagement is measured as described in this definition it is likely to be associated with expectancies for success because when students feel confident in their abilities they may push their knowledge further by persisting on a task or trying more difficult activities that are related. However, students who feel overly challenged by a task might give up more easily and neither persist and nor go above and beyond on the task. Alternatively, students who feel that they will ultimately succeed will believe their efforts are a good use of time and will engagement and perform at a higher level.

Association between cognitive engagement and performance. In this study, students' cognitive engagement was associated significantly with their Reading/Language Arts grades at r = .32 and ITC at r = .15, which is similar to the studies discussed in Chapter 2. Pintrich and DeGroot (1990) also found that cognitive engagement was associated with grades at *r* = .32 at Time 1 and *r* = .36 at Time 2. Greene et al. (2004) found that strategy use was associated with grades at *r* = .33 and Liem et al. (2008) found that task disengagement was negatively associated with achievement at *r* = -.12. The bivariate association of cognitive engagement and grades in this study was similar to previous literature.

The finding that cognitive engagement was a positive significant predictor of both grades and ITC is in line with previous literature. Recent work on cognitive engagement in reading has consistently suggested that cognitive engagement is highly tied to achievement (Cambria et al., 2010; Guthrie, al., 2012; Lutz, Guthrie, & Davis, 2006). For example, in qualitative interviews with students and teachers, cognitive engagement

emerged as a central theme for achievement in reading (Cambria & Guthrie, 2010). In these interviews, both teachers and students consistently talked about how their cognitive engagement has helped them in overcoming difficult reading tasks. Students talked about increasing their effort in working toward goals that are important to them and that believe they can be successful. Likewise, teachers described how students who struggle in reading will put in extra time working on tasks that are important for their goals.

The available research has shown a high correlation between cognitive engagement and academic accomplishments (Bembenutty, 2009; Betts, 2012; Fredricks & McColskey, 2012; Fredricks et al., 2004; Newmann et al., 1992). One example of this finding is in Guthrie et al. (2013) in which cognitive engagement is reported to be highly correlated with amount of reading. If students are practicing reading more, they are likely to be more successful both in class (Reading/Language Arts grades) and score higher on comprehension tests (e.g., ITC). Students who are cognitively engaged with reading read more and more often than students who are not cognitively engaged (Wigfield, 1997). Cognitive engagement reflects the willingness to invest in reading tasks that may allow students to perform at a higher standard.

Association between values and expectancies for success. I turn next to a discussion of the association between expectancies for success and values. First, in this study, students' task values were correlated with their expectancies at $r = .49$ in bivariate associations. In the modeling analyses, students' values and expectancies for success related at $b = .50$. Values and expectancies for success are typically associated positively with each other in expectancy-value studies (Eccles & Wigfield, 2002; Jacobs et al., 2002; Watt, 2004; Wigfield & Eccles, 2000). From the studies that were discussed in

Chapter 2, Pintrich and DeGroot (1990) reported that values and self-efficacy are significantly positively related to each other (r = .48), while Sungur and Tekkaya (2006) found that value and efficacy correlated at r = .54. Wolters et al. (1996) found that efficacy and values were positively correlated at .57 at Time 1 and .59 at Time 2. Thus, the correlation between expectancies for success and values in this dissertation is at about the same range as other studies. It seems as Wigfield et al. (1997; see also Wigfield & Eccles, 1992) have explained, individuals value the tasks which they think they have a good chance of doing well.

As Wigfield and Cambria (2010) have discussed, an interesting question from a developmental perspective is whether expectancies for success drive values, the reverse, or whether the influence is bidirectional. Bandura (1997) argued that efficacy beliefs are the prior causal factor; that is, children learn to enjoy those activities at which they are competent. In first through twelfth grade, Jacobs et al. (2002) found that children were more likely to value math, sports, and language arts activities when they believed they were competent at those activities. Further, change in competence beliefs predicted the developmental trajectory in children's subjective task values and accounted for over 40% of the variance in these trajectories. Therefore, an increase in children's values was based strongly in how their competence beliefs changed.

Values and reading performance. Previous studies based in expectancy-value theory have established that values are associated with reading performance (Baker & Wigfield, 1999; Wigfield & Cambria, 2010). It was expected in this study that values should be moderately correlated with the two reading outcomes, based on previous work; however, recent reviews have discussed that values is typically more associated with

academic choices than achievement (e.g., Wigfield & Cambria, 2010). In this study, values had a significant positive bivariate correlation of Reading/Language Arts grades (r = .10) and was not significantly correlated with ITC. Reading grades may be positively correlated with values because they reflect students' reading in class and decisions complete to homework (Nagengast, Trautwein, Kelava, & Lüdtke, 2013). However, this correlation was not as great in magnitude as expected. This finding may be because the Reading/Language Arts grades were not specific to informational book reading and the values item focused on this aspect of reading. Bandura (2006) commented that the reading outcome should be in the same domain or level of specificity as the item and there is a mismatch here.

Students' values and ITC test scores were not significantly correlated in the bivariate analyses, but there was a potentially inflated relationship in the SEM analyses. The reason for the nonsignificant bivariate analysis may be that ITC was a one time performance test. In other words, this measure captured how well students performed on an isolated test that does not affect their future reading goals, and therefore, might not be associated. This finding is in line with previous work that has reported that values tend to be more associated with reading choices and expectancies than with performance (Wigfield & Eccles, 2000). In the structural equation modeling portion of this study, students' reading values were significantly negatively associated with performance on the information text comprehension measure (b =-.34) test, as can be seen in Models 1. This finding was similar to previous work by Guthrie et al. (2013) who found that values and ITC were significantly associated at b = -.09. As discussed, there are a variety of potential reasons for this association.

The bivariate association between values and Reading/Language Arts grades was not as strong as in the studies discussed in Chapter 2. Pintrich and DeGroot (1990) reported that values and reading grades were associated at r = .25 at Time 1 and r = .30 at Time 2, while Wolters et al. (1996) found that values and grades averaged across subject areas were correlated at .22 at Time 1 and .26 at Time 2. In line with the current study, Wolters and Pintrich (1998) reported that values were not significantly correlated with grades in English, mathematics, or social studies. However, Greene et al. (2004) reported that instrumentality and grades were correlated at r = .25. Durik et al. (2006) reported that ratings of the importance of reading and reading for leisure were not significantly associated in fourth grade, but significantly associated at r = .12 in 10th grade, importance for reading and reading grade in fourth grade were associated r = .12 and .14 in 10th grade. Liem et al. (2008) found that values and prior English grades were not significantly associated. Therefore, the finding that values and reading performance are not negatively related is not in line with previous literature. This finding may be because the values items were specific to ITC and Reading/Language Arts grades were not.

Expectancies for success to reading performance. Researchers have consistently found that expectancies are associated positively with achievement outcomes (Eccles et al., 1983; Wigfield & Eccles, 2000). In this study, expectancies for success were a significant positive predictor of ITC and Reading/Language Arts grades. This finding replicated previous work in the expectancy-value literature. Chapman and Tumner (2003) reported that self-efficacy is positively associated with word recognition and reading strategies. Other studies have shown positive association between expectancies and grades (e.g., Selkirk, Bouchey, & Eccles, 2011). Therefore, the finding

that expectancies for success are associated positively with reading outcomes was expected.

It was reasonable to expect that expectancies for success would be positively associated with reading outcomes. By middle school, students tend to know how well they can perform on certain tasks and across domain (Wigfield & Cambria, 2010). Also, it is likely that expectancies for success would be associated with an achievement measure more strongly than Reading/Language Arts grades. This result may be because the expectancies for success measures are based on how confident students are with success on different reading tasks, beliefs which likely have become accurate by adolescence (Wigfield & Eccles, 2000). Reading and Language Arts grades are based on many different assignments that students do over a quarter and may be more associated with other variables, such as cognitive engagement.

Gender, race, and socioeconomic status effects on reading performance. In this study, females received higher reading grades than did males, but did not perform significantly differently on the ITC test. Although there are many possible reasons for this finding, one may be that that the ITC test and Reading/Language Arts grades that Reading/Language Arts grades tends to favor females. Some work has shown that in middle school through high school, females' competence beliefs in Language Arts are higher than males (Jacobs et al., 2002) that may explain why females outperformed males in class, but performed similarly on the ITC test. The finding that gender has a significant effect on grades, but not ITC is in line with Jacobs et al. (2002) that there may be gender differences in Reading/Language Arts performance.

In this study, there were no significant effects of race on Reading/Language Arts grades, but there were significant differences on the ITC. Post hoc tests revealed that African American students scored significantly lower than Asian American and European American students on ITC. This finding is in line with work on continuing achievement gaps (NCES, 2009). There are many other potential reasons for this difference that are beyond the scope of this dissertation. One next step to further explore this association is to examine the ITC for measurement invariance by demographics group. Briefly, this analysis would be performed by examining a series of confirmatory factor analyses for differences in item means, loadings, and item variances by demographic group. This should be explored because it is possible that items may have functioned differentially by race. This step has become increasingly common in educational science for test validation and is important to do for the ITC before performing further analyses and drawing conclusions concerning demographic groups.

Socioeconomic status was a significant predictor of Reading/Language Arts grades as well as achievement on the ITC test. In this study, participation in the free and reduced priced meals program was used as an indicator of socioeconomic status. Post hoc tests revealed that students whose families paid in full performed significantly higher on the ITC test and had higher grades than students who partook in the program. Students who received reduced or free lunch did not differ from each other on either ITC or Reading/Language Arts grades. Similarly, Ransdell and Baker (2004) found similar results in upper elementary students in a free and reduced lunch program and performance on the FCAT reading test.

There is a large body of research on socioeconomic status and achievement. This work has shown that low socioeconomic status is associated with other correlates of lower achievement such as mother's education, school absences, documented IEPs, fewer books at home, lower proportion of students in gifted programs, and less membership in student groups (American Psychological Association, 2012; Steele, 1997; Steele & Aronson, 1995). On their website, the American Psychological Association (2012) discussed the association between socioeconomic status and lower academic performance and suggested chronic stress and fewer financial resources may at least partially explain this finding. Furthermore, Coley (2002) reported that 36% of parents with kindergarteners from a lower socioeconomic status read to their child daily, while 62% of upper socioeconomic status parents read to their children daily. Coley (2002) reported that by high school there is a 3.3 grade level disparity in reading grades between families of high and low socioeconomic status.

In this study, socioeconomic status was included as a control. This means that the associations between motivation, engagement, and achievement can be interpreted without socioeconomic status being confounded because it has already been accounted for to some extent; this interpretation is also true of race and gender. The reason I say "to some extent" is because FARMS is a very general, gross estimate of socioeconomic status. Also, the significant negative association of socioeconomic differences with both performance measures implies that accounting for socioeconomic status is crucial to adequately account for its impact on the dependent variable. Most of the studies examined in Chapter 2 did not include an assessment of socioeconomic status and future work should include a measure of socioeconomic status.

Implications for Expectancy-value Theory

This study is based on theoretically derived questions of expectancy-value theory. Expectancy-value theory generally is concerned with the influences on students' expectancies for success and values in different areas and how expectancies for success and values relate to student outcomes, such as performance and choice. Within this theoretical framework, the goal of this study was to examine how expectancies for success and values may impact reading outcomes by way of engagement.

This dissertation used performance as an outcome, but many expectancy-value studies have used choice an outcome (e.g., Durik et al., 2006; Simpkins et al., 2006). To tie expectancy-value to engagement theory, these choices can be viewed as a form of behavioral engagement to participate in a class or activity. For instance, Battle and Wigfield (2003) examined women's decision to go to graduate school. In this case, their motivations would drive their decision to attend graduate school. From an engagement theory perspective, one could say the decision to attend graduate school is a form of behavioral engagement. Another alternative is that the choice, or decision, to attend graduate school precedes behavioral engagement. This ordering of the belief, value, choice, and engagement variables speaks to a current problem in the field of student engagement that behavioral engagement is defined very broadly. Perhaps behavioral engagement will be defined as time or effort spent working on tasks for graduate school. Then choice would precede behavioral engagement in a model. The fact that models can present engagement in many different ways is a problem for the field.

What might the role of cognitive engagement be in these choices? Studies using the expectancy-value framework often view choice, such as course selection, as an

outcome variable (Battle & Wigfield, 2003; Durik et al., 2006); however, it is possible that the associations between values and expectancies with the choice to, for example, attend graduate school may be mediated by cognitive engagement because expectancies for success for success and task values will lead to cognitive engagement in searching for information about graduate school and potentially a choice to enroll. Particularly with a decision such as attending graduate school, this process may also be mediated by other life circumstances not measured in this study, such as financial or family responsibilities.

This study has focused on expectancies, values, and engagement for reading informational texts and future studies should examine mediation in other domains. It is reasonable to expect that motivation will lead to engagement, which will lead to achievement-related outcomes in other domains as well; however, depending upon the measurement of cognitive engagement this may not occur That is, if cognitive engagement is measured in the future as strategy use, different strategies may be used for different tasks in different domains.

This study was designed to examine the theoretically derived question about how expectancy-value constructs are associated with cognitive engagement and performance. More specifically, the study examined whether cognitive engagement mediated relations of students' expectancies for success and achievement values and their reading outcomes. In this dissertation study, the relationship of both values and expectancies for success and Reading/Language Arts grades was mediated by cognitive engagement. Similarly, the relationship of values and expectancies for success with reading outcomes was also mediated by cognitive engagement. However, interpretation of the mediation of the

relations between values and reading performance is difficult because there may be collinearity among the values and cognitive engagement scales.

Future Directions

Empirical problems aside, there are potentially interesting conceptual ideas related to engagement as a mediator that can be discussed and perhaps can be examined as good methods become more widely available. Specifically, one idea is whether the expectancy-value constructs and performance are mediated by affective, behavioral, and cognitive engagement when examined together. As Eccles and Wang (2012) have proposed, mediation may depend on which type of engagement is assessed and how it is measured. First, in the case of behavioral engagement, it is reasonable to assume that behaviors occur after motivation. Individuals must have a reason (motivation) for doing a task before they can participate in a task. Another question is if cognitive and behavioral engagements are included in the same mediation model, should they occur simultaneously and be allowed to correlation or are they causally related within the model? It makes sense that cognitions drive behavior, but perhaps behavior also influences future cognitions? This would affect the causal order in which these engagements are entered into a mediation model together.

Second, the placement of emotional engagement in a model mediating expectancies and values with achievement, but its placement along with other variables in the model needs to be thought out carefully. First, the research that does exist has been unclear on the distinctions between emotional engagement and motivation (i.e., describing values as a measure of emotional engagement; see Fredricks et al., 2004). This definition of emotional engagement overlaps with motivation constructs such as

interest, anxiety, and value. Motivation researchers such as Wang, Willett, and Eccles (2011) have included value in their measure of emotional engagement. In this dissertation, values and emotional engagement are distinguished in the following way: Motivations describe the values, beliefs, and goals that drive academic achievement (Wigfield & Eccles, 1992; Wigfield & Cambria, 2010). Emotional engagement is the continued feelings about the task that students manage in real time while working on the task. It is likely that motivation and emotional engagement are highly related and have a reciprocal relationship; however, Pekrun (2010) discussed that emotional engagement should be placed after motivation. Eccles and Wang (2012) have argued the alternative, that emotional reactions are precursors to motivation. An additional question is depending on the conceptualization of emotional engagement, would it occur before, simultaneously, or after behavioral and cognitive engagement?

In studying affective, behavioral, and cognitive engagement simultaneously, it will be interesting to see which form of engagement would predict engagement most strongly while holding other forms of engagement constant. As discussed above, this will be influenced by which measure of engagement is used and where it is placed in causal order in the model. One issue that should be addressed by future researchers measuring all three engagements is how to avoid collinearity between the types of engagement. Some suggestions are to clearly define types of engagement so that they are distinct. Engagement variables should be carefully defined so that their empirical distinctions are drawn from their definitional distinctions.

Expanding the meaning of engagement: Agentic engagement. Recently, Reeve and Tseng (2011) discussed the importance of agency in researching student engagement.

They argued that the three-component model of engagement that is largely accepted in the field of achievement motivation does not fully capture an image of an engaged student. They propose the addition of agentic engagement, which describes the extent to which students exert their own influence over their engagement in different activities. For example, students may express their agency by reading ahead and talking to their teacher about concepts that particularly interest them.

In a sample of 369 high school students, Reeve and Tseng (2011) gave students measures of agentic engagement along with affective, behavioral, and cognitive measures and found that agentic engagement was empirically distinct, as shown by a 4-factor solution in their exploratory factor analysis. Agentic engagement was significantly positively correlated with behavioral, emotional, and cognitive engagements, as well as with perceived autonomy, competency, relatedness, and an average of grades across classes. They also found that agentic engagement, emotional engagement, cognitive engagement, and behavioral engagement significantly mediated the association between motivation and grades.

Although this form of engagement did factor separately, more work is needed to establish its viability as a unique construct. In addition, the field should begin to draw boundaries about what engagement is. As discussed, agentic engagement is defined as students' constructive contribution to the learning they receive; however, many of these items can be classified as actions and therefore can be also classified as behavioral engagement (e.g. "During class, I ask questions" [p. 262]). Another issue is to consider how different this measure is from a personality trait. For example, taking initiative in learning may also be related to the Big 5 feature of conscientiousness (John, Caspi,

Robins, Moffitt, & Stouthamer, & Loeber, 1994; Mervielde, Buyst, & De Fruyt, 1995; Mervielde & De Fruyt, 2000). Nevertheless, it seems that agentic engagement can be subsumed by other types of engagement or other theories and may not be needed as a separate form of engagement. Further work should be done to fully understand the nature of agentic engagement and whether it indeed represents a unique aspect of engagement.

Interactions of expectancies and values on engagement. There may also be interaction effects of expectancies and values on cognitive engagement. High expectancies for success and high values (with low cost) are likely to be related to high levels of cognitive engagement. Similarly, low expectancies and low values are likely to be related to low levels of cognitive engagement. When students have a mix of high values and low expectancies, relations to engagement may be more complex. High expectancies and low values are likely related to low or moderate cognitive engagement because students may complete the task, knowing they can complete it quickly and may not achieve as highly. Students may not persist for a long time if the task is not valued. Another issue with this interaction in relation to cognitive engagement is that motivation and engagement may relate differently based on whether a task is required or not.

Appendices

Tables and Figures

Figure 1.

Expectancy – value Model of Achievement Choice

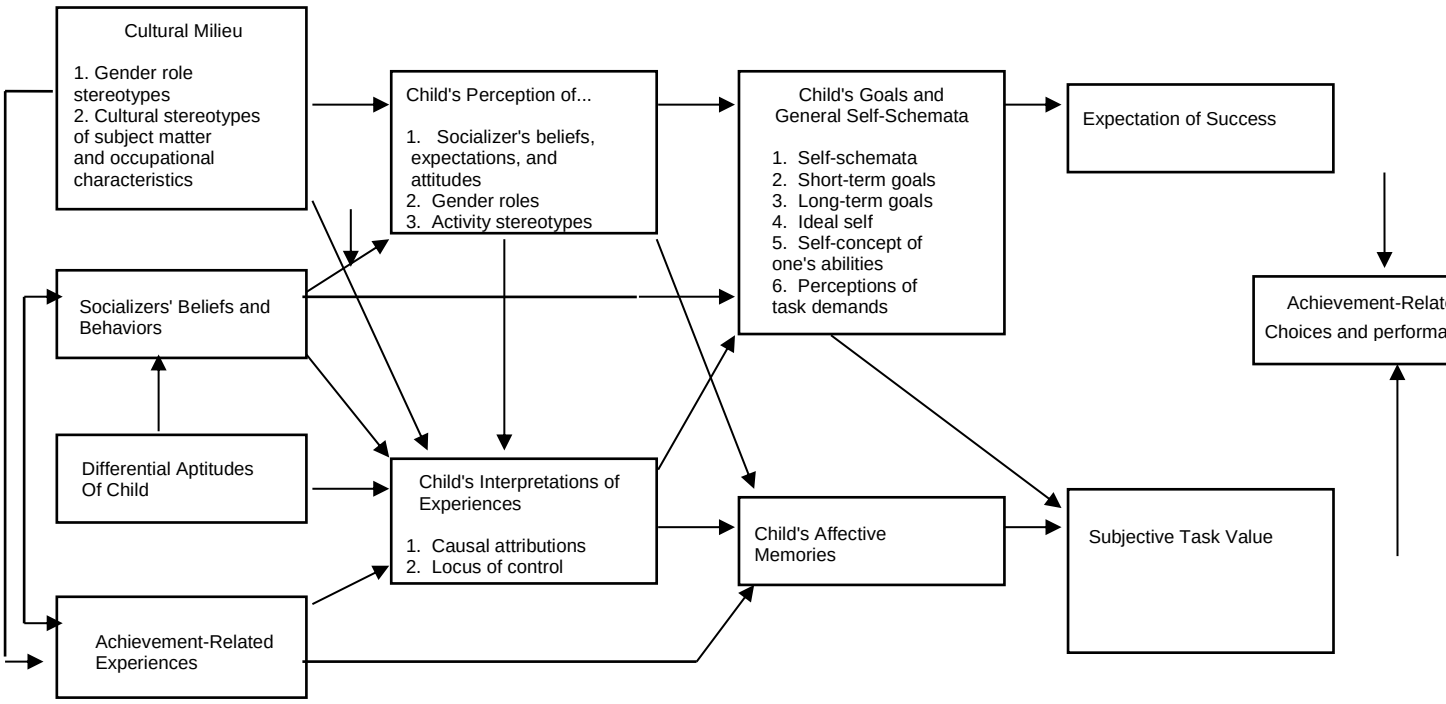


Figure 2

Conceptual Model with Information Text Comprehension

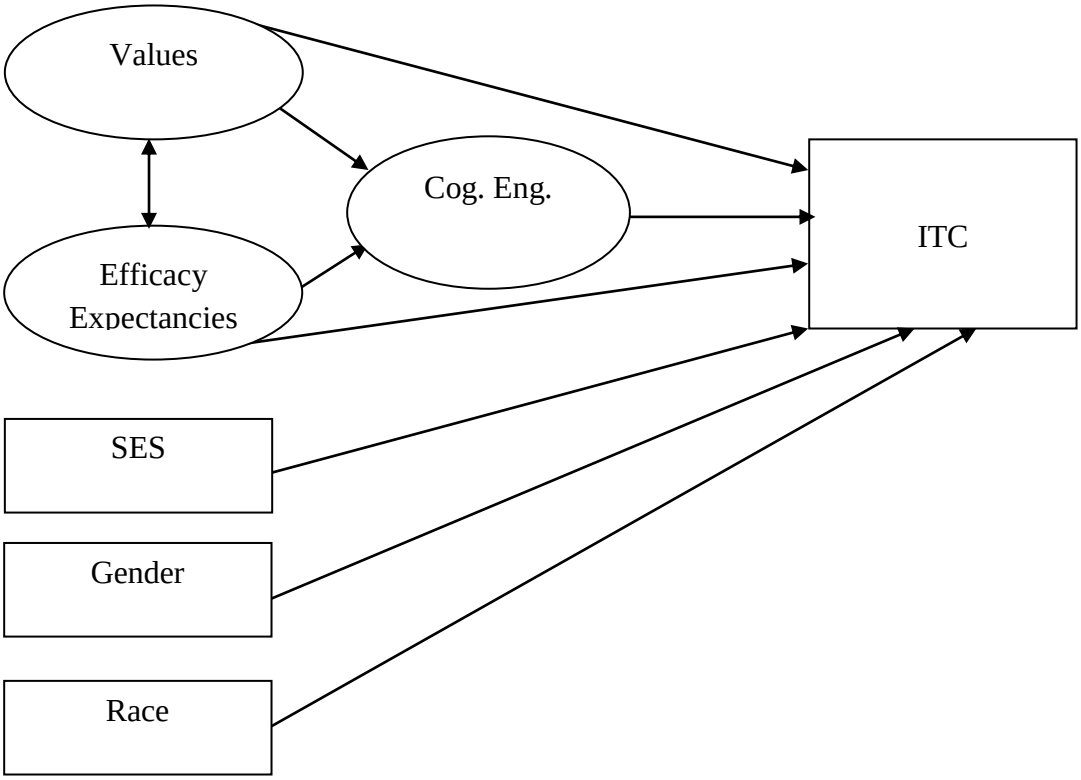


Figure 3

Conceptual Model with Reading/Language Arts Grades

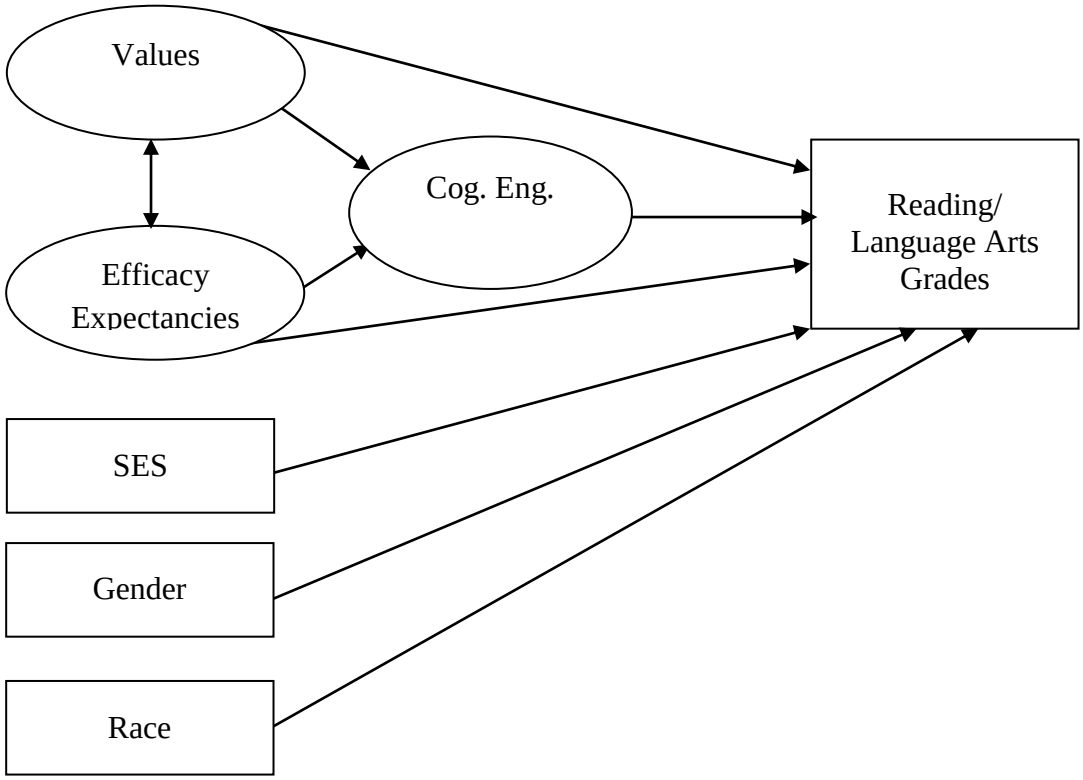


Table 1

Item Indices of Central Tendency, Dispersion, Normality and Missingness

		ean	*td. Deviation*	*kewness*	*urtosis*	*Missing*
Race	158					.00%
Free and Reduced Meals	158					.00%
Gender	158					.00%
Efficacy 1	146	.82	.91	0.45	0.54	.05%
Efficacy 2	143	.94	.74	0.58	.41	.31%
Efficacy 3	149	.86	.78	0.65	.37	.78%
Efficacy 4	149	.94	.88	0.57	0.31	.78%
Efficacy 5	150	.99	.82	0.66	.10	.70%
Efficacy 6	136	.63	.84	0.42	0.39	.94%

Efficacy 7	147	.10	.72	0.70	.74	.96%
Cognitive Engagement 1	147	.31	.79	1.07	.77	.96%
Cognitive Engagement 2	145	.33	.83	1.15	.66	.14%
Cognitive Engagement 3	145	.77	.91	0.31	0.69	.14%
Cognitive Engagement 4	145	.18	.90	.23	0.84	.14%
Cognitive Engagement 5	145	.50	.95	.01	0.90	.14%
Cognitive Engagement 6	142	.77	.91	0.25	0.77	.40%
Cognitive Engagement 7	138	.10	.88	0.76	0.16	.76%
Cognitive Engagement 8	138	.06	.97	0.75	0.46	.76%
C						

ognitive Engagement 9	13	.47	.94	.01	0.88	.12%
Cognitive Engagement 10	132	.36	.91	.03	0.86	.30%
Cognitive Engagement 11	133	.93	.81	0.55	.00	.21%
Cognitive Engagement 12	123	.00	.90	0.58	0.45	.12%
Value 1	142	.05	.83	0.70	.09	.40%
Value 2	146	.37	.93	.11	0.86	.05%
Value 3	132	.12	.81	.25	0.55	.30%
Value 4	146	.13	.85	0.83	.14	.05%
Value 5	145	.92	.95	0.48	0.73	.14%
Value 6	144	.31	.93	.15	0.86	.58%

	0					
Value 7	12 4	.71	.93	0.26	0.79	.02%
Grades	14 7	.69	.20	0.74	0.28	.96%
ITC	149	4.91	.69	0.08	0.63	.78%

Figure 4

QQ Plot of Regression 1

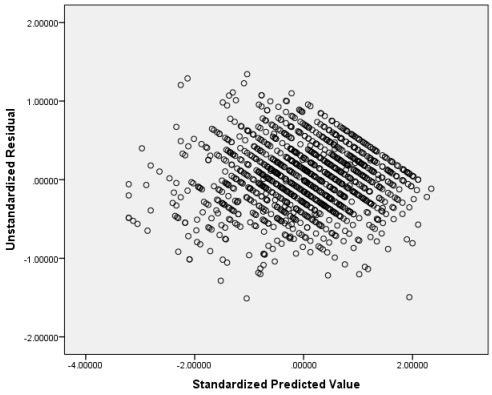


Figure 5

QQ Plot of Regression 2

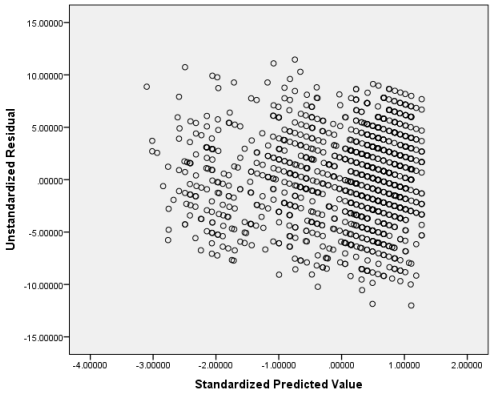


Figure 6

QQ Plot of Regression 3

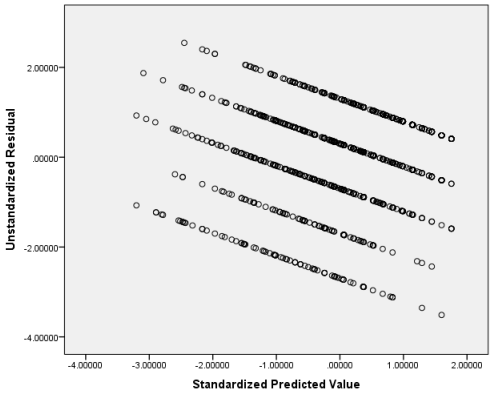


Figure 7

Cognitive Engagement Histogram

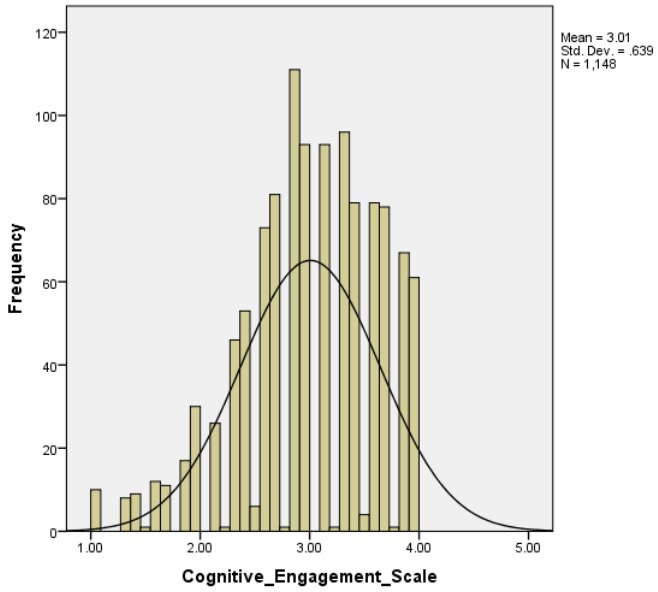


Table 2

Regression 1 Fit and Multicollinearity Indices

Model	B	Std. Error			ig.	ol.	IF
(Constant)	610	073		.414	000		
Values							
Efficacy	609	022	613	8.155	000	833	.201
Expectancies	267	025	235	0.795	000	833	.201

Note: Dependent variable: Cognitive engagement scale; Tol. is Tolerance.

Table 3

Regression 2 Fit and Multicollinearity Indices

Model		td. Error	β			ol.	IF
(Constant)	.544	9299		.813	000		
Race	608	0833	2088	.339	0000	8533	.172
Free and Reduced Meals	.119	1771	1886	.556	0000	8499	.177
G							

ender	.134	2501	.014	.536	5925	958	.044
Values	1.556	279	.2143	5.583	0000	466	.146
Efficacy Expectancies	.253	2527	271	.954	0000	746	.340
Cognitive Engagement	.252	2927	171	.292	0000	431	.320

Note: Dependent variable: Information Text Comprehension: Full Test - Number Correct (of 25 items) - Apr. 2010; Tol. is Tolerance.

Table 4

Regression 3 Fit and Multicollinearity Indices

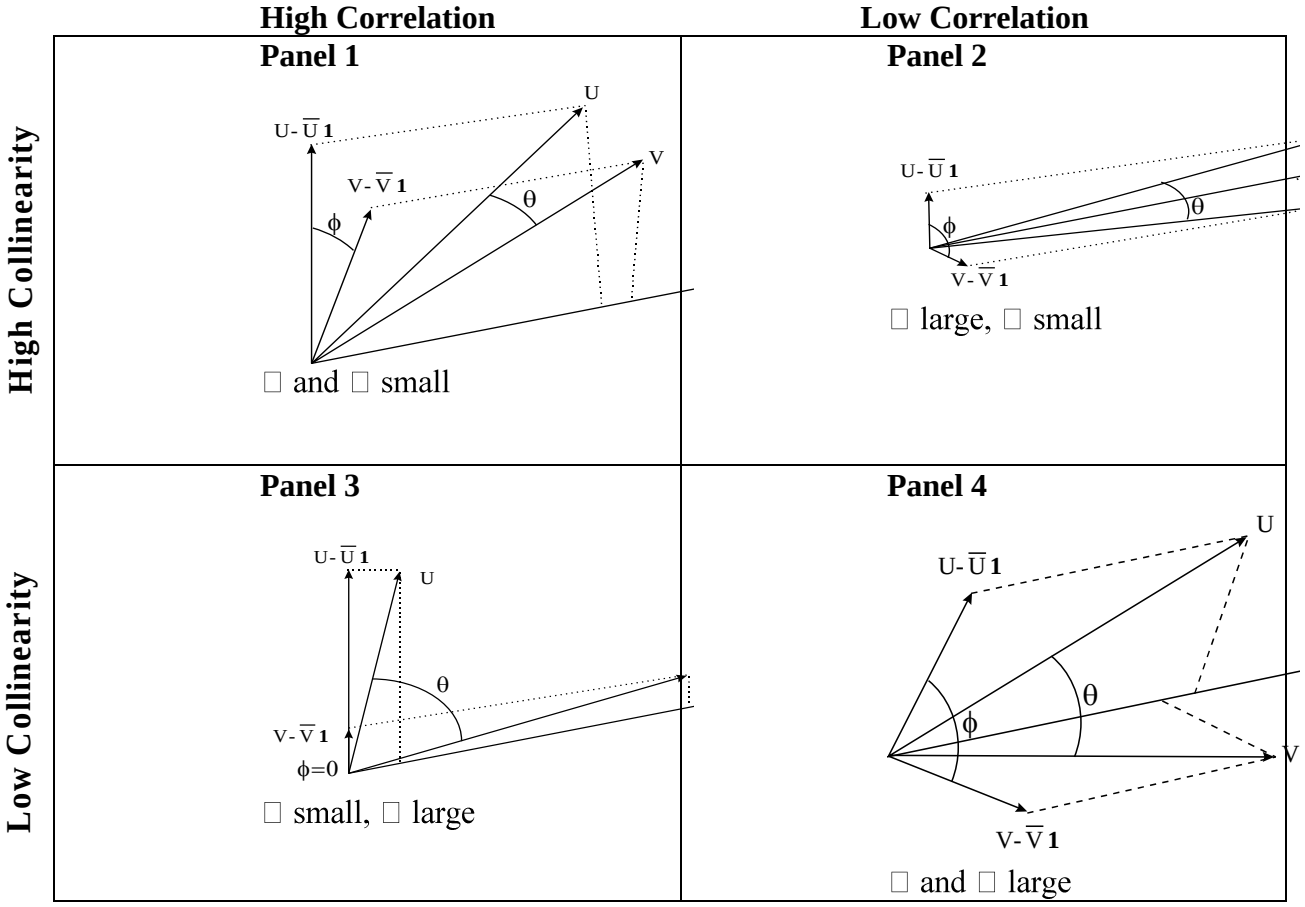
Model		td. Error			Sig.	Sol.	IF
(Constant)	6.663	2.410		.749	006		
Race							
Free and Reduced Meals	029	022	038	.320	1871	851	.175
Gender							
Value	3.029	0.022	2.038	.320	0.871	8.51	.175
Efficacy							

Expectancies	2	4	1	5	0	4	1
Cogni	4	5	0	7	0	7	8
tive							1
Engagement							
	3	0	1	.6	0	9	.
	0	6	2	4	0	5	0
	2	5	7	3	0	6	4
							6
	.	0	.	5.	0	4	.
	3	7	1	0	0	6	1
	6	2	9	6	0	8	3
	6		7	2			5
	0	0	0	.4	1	7	.
	9	6	4	4	4	4	3
	5	6	5	9	7	0	5
							2
	7	0	4	0.	0	4	.
	7	7	1	1	0	3	3
	4	6	4	9	0	1	2
				1			2

Note: Dependent Variable: 2009-2010 Reading/Language Arts Grade - Marking Period 3; Tol. is Tolerance.

Figure 8

Graphical Demonstration That Bivariate Correlation Can Be Unrelated To Bivariate Collinearity



Note: U and V are N-vectors of the observations and $U - \bar{U}\mathbf{1}$ and $V - \bar{V}\mathbf{1}$ are orthogonal projectors of U and V onto the **1** unit vector, i.e., mean-centered vectors. The cosine of the angle □ is the correlation between the vectors while the cosine of the angle □ is the collinearity of the two vectors.

Figure 9

Linearity Plot of Regression 1

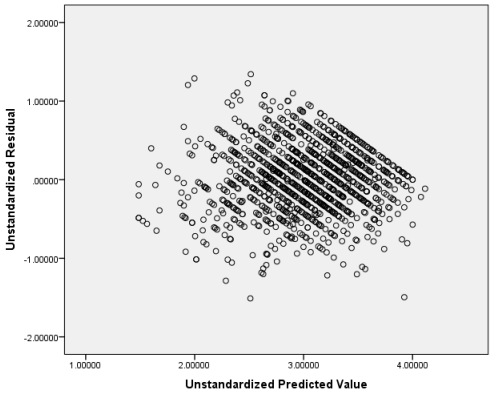


Figure 10

Linearity Plot of Regression 2

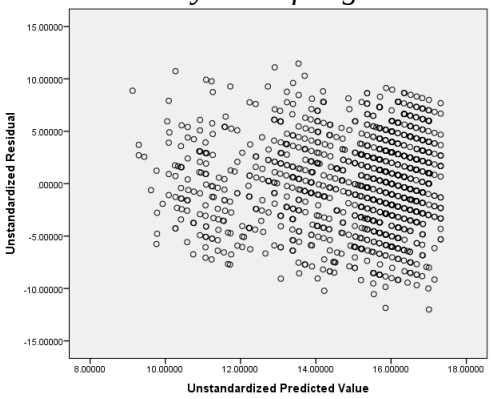


Figure 11

Linearity Plot of Regression 3

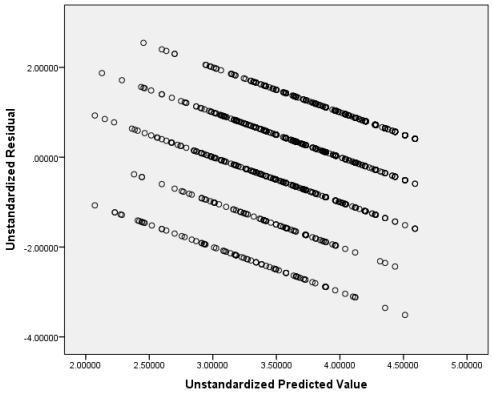


Table 5

Scale Descriptive Statistics

		inimum	aximum	ean	td. Deviation
Value	148	.00	.00	.6610	64511
Efficacy Expectancies	152	.00	.00	.8998	56358
Cognitive Engagement Scale	148	.00	.00	.0061	63916
2009-2010 Reading/Language Arts Grade - Marking Period 3	147	.00	.00	.69	.199
Information Text Comprehensi	14	.00	5.00	4.9138	.68953

Table 6

Interscale Correlations

on: Full Test - Number Correct (of 25 items) - Apr. 2010	9
Valid N (listwise)	125

	.	.	.	.	.	.	.
1. alues Scale							
2. fficacy Expecta tions Scale	4 0 9**						
3. ognitive Engage ment Scale	7 1 1**	.4 8 6**					
4. Grades	0 9 6**	.1 7 6**	3 1 8**				
5. Informa tion Text Compre hension	.0 3 4	.2 7 6**	1 4 8**	3 3 3**			
6. Race	.1 4 5**	.0 1 0	. 0 2 1	1 3 3**	.3 0 0**		
7. Free and Reduce d Meals	.1 1 3**	0 5 7	0 1 6	2 5 1**	.3 0 7**	.3 7 4**	
8. Gender	0 9 6**	.0 1 3	1 6 0**	1 6 1**	- .0 2 7	.0 2 9	. 0 6 0*

Table 7

Confirmatory Factor Analysis Fit Indices

oodness-of-Fit ndices	*E, Values, CE*
^{2}	793.368
f	186
	.001
FI	0.972
R	0.460
MR	
M	0.053
SEA	(0.049
90% CI)	0.057)

Table 8

Efficacy Expectancies, Values, and Cognitive Engagement Confirmatory Factor Analysis

	Estimate	S.E.	Est./S.E.	P-Value
EFF BY				
EFF1	1.000	0.000	999.000	999.000
EFF2	1.130	0.049	23.215	0.000
EFF3	1.001	0.051	19.459	0.000
EFF4	1.017	0.050	20.337	0.000
EFF5	0.889	0.049	18.314	0.000
EFF6	1.122	0.047	23.701	0.000
EFF7	1.136	0.053	21.263	0.000
VAL BY				
VAL1	1.000	0.000	999.000	999.000
VAL2	1.162	0.035	32.936	0.000
VAL3	0.779	0.037	21.004	0.000
VAL4	0.989	0.032	30.628	0.000
VAL5	1.114	0.034	32.641	0.000
VAL6	1.211	0.038	32.272	0.000
VAL7	1.177	0.036	32.851	0.000
COG BY				
COG1	1.000	0.000	999.000	999.000
COG2	1.102	0.033	33.635	0.000
COG6	1.132	0.032	35.151	0.000
COG7	0.909	0.034	26.575	0.000
COG8	1.081	0.031	34.506	0.000
COG9	1.093	0.032	34.247	0.000
COG12	1.065	0.033	31.849	0.000
EFF WITH				
COG	0.234	0.017	13.921	0.000
VAL	0.221	0.017	13.085	0.000
VAL WITH				
COG	0.431	0.019	22.891	0.000

Table 9

Factor Correlations Values, Efficacy Expectancies, Cognitive Engagement

	.	.	.
. V			
. EE	492		
. CE	912	511	

Note: EE = Efficacy Expectancies, CE = Cognitive Engagement, V = Values

All are significant at $p < .001$.

Table 10

Structural Equation Models Fit Indices

Goodness-of-Fit Indices	*Informational Text Model (Model 1)*	*Reading/Language Arts Model (Model 2)*
χ^2	703.266	768.511
df	265	265
p	.001	.001
CFI	.956	0.979
WRMR	1.534	1.449
RMSEA (90% CI)	0.038 (0.034 0.041)	0.041 (0.037 0.044)

Figure 12
Model 1: Information Text Comprehension Theoretical Model Fit

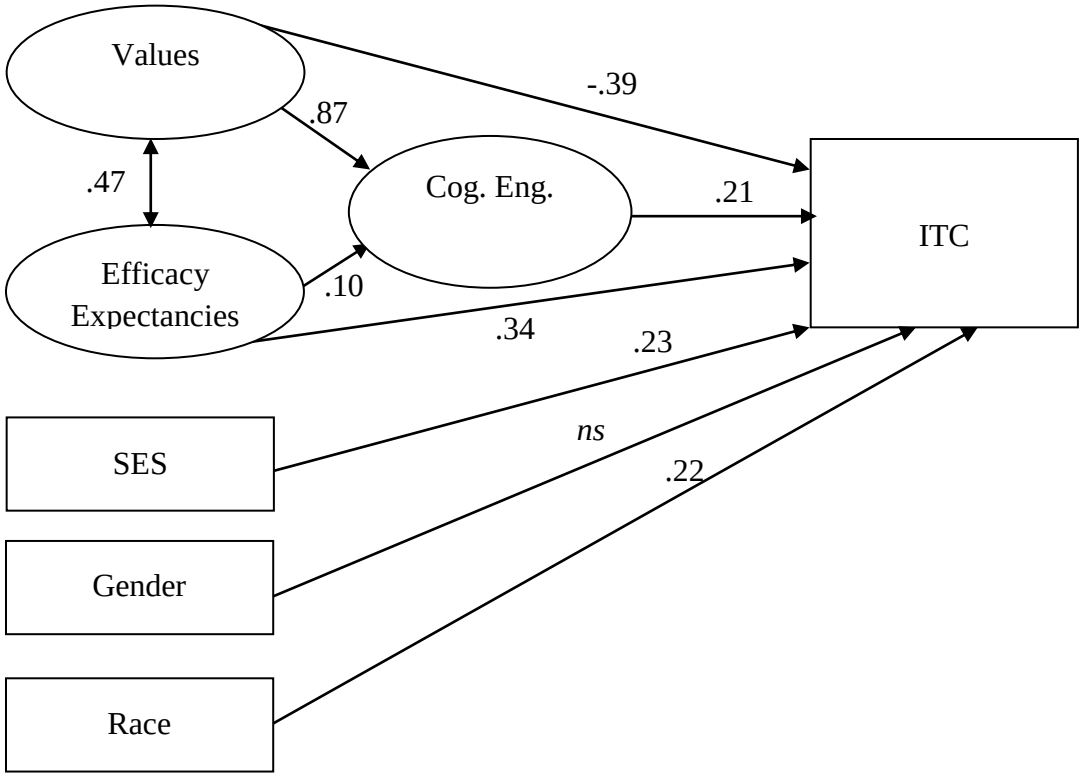
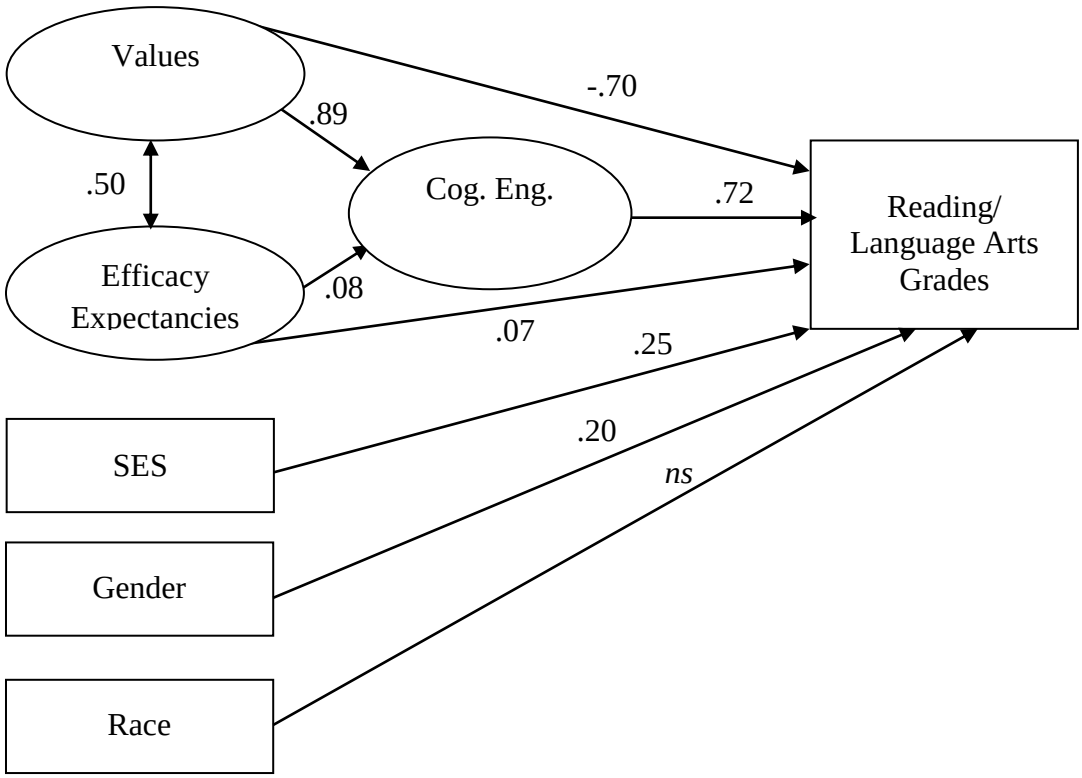


Figure 13

Model 2: Reading/Language Arts Grades Theoretical Model Fit



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