ABSTRACT

Title of Dissertation:	STUDENTS' PERCEPTIONS OF TEACHER INSTRUMENTAL SUPPORT AS A PREDICTOR OF MOTIVATION IN READING AND MATH AND ACHIEVEMENT FROM SECOND THROUGH TWELFTH GRADE
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In this study, relations among students' perceptions of instrumental help/support from their teachers and their reading and math ability beliefs, subjective task values, and academic grades, were explored from elementary through high school. These relations were examined in an overall sample of 1,062 students from the Childhood and Beyond (CAB) study dataset, a cohort-sequential study that followed students from elementary to high school and beyond. Multi-group structural equation model (SEM) analyses were used to explore these relations in adjacent grade pairs (e.g., second grade to third grade) in elementary school and from middle school through high school separately for males and females. In addition, multi-group latent growth curve (LGC) analyses were used to explore the associations among change in the variables of interest from middle school through high school separately for males and females.

The results showed that students' perceptions of instrumental help from teachers significantly positively predicted: (a) students' math ability beliefs and reading and math task values in elementary school within the same grade for both girls and boys, and (b) students' reading and math ability beliefs, reading and math task values, and GPA in middle and high school within the same grade for both girls and boys. Overall, students' perceptions of instrumental help from teachers more consistently predicted ability beliefs and task values in the academic domain of math than in the academic domain of reading. Although there were some statistically significant differences in the models for girls and boys, the direction and strength of the relations in the models were generally similar for both girls and boys. The implications for these findings and suggestions for future research are discussed.

STUDENTS' PERCEPTIONS OF TEACHER INSTRUMENTAL SUPPORT AS A PREDICTOR OF MOTIVATION IN READING AND MATH AND ACHIEVEMENT FROM SECOND THROUGH TWELFTH GRADE

By

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Dedication

Lovingly dedicated to Nitin, Mike, Rosetta, and Dustin.

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I would like to thank my friends and family (and pets!) for supporting me throughout my long academic journey. Thank you all for understanding my absence at many significant events in your lives while I worked long hours to finish my dissertation while working full-time. Your support and understanding have been paramount to my success, and I will forever be in your debt.

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Chapter 1: Introduction

Teachers are important socializers for their students, at all levels of schooling. Teacher Nina Seifert Bishop (2013) reminisces below about her experiences as a student with her own teachers:

> "I can think of many teachers who left an impact on my life. Teaching is personal. It's the interaction between two human beings which makes the difference between regurgitating information and loving to learn. The object of the exercise is to create life long learners. No[thing…] can take the place of the love a nurturing teacher gives. Thank you to my 1st grade teacher who taught me honesty. She put a great big F on my math paper and I never copied anyone's work again. Thank you to […] Mrs. Evans; 4th grade-taught me respect, Mrs. Eshman; 6th grade- taught me to love reading, Sheila Rich; […] Joe Domko; 9th grade- taught me to explore the world and really see what was in it, Leland Andres; my last 2 years of high school-helped hone my voice […] for college […] These were the PEOPLE, human beings, who nurtured me and showed me different points of view."

In Nina's testimony, we see evidence of the impact of the relationship between students and their teachers—socially, emotionally, and academically. The relationship that forms between a student and her teacher can be life changing for that student and the lessons learned from a teacher can continue to resonate with a student long after she has left a teacher's classroom.

As we saw from Nina's comments, a student's perception of various aspects of her relationship with her teacher can leave a lasting impact on a student's social, emotional, and academic trajectory. Importantly, it is students' *perceptions* of teacher behavior that are paramount to understanding how students internalize socialization experiences with teachers, as Wubbels, Brekelmans, van Tartwijk, and Admiral (1999) explain:

> "Whatever someone's intentions are, the other persons in the communication will infer meaning from that someone's behavior. If, for example, teachers ignore students' questions, perhaps because they do not hear them, then students may not only get this inattention but also infer that the teacher is too busy or thinks that the students are too dull to understand or that the questions are impertinent. The message that the students take from the teacher's negation can be different from the teacher's intention." (pp. 153-154).

In addition, Wentzel and Battle (2001) stated that interpersonal experiences, include those between a student and her teacher, may directly influence how those experiences are perceived, and ultimately interpreted, by the student. Similarly, Eccles, Adler, Futterman, et al. (1983) note that students' interpretations of past successes and failures directly impact students' expectancies, values, and behavior, and Martin and Dowson (2009) also proposed that relationships directly impact students' beliefs and emotions, and then impact motivation. Thus, it is important to understand how students' perceive and interpret their teachers' behaviors in order to fully understand how the context of the teacher-student relationship impacts various outcomes, such as expectancies, values, and achievement.

Taken together, these works emphasize the importance of recognizing students' perceptions of their academic environment in order to fully understand their ability beliefs, task values, and academic achievement. In the present study, I explore how aspects of the teacher-student relationship, specifically students' perceptions of instrumental help from teachers, relate to their ability beliefs and task values in reading and math, and academic grades from second through sixth grade and seventh through 12^{th} grade for girls and boys.

One critical aspect of teacher-student relationships is the support that students' perceive from their teachers (Perry, Turner, & Meyer, 2006; Wentzel & Battle, 2001). Teacher support includes emotional caring, willingness to provide help and advice (which I will refer to as instrumental help/support throughout this dissertation, as I will discuss in more detail later), and respect for autonomy that students' receive from their teachers in academic environments (Eccles & Wang, 2012). Prior research suggests that middle and high school students' perceptions of support from their teachers are important predictors of children's academic motivation (Wentzel & Battle, 2001; Wentzel & Wigfield, 1998; Wentzel, 1994, 1998), including precursors to motivation such as ability beliefs and values (which will be discussed in more detail in Chapter 2), and achievement (Goodenow, 1993; Midgley, Feldlaufer, & Eccles, 1989; Wang & Eccles, 2012).

Work also suggests that these relations among teacher support, ability beliefs, values, and indicators of achievement, such as grades, can differ by the core academic domains of reading/language arts and math (Bill and Melinda Gates Foundation, 2010;

Fredricks & Eccles, 2002; Goodenow, 1993; Hughes, 2011; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Midgley et al., 1989; Rowan, Correnti, & Miller, 2002; Watt, 2004; Wigfield et al., 1997). For example, a report from the Bill and Melinda Gates Foundation (2010) suggested that students' math achievement may be more influenced by teachers than reading achievement because students' families have a stronger impact on students' reading and verbal achievement than their teachers. They also noted that open-ended reading assessments (as opposed to multiple-choice assessments) result in similar teacher effects as those found in math assessments, so the differences in the strength of teacher effects for reading and math achievement may also just be an artifact of the testing format that is used to assess achievement in each domain.

In addition, researchers have also have found that boys and girls differ in their perceptions of teacher support (Reddy, Rhodes, & Mulhall, 2003; Roorda, Koomen, Spilt, & Oort, 2011; Rueger, Malecki, & Demaray, 2010; Suldo et al., 2009). Eccles and colleagues Expectancy-Value Theory (EEVT; Eccles & Wang, 2012; Eccles et al., 1983), the primary theory guiding the current study also explores the relations among ability beliefs, subjective task values, and achievement separately by gender, for reasons which will be discussed more fully in Chapter 2.

Goals of the Current Study

The purpose of this dissertation study is to examine the relations among students' perceptions of instrumental help/support from teachers and their ability beliefs and task values in the domains of reading/language arts and math, and academic achievement via grades/grade point average (GPA) for girls and boys throughout elementary school and throughout middle school and high school. I focus on students' perceptions of instrumental help from their teachers because: (a) prior research (Furman & Buhrmester, 1985; Lempers & Clark-Lempers, 1992) has found that instrumental help/support from teachers is more important for student outcomes than other teacher relational attributes, and (b) research on the relations among students' perceptions of instrumental help/support and ability beliefs, subjective task values, and course grades is scant compared to the literature on general teacher support, as will be discussed in more detail in Chapter 2.

Theoretical Foundations and Theoretical Model for the Study

To explore the relations among students' perceptions of instrumental help/support from teachers and students' ability beliefs and subjective task values in reading and math and academic grades, three theoretical perspectives are utilized. Specifically, these include Eccles and colleagues' Expectancy-Value Theory (EEVT; Eccles & Wang, 2012; Eccles et al., 1983; Wigfield, Tonks, & Klauda, 2009; Wigfield, 1994), Eccles and colleagues' stage-environment fit theory (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011), and self-determination theory (SDT) as it applies to teacher-student relationships (e.g., Connell & Wellborn, 1991; R. M. Ryan, Stiller, & Lynch, 1994; Skinner, Furrer, Marchand, & Kindermann, 2008; Skinner & Pitzer, 2012). EEVT is the primary theory in the current study, and Stage Environment Fit Theory and SDT are supporting theories. The rationale for this decision will be explained fully in Chapter 2.

Taken together, these three perspectives speak to how students' perceptions of general support from teachers, including teacher's instrumental help/support, may influence academic motivation and achievement throughout the elementary, middle, and high school grades as a result of student's self-system processes. In brief, EEVT includes the primary academic motivation variables of interest, ability beliefs and task values, and includes a model of how these variables may be impacted by the cultural context, including gender, academic domain, including reading and math, and socializers, such as teachers. Stage Environment Fit Theory includes a rationale for developmental changes in these relations across the school years, especially during adolescence. Lastly, SDT includes reasons behind the process of how aspects of the teacher-student relationship may be internalized by students such that their academic motivation and achievement may be impacted. I briefly discuss each of these perspectives next.

Eccles and colleagues' Expectancy-Value Theory (EEVT; Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994) is a theoretical model of how peoples' expectations for success and value for particular achievement activities directly relate to their achievement outcomes such as performance and activity choice. Importantly, this theory considers the impact of expectancies and values within an individual's cultural and social context. In EEVT, Eccles, Wang, Wigfield, and colleagues (Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994) proposed that perceptions of socialization experiences may mediate the relations between those experiences and resulting motivation and achievement, which can differ by academic domain and gender. Eccles and colleagues (e.g., Eccles & Wang, 2012) also proposed that students need to perceive support from their social network, including support from their parents, teachers, and peers in order to: (a) feel motivated to attempt academic challenges, (b) have the opportunity to experience success, and (c) increase their ability beliefs for various subjects (Eccles & Wang, 2012).

Eccles and colleagues (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011) stage-environment fit theory complements' EEVT by adding in a developmental component explaining how socialization contexts, such as schools, can influence students' motivational beliefs and values positively or negatively across development based on stage-environment fit. In Stage-Environment Fit Theory, Eccles and colleagues (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011) note how teachers are better able to support students' developmental needs in elementary school than in middle or high school due to class size and school structure, which may result in higher academic motivation and achievement in elementary school than in middle or high school. This may occur because students only have one teacher in elementary school, but switch to having multiple teachers in middle school and high school, and so students often are unable to develop deep, meaningful connections with their teachers (Eccles & Roeser, 2011). This change from one teacher to multiple teachers happens during adolescence, which is a developmental time when support and caring from non-parental adult mentors are important. This mismatch could be one cause of declining motivation and achievement experienced by many students in middle school and high school.

Lastly, in SDT (e.g., Deci & Ryan, 2008; R. M. Ryan & Deci, 2002), and particularly through Connell and Wellborn's (1991) Self System Model of Motivational Development (SSMMD) that is based in SDT, teacher behaviors, such as instrumental help, are expected to influence student's self-system motivational processes by helping students become more internally motivated by meeting their needs for competence and relatedness. Connell and Wellborn (1991) posit that when this occurs students will engage in achievement behaviors that lead to positive academic outcomes, such as academic achievement.

Taken together, these three perspectives speak to how students' perceptions of general support from teachers, including teacher's instrumental help/support may influence academic motivation and achievement throughout the elementary, middle, and high school grades as a result of student's self-system processes. I will discuss the rationale for looking at the relations among students' perceptions of instrumental help/support and ability beliefs, task values, and academic grades in the academic domains of math and reading/English language arts and by student gender in more detail in Chapter 2. Next, I will review empirical work that informs the nature of these relations.

Overview of Relevant Literature

Researchers have found that the quality of students' early relationships with teachers may predict the quality of later teacher-student relationships up through late elementary school (Howes, Hamilton, & Philipsen, 1998; Hughes, Luo, Kwok, & Loyd, 2008). Students also seem to have closer relationships with their teachers in elementary school than in middle school (Newman & Schwager, 1993). In addition, teacher-student relationships can influence academic engagement and achievement throughout primary and secondary school.

Some empirical work also suggests that students' perceptions of general teacher support decline, during both middle school (Reddy et al., 2003), and from late elementary school through the middle of high school (Bru, Stornes, Munthe, & Thuen, 2010). General teacher support was also found to be positively related to expectancies and subjective task values (Goodenow, 1993; Midgley et al., 1989) from middle school through high school.

Although studied less than other aspects of teacher support, some findings suggest that teacher instrumental help or aid is more important than other relational attributes with teachers, such as nurturance, affection, intimacy, satisfaction, and admiration, for many young and middle adolescent students. In addition, Furman and Buhrmester (1985) and Lempers and Clark-Lempers (1992) found that instrumental help from teachers may be more influential for student outcomes than teacher's emotional support for students. Instrumental help/support from teachers has also been found to decline during the transition from elementary school to middle/junior high school (Seidman, Allen, Aber, Mitchell, & Feinman, 1994). Even so, it appears that teachers continue to be an important source of support for students during middle school, even if overall students perceive less support from their teachers during the transition into and during middle school (Reddy et al., 2003).

Both ability beliefs and subjective task values have been found to decline from primary through secondary school (Archambault, Eccles, & Vida, 2010; Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997). In addition, grades decline from middle school to high school (Meece, Wigfield, & Eccles, 1990; J. C. Perry, Liu, & Pabian, 2010; A. M. Ryan, Shim, & Makara, 2013; Seidman et al., 1994). General teacher support was also found to be positively related to grades from middle school to high school (Hamre & Pianta, 2001; Jia et al., 2009; Lam et al., 2012; J. C. Perry et al., 2010; Strøm, Thoresen, Wentzel-Larsen, & Dyb, 2013). To date, however, no one has looked at: (a) how earlier student perceptions of teacher instrumental help/support relate to later student perceptions of teacher instrumental help/support, (b) how students' perceptions of teacher instrumental help/support relate to ability beliefs, subjective task values, and grades in reading and math from second grade through twelfth grade, and (c) how these relations differ by gender.

In addition, researchers have found that relations among teacher support, ability beliefs, subjective task values, and grades differ by academic domain (Bill and Melinda Gates Foundation, 2010; Fredricks & Eccles, 2002; Goodenow, 1993; Hughes, 2011; Jacobs et al., 2002; Midgley et al., 1989; Rowan et al., 2002; Watt, 2004; Wigfield et al., 1997) and gender (Archambault et al., 2010; Fredricks & Eccles, 2002; Goodenow, 1993; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997). Students' ability beliefs predict task values in math and reading throughout elementary, middle, and high school (Fredricks & Eccles, 2002; Jacobs et al., 2002; Wigfield et al., 1997). In some cases, gender has been found to influence teacher support (Reddy et al., 2003; Roorda et al., 2011; Rueger et al., 2010; Suldo et al., 2009), but the findings on gender differences in teacher support are mixed (Bru et al., 2010; Reddy et al., 2003).

In summary, empirical work supports the prediction from EEVT that both students' and teacher's perceptions of teacher-student relationships, including instrumental help/support, relate to elementary, middle, and high school students' ability beliefs, values, and grades in various achievement domains. In addition, it is clear that students' ability beliefs predict task values in math and reading throughout elementary, middle, and high school. Empirically, ability beliefs and subjective task values, including interest and importance, have also been consistently shown to decline over time. Overall, this literature, which will be discussed in more detail in Chapter 2, suggests that general teacher support predicts academic motivation and achievement in elementary, middle, and high school. These relationships also differ by gender and academic domain.

Statement of Problem and Hypotheses/Research Question

Based on the three theoretical perspectives discussed earlier, EEVT, Stage Environment Fit Theory, and SDT, in the current study students' perceptions of instrumental help/support from their teachers are expected to predict students' ability beliefs, academic values, and academic grades. I predict that instrumental help/support from teachers will positively predict domain-specific ability beliefs, values, and grades from second through sixth grade (Hypothesis 1) and from seventh through 12th grade (Hypothesis 2). Further, all of these relations are expected to differ by student gender and academic domain, such that the relations among students' perceptions of instrumental help from teachers and ability beliefs, task values, and grades will be stronger in the domain of math for girls and stronger in the domain of reading for boys.

Specifically, I explore the following two hypotheses in this study:

Hypothesis 1: In adjacent grade pairs (e.g., second and third grade) during second through sixth grade, instrumental help/support from teachers will positively relate to ability beliefs, task values, and academic course grades within the same grade-level in reading and math. These relations will differ by gender, with instrumental help/support relating to these variables more strongly for girls in the domain of math and for boys in the domain of reading.

Hypothesis 2: In adjacent grade pairs (e.g., seventh and eighth grade) during seventh through 12th grade, instrumental help/support from teachers will positively relate to ability beliefs and task values in reading/language arts and math and grade-point average (GPA) within the same grade-level. Change over time in instrumental help/support from teachers and ability beliefs and task values in reading/language arts and math and GPA will also be associated with each other. All of these relations will differ by gender, with instrumental help/support relating to these variables more strongly for girls in the domain of math and for boys in the domain of reading/language arts.

Contributions

The present study extends prior work by exploring relations among students' perceptions of instrumental help/support from teachers and their ability beliefs and subjective task values in reading and math and academic grades. These areas of inquiry provide important new information that leads to a better understanding of how students' perceptions of instrumental help/support from teachers relate to their ability beliefs and subjective task values in reading and math and academic grades for girls and boys throughout elementary school and throughout middle school and high school.

The current study examines the relations between perceived teacher support and various academic motivation and performance outcomes, including ability beliefs and task values in math and reading and academic grades, from second through twelfth grade. Math and reading were chosen as academic subjects of primary interest because these are key subjects in school that greatly affect students' overall school performance. For example, students' who are not proficient readers by third grade are four times more likely to drop out of school before the age of 19 than students who are proficient readers by third grade (Hernandez, 2012). Given that prior work that has found both mean-level and trajectory-level differences in ability beliefs and subjective task values for reading/language arts and math, these motivational components are explored separately by domain to determine whether perceptions of support from teachers differentially influences these domains.

In addition, it is unclear whether gender impacts students' perceptions of support from their teachers. In prior work, some studies have found that gender influences teacher support (Reddy et al., 2003; Roorda et al., 2011; Rueger et al., 2010; Suldo et al., 2009), but other studies have not found differences by gender (Bru et al., 2010; Reddy et al., 2003). Thus, the current study may bring additional clarity as to how gender may (or may not) relate to the relations among students' perceptions of instrumental help/support from teachers and their ability beliefs and task values in reading and math and academic grades.

In the current study I use data from the longitudinal Childhood and Beyond (CAB) study, a cohort-sequential longitudinal study that began in 1986 (Eccles, Wigfield, Harold, & Blumenfeld, 1993; see the Gender and Achievement Research Program, 2015, website for a detailed description of this study). This dataset is uniquely suited to address the hypotheses posed in this dissertation study. The original purpose of the CAB study was to explore the development and socialization of students' ability beliefs, expectancies for success, task values, and other beliefs, and examine how they related to children's performance in different areas and choices of activities. As such, data were collected from students regarding their perceived emotional support from teachers from second through sixth grade, perceived general support from teachers from seventh through twelfth grade, ability beliefs and subjective task values in reading and math from second grade through twelfth grade, academic grades in reading and math from second grade through sixth grade, and grade-point average (GPA) from seventh grade through twelfth grade. Thus, the CAB study dataset allows me to explore how students' prior perceptions of support from teachers relate to ability beliefs and subjective task values in reading and math and academic grades longitudinally from second through sixth grade and seventh through twelfth grade. This sample is also evenly split amongst males and females (see Table 3 in Chapter 3), so I am able to explore how relations among these trajectories may differ by gender. The methods and design of the CAB study will be described in more detail in chapter 3.

Limitations

Although the current study has the potential to make significant contributions to the teacher instrumental help/support and ability beliefs, subjective task values, and achievement literature, there are some noted limitations to this work.

Although the use of the CAB study provides a unique cohort-sequential design for exploring the variables of interest across the primary and secondary school years in three different cohorts of students, this dataset does have some drawbacks. Firstly, the sample from the CAB study is not ethnically diverse, with the majority of students being white. Secondly, the CAB study does not have self-report data on perceptions of teacher support in first grade or kindergarten, and the items for students' perceptions of instrumental help/support from teachers are different from second through sixth grade and seventh through 12th grade (as will be discussed in more detail in Chapter 3), so I can only look at change over time from second grade through sixth grade and seventh grade through twelfth grade in the current study. Lastly, the cohort-sequential design of the CAB study limits my ability to see how students change from year to year; instead, I statistically draw an approximation of that change from second through sixth grade and seventh through twelfth grade.

Conclusion

It is well known that students' perceptions of support from their teachers relate to students' academic motivation and achievement (e.g., Wentzel & Battle, 2001; Wentzel & Wigfield, 1998). However, it is not clear how students' perceptions of instrumental help/support from teachers relate to students' ability beliefs and subjective task values in reading and math and academic grades for girls and boys throughout elementary school and throughout middle school and high school. EEVT, Stage-Environment Fit Theory, and SDT (and SSMMD) provide strong theoretical frameworks for exploring relations among students' perceptions of instrumental help/support from teachers and their ability beliefs and subjective task values in reading and math and course grades for girls and boys throughout elementary school and throughout middle school and high school. In addition, the CAB study dataset provides a unique cohort-sequential design for exploring how these relations change across elementary school and across middle school and high school. Ultimately, the current study illuminate how students' perceptions of instrumental help/support from teachers relate to their ability beliefs and subjective task values in reading and math and academic grades for girls and boys throughout elementary school and throughout middle school and high school.

Definitions of Terms

Perceptions of Instrumental Help/Support from Teachers are defined in various ways depending on the specific theory that is utilized. For the purposes of this study, the definition of instrumental help/support from teachers is built from the definition of overall teacher support given by Eccles and colleagues in their EEVT (Eccles & Wang, 2012; Eccles et al., 1983). They stated that perceptions of teacher support include students' perceptions of teachers' emotional caring, willingness to provide help and advice (also referred to as instrumental help/support – the major teacher variable of interest in the current study), and respect for autonomy that students' receive from their teachers in academic environments (Eccles & Wang, 2012). Within the Childhood and Beyond (CAB) study, teacher support questions address students' perceptions of emotional caring, willingness to provide help and advice, and fairness/equity (discussed in more detail in chapter 3). In the current study, only items for instrumental help/support, which refer to students' perceptions of their teachers' willingness to provide help and advice to the student, are used because instrumental help/support is the primary teacher variable of interest.

Ability Beliefs are children's perceptions of their current abilities (Wigfield et al., 2009) or one's assessment of his competency in performing a particular task or behaving in socially "role-appropriate" ways (Eccles et al., 1983). A related concept is expectations for success. Expectations for success, or expectancies, are defined as children's anticipatory beliefs about how well they will perform on a future task (Eccles et al., 1983). Both ability beliefs and expectancies can be either domain general or domain specific. Ability beliefs and expectancies are conceptually discussed as separate constructs in EEVT (Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994), but they do factor together for children and adolescents in empirical work (Eccles & Wigfield, 1995; Wigfield & Eccles, 2000). For the purposes of this study, and due to the high correlation of ability beliefs and expectancies in empirical research, expectancies/ability beliefs are discussed as one construct. The measures of ability beliefs in the CAB study dataset are consistent with this definition.

Subjective Task Values refer broadly to the incentives or reasons why children engage in different achievement tasks. More specifically, *task values* are defined as the degree to which a given achievement task meets various needs, goals, and personal aspirations of an individual (Eccles et al., 1983). Eccles and her colleagues (Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994) subdivided subjective task values into four components: attainment value (i.e., subjective importance), interest value, utility value (i.e., usefulness), and relative cost. Attainment value is defined as, "…the importance of doing well…" on a task, intrinsic value is defined as the enjoyment that one experiences from a task, and utility value is the usefulness or importance of a task (Eccles et al., 1983, p. 83). Lastly, cost is defined as the anticipated sacrifices and effort that one will need to undergo to complete a task (Wigfield et al., 2009). However, in empirical studies of children and adolescents' subjective task values, researchers either have used a combined values scale or, more often, have separated it into two sub-constructs: attainment/utility value and interest value (Archambault et al., 2010; Jacobs et al., 2002; Simpkins, Davis-Kean, & Eccles, 2006). In the current study, I use the attainment/utility variable for subjective task value to remain consistent with prior empirical work using the CAB study data. Cost is not be included in the current study.

Grades are defined as letter grades on a decimal system (e.g. 0.0 to 4.0 with higher scores indicating better performance) that are assigned to students by their teachers in various academic subject areas. These grades are either self-reported by students or are recorded in student records at the school. Grade-point average (GPA) is an average of all of the grades that a student has earned in all subject areas.

Chapter 2: Literature Review

In this chapter I review the selected theories and perspectives regarding the relations among teachers' instrumental support and students' ability beliefs, subjective task values, and grades in different academic domains, specifically reading and math. In addition, I will review both cross-sectional and longitudinal studies investigating these relations that have been done with elementary through high school students. The procedure for conducting this literature review will be described in the next section along with an overview of the structure of Chapter 2.

Literature Search Process and Chapter Organization

I conducted a literature search using the PsycINFO and ERIC databases. The terms "teacher support", "social support", "student perceptions", "teacher student relationships", "student teacher relationships", "academic motivation", "academic achievement motivation", "expectancy value theory", "ability beliefs", "value", "grades", "academic achievement", "math", "reading", and "gender differences" were entered as search terms in various combinations. In addition, because this study utilizes the Childhood and Beyond (CAB) study dataset, all publications from this dataset were reviewed from the CAB study website (http://www.rcgd.isr.umich.edu/cab/) for relevance to the current study. Lastly, the reference sections of relevant articles from the abovementioned search were reviewed to obtain additional articles of interest. No limitations were placed on the year of publication in this search.

In this review, I will first provide an overview of the guiding theories and perspectives for this study. I then will discuss empirical research that relates to my hypotheses and research question; specifically: (a) teacher-student relationships, including general teacher support and instrumental help/support, and how they change over time, (b) students' ability beliefs and subjective task values and how they change over time, and (c) students' grades and how they change over time. I will then discuss research on how these variables are impacted by: (a) academic domain, specifically reading and math and (b) gender. Lastly, I will discuss important issues that remain unaddressed in the literature and explain how my study addresses some of them.

Guiding Theoretical Frameworks

The primary theoretical framework for this study was selected based on the theoretical alignment of the secondary data used in this study—the Childhood and Beyond (CAB) study data. The CAB study was designed to assess the developmental aspects of both the critical ability beliefs and task values in EEVT, as well as the developing relations of student beliefs and values and socializers' beliefs and values within various academic domains, including math and reading. Thus, Eccles, Wigfield, and colleagues' EEVT (Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994) is the primary theoretical framework guiding the present study. In the CAB study, the researchers predicted, and found, that relations of student ability beliefs and subjective task values to teacher variables became stronger as students' beliefs and values took shape during elementary school (e.g., Wigfield et al., 1997). This finding is relevant to Hypothesis 1, pertaining to grades two through six, in the current study, which will be described in detail later.

In addition, Eccles, Midgley, and colleagues' Stage Environment Fit theory (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011) is a secondary theory used in the present study. Stage Environment Fit theory is relevant to the present study with respect to how student-socializer relations may change over time, especially during middle school and high school (i.e., adolescence) and during school transitions (i.e., elementary to middle school, and middle school to high school). Thus, Stage Environment Fit theory is particularly relevant for Hypothesis 2, pertaining to grades seven through 12, in the current study, which will be described in detail later.

The present study also includes Self-Determination Theory (SDT) as a secondary theory because the developers of that theory, Edward Deci and Richard Ryan (e.g., Deci & Ryan, 1985, 2008; Ryan & Deci, 2002), discuss the processes behind how (and why) student's internalize teacher beliefs and behaviors, which can help explain the process of how instrumental help from teachers relates to student academic motivation and achievement.

Although I draw from these three theories, it is important to note that there are many other theories that have provided the basis for studies of the relations among aspects of teacher-student relationships and academic motivation and achievement. For example, in my review of teacher-student relationship theories, I found three additional theoretical perspectives that focus on understanding relations among teacher-student relationships, academic motivation, and achievement (see Wentzel, 2009). These are: (a) teacher-student relationships as socialization contexts (e.g., Wentzel, 1997, 2002, 2009), (b) applications of attachment theory to teacher-student relationships (e.g., Hamre & Pianta, 2001; Howes et al., 1998; Pianta, 1994), and (c) social support theories (e.g., Cohen & Wills, 1985; Malecki & Demaray, 2003). However, based on the reasons provided above, these theories do not guide the present study.

I will discuss the primary theory (EEVT) guiding this dissertation study next, followed by discussions of the two supporting theories (Stage-Environment Fit Theory and SDT) guiding this work.

Expectancy-Value Theory

As mentioned in Chapter 1, Eccles and colleagues' Expectancy-Value Theory (EEVT; Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994) is a theoretical model of how peoples' expectations for success and value for particular achievement activities directly relate to their achievement outcomes such as performance and activity choice. Importantly, this theory considers the impact of expectancies and values within an individual's cultural and social context.

Figure 1 below displays a full model of this theory. The pathways through this model run from left to right in four main sections. In the far left column are cultural, social, and other contextual factors that impact expectancies, values, and everything else within the model. In the second column are an individual's perceptions of these cultural, social, and other contextual factors. The third column contains an individual's identity, goals, self-ability beliefs, and affective reactions and memories. Lastly, on the far right are an individual's expectancies for success, task values, and later achievement outcomes.

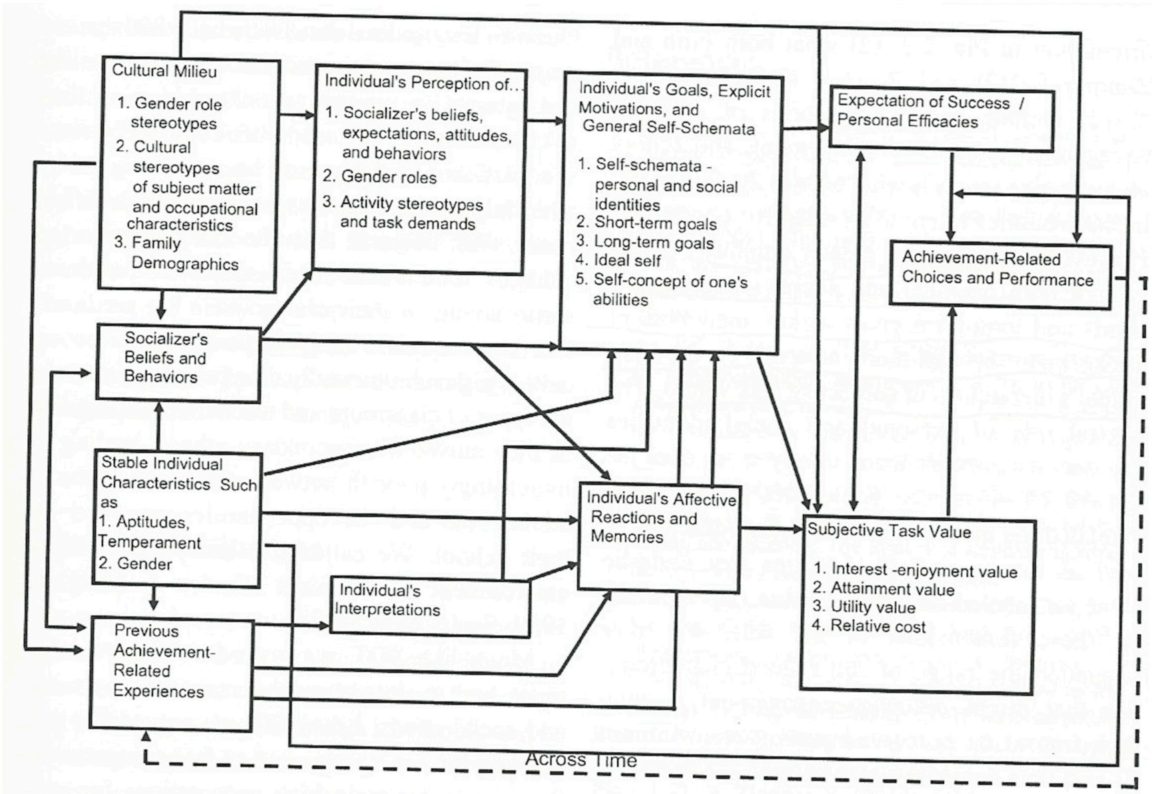

Figure 1. Eccles et al.'s (1983) expectancy value framework from Eccles and Wang (2012).

Thus in this model individuals' expectancies and task values are the strongest proximal influence on their achievement outcomes, and are themselves influenced by a complex array of factors. Another key point of this theory is the importance that is placed on individuals' perceptions of the social and cultural context around them (the section of boxes in the middle left of Figure 1). These perceptions make the connection between the social and cultural context (the boxes on the far left of Figure 1) and individuals' identity, goals, ability beliefs, and affective reactions and memories (the boxes on the middle right of Figure 1). Expectancies, values, and achievement outcomes only come into play after the influence of these social/cultural, individual perceptions, and individual goals, beliefs, memories, and feelings.

In the current study, I explicitly focus on portions of the last three columns in the model: (a) individuals' perceptions of instrumental support from teachers, (b) individuals' goals, beliefs, and memories, and (c) individuals' expectancies, subjective task values, and achievement outcomes. Specifically, I explore how students' perceptions of their socializers' beliefs and behaviors influence their expectations for success (based on an assessment of their own ability beliefs) and their task values, which then motivate achievement outcomes. I examine these pathways as occurring within the cultural context, which includes gender and subject domain stereotypes.

Important motivational constructs in the EEVT model that I explore include expectancies for success, ability beliefs, and subjective task values. Ability beliefs are children's perceptions of their current abilities or competencies for performing a particular task (Eccles et al., 1983). A related concept is expectations for success. Expectations for success, or expectancies, are defined as children's anticipatory beliefs about how well they will perform on a future task (Eccles et al., 1983). Both ability beliefs and expectancies can be either domain general or domain specific. Ability beliefs and expectancies are conceptually discussed as separate constructs in EEVT (Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994), but they do factor together for children and adolescents in empirical work (Eccles & Wigfield, 1995; Wigfield & Eccles, 2000). For the purposes of this study, and due to the high correlation of ability beliefs and expectancies in empirical research, expectancies/ability beliefs are discussed as one construct. The measures of ability beliefs in the CAB study dataset are consistent with this definition.

Subjective task values refer broadly to the incentives or reasons why children engage in different achievement tasks. More specifically, *subjective task values* are defined as the degree to which a given achievement task meets various needs, goals, and personal aspirations of an individual (Eccles et al., 1983). Eccles and her colleagues (Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994) subdivided subjective task values into three components: attainment value (i.e., subjective importance), interest value, and utility value (i.e., usefulness). Attainment value is defined as, "…the importance of doing well…" on a task, intrinsic value is defined as the enjoyment that one experiences from a task, and utility value is the usefulness or importance of a task (Eccles et al., 1983, p. 83). Lastly, cost, included in the model as part of values but actually an influence on it (see Eccles, 2005; Eccles et al., 1983) is defined as the anticipated sacrifices and effort that one will need to undergo to complete a task (Wigfield et al., 2009). However, in empirical studies of children and adolescents' subjective task values, researchers either have used a combined values scale or, more often, have separated it into two sub-constructs: attainment/utility value and interest value (Archambault et al., 2010; Jacobs et al., 2002; Simpkins et al., 2006). In the current study, I use the attainment/utility variable for subjective task value to remain consistent with prior empirical work using the CAB study data.

As discussed in Chapter 1 in this study I focus on relations of students' ability beliefs and subjective task values to their *perceptions of the instrumental support they receive from their teachers*; this variable is contained in column 2 in the EVT model shown in Figure 1. Eccles and colleagues (Eccles & Wang, 2012; Eccles et al., 1983) define perceptions of teacher support as including students' perceptions of teachers' emotional caring, willingness to provide help and advice (also referred to as instrumental help/support, which is the major teacher variable of interest in the current study), and respect for autonomy that students' receive from their teachers in academic environments (Eccles & Wang, 2012). Within the Childhood and Beyond (CAB) study, where the data are drawn from for the current study, teacher support questions address students' perceptions of teachers' emotional caring, willingness to provide help and advice, and fairness/equity (discussed in more detail in chapter 3). In the current study, items for instrumental help/support, which refer to students' perceptions of their teachers' willingness to provide help and advice to the student, is used because instrumental help/support is the primary teacher variable of interest. The reasons for this choice will be explained in more detail later in this chapter.

It is important to note that the box containing "individual's perceptions" in the EEVT includes students' perceptions of their teachers and parents' beliefs, values, and attitudes, as well as teachers' practices (e.g., Eccles et al., 1983). These variables, are hypothesized to influence students' perceptions of their own ability-related beliefs, and values. Thus, the quality of various aspects of students' relationships with their teachers can either enhance or diminish student expectancies and values. Support from teachers is talked about more generally by Eccles and colleagues (Eccles & Wang, 2012; Eccles et al., 1983) in EEVT, but is considered to be part of the "various aspects of students' relationships with teachers" that can influence student motivation.

As briefly mentioned above, two other variables of interest in the current study, and that are central in EEVT, are gender and academic domain. Beginning with gender, Eccles et al. (1983) initially included it in the EEVT model because a primary focus of their early work was assessing gender differences in students' choices and performance in the academic domains of science and math. Because gender stereotypes are part of the box at the far left of the model concerning cultural contexts in which students exist, according to Eccles and colleagues (Eccles & Wang, 2012; Eccles et al., 1983), this would mean that all variables in the EEVT model are impacted by the context of gender, including perceptions of socializers' beliefs and behaviors, ability beliefs, task values, and achievement. In addition, as will be discussed in the empirical evidence section, researchers have found that there are gender differences in students' perceptions of support from teachers (e.g., Rueger et al., 2010). Thus in the present study I assess how the context of gender shapes the relations among students' perceptions of teacher instrumental support (i.e., perceived socializer's behaviors), ability beliefs, task values, and academic grades (i.e., achievement). Specifically, I explore gender as a grouping variable through which all predicted pathways might differ, instead of as a variable that might only influence a few variables in the predicted model.

With respect to academic domain, Eccles, Wigfield and their colleagues (Eccles et al., 1993; Wigfield et al., 1997) have traditionally studied students' beliefs and values at the domain specific level in the CAB studies. Thus, students' ability beliefs and values are examined at the domain-specific level in the current study. Specifically, ability beliefs in reading/language arts and math and task values in reading/language arts and math are included as variables of interest in the analyses. In addition, to the extent possible, domain-specific variables are included for achievement (i.e., academic course grades in the current study) – the specific domain-specific grade variables that are used will be discussed in detail in Chapter 3.

In summary, in their EEVT model Eccles and her colleagues Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994) proposed how students' ability-related beliefs expectancies and subjective task values relate to their achievement outcomes in different achievement domains. As will be discussed later in this chapter, Eccles and colleagues have found that the strength of these relations change over time. For example, Wigfield et al. (1997) found that relations of students' ability beliefs and task values to parent and teacher ratings of the children's ability become stronger over time. Thus, the association among teachers' evaluations of their students' ability beliefs and students' evaluations of their own ability beliefs become stronger over time. Although instrumental support/help from teachers has not been explored empirically with the CAB study data, Eccles and colleagues EEVT can be utilized to address the goals of the current study. Specifically, based on EEVT and the findings presented here, I would predict that teachers (i.e., socializers), including students' perceived instrumental help/support from teachers, positively impact students' ability beliefs and values, which then either enhance or lower various student achievement outcomes, such as earning good course grades, depending upon the nature of these relationships.

As noted earlier the CAB study was designed to examine how the crucial ability belief and value constructs in Eccles et al.'s developed over time, and how students' perceptions of their socializers influenced these developing beliefs and values. In their Stage Environment Fit Theory, Eccles and her colleagues (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011) discussed specifically how student-teacher relations likely change during the early adolescent period. Because I include early adolescent and adolescents in this study Stage Environment Fit Theory is relevant, and so I describe it next.

Stage-Environment Fit Theory

Eccles and colleagues (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011) stage-environment fit theory complements' EEVT by adding in a developmental component explaining how socialization contexts, such as schools, can influence students' motivational beliefs and values positively or negatively across development based on stage-environment fit. If the social context, such as the school context, results in good stage-environment fit, then students will be optimally motivated. However, if a school context leads to poor stage-environment fit for a student, then his motivation will decrease. They focused in particular on the early adolescent period, because of the multiple transitions that occur during this period, such as school changes (from elementary to middle school), developmental changes (such as puberty), and social changes that occur in adolescence. As will be discussed throughout this dissertation, although the amount of decline varies for different groups of students (Archambault et al., 2010; Wigfield et al., 2015), all student trajectory groups generally experience declines in subjective task values and self-concept of ability from at least first grade through seventh grade, with marked declines for many students in middle school (see Wigfield, Byrnes, & Eccles, 2006). In their stage-environment fit theory, Eccles and colleagues propose that one important reason why these declines occur is because students' transition from elementary school to middle school may be further complicated by students' developmental transition into adolescence, which may result in negative changes to students' stage-environment fit (i.e., stage of adolescence and environment of middle school).

In their writings on Stage Environment Fit Theory, Eccles, Wigfield, and colleagues (e.g., Eccles & Midgley, 1989; Wigfield, Byrnes, et al., 2006) focused on how school structural and organizational changes that occur for many children as they transition from elementary school to secondary school also may influence these declines in motivation:

> "Traditional secondary schools differ structurally in important ways from elementary schools. […] students are likely to feel more anonymous and alienated because of the large size of many secondary schools. […] These kinds of changes should affect the students' sense of belonging as well as their sense of social competence" (Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006, p. 982).

In addition, changes in teachers and instruction also may change the relationships that students have with their teachers. For example, due to the change from having one teacher in elementary school to having multiple teachers in middle school and high school, students often are unable to develop deep, meaningful connections with their teachers (Eccles & Roeser, 2011). In addition, in middle school and high school, teachers typically teach classes in one domain, such as math. Thus, teachers are likely to teach multiple groups of students in the same day and may not teach the same groups of students for more than a year (Wigfield, Eccles, et al., 2006). Thus, students have little opportunity to interact with their teachers in any dimension other than the academic subject that the teacher instructs. This structure does not offer students as much opportunity to build supportive, close relationships with any one teacher, which may be easier in elementary schools when students typically have the same teacher for the entire school year (e.g., Eccles & Midgley, 1989; Wigfield, Byrnes, et al., 2006; Wigfield, Eccles, et al., 2006). This change from one teacher to multiple teachers coincides with adolescence, which is a developmental time when support and caring from non-parental adult mentors are important. This mismatch could be one cause of declining motivation and achievement experienced by many students in middle school and high school.

Eccles and colleagues (e.g., Eccles & Midgley, 1989; Wigfield, Eccles, et al., 2006) note that this change in structure could make it more difficult for teachers to identify when specific students are having problems. This could then decrease the chances of a teacher providing appropriate instructional supports for students, either due to a lack of time for the teacher to appropriately address the needs of a student who needs additional academic help, or due to a lack of familiarity with the student in order to determine when that student is struggling.

Given these changes during the *transition from elementary school to middle school*, as well as the profound biological and social changes that occur during the developmental time of adolescence, this time period may be difficult for students to navigate, resulting in a decrease in their motivation. With respect to the present study, such decreases may be especially likely if students do not have positive relations with their teachers both emotionally and with respect to the perceived instrumental support teachers provide their students. Thus, I would predict that support from teachers has more positive relations to ability beliefs, values, and achievement in middle school and high school—a time when student's need more support from teachers but may not receive it—than in elementary school.

The *transition from middle school to high school* may also be difficult for students for similar reasons. Wigfield and colleagues (2006) note that, in high school there is also a lower likelihood for students and teachers to develop close, supportive bonds, which could result in a lack of trust between them along with a separation between their goals and values. With little time for teachers to get to know students on a personal level, there is also a lower likelihood that teachers will form a mentor-like relationship with their students. Wigfield and colleagues (2006) suggest that this could result in teachers not attempting to make instruction meaningful or relevant to students, which is likely to be undermining for student motivation and involvement—especially for those students who are already at risk of low academic achievement or who already feel disconnected from the values of adults at their school. Children's perceptions of their socializers' behavior impacts their own development and achievement choices (Eccles, 2007). Thus, student's perceptions of social agents, such as teachers, are important to consider here.

Although EEVT, the primary theory guiding this dissertation study, along with developmental components from Stage Environment Fit theory, one crucial piece is not clearly specified in those theories: the *processes* behind how socializer's behaviors relate to ability beliefs, task values, and grades. Self-Determination Theory (SDT) explains an internalization process that gets at this "how", which will be reviewed next.

Self-Determination Theory (SDT)

At the most basic level, in their SDT, Deci and Ryan (e.g., Deci & Ryan, 1985, 2008; Ryan & Deci, 2002) propose that all human beings have three psychological needs: competence, relatedness, and autonomy. Competence is the need for mastery and challenge, relatedness is the "need to belong", and autonomy is the need to feel in control of one's actions (La Guardia & Patrick, 2008; Ryan & Deci, 2002). These needs are thought to be universal across all cultures (although expressed differently in different cultures) and necessary for humans to thrive psychologically (Deci & Ryan, 1985, 2008; Ryan & Deci, 2002). Although competence is considered a "need" in SDT, competence beliefs (i.e., ability beliefs) are not considered a "need" in EEVT; however, these concepts are related. Of most relevance to the current study is the need of relatedness—the "need to belong" and feel worth-while (Deci & Ryan, 1985; La Guardia & Patrick, 2008; Ryan & Deci, 2002).

The process for how student needs in the classroom are met via students' motivation comes from *organismic integration theory*, one of the five mini-theories in SDT (Reeve, 2012). According to Reeve (2012), "[o]rganismic integration theory focuses on internalization and why students initiate socially important, but not intrinsically motivating, behaviors. It […] explains students successful versus unsuccessful academic socialization" (p. 153). The most relevant aspect of organismic integration theory for the current study is the process of *internalization*, or the degree to which a person has integrated motivation into their sense of self (Deci & Ryan, 2008; Ryan & Deci, 2002). In this mini-theory, internalization and motivation work hand-in-hand. For example, if motivation has been internalized, that means that the motivation is valued, integrated into a students' sense of self, and reflects' student autonomous choices in what to engage. However, if motivation has not been internalized, then the student is doing an activity for extrinsic, controlled reasons rather than autonomous ones. In organismic integration theory, motivation does not need to be internalized for a student to do well in school; however, over the long term internalized motivation tends to yield the greatest benefits in terms of performance, persistence, and psychological well-being (e.g., Ryan & Deci, 2000). This concept of internalization from organismic integration theory is the basis for the self-system processes that Connell and Welborn (1991) discuss in their theory, which I will describe in detail next.

Connell and Welborn (1991) proposed a Self-System Model of Motivational Development (SSMMD) that is based in SDT. Connell and Wellborn (1991) explain how the core basic needs can be met in social contexts, which then influence students' self-system for motivation. When students' core needs are met through social contexts or activities, such as a school classroom, Skinner and Pitzer (2012) claim that students will engage within that social context. However, if those needs are not met, then students will "act out", withdraw, or escape from that social context. Thus, school contexts influence students through self-system processes, or students' views of themselves, by either supporting or perhaps hindering students' experiences of themselves as having these needs met, such as feeling "related" or like they belong at school (Connell & Wellborn, 1991; Skinner, Kindermann, Connell, & Wellborn, 2009; Skinner & Pitzer, 2012). Skinner and Pitzer (2012) note that these self-system processes, "…are not fleeting self-perceptions; they are durable convictions that shape apparent reality and so guide action" (p. 27). In other words, a student's self-system guides her perceptions and actions related to motivation via internalization. See Figure 2 below for a general process model for motivation from SSMMD.

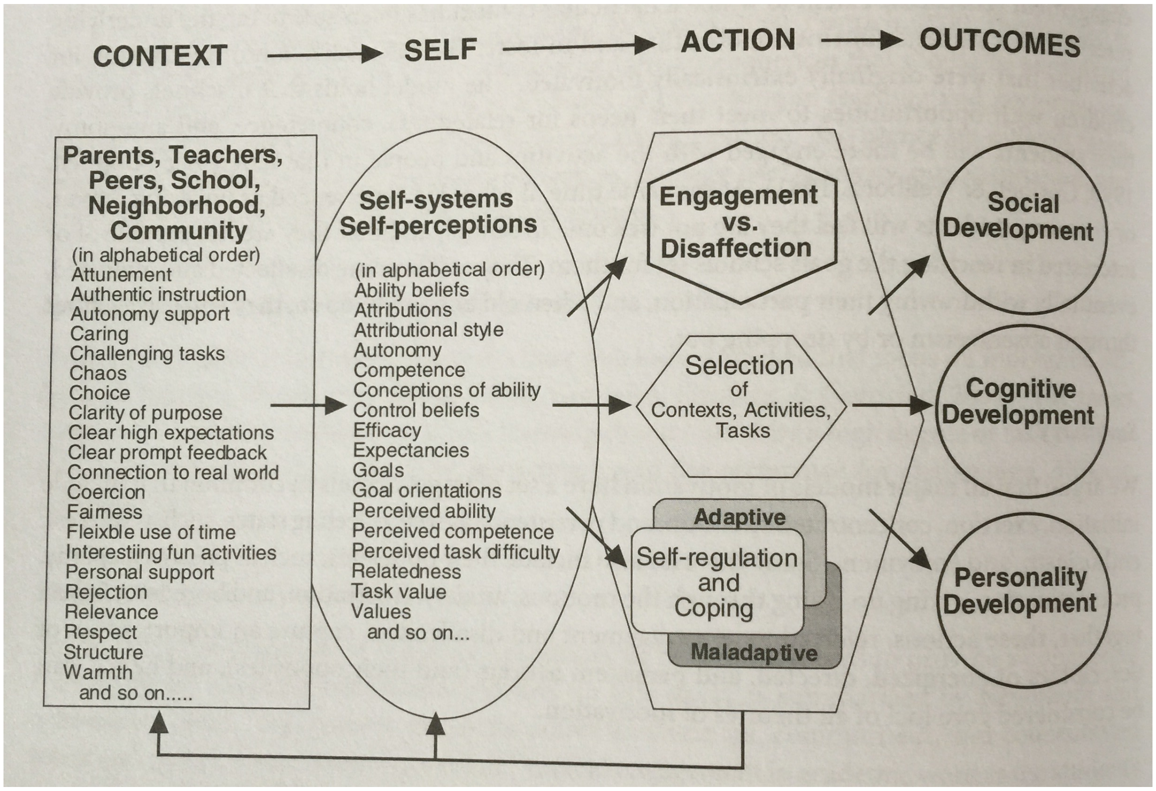

Figure 2. Skinner, Kindermann, Connell, and Wellborn's (2009) SSMMD process model, depicting motivation as distinct from social contexts and self-systems.

In teacher-student relationship research based on the SSMMD, Skinner et al. (1993) and other researchers studied how teacher behaviors, such as instrumental help and support, influence students' academic motivation and academic outcomes by shaping students' self-system processes (e.g., Skinner et al., 1993). For example, Turner (2014) states that, "…students are more likely to engage in learning if teachers support their perceptions of competence, autonomy, belongingness, and make learning meaningful" (p. 341). Skinner and Pitzer (2012) proposed that three different dimensions of the social context influence student's self-system processes: warmth, autonomy support, and provisions of structure.

In the context of students' relationships with their teachers, certain teacher behaviors fulfill these three proposed dimensions of the social context of school. Warmth from teachers is thought to influence the need of relatedness, and can include such teacher behaviors as involvement with students by taking time for, enjoying interactions with, expressing affection towards, dedicating resources to, and being attuned their students (Skinner & Belmont, 1993). Structure in the classroom can include such teacher behaviors as clear communication of expectations by responding to students in predictable and consistent ways, offering instrumental support and help, and by tailoring instruction to each student, which are thought to support student competence. Finally, autonomy support from teachers can include such teacher behaviors as making connections between school activities and students' interests and allowing children latitude in their learning activities (Skinner & Belmont, 1993). These actions help fulfill students' need for autonomy.

In the SSMMD model, all of the teacher behaviors mentioned above (i.e., warmth, structure, and autonomy support) are predicted to either support or perhaps hinder the fulfillment of the core needs in SDT via the level of internalization that students have for their motivations to fulfill these needs. The fulfillment of these needs then predict the relationship between adaptive/maladaptive coping and engagement in the classroom, which then further influence learning and achievement outcomes and future perceptions of teacher support and future core need attainment (Skinner & Pitzer, 2012). With respect to the variables measured in this study, instrumental help, a type of teacher behavior to support structure in the classroom, in particular may positively impact students' ability related beliefs and task values and ultimately student academic achievement (as measured via course grades in the current study).

Thus SDT and the related SSMMD can be used in conjunction with EEVT to understand the "why" behind how students' relationships with teachers may influence academic motivation and achievement. Specifically, teacher behaviors directly influence students' self-system processes, which impact how students perceive and interpret teacher behaviors, how students engage in the school context, and ultimately how all of the above factors impact students' academic motivation and achievement. Connell, Skinner and their colleagues have done much relevant empirical work that provides further support for the predicted links among teacher support and academic motivation and achievement. This empirical work will be discussed later in this chapter.

Theoretical Model Guiding the Current Study

To review, three perspectives guide the current study: EEVT as the base theory, stage-environment fit theory to further explain developmental changes, and SDT to explain process.

In EEVT, Eccles and colleagues (e.g., Eccles & Wang, 2012) proposed that students need to perceive support[1] from socializers, including support from their parents, teachers, and peers in order to: (a) feel motivated to attempt academic challenges, (b) have the opportunity to experience success, and (c) increase their ability beliefs for various subjects (Eccles & Wang, 2012). Although support is mentioned more generally

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[1] In chapter 1, I provided a definition of teacher support from EEVT. Specifically, in EEVT, perceptions of teacher support are students' perceptions of emotional caring and cognitive factors, such as willingness to provide help and advice, respect for autonomy, etc., that students' receive from their teachers in academic environments (Eccles & Wang, 2012). Thus, in this study, student's perceptions of teacher support according to Eccles and Wang's (Wang & Eccles, 2012) definition will be included in the "children's perceptions of socializers and their beliefs, expectations, attitudes, and behaviors" portion of the EEVT model (see Figure 1 above).

here, I focus on students' perceptions of instrumental help/support from teachers in the current study because items addressing instrumental help/support are the only teacher support items in the CAB study data that are available from elementary school through high school. It is also important to study instrumental support because less attention has been paid to it in the literature.

In their Stage-Environment Fit Theory, Eccles and her colleagues (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011) proposed that elementary school offers better stage-environment fit for students than in middle school or high school because of the following reasons. Teachers are better able to support students' developmental needs in elementary school than in middle or high school due to class size, school structure and other issues, which directly impact the amount of time that teachers can spend with their students and the likelihood that a teacher will recognize when a particular student is in need of additional supports. This is then thought to be one of the reasons why many students' motivation is higher in elementary school than in middle or high school.

Lastly, in SDT (Deci & Ryan, 2008; R. M. Ryan & Deci, 2002) and particularly through Connell and Wellborn's (1991) SSMMD that is based in SDT, teacher behaviors, such as instrumental help, are expected to influence student's self-system motivational processes (via internalization of motivation to meet the three basic needs), such as students' feelings of competence, which then impact student behavior/action that could result in positive academic outcomes, such as academic achievement.

Taken together, these three perspectives speak to how students' perceptions of general support from teachers, including teacher's instrumental help/support may influence academic motivation and achievement throughout the elementary, middle, and high school grades as a result of student's self-system processes. Specifically, based on these three perspectives, in the current study students' perceptions of instrumental help/support from their teachers are expected to predict students' ability beliefs, academic values, and academic grades. I predict that support from teachers will positively relate to domain-specific ability beliefs (i.e., reading and math), values (i.e., reading and math), and grades from second through sixth grade (Hypothesis 1) and from seventh through 12th grade (Hypothesis 2). Further, all of these relations are expected to differ by student gender, such that the relations among students' perceptions of instrumental help from teachers and ability beliefs, task values, and grades will be stronger in the domain of math for girls and stronger in the domain of reading for boys. I will discuss the rationale for looking at the relations among students' perceptions of instrumental help/support and ability beliefs, task values, and academic grades in the academic domains of math and reading/English language arts and by student gender in more detail at the end of this chapter. Next, I will review empirical work that informs the nature of these relations.

Teacher Support and its Relations to Students' Ability Beliefs, Subjective Task Values, and Grades in Different-Aged Students

Now that the guiding theoretical perspectives underlying the present study have been described, I next review empirical evidence exploring the nature of teacher-student relationships, focusing on how teachers support, or do not support, their students in various ways. I focus in particular on teachers' instrumental help/support. Following this I review work on how perceived teacher support[2] relates to students' academic motivation, specifically their ability beliefs and subjective task values, and academic

[2] As a reminder, I am focusing on students' perceptions of instrumental help/support from teachers in the current study.

achievement in the form of course grades. These findings will be discussed from elementary school through high school.

Instrumental Help/Support from Teachers

To start this section I will first review empirical work for teachers' instrumental help/support for their students in the classroom, which is the main teacher support construct of interest in the current study. Then I will discuss work on how general aspects of *teacher-student relationships*, including the quality of the teacher student relationship, teachers' emotional support for their students, and the instrumental help/support that teachers provide for their students relate to future aspects of *teacher-student relationships* and academic motivation and achievement. At the end of this section, I will discuss empirical work about the trajectory of *teacher support*, generally, and how it relates to academic motivation and achievement.

The reasons for structuring this section in the way noted above are as follows. There is a larger body of work on how general teacher support (which may include aspects of emotional support, instrumental help/support, and other types of support) relates to achievement motivation and academic achievement than how teacher instrumental help, more specifically, relates to achievement motivation and academic achievement. This is why I review relevant research on teacher instrumental help first, but then I will discuss relevant research about teacher-student relationships in general and more general teacher support work to fill in the gaps in work on instrumental help/support from teachers.

Instrumental help/support from teachers. One important aspect of teacher support is instrumental help or aid (e.g., Wentzel, 2004). Instrumental help is defined as the help that teacher's provide to their students as it relates to instruction (Ang, 2005; Kozanitis, Desbiens, & Chouinard, 2007; Lempers & Clark-Lempers, 1992; Suldo, McMahan, Chappel, & Bateman, 2014). Instrumental help includes the help that teachers provide to students, whether in the form of modeled behavior, particular experiences that aid learning, advice, or other information as relevant to classroom experiences (Wentzel, 2004).

Lempers and Clark-Lempers (1992) found that instrumental aid from teachers seemed to be more important than other relational attributes, such as nurturance, affection, intimacy, satisfaction, and admiration, for young adolescent (age 11-13) males and females and middle-adolescent (age 14-16) males, but not for older adolescent (age 17-19) students or middle-adolescent females. Lempers and Clark-Lempers (1992) suggested that these findings might mean that teachers are not as important to adolescents in comparison to their relationships with their parents, friends, and siblings. In addition, they note that the nature of schools, which they argue is not conducive to fostering emotionally salient teacher-student relationships, may be to blame for the low importance that adolescent students' placed on their relationships with teachers in this study. Lempers and Clark-Lempers' (1992) finding that students' reported seeking instrumental help from teachers more than emotional support corresponds with Furman and Buhrmester's (1985) findings with fifth and sixth grade students. Thus, it appears that instrumental help from teachers may be more influential for student outcomes than emotional support.

Researchers studying how students' perceptions of instrumental help/support from teachers change over time generally have found that these perceptions decline. For example, Seidman, Allen, Aber, Mitchell, and Feinman (1994) found that instrumental help/support from teachers (along with other aspects of support from teachers) declined during the transition from elementary schools to middle/junior high schools. In addition, Reddy, Rhodes, and Mulhall (2003) found that most students' perceptions of teacher support (as measured by ratings of students' perception of teachers caring for students at their school, teachers being willing to help students in their school, etc.) declined from sixth to eighth grade. However, they also found that students' who perceived increases in teacher support across this age span reported declines in depressive symptoms and increases in self-esteem. This finding indicates that teachers continue to be an important source of support during middle school, even if overall students' perceive less support from their teachers from sixth to eighth grade.

The relations among instrumental help/support from teachers and ability beliefs, subjective task values, and grades have not been explored much in past research; thus it is important to further explore these relations. This is why the current study focuses on these relations in particular. Now I will discuss more general research on teacher-student relationships and support from teachers.

Teacher-student relationships. Various components of teacher-student relationships have been explored empirically, including teacher support, mutual respect, teacher-student relationship quality, teacher fairness/equity, and student/peer support (Perry et al., 2006). Generally, the quality of teacher-student relationships positively influences school outcomes such as academic motivation (see Wentzel, 1998).

Students' early relationships with teachers have been found to predict later relationships with teachers. For example, in a longitudinal study, Howes, Hamilton, and

Philipsen (1998) examined whether students' earlier relationships with teachers might influence later relationships with teachers. Specifically, Howes et al. (1998) examined the stability and continuity of the *quality* of 55 children's relationships with childcare providers/teachers, as assessed by students reports concerning whether their childcare providers/teachers would react in a supportive, indifferent, or hostile way to 10 different classroom/school situations. The quality of these relationships was assessed when the children were age one through age nine, with assessments at ages one, four, and nine. Howes et al. (1998) found that children's relationships with their first childcare provider/teacher predicted whether they would have positive or negative relationships with their teachers at the age of nine. Interestingly, this result occurred even though the children's teachers changed from year-to-year. Howes et al. (1998) argued that this finding may mean that students maintain similar "ways of relating" with their teachers as they age and advance through elementary school. They explained that,

> "…it seems unlikely that children experienced similar social interaction styles from each of their many different teachers. It is more plausible to suppose that children formed a cognitive representation of teacher as either positive or negative and that their behavior toward each new teacher was consistent with their working model, thus eliciting consistent patterns of interaction" (p. 425).

Similarly, Hughes, Luo, Kwok, and Loyd (2008) also found that teacher-student relationship *quality* in first grade predicted third grade teacher-student relationship quality above-and-beyond year-to-year stability, in a study of 671 academically-at risk students. Their measure of teacher-reported teacher-student relationship quality focused on teacher-student conflict and teacher emotional support for students in the academic environment. Overall, these findings support Howes et al.'s (1998) findings that teacher-student relationship quality in first grade can predict teacher-student relationship quality in third grade, and teacher-student relationship quality in the prior year can predict teacher-student relationship quality in subsequent years. Notably, Hughes et al. (2008) found that these relationships did not differ by gender or ethnicity. In addition, similar to Howes et al. (1998), Hughes et al. (2008) did not control for or account for the fact that students' teachers changed over time—no rationale was given for this choice.

Even though Howes et al. (1998) and Hughes et al. (2008) found that students' relationships with their first childcare providers/teachers predicted their relationships with teachers up to third grade, some work suggests that the strength of these relationships may vary across age. For example, Newman and Schwager (1993) conducted semi-structured interviews regarding third, fifth, and seventh grade students' perceptions of their relationships with their teachers. The questions about relationships focused on how much students like their teachers as people, whether they feel comfortable asking their teachers for help, and whether they feel that their teachers will give them support in the classroom when the student asks for help. Third grade students felt they had closer personal relationships with their teachers than fifth and seventh grade students. Interestingly, these findings did not differ by gender. Newman and Schwager (1993) were surprised by the lack of significant gender differences in their study, but they did not offer a rationale as to why they thought gender did not predict variance in their work. Regardless, this work suggests that students might feel closer to their teachers and more supported for academic activities in earlier grades in elementary school than in later grades in middle school. Newman and Schwager (1993) also did not account for the fact that students had different teachers at each grade level; however, they did note that future work should determine if the classroom experience facilitated by teachers may influence students' perceptions of support from their teachers.

Students' perceptions of their relationships with their teachers also have been found to relate to their academic motivation and achievement. In a meta-analysis of 99 studies with participants from preschool to high school both within the United States and other countries, Roorda, Koomen, Spilt, and Oort (2011) found that positive and negative affective qualities of teacher-student relationships (i.e., teacher's emotional support of students) had medium to large effect sizes for student engagement and small to medium effect sizes for student achievement. The studies analyzed in this meta-analysis contain teacher-, student-, and observer- reported measures of the affective qualities (i.e., teacher emotional support for students) of teacher-student relationships. Overall, the associations among teacher-student relationships and engagement and achievement were statistically significant, even after correcting for methodological biases. Generally, the association among positive teacher-student relationships and positive academic engagement and achievement were stronger in higher grades than in lower grades. This finding is surprising given that Newman and Schwager (1993) found that students in third grade reported closer relationships with teachers than students in seventh grade. However, Roorda et al. (2011) also found that negative teacher-student relationships seemed to be more influential for negative engagement and achievement outcomes in primary school than in secondary school.

In contrast to Newman and Schwager's (1993) results on relationship closeness, gender also appeared to moderate these associations, with positive and negative teacher-student relationships being more influential for boys' engagement, and positive teacher-student relationships being more influential for girls' achievement. Roorda et al. (2011) explained these differential gender findings through the lens of the "academic risk hypothesis" from Hamre and Pianta (2001). Specifically, according to the academic risk hypothesis, students who are at higher risk due to low-SES, ethnic minority status, or learning disabilities may be more strongly influenced by the teacher-student relationship than children who are normative. Thus, Roorda et al. (2011) explained that boys were more "at risk" than girls in their study because boys have "…more to gain or lose" (p. 518), and so, that is why boys' engagement was influenced by both positive and negative teacher-student relationships, whereas girls' engagement was only influenced by positive teacher-student relationships. However, Roorda et al. (2011) did not provide empirical support for this hypothesis and did not explain why boys have more to gain or lose than girls.

Furrer and Skinner (2003) found that students' perceptions of engagement and teachers' perceptions of student engagement both independently partially mediated the relationship between general relatedness (to parents, teachers, and peers, combined) and academic performance. In addition, perceived control and relatedness both individually positively predicted student's perceptions of engagement and teacher's perceptions of student engagement. Interestingly, relatedness was a stronger predictor of engagement than perceived control. Furrer and Skinner (2003) suggested that these findings suggest that relatedness may be more important for student engagement than feelings of autonomy. Therefore, it seems that relatedness, including students' relationships with teachers, are an important factor to consider for student academic motivation and achievement outcomes.

Teacher support. What behaviors from teachers make students feel supported? Suldo, Fiedrich, White, et al. (2009) explored this question for overall support from teachers in a focus group study with 50 middle school students. The following themes were brought up by students during the focus groups when discussing their perceptions of their teachers: "Students perceive teachers to be supportive primarily when they attempt to connect with students on an emotional level, use diverse and best-practice teaching strategies, acknowledge and boost students' academic success, demonstrate fairness during interactions with students, and foster a classroom environment in which questions are encouraged" (Suldo et al., 2009, p. 67). Gender differences also arose in the focus groups. Specifically, girls were twice as likely to feel that teachers were supportive when they actively tried to improve students' emotional states. On the other hand, boys were twice as likely to feel that teachers were supportive when they were fair with discipline, encouraged questions, helped students earn better grades, assigned enjoyable activities to students, and had a manageable workload in class. No gender differences were found in the quantitative component of the study. Suldo et al. (2009) explained that this finding suggests that quantitative measures may mask subtle, yet important, gender differences in how girls and boys perceive social support.

Wentzel, Battle, Russell, and Looney (2010) explored how various aspects of students' perceptions of teacher support relate to academic and social motivation in a sample of sixth, seventh, and eighth grade students. The aspects of peer and teacher support that they examined were: (a) expectations for specific behavioral and academic outcomes, (b) provisions of safety, (c) emotional nurturing, and (d) provisions of help. Generally, they found that this multi-dimensional approach to exploring perceived support from teachers and peers and how these supports relate to student motivation was useful. Specifically, all four teacher supports predicted student interest. In addition, teacher safety and emotional support and peer expectations for behavior and safety predicted social goal pursuit. Wentzel et al. (2010) also found gender differences across four dimensions of perceptions of support from teachers. Specifically girls perceived more emotional support and higher expectations for socially competent behaviors from both peers and teachers than did boys. Wentzel et al. (2010) interpreted this finding to mean that females pay more attention to social-emotional aspects of relationships than males. Even so, both males and females in their study perceived similar levels of safety, availability to help, and academic expectations from both teachers and peers. A grade-level gender effect was also evident, with girls perceiving less support then boys across all four dimensions examined in seventh grade, whereas girls perceived more support across all four dimensions than boys in sixth and eighth grade.

Curby, Rimm-Kaufman, and Abry (2013) observed 240 third- and fourth-grade teachers from 24 schools five times throughout a single school year. They found that observed teacher's emotional support for their students earlier in the school year positively predicted observed teachers' instructional support for their students later in the year. In addition, higher instructional support earlier in the year also predicted higher emotional support for students later in the year. Thus if teachers provide emotional support for their students early on, then they are more likely to provide quality instructional support for their students at the end of the year, and vice versa.

Continuing to middle school, Wentzel (1997) suggested that student perceptions of teacher support, in particular perceptions of social and academic "teacher caring", are very important because they also predict the amount of effort that students put forth in school, and has found support for these linkages in a study of eighth grade students. A subset of these students were followed from sixth through eighth grade with data collected at two time points: the end of sixth grade for students in all subjects (17 classroom teachers) and the end of eighth grade for students in English (3 classroom teachers). Wentzel (1997) found that changes in students' effort from sixth to eighth grade could be partially accounted for by perceived teacher caring even after controlling for other variables, such as past behavior and gender. In sum, Wentzel (1997) interpreted these findings to mean that, "…students are more likely to engage in classroom activities if they feel supported and valued" (p. 417).

Turning to high school, Anderman, Andrzejewski, and Allen (2011) assessed high school students' perceptions of teachers as supportive for their motivational and learning-related beliefs in science and social studies classrooms. After determining which teachers the students perceived as being supportive, observations of these teachers' classroom behaviors and interactions with students were initiated. Based on these observations, patterns emerged in which teachers that were noted by their students as being supportive of motivation and learning had three common characteristics: (a) they supported students' understanding of material, (b) they built and maintained rapport with students, and (c) they successfully managed their classroom. These characteristics did not differ by subject area in science or social studies or by teacher gender.

In the domain of math, Federici and Skaalvik (2013) found that ninth and tenth grade Norwegian students' perceptions of both emotional and instrumental support in math were related to students' math-related motivations. Specifically, students' perceptions of instrumental support negatively predicted math anxiety and positively predicted intrinsic motivation for math, effort in math, and help-seeking behavior for math. Perceptions of emotional support did not predict math anxiety or math effort, but it was positively predictive of intrinsic motivation in math and help-seeking behaviors in math.

Regarding how teacher support changes over time, Bru, Stornes, Munthe, and Thuen (2010) found that Norwegian students also reported gradual declines in their perceptions of support from their teachers from fifth to tenth grade. Bru et al. (2010) noted that an important contribution of their work is that it provides evidence suggesting that this decline in perceived teacher support is gradual and is not abrupt during the transition from primary to secondary school. In addition, they controlled for levels of perceived parental support, gender, and SES in their analyses; however, these controls did not change the observed declines in perceived teacher support. These findings did not differ by gender either when it was entered as an interaction term.

Bru et al. (2010) thought that these gradual declines in perceived teacher support might be due to the number of teachers that students have at each grade. In Norway, students are first taught by one or a few teachers and then increase the number of teachers that they have as they progress through school. Bru et al. (2010) proposed that it may be more difficult for students to build close relationships with their teachers as they become older because they simply have more teachers that they need to interact with and they do not get to spend a significant amount of time with any one teacher. They also noted that it might also be possible that teachers just do not provide as much support for students as they become older. These studies provide valuable information about changes in students' perceptions of teacher support; however, this work needs to be extended to other countries and cultures as it all was done in Norway.

Findings regarding gender differences in perceptions of teacher support are mixed, with some work suggesting that these perceptions do not differ by gender (Bru et al., 2010; Reddy et al., 2003), while Reddy et al. (2003) found that girls perceived more support from teachers in sixth grade. Suldo et al. (2009) also found that middle school boys and girls discussed teacher support differently, with girls feeling more supported when teachers tried to improve student emotional states and boys feeling more supported when teachers provided instructional support and discipline in the classroom. However, no study has looked at change over time in teacher support across the entire elementary and secondary school years.

In summary, these studies generally support the conclusion that students' perceptions of support from their teachers, both emotional support and instrumental help/support, seem to be important for student motivation, learning, and achievement throughout primary and secondary schooling, and especially important for high school students.

Change Over Time in Students' Ability Beliefs and Subjective Task Values

As discussed earlier, in EEVT students' ability beliefs and values are proposed to be the strongest direct predictor of their performance on different achievement activities and choices of whether to continue them. A large body of work shows that children's ability beliefs and task values decline over time, although the most recent work on this topic shows that there are different patterns of change for different groups of students (see Wigfield et al., 2015 for review).

Using the Childhood and Beyond (CAB) study data, Jacobs, Lanza, Osgood, Eccles and Wigfield (2002) explored changes in children's ability beliefs and task values in math and language arts from first grade through twelfth grade. After controlling for prior performance, Jacobs et al. (2002) found that ability beliefs in language arts and math significantly declined from first grade through twelfth grade. These rates of decline differed by domain and gender. Males had higher ability beliefs, on average, in math, whereas females had higher ability beliefs in language arts. Specifically, for language arts, ability beliefs declined more rapidly during elementary school, but tapered off and did not change much after seventh grade. Gender differences were also apparent. Specifically, both males and females had similar ability beliefs in first grade, but by sixth grade girls had higher ability beliefs in language arts in both middle school and high school. This occurred because boys had a rapid decrease in ability beliefs in language arts in elementary school that plateaued during middle school. Girls' ability beliefs in language arts declined as well, but this decline was more gradual in elementary school before plateauing in middle school. Interestingly, even though males had higher ability beliefs in math than females at first grade, these beliefs declined at a faster rate than girls, which resulted in males and females having similar ability beliefs in math at the end of high school.

Jacobs et al. (2002) also found that children's task values also significantly decreased from first grade through twelfth grade, with the declines most rapid for language arts during elementary school, and for math during high school. Males and females had significantly different initial levels of task values in language arts in first grade, with females having higher task values in language arts than males. Although not significant, a statistical trend was evident with females having higher language arts tasks values in first grade. This gap narrowed by late elementary school because girls' tasks values in language arts declined more quickly than boys in elementary school. However, the gap increased in high school because females' tasks values for language arts increased in high school, whereas males' tasks values in language arts plateaued in high school. Males and females did not differ on initial levels of math task value—significant differences between males and females were not evident in change over time in math task values either.

Archambault, Eccles, and Vida (2010) also explored the trajectory of change in ability beliefs and subjective task value in school-based literacy activities from first through twelfth grade using the CAB study dataset. Overall, Archambault et al. (2010) found that the trajectory for ability beliefs and subjective task value for reading/English declined from first through twelfth grade for both boys and girls. However, seven groups emerged with differing trajectories of change. I will not go into the details regarding what these trajectories were because they are not germane to my hypotheses. However, I do want to point out that Archambault et al. (2010) were surprised that a trajectory did not emerge where ability beliefs and subjective task values remained stable over time.

Fredricks and Eccles (2002) provided further information about how ability beliefs and subjective task values change over time. Using the Childhood and Beyond (CAB) study dataset, the same cross-sequential cohort dataset that is used in the current study, Fredricks and Eccles (2002) found that children's ability beliefs and valuing for math, respectively, generally declined from first through twelfth grade. Valuing of math was split into interest in math and importance of math in Fredricks and Eccles' (2002) study—I will only review findings related to importance of math here, with the rationale for this decision described below. Math importance showed a quadratic rate of change over time, with overall declines from first through twelfth grade with a slight increase in math importance at tenth grade. Fredricks and Eccles (2002) interpreted this slight increase as an indicator that students in tenth grade might be realizing the importance of math for obtaining their future educational or occupational goals. In addition, there were differences by gender for ability beliefs, with boys having higher math ability beliefs than girls in Fredricks and Eccles' (2002) study. However, the disparity or "gap" between boys and girls math ability beliefs lessened over time. Gender differences were not apparent for importance.

Similarly, using a non-CAB study longitudinal data source that followed Australian students from grade seven through grade 11, Watt (2004) also found that students' perceptions of their own ability beliefs and subjective task values declined from grade seven through grade 11. In addition, boys had higher ability beliefs and task values in math, while girls had higher ability beliefs and task values in English. These findings corroborate the middle school through high school findings from Fredricks and Eccles' (2002) study described above.

Based on the research reviewed here, both ability beliefs and subjective task values have been found to decline from primary through secondary school (Archambault et al., 2010; Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997). In addition, this work suggests that students can be placed into different trajectories of change (Archambault et al., 2010), and that differences have been found for reading and math (Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997) and by gender (Archambault et al., 2010; Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997). Do these changes in children's ability beliefs and values relate to their perceptions of teacher support? That is the focus of the next section.

Relations of student's perceptions of teacher support to students' ability beliefs and task values. As mentioned earlier, must of the work on how teacher support relates to students' ability beliefs and task values focuses on either general measures of teacher support or on teacher emotional support for students instead of teacher instrumental help/support for students specifically. Thus, I will review this work here, and will mention studies with teacher instrumental help/support when available.

Most of the research that I will discuss next exploring the relations among teacher support and the motivational variables of interest in the current study focus only on how teacher support relates to task values (Goodenow, 1993; Midgley et al., 1989; Wang & Eccles, 2012)—not how teacher support relates to ability beliefs. However, I did find one study that explores the relationship among teacher support and expectancies for success and task value. Goodenow (1993) assessed students' perceived teacher support (measured as student's perceptions of being liked, included, and respected by teachers in the classroom), expectancies for success, value, intrinsic interest, and grades in English class. Participants were 353 middle school students in sixth, seventh, and eighth grade. Perceived teacher support significantly positively predicted students' values and expectancies. Of note, the relationship between teacher support and motivation (value, intrinsic interest, and expectancies for success) was less strong for students in higher grades, with the relationship being the weakest in eighth grade and the strongest in sixth grade. Perceived support from teachers also shared a stronger relationship with motivation for girls than for boys.

Midgley, Feldlaufer, and Eccles (1989) explored how student's perceptions of support from their teachers influenced their valuing of math across the transition from elementary school to junior high. Data for this work came from the Michigan Study of Adolescent and Adult Life Transitions (MSALT). Students' perceptions of teacher support were assessed with questions that asked students about their perceptions of how much teachers cared about students within the classroom, whether the teacher treated students fairly and equally, whether teachers were friendly to students, etc (i.e., emotional support). Valuing of math was assessed with a measure of usefulness/importance of math and intrinsic valuing of math as a discipline.   Sixth-grade students completed these and many other measures twice in sixth grade and twice in seventh grade; only students who had the same math teacher for both semesters during sixth grade and seventh grade, respectively, were included in the Midgley et al. (1989) study.

Midgley et al. (1989) found that students' perceptions of support from their teachers influenced their valuing of math; however, this influence varied depending on how students' perceptions of support changed from sixth to seventh grade. Specifically, students who perceived their teachers to be highly supportive in sixth grade, but less supportive in seventh grade, experienced steeper declines in their valuing of math. However, students who perceived their teachers to be less supportive in sixth grade but more supportive in seventh grade, experienced increases in valuing of math. Students who perceived their teachers as providing low levels of support at both sixth and seventh grade had the lowest levels of math valuing, while students who perceived their teachers as providing high levels of support at both grades had the highest levels of math valuing of all of the groups. Even though Midgley et al. (1989) anticipated girls being more influenced by their perceptions of teacher support than boys, these relationships did not differ by gender. Midgley et al.'s (1989) findings suggest that the valence of students' perceptions of support from their teachers can both positively and negatively influence their valuing of math during the transition to junior high. In addition, it seems that student valuing of math can even increase across this transition if students perceive their new junior high math teacher as being more supportive than their last elementary school math teacher.

Building on Midgley et al.'s (1989) work, Wang and Eccles (2012) utilized the MSALT dataset to explore how social support from teachers influences student value from middle school to high school. Subjective valuing of learning, defined as a desire to go to school in order to learn, was assessed through student self-report. In addition, teachers provided reports on the amount of personal/emotional social support that they provided for each student. Using hierarchical linear model (HLM) growth curves, Wang and Eccles (2012) found that subjective valuing of learning declined from seventh through eleventh grade. Gender differences were also found, with girls having higher levels of valuing in seventh grade. Wang and Eccles (2012) also found that increases in students' perceptions of teacher support (as assessed via the slopes of students' perceptions of teacher support) reduced the decreases in students' subjective task values (as measured via the slope of students' subjective task values) from seventh to eleventh grade. Overall, Wang and Eccles' (Wang & Eccles, 2012) explained that their findings show that teacher's reports of support for seventh through eleventh grade students may play a protective role for students' valuing of learning throughout middle and high school.

The studies reviewed in this section suggest that teacher support is positively related to expectancies and subjective task values in math (Midgley et al., 1989) and reading (Goodenow, 1993) from middle school through high school. This work also suggests that teacher support could act as a protective factor against the typical decline that is found in subjective task values from middle school (Midgley et al., 1989) to high school (Wang & Eccles, 2012). Some support was also evident for gender differences in these relations (Goodenow, 1993). The relations among instrumental help/support from teachers and ability beliefs and values have not been explored much in past research; thus the current study does so.

Relations of Perceived Teacher Support to Students' Grades

As mentioned earlier, most of the work on how teacher support relates to students' grades also focuses on either general measures of teacher support or on teacher emotional support for students instead of teacher instrumental help/support for students specifically. Thus, I will review this work here, and will mention studies with teacher instrumental help/support when available.

Hamre and Pianta (2001) explored longitudinal relationships among teachers' perceptions of their relationships with students and students' grades from kindergarten to eighth grade. They found that kindergarten teacher's reports of low relational negativity (defined as a teacher's feelings and beliefs regarding her conflict with a student and the teacher's perceptions of the students' feelings and beliefs regarding conflict towards her) in their relationships with students related to higher student grades through the end of fourth grade. These relations were not evident from fifth grade to eighth grade. However, Hamre and Pianta's work does show that low ratings of negative aspects of students' early relationships with teachers do seem to be important for predicting positive academic grades up to fourth grade.

Moving to how teacher support relates to grades in middle school, Jia et al. (2009) found that students' perceptions of teacher support (measured as general teacher support, including items addressing emotional support, autonomy support, and academic/instrumental support) positively related to their GPA in a sample of students from both China (n = 706) and the U.S. (n = 709). These findings suggest that GPA and teacher support are related to each other in middle school samples from different nationalities. Similarly, in an international study of 3,420 seventh, eighth, and ninth grade students from Austria, Canada, China, Cyprus, Estonia, Greece, Malta, Portugal, Romania, South Korea, the United Kingdom, and the United States, Lam et al. (2012) found that girls were rated as having higher homeroom academic performance by their teachers than boys. However, regardless of gender, perceptions of teacher support and parent support were both positively related to academic performance. Strøm, Thoresen, Wentzel-Larsen, and Dyb (2013) also found that students' perceived teacher support predicted better grades in 7,343 Norwegian 15- and 16- year old high school students from 56 different schools.

Similarly, in a sample of diverse urban middle school and high school students ranging from seventh to twelfth grade, Perry, Liu, and Pabian (2010) found that high levels of teacher support (as measured with a general teacher support measure, with items regarding emotional support, teacher investment, the accessibility of teachers, and high expectations from teachers) were predictive of higher grades through high levels of school engagement. They did not find significant differences by gender. Perry et al. (2010) also found that middle school students had higher self-reported grades than high school students. It is important to note that self-reported grades were significantly positively correlated with self-reported GPA on a 4-point scale, suggesting that this age group can accurately report their grades. Even though middle school students had higher grades than high school students, no significant differences were found between the two school levels on measures of teacher support or parental career support. Perry et al.'s work corresponds with Meece et al. (1990) and Ryan et al. (2013), supporting the exhibited decline in grades from sixth grade through high school. However, it is important to note that Simpkins, Davis-Kean, and Eccles (2006) found that math grades in fifth grade significantly positively predicted math grades in 10^{th} grade using the CAB study dataset. Thus, there may be some connection between grades at the end of elementary school and grades in high school.

Summary

To review, the empirical work summarized above suggests that students' early general aspects of relationships with teachers may predict later general aspects of teacher-student relationships up through late elementary school (Howes et al., 1998; Hughes et al., 2008). Students also seem to have closer relationships with their teachers in elementary school than in middle school (Newman & Schwager, 1993). In addition, teacher-student relationships can influence academic engagement and achievement at varying levels throughout primary and secondary school.

Some empirical work also suggests that students' perceptions of general teacher support decline, during both middle school (Reddy et al., 2003), and from late elementary school through the middle of high school (Bru et al., 2010). General teacher support was also found to be positively related to expectancies and subjective task values (Goodenow, 1993; Midgley et al., 1989) from middle school through high school.

Although studied less than other aspects of teacher support, according to Lempers and Clark-Lempers (1992), teacher instrumental help or aid was found to be more important than other relational attributes with teachers, such as nurturance, affection, intimacy, satisfaction, and admiration, for many young and middle adolescent students. In addition, Furman and Buhrmester (1985) and Lempers and Clark-Lempers (1992) found that instrumental help from teachers may be more influential for student outcomes than teacher's emotional support for students. Instrumental help/support from teachers has also been found to decline during the transition from elementary school to middle/junior high school (Seidman et al., 1994). Even so, it appears that teachers continue to be an important source of support for students during middle school, even if overall students perceive less support from their teachers during the transition into and during middle school (Reddy et al., 2003).

Both ability beliefs and subjective task values have been found to decline from primary through secondary school (Archambault et al., 2010; Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997). In addition, this work suggests that students can be placed into different trajectories of change (Archambault et al., 2010). Grades decline from middle school to high school (Meece et al., 1990; J. C. Perry et al., 2010; A. M. Ryan et al., 2013; Seidman et al., 1994). General teacher support was also found to be positively related to grades from middle school to high school (Hamre & Pianta, 2001; Jia et al., 2009; Lam et al., 2012; J. C. Perry et al., 2010; Strøm et al., 2013). To date, however, no one has looked at: (a) how earlier student perceptions of teacher instrumental help/support relate to later student perceptions of teacher instrumental help/support, (b) how students' perceptions of teacher instrumental help/support relate to ability beliefs, subjective task values, and grades in reading and math from second grade through twelfth grade, and (c) how these relations differ by gender. I will now discuss additional predictors that are important for the relations of interest in the current study.

Impact of Student Gender and Academic Domain on Perceived Teacher Support

As mentioned earlier, in EEVT, the relations among students' perceptions of socializers' beliefs, ability beliefs, subjective task values, and grades are thought to be influenced by both students' gender and academic domain. These variables will be discussed separately in this section. However, since the empirical work on gender and academic domain are related, in some cases, gender and academic domain will be discussed together. I will review relevant empirical work exploring the relations among students' perceptions of various facets of their relationships with their teachers, ability beliefs, task values, and achievement by: (a) gender, and (b) the academic domains of math and reading.

Gender

The relations among teacher support, both general teacher support and instrumental help/support from teachers, ability beliefs, and subjective task value have been found to differ by gender in prior research (Reddy et al., 2003; Roorda et al., 2011; Rueger et al., 2010; Suldo et al., 2009) and so it is important to consider gender in the current study.

With respect to whether boys and girls view support from teachers differently, Rueger, Malecki, and Demaray (2010) assessed gender differences in 636 seventh and eighth grade students' perceived social support at the beginning and the end of the same academic year. As predicted, they found that girls perceived more support from teachers than boys. Even so, as discussed earlier, boys were found to be more impacted by both positive and negative teacher-student relationships, while girls were more impacted by only positive teacher-student relationships (Roorda et al., 2011).

However, findings regarding gender differences in perceptions of teacher support are mixed, with some work suggesting that these perceptions do not differ by gender (Bru et al., 2010; Reddy et al., 2003), while Reddy et al. (2003) found that girls perceived more instrumental help/support from teachers in sixth grade than boys. Suldo et al. (2009) also found that middle school boys and girls discussed teacher support differently, with girls feeling more supported when teachers tried to improve student emotional states and boys feeling more supported when teachers provided instructional support and discipline in the classroom.

As discussed earlier, Goodenow (1993) found gender differences in the relations among teacher support and expectancies and subjective task values. In addition, ability beliefs and subjective task values have also been found to differ by gender. According to Eccles and colleagues,

> These gender differences appear particularly in gender-role stereotyped domains and on novel tasks. For example, boys hold higher competence beliefs than girls for mathematics and sports, even after all relevant skill-level differences are controlled; in contract, girls have higher competence beliefs than boys for reading and English, music and arts, and social studies (Wigfield, Byrnes, et al., 2006, p. 96).

Trajectories of change in ability beliefs and subjective task values for reading and math have also been found to differ by gender (Archambault et al., 2010; Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997).

To understand how students' perceptions of teacher behavior impact student outcomes, it can be helpful to take a step back and consider teachers' perceptions of their students. For example, Kesner (2000) studied pre-service teachers' ratings of kindergarten through fifth grade students and found that teachers rated the quality of their relationships with girls as more favorable than with boys. In addition, Ramsey (2008) notes that teacher's generally overlook girls in school and that teacher's do not encourage girls to excel in subjects such as math, science, and physically demanding activities, whereas boys are more likely to be encouraged to excel in school by their teachers. This work emphasizes the importance of considering the influence of student gender when exploring teacher-student relationships and levels of support that students receive from their teachers. Although this phenomenon is not explored by students' perceptions of instrumental help/support from teachers, I propose that students' may perceive these teacher gender-typed behaviors towards them, such that girls may perceive less instrumental help/support from teachers while boys may perceive more instrumental help/support from teachers. There may also be differences by academic domain here as well, which I will discuss next.

Academic Domain: Reading and Math

In Eccles and colleagues' EEVT, domain differences in ability beliefs and values are tied to gender differences. These differences in domain depend on stereotypes of ability, such as the stereotype that girls are bad at math or that boys are bad at reading, and the types of work that girls are socialized to pursue within society. In the present study, math and reading were chosen as academic subjects of primary interest because math and reading are key subjects in school that greatly affect students' overall school performance. For example, students' who are not proficient readers by third grade are four times more likely to drop out of school before the age of 19 than students who are proficient readers by third grade (Hernandez, 2012).

As discussed earlier, students relationships with teachers have been found to predict math and reading achievement growth (Rowan et al., 2002). Research also supports that students' perceptions of their relationships with teachers may differ by domain, specifically math and reading (Hughes, 2011), and that math achievement may be more influenced by aspects of teacher-student relationships than reading achievement

(Bill and Melinda Gates Foundation, 2010; Hughes, 2011). Research reviewed earlier also suggests that teacher support is positively related to expectancies and subjective task values in math (Midgley et al., 1989) and reading (Goodenow, 1993) from middle school through high school. Differences have also been found for reading and math in the trajectories of change for both subjective task values and ability beliefs from first through twelfth grade (Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997). In addition, students value math as more important in elementary school, while English is valued as more important in high school (Wigfield & Eccles, 2000).

Hughes (2011) did not provide an explanation as to why students' perceptions of their relationships with their teachers were more predictive of math achievement than reading achievement in their study. However, researchers at the Bill and Melinda Gates Foundation (2010) suggested that students' math achievement may be more influenced by teachers than reading achievement because students' families have a stronger impact on students' reading and verbal achievement than their teachers. They also noted that open-ended reading assessments (as opposed to multiple-choice assessments) result in similar teacher effects as those found in math assessments, so the differences in the strength of teacher effects for reading and math achievement may just be an artifact of the testing format that is used to assess achievement in each domain.

Thus, based on these reasons, it is possible that students' perceptions of instrumental help from teachers in the current study might relate more strongly to students' ability beliefs, subjective task values, and course grades in math than in reading because students' perceive, receive, or seek more instrumental help from teachers in their math work, while they may seek more instrumental help in reading from their families.

Although the current study does not explore the influence of families on the variables of interest, this work examines whether students' perceptions of instrumental help from teachers are more predictive of ability beliefs and task values in the domain of math than in the domain of reading.

Overall Summary

From the articles reviewed above, it is clear that relations among teacher support, ability beliefs, subjective task values, and grades differ by academic domain (Bill and Melinda Gates Foundation, 2010; Fredricks & Eccles, 2002; Goodenow, 1993; Hughes, 2011; Jacobs et al., 2002; Midgley et al., 1989; Rowan et al., 2002; Watt, 2004; Wigfield et al., 1997) and gender (Archambault et al., 2010; Fredricks & Eccles, 2002; Goodenow, 1993; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997). It is also clear that students' ability beliefs predict task values in math and reading throughout elementary, middle, and high school (Fredricks & Eccles, 2002; Jacobs et al., 2002; Wigfield et al., 1997). In some cases, gender has been found to influence teacher support (Reddy et al., 2003; Roorda et al., 2011; Rueger et al., 2010; Suldo et al., 2009), but the findings on gender differences in teacher support are mixed (Bru et al., 2010; Reddy et al., 2003).

In summary, empirical work supports the prediction from EEVT that both students' and teacher's perceptions of teacher-student relationships, including instrumental help/support, can relate to middle school and high school students' ability beliefs, values, and grades for various domains. In addition, it is clear that students' ability beliefs predict task values in math and reading throughout elementary, middle, and high school. Empirically, ability beliefs and subjective task values, including interest and importance, have also been consistently shown to decline over time. The studies reviewed in this section also suggest that general teacher support predicts academic motivation and achievement in elementary, middle, and high school. These relationships also differ by gender and academic domain. Next I will discuss the gaps in this literature that I explore in the current study.

Important Remaining Questions Regarding Perceived Teacher Instrumental Help/Support

As should be clear from the studies reviewed, teacher support of different kinds related to students' motivation and achievement across the school years. However, to date, teachers' emotional support has received much more attention in the literature than has their instrumental support. Specifically, no empirical work has explored: (a) how students' perceptions of instrumental help/support from their teachers influence later perceptions of instrumental help/support from teachers from elementary to high school, and (b) how students' perceptions of instrumental help/support from teachers influence their ability-related beliefs and values and achievement in elementary and secondary school. These are important relations to explore in order to understand better the intricacies of students' perceptions of aspects of student-teacher relationships and their influence (or lack thereof) on student motivation and academic outcomes throughout students' formative years of schooling.

Although prior research has found that students' early relationships with teachers may predict later teacher-student relationships up through late elementary school (Howes et al., 1998; Hughes et al., 2008), more work is needed to understand these predictive relations during elementary school and during middle school and high school. Overall, students perceive that support of different kinds from their teachers decline from late elementary school through the middle of high school (Bru et al., 2010; Reddy et al., 2003), but it is not clear how this trajectory changes from the beginning to the end of elementary school and from the beginning of middle school through the end of high school. It is also unclear how students' earlier perceptions of teacher instrumental help/support relate to later perceptions of teacher instrumental help/support both throughout elementary school and throughout middle school and high school.

As mentioned earlier, general teacher support and teacher emotional support have been found to be positively related to expectancies and subjective task values (Goodenow, 1993; Midgley et al., 1989) from middle school through high school. General teacher support has also been found to be positively related to grades from middle school to high school (Hamre & Pianta, 2001; Jia et al., 2009; Lam et al., 2012; Perry et al., 2010; Strøm et al., 2013). However, it is not clear how teacher instrumental help/support relates to expectancies/ability beliefs, subjective task values, and grades in elementary school, and how these relations change throughout elementary school and throughout middle school and high school.

It is clear that relations among general teacher support, ability beliefs, subjective task values, and grades differ by gender (Reddy et al., 2003; Roorda et al., 2011; Rueger et al., 2010; Suldo et al., 2009). However, in some cases, gender has been found to influence general teacher support and teacher instrumental help/support, but the findings on gender differences in teacher support are mixed—additional work is needed to determine how gender relates to students' perceptions of instrumental help/support from their teachers.

These relations also differ by the academic domains of reading and math (Bill and Melinda Gates Foundation, 2010; Fredricks & Eccles, 2002; Goodenow, 1993; Hughes, 2011; Jacobs et al., 2002; Midgley et al., 1989; Rowan et al., 2002; Watt, 2004; Wigfield et al., 1997). Specifically, the findings from prior studies suggest that students' perceptions of their relationships with teachers may differ by domain, specifically math and reading (Hughes, 2011), and that math achievement may be more influenced by aspects of teacher-student relationships than reading achievement (Bill and Melinda Gates Foundation, 2010; Hughes, 2011). Research reviewed earlier also suggests that teacher support is positively related to expectancies and subjective task values in math (Midgley et al., 1989) and reading (Goodenow, 1993) from middle school through high school. Differences have also been found for reading and math in the trajectories of change for both subjective task values and ability beliefs from first through twelfth grade (Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997). In addition, students value math as more important in elementary school, while English is valued as more important in high school (Wigfield & Eccles, 2000). However, although suggested hypotheses have been put forth, it is not clear why these domain differences exist.

Given these gaps in the literature, in the current I study explore: (a) the trajectory of change in students' perceptions of instrumental help/support from teachers from second through sixth grade and from seventh through 12th grade and the influence of early student perceptions of teacher instrumental help/support on later perceptions of instrumental help/support by gender, (b) the relation among the trajectory of students' perceptions of teacher instrumental help/support to the trajectory of change in students' ability beliefs in reading and math from second through sixth grade and from seventh through 12th grade by gender, (c) the relation among the trajectory of students' perceptions of teacher instrumental help/support to the trajectory of change in students' subjective task values in reading and math from second through sixth grade and from seventh through 12th grade by gender, and (d) the relation among the trajectory of students' perceptions of teacher instrumental help/support to the trajectory of change in students' overall grades from second through sixth grade and from seventh through 12th grade by gender.

Conclusion

This literature review explored work on EEVT, stage-environment fit theory, and SDT via the SSMMD to explain how students' perceptions of instrumental help/support from teachers may influence ability beliefs, subjective task values, and grades in math and reading. I first reviewed the three theories that are guiding this dissertation study, including EEVT, stage-environment fit theory, and SDT via the SSMMD. Then, I reviewed empirical evidence for how: (a) teacher-student relationships, including general teacher support and teacher instrumental help/support, change over the primary and secondary school years, and (b) general teacher support and teacher instrumental help relates to ability beliefs, values, and grades across the primary and secondary school years. I also reviewed how these relations are influenced by: (a) academic domain, specifically math and reading and (b) gender.

Chapter 3: Methods

In this study, I explore how young students' perceptions of support, via instrumental help/support from their teachers, relate to their ability beliefs and subjective task values in math and reading and academic grades, in elementary school and from middle school to the end of high school. I also explore whether these relations differ by gender.

In order to conduct this study, data from a long-term longitudinal study is required. I chose the dataset from the longitudinal Childhood and Beyond (CAB) study (Eccles et al., 1993; Gender and Achievement Research Program, 2015); it is an ideal dataset to use because the researchers followed students throughout primary and secondary school, and measured the variables of interest in this study: students' perceptions of support from teachers, ability beliefs and subjective task values in math and reading, and academic grades.

In this chapter, I describe the CAB study and the data collected as part of the study. I also discuss the CAB study measures that were used to assess the variables of interest in the current study. Lastly, the statistical analyses that were used to address the hypotheses are described.

The Childhood and Beyond (CAB) Study Dataset

Participants were drawn from the Childhood and Beyond (CAB) study, a cohort-sequential study begun by Jacquelynne Eccles, Allan Wigfield, and Phyllis Blumenfeld in 1986 (Gender and Achievement Research Program, 2015). Their original purpose for the CAB study was to explore the development and socialization of students' ability beliefs, expectancies for success, task values, and other achievement-related beliefs, and examine how they related to children's performance in different areas and choices of activities. The project began with a group of kindergarten, first, and third graders. As discussed in more detail below, to date there have been ten data collection waves, and data collection is ongoing. Across these data collection waves, students have been followed through elementary, middle school, and high school, and post-high school. Depending on the data collection year, or "wave", surveys and interviews were collected from children and their mothers, fathers, and teachers. In some cases, data were also collected from the participating children's siblings. Data are currently only available from waves one through nine.

Students were recruited through ten elementary schools in four lower-middle to middle class public school districts in primarily white urban and suburban communities in the Midwest. Permission slips and letters describing the study were distributed to the students' families by their teachers, and approximately 75% to 90% of families in each school agreed to participate (Simpkins et al., 2006). Since data were collected across elementary, middle, and high school, the participating students encountered different teachers and varied curricula (Jacobs et al., 2002).

Across the first nine waves of data collection from 1986 to 1999, data were collected during at least one wave from a total of approximately 1136 children, 80% from at least one of their parents, and 99% from at least one their teachers. Of the child participants who participated at least once across the first nine waves of the CAB study, 36% came from families with income ranging from $30,000 - $59,999, 25% from families earning more than $60,000, and 10% from families earning less than $29,999 per yea. The remaining 29% of participants did not specify their family income[3]. Data provided by the participating school districts regarding income indicated that the children in the study came from middle-class backgrounds, with an average of $50,000 for family income within the districts in 1990 (Jacobs et al., 2002). In this same child sample, 74% identified themselves as being white, 3% as Asian Indian or Asian American, 2% as Arab, 1% as black or African American, 0.4% as Hispanic, and 0.3% as American Indian, with 20% of participants choosing not to self-identify their racial or ethnic background. In addition, 51% of these children were female and 49% were male. The dispersion of participants in each cohort did not vary significantly by family income, ethnicity, or gender.

A cross-sequential design was used in the CAB study, with three cohorts of students being followed across the elementary, middle, and high school years. A strength of this design is the replication of grade-level effects since data are available at the same grade level for more than one cohort of students at various time points (Jacobs et al., 2002). The three cohorts of students in the CAB study include the oldest cohort (Cohort 1), the middle cohort (Cohort 2), and the youngest cohort (Cohort 3; see Figure 3). In wave 1, the majority of the youngest cohort was in kindergarten[4], the majority of the middle cohort was in first grade, and the majority of the oldest cohort was in third grade. In general, data are available for the youngest cohort from kindergarten through third grade, seventh grade through ninth grade, and twelfth grade; for the middle cohort from first grade through fourth grade, eighth grade through tenth grade, and twelfth grade; and for the oldest cohort from third grade through sixth grade, tenth grade through twelfth

[3] Note that these data were collected between 1986 and 1999 and reflect the monetary rates of that time period.
[4] It is important to note that no child self-report data was collected for the kindergartners.

grade, and two years post-high school (see Figure 3). In total, data are available from kindergarten through two years post-high school. Gaps in data collection between waves four and five and waves seven and eight were due to a loss of funding. The current study focuses on waves three through nine only. A rationale for this choice and specific details about the data collection strategies for waves three through nine will be described in more detail below. An overview of the data collection timeline for waves one through nine of the CAB study is presented in Figure 3.

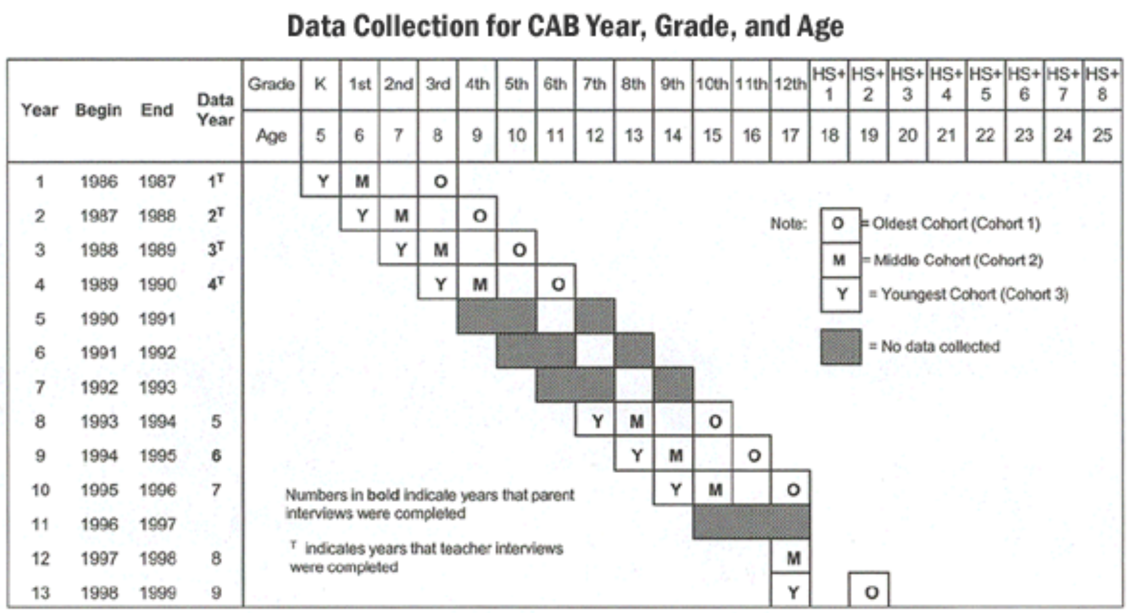

Figure 3. Overview of the data collection timeline for the CAB study by age, grade, year, and wave from the CAB study research website (Gender and Achievement Research Program, 2015).

In the spring of each data collection year, participating students completed questionnaires assessing a large variety of constructs, including children's ability beliefs and values in different academic and nonacademic domains, and perceptions of teacher support (Eccles et al., 1993; Jacobs et al., 2002). The entire set of measures and scales built from them can be found on the Gender and Achievement Research website. Ability beliefs and task values were assessed in the domains of math, reading/language arts, science, music, and sports. During the first few years of data collection, questionnaires were completed by students within their classrooms at the participating schools in three 20 minute sessions (Jacobs et al., 2002). The items on the questionnaires for ability beliefs and subjective task values were mostly on a Likert scale ranging from one to seven and were adapted from prior questionnaires developed by Eccles and colleagues (Jacobs et al., 2002). These items have excellent psychometric properties (Eccles et al., 1993; Eccles & Wigfield, 1995; Parsons, Adler, & Kaczala, 1982). Since the CAB study measures were given to students who were younger than children who the measures were given to previously, these measures were pilot tested on 100 children to ensure they comprehended the questions. In addition, the answer options had illustrations to make it easier for children to understand their meaning (discussed fully in Eccles et al., 1993). The questions were also read aloud to students in the first and second waves, and to the youngest cohort in the third wave—after these waves the students read the questionnaires independently. In later waves questionnaires were mailed to students.

Student record data and public record data were also collected in the form of semester grades, special education placement, and standardized test scores. In the current study, prior developed measures of ability beliefs and task values (specifically importance), for math and reading/language arts, are used. In addition, some items from prior developed measures of students' perceptions of support from teachers in waves 3-4 and general support from teachers in waves 5-9 are used. Lastly, course grades in math and reading/language arts from school records in waves 3-6 and student-reported grade-point average (GPA) in waves 7-9 are also be utilized.

Analytic Sample for Dissertation Study

In order to take full advantage of the available CAB study data across elementary, middle, and high school, all students who completed the student measures at any point in time from waves three through waves nine, including students from all three cohorts and students who were not part of a cohort, were included in the analyses for this dissertation study. Since the hypotheses in the current study pertain to students' perceptions of instrumental help/support from teachers and their ability beliefs, values, and grades from second through sixth grade and seventh through 12th grade—not by cohort—it is not necessary to keep the sample separated by cohort.[5] As such, all student data from the CAB study data pertaining to the hypotheses were reorganized by grade-level instead of by cohort for the current study.

It is important to note that it only makes sense to reorganize the data by grade-level if the measures are identical across the waves of interest in the current study (waves 3-9). As I will explain later in this chapter, the scales that are used in the current study for ability beliefs in math, ability beliefs in reading, subjective task values in math, and subjective task values in reading are identical across waves 3-9. However, the students' perceptions of teacher instrumental help/support items and the type of academic grade scores available are different from waves 3-4 to waves 5-9, as will be discussed later in this chapter. The majority of students in grades two through six had their data collected during waves three and four, while the majority of students in grades seven through 12 had their data collected during waves five through nine (see Appendix A). As such, in order to reorganize the data by grade-level instead of by wave, and to accommodate the

[5] I will explain how the chosen analytical strategy for this dissertation study allows student data to be collapsed by grade-level instead of by cohort later in this chapter.

fact that the student-reported teacher instrumental support measures were different from waves 3-4 and waves 5-9, I have only included students who had data collected in grades two through six for waves three and four, and students who had data collected in grades seven through 12 for waves five through 9.

As mentioned above, data were only analyzed from waves 3-9 instead of from all nine waves. Although this decision resulted in a loss of 74 students (from 1136 students to 1062 students; see Table 1), the benefits of such a strategy outweigh the small loss of sample size due to this decision. Please see Table 1 for a comparison of students who participated at least once from waves one through waves nine and waves three through waves nine by cohort.

Table 1

Number and Percent of Students who Participated at Any Point in Time from Waves One Through Nine or Waves Three Through Nine by Cohort

	Participated At Least One Time From Waves 1-9		**Participated At Least One Time From Waves 3-9**	
Cohort	**N**	**Valid %**	**N**	**Valid %**
Cohort 1 (oldest)	421	37.1%	407	38.3%
Cohort 2 (middle)	330	29.0%	303	28.5%
Cohort 3 (youngest)	318	28.0%	285	26.8%
Not in a Cohort	67	5.9%	67	6.3%
Total	1136	100.0%	1062	100.0%

The reasons for this decision are as follows. Firstly, in wave 1, data were only collected from children’s parents and teachers and measures are not available from the students. Since the primary questions of interest in this study pertain to students’ perceptions, and not those of parents' or teachers', wave one of the CAB study is not relevant. Secondly, in wave two, students were not asked about their perceptions of instrumental help/support from their teachers. Thus, wave two is not relevant to the current study, since all of the hypotheses in the present study are concerned with students' perceptions of instrumental help/support from their teachers and how those relate to students' ability beliefs and values in math and reading and their academic grades. Therefore, in this study, I explore the relations of students' perceptions of instrumental help from their teachers with students' ability beliefs and values in math and reading and their grades from waves 3-9.

I will now discuss waves 3-9 in more detail. In waves three and four, data are available from children, their teachers, and school records. After wave four, there was three-year gap in data collection between waves four and 5; this occurred because there was a lapse in the study's funding. Upon continuing the study in wave five, all children (now in grades seven, eight, and 10) from the original sample were re-contacted and 82% agreed to participate in the fifth wave of data collection. The CAB study researchers continued to ask student participants to contribute to the study for four more waves (waves six through 9), following students through two years post-high school.

To maximize the number of students' with data from each grade level, all child participants who completed measures in at least one data collection wave from wave three through wave nine were included in the analyses for this study, resulting in a sample size of 1062 (see Appendix A for more details). The reasons that I did not narrow the sample in my study to include only students who had data at every time point of interest (i.e., waves 3-9) are as follows. Firstly, if I had limited the sample to only students who participated in every data collection wave from wave three through wave nine, then the sample would have been limited to just one student (see Table 2). The sample size would not have increased drastically if I had decided to narrow the waves of interest in the current study to only waves 3-8; such a sample would have only included 92 students (see Table 2). A final option would have been to limit the sample to only students who participated in every data collection from wave three to wave seven, but this would have resulted in a sample size of only 378 participants (see Table 2). Since most of the questions/hypotheses for this study are longitudinal in nature, it is important to have as large a sample as possible for grades two through six and grades seven through 12. Thus, the current study benefits from using as much data as is available from students from waves three through wave nine who were in grades two through 12. To see a full breakdown of the analytical sample for the current study, please see Appendix A.

Table 2

Number of Students who Participated in Every Wave from Waves Three Through Seven, Three Through Eight, or Three Through Nine by Cohort

Cohort	Wave Range		
	Waves 3-7	Waves 3-8	Waves 3-9
Cohort 1 (oldest)	142	N/A[1]	N/A[1]
Cohort 2 (middle)	111	91	N/A[1]
Cohort 3 (youngest)	108	1	1
Not in a Cohort	17	0	0
Total by Wave Range	378	92	1

[1] No longer in high school in this wave.

The breakdown of this sample by gender does not differ greatly from the full sample of students who participated from waves one through 9. As can be seen in Table 3, the sample for the current study is fairly evenly split among male and female students from grades two through 12.

Table 3

Number and Percent of Second Through 12th Grade Students Who Participated at Any Point in Time from Waves Three Through Nine by Grade Level and Gender

Grade Level	**Gender**				**Total by Grade Level**
	Male		**Female**		
	N	**%**	**N**	**%**	
2	161	52.10%	148	47.90%	309
3	274	50.18%	272	49.82%	546
4	128	48.12%	138	51.88%	266
5	200	47.73%	219	52.27%	419
6	183	47.53%	202	52.47%	385
7	112	51.38%	106	48.62%	218
8	162	47.79%	177	52.21%	339
9	133	45.39%	160	54.61%	293
10	210	46.26%	244	53.74%	454
11	92	41.26%	131	58.74%	223
12	181	42.00%	250	58.00%	431

In addition, the race and ethnicity categorizations for students do not differ much in the current study sample (see Table 4) from the full sample of students who participated from waves one through 9. However, whereas the sample in grade two is only 80% white, by grade 12 the sample is 91% white. In any case, the sample is still composed of a majority of students who designated their race/ethnicity as being white, regardless of grade level.

Table 4

Number and Percent of Second Through Twelfth Grade Students Who Participated at Any Point in Time from Waves Three Through Nine by Grade Level and Race/Ethnicity

Grade Level	Race/Ethnicity														Total by Grade Level
	White		Asian Indian/ Asian-American		Arab		Black/ African-American		Hispanic		American Indian		Missing		
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
2	246	79.6%	7	2.3%	5	1.6%	4	1.3%	1	0.3%	1	0.3%	45	14.6%	309
3	448	82.1%	17	3.1%	8	1.5%	7	1.3%	1	0.2%	2	0.4%	63	11.5%	546
4	238	89.5%	11	4.1%	3	1.1%	3	1.1%	0	0.0%	2	0.8%	9	3.4%	266
5	344	82.1%	16	3.8%	9	2.1%	6	1.4%	4	1.0%	0	0.0%	40	9.5%	419
6	338	87.8%	15	3.9%	9	2.3%	6	1.6%	4	1.0%	0	0.0%	13	3.4%	385
7	196	89.9%	6	2.8%	5	2.3%	0	0.0%	1	0.5%	0	0.0%	10	4.6%	218
8	311	91.7%	8	2.4%	4	1.2%	1	0.3%	0	0.0%	1	0.3%	14	4.1%	339
9	264	90.1%	7	2.4%	5	1.7%	1	0.3%	1	0.3%	1	0.3%	14	4.8%	293
10	414	91.2%	14	3.1%	7	1.5%	4	0.9%	2	0.4%	1	0.2%	12	2.6%	454
11	203	91.0%	9	4.0%	0	0.0%	1	0.4%	2	0.9%	0	0.0%	8	3.6%	223
12	390	90.5%	14	3.2%	5	1.2%	3	0.7%	2	0.5%	1	0.2%	16	3.7%	431

Lastly, the breakdown of the sample for the current study (see Table 5 below) is mainly middle-class, as is the full sample of students who participated in the CAB study from waves one through 9.

Table 5

Number and Percent of Second Through 12th Grade Students Who Participated at Any Point in Time from Waves Three Through Nine by Grade Level and Average Family Income (in 1988 dollars and calculated Across Waves One Through 4)

Grade Level	Average Family Income (Calculated Across Waves 1-4)								Total by Grade Level
	under $29,999		$30,000 - $59,999		over $60,000		Missing		
	N	%	N	%	N	%	N	%	
2	42	13.6%	122	39.5%	75	24.3%	70	22.7%	309
3	65	11.9%	218	39.9%	130	23.8%	133	24.4%	546
4	22	8.3%	111	41.7%	69	25.9%	64	24.1%	266
5	27	6.4%	140	33.4%	123	29.4%	129	30.8%	419
6	22	5.7%	132	34.3%	116	30.1%	115	29.9%	385
7	29	13.3%	99	45.4%	55	25.2%	35	16.1%	218
8	39	11.5%	154	45.4%	89	26.3%	57	16.8%	339
9	28	9.6%	138	47.1%	80	27.3%	47	16.0%	293
10	26	5.7%	182	40.1%	135	29.7%	111	24.4%	454
11	14	6.3%	93	41.7%	71	31.8%	45	20.2%	223
12	32	7.4%	177	41.1%	130	30.2%	92	21.3%	431

Specifically, in the sample for the current study (waves 3-9 only), approximately 40% of the students across grades two through 12 reported an average family income between $30,000 to $59,999 in waves one through 4. However, it is notable that students who had an average family income greater than $60,000 make up a larger portion of the sample in 12th grade, at 30%, than at second grade when the percentage is only 24%. In addition, students from families with an average income of less than $29,999 make up a smaller portion of the sample in 12th grade, at 7%, than in second grade when they made up 14% of the sample. The percentage of students who had a missing reported family income stayed relatively consistent from grades two through four and grades 10 through 12, hovering between 20-24%. However, the percentage of students who had a missing reported family income jumped to 30% in grades five through six and dipped to 16-17% in grades seven through 9. In sum, the sample for this study is mostly composed of students from middle class backgrounds across the grades 2-12. Due to this lack of variation, and findings from previous CAB study research (discussed next), income is not be explored in the current analyses.

Missing Data

Given the long-term longitudinal nature of the CAB study, sample attrition occurred and so must be taken account of in the analyses. Especially in multi-wave panel studies, it can be challenging to continue to locate families across time, and the participants can become fatigued from participating in the study year after year (Fredricks & Eccles, 2002). According to Jacobs et al. (2002), attrition in waves one through six of the CAB study sample mostly occurred due to children who moved far away from the sample school districts. Specifically, the administrators of the CAB study made every attempt to contact all of the participants each wave of the CAB study. For example, even if children moved out of the sample school districts, they were still located and asked to participate in the study if they still lived in the same general area (Jacobs et al., 2002). Even so, Fredricks and Eccles (2002) noted that it is important to determine whether the children who continued to participate in the CAB study differed systematically from those who dropped out of the study at any point in time during the study. Thus, to determine if any biases were present between the retained students and the students who were lost to attrition, Fredricks and Eccles (2002) explored the distribution of missing data to determine if their findings were muddled by any anomalies in the data. Fredricks and Eccles (2002) explored attrition in a smaller sample of the CAB study from wave one through wave six, including only students who had corresponding parent data.

To accomplish this task, Fredricks and Eccles (2002) used ANOVAs to explore in four groups of students mean differences in their demographic variables and ability beliefs and valuing (including interest and importance) in math. These four groups were the: (a) early attrition group, (b) late attrition group, (c) group with data missing at random, and (d) group with data available from waves one through 6. The early attrition group, which included 5.5% of the sample, included students who left the study during elementary school and the late attrition group, which included 29% of the sample, included students who left the study during high school. In addition, 13% of students were determined to have data missing at random, and 52.5% of students had all data available from waves one through 6. Fredricks and Eccles (2002) thought that the high percentage of student in the late attrition group was likely due to the 3-year gap in data collection between wave four and wave 5.

The ANOVA tests revealed no significant differences in the means for the early attrition group and the late attrition group for the variables that Fredricks and Eccles (2002) explored in their study. Even so, lower family incomes were found for both the early and late attrition groups when compared to the sample of students who had data present at waves one through 6. Thus, Fredricks and Eccles (2002) determined that their sample from the CAB study underrepresented students from lower socioeconomic households, but this effect was small. Specifically, the early attrition group had less than a 0.3 SD lower mean family income than the sample with data available from waves one through six, and the late attrition group had less than a 0.2 SD lower mean family income than the sample with all data present. As such, Fredricks and Eccles (2002) concluded that their main findings were unlikely adversely affected by attrition, due to the low likelihood of such small effects constraining the variance in their variables of interest.

In the sample of for the current study, students who were lost due to attrition varied by wave. A full breakdown of the percent of students who were missing data from wave three through wave nine of data collection by cohort and grade level can be viewed in Appendix A. Specifically, in wave three, only 1% of the sample is missing, whereas by wave seven, 48% of the sample was missing. A discussion of missing data at waves eight and waves nine are a bit more complicated. Although data were collected from students in college in waves eight and waves nine, I will only discuss data that were collected for students in grades two through twelve in my study. Thus, since the oldest cohort of students graduated high school after wave seven was collected, those students are no longer relevant for inclusion in my study in waves eight and 9. In addition, the middle cohort of students graduated high school after wave eight was collected, so that cohort is also no longer relevant for my study in wave 9. Thus, this point makes it difficult to determine attrition in waves eight and 9. However, for the middle cohort

(Cohort 2) in wave eight, 62% of that cohort was missing and in wave nine, 57% of the youngest cohort (Cohort 3) was missing (see Appendix A).

It is important to note that some participants data is “missing by design” due to the cohort-sequential nature of the CAB study. For example, for the oldest cohort—Cohort 1—data were only collected from third grade through sixth grade, and then from 10th grade through 12th grade due to the cohort-sequential design (see Figure 3 above for a reminder). As such, data from Cohort 1 of the CAB study are *intentionally* missing at grades one, two, seven, eight, and nine. Duncan, Duncan, and Strycker (2006) noted that “planned missingness” through a cohort-sequential design is controllable, and so can be considered Missing Completely at Random (MCAR). In addition, they also said that, aside from a small loss of statistical power, planned missingness does not negatively hamper statistical conclusions (Duncan et al., 2006). Thus, any data that is missing from Cohort 1, 2, or 3 due to the nature of the cohort-sequential design is not detrimental to the planned statistical analyses in the current study.

In order to maximize use of the data collected while still taking appropriate actions to address missing data in the sample, full-information maximum likelihood (FIML) was employed as a missing data strategy in the analyses. FIML was chosen for these analyses over pairwise/listwise deletion and imputation methods because FIML estimates the parameter estimates and standard errors from the observed data directly, which increases the accuracy of the estimates (Enders, 2006). Feng, Cong, and Silverstein (2012) note that,

> "[s]imulation studies consistently support the notion that FIML estimation in SEM is superior to the traditional approaches in that it is unbiased and more efficient (i.e., the standard error of the parameter estimate is small), minimizes convergence failures, and provides near-optimal Type 1 error rates" (p. 81).

FIML assumes that the data are either missing at random (MAR) or missing completely at random (MCAR). For data to be MAR, "missingness," or attrition, in the variables of interest depends only on observed data and not on unobserved data. Feng et al. (2012) provided the following example for MAR:

> "…a subject who fails to answer a question about memory problems in a follow-up survey would lead to responses that are MAR if the reason for not answering is due to poor memory, and the memory problems of the subject can be predicted from the same questions included in previous waves of the survey" (p. 74).

For data to be MCAR, missingness in the variables of interest is completely independent for both observed and unobserved data. Feng et al. (2012) provided the following example for MCAR: "…a subject who forgets to complete a question about household income in a longitudinal survey would lead to data MCAR, if the reason for forgetting is unrelated to the subject's household income, or to any other variables" of interest (p. 74). For both MAR and MCAR, the "missing data mechanism" is not expected to substantially influence the model of interest—thus data missing is considered "ignorable"

(Feng et al., 2012). As such, it is assumed that attrition does not negatively impact the sample, especially when using FIML techniques.

Thus, for data in my study to be considered MCAR, the reason for missing data for students' perceptions of teacher instrumental support, ability beliefs in reading and math, subjective task values in reading and math, and grades would need to be unrelated to these particular variables. For example, the reason for missing data regarding students' perceptions of teacher instrumental support would need to be unrelated to missing students' low perceptions of teacher instrumental support in a prior data collection wave. Continuing with this example, for the data in my study to be considered MAR, if missing students' low perception of teacher instrumental support in a prior data collection wave did predict whether they would have missing data on their perceptions of teacher instrumental support at a later data collection point, then I would need to take into account the last prior assessed measure of teacher instrumental support for students who have missing data at a later time point for that variable. Since most of the analyses in my study utilize repeated measures across between 4-6 data collection waves (depending on cohort), it is likely that any effect of missingness due to prior measured levels of teacher instrumental support, ability beliefs, subjective task values, or grades was accounted for within my analyses. Thus, any data in the current analyses can be considered MAR.

Measures

Student Perceptions of Teacher Instrumental Support Variables

Students' perceptions of support from their teachers were measured in waves three through nine in the CAB study; however, a shorter measure was used to assess perceived teacher support in waves three and four, and a separate longer measure was used to measure various aspects of teacher support in waves five through 9. In the current study, only items that refer to the students' perceptions of how their teacher treats them or acts towards them specifically, as opposed to the whole class, are used. An item from the teacher support scale from waves three and four is used to assess teacher instrumental support in grades two through six, while an item from the longer, more general teacher support scale from waves five through nine is used to assess teacher instrumental support in grades seven through 12.

The developers of the CAB study created the teacher support items for the study. All teacher support items for waves three through seven can be found on the Gender and Achievement Research Program website under the CAB study data section for researchers (Gender and Achievement Research Program, 2015). Teacher support items for waves eight and nine can be requested from the Gender and Achievement Research Program website—these items are the same as the items used in waves five through 7.

In waves three and four, the shorter student perceptions of teacher support measure contains four items rated on a Likert-scale from one (almost never) to seven (all the time). For the purposes of the current study, only the following item was used as an indicator of instrumental help in the analyses:

- I feel comfortable asking my teacher for help.

Since this item ask students about their perceptions of their personal comfort-level in asking their teacher for help, as opposed to the comfort-level for the entire class in asking the teacher for help, this item is the most appropriate for addressing the hypotheses in the current study. It is also important to note that students were asked to respond to this item separately by domain. However, the "math teacher support" items were only asked in fifth and sixth grade, fewer than 200 students completed the items, and the items in the questionnaire actually say "science" instead of math, so it is not clear if these items actually address students' perceptions of support from their math teachers. As such, only the general teacher support items were explored in the current analyses.[6]

In waves five through nine, the longer student perceptions of general teacher support measure contains ten items rated on a Likert-scale from one (none) to four (half) to seven (all). For the purposes of the current study, only the following item was used in the analyses:

- How many of your teachers are willing to help you with your homework?

Since this item asks students about their perceptions of how many of their teachers would be willing to help them personally with their homework, as opposed to an estimate of

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[6] Students in grades 2-4 were not asked for the names of their teachers. However, in grade 5 and sometimes in grade 6 students were asked the names of their reading and math teachers (depending on the data collection wave the student was in during these grades), but most students did not provide the names of their teachers and those that did mostly had the same "general" teacher and "reading teacher" (e.g., ~296 in 5th grade and ~8 in 6th grade) and some students had the same "general" teacher and "math teacher" (e.g., ~190 in 5th grade and ~8 in 6th grade). It was not always clear if students' math and reading teachers were the same or different in grades 5 and 6 due to teacher names not typically being provided, and those that were provided were typically only given for the "general" teacher and one subject area (e.g., only "general" and reading – not reading and math). Thus, it is not clear if students had the same teachers in reading and math in grades 5-6.

how all students within the school would answer this question, this item was considered the most appropriate for addressing the hypotheses in the current study.

These items measuring teacher instrumental help are comparable to other measures of instrumental help/support. For example, the following items from the Network of Relationships Questionnaire (NRQ) were used to assess students' perceptions of instrumental aid from their teachers in Furman and Buhrmester (1985) and Lempers and Clark-Lempers (1992) studies (reviewed earlier in Chapter 2): "How much does this person help you when you need to get something done?" "How much does this person help you figure out or fix things?" and "How much does this person teach you how to do things that you don't know?" (Furman & Buhrmester, 2010, p. 3). The items were answered by students on a 5-point Likert scale, with one = "little or none" and five = "the most." As another example, in Seidman et al.'s (1994) study (also discussed earlier in Chapter 2), students' perceptions of instrumental support from teachers were addressed with an item from Cauce, Felner, and Primavera's (1982) Social Support Rating Scale (SSRS) that asks students about their perceptions of the helpfulness of their teachers. This item was rated on a 3-point scale, ranging from one = "not at all helpful" to three = "a great deal helpful." Lastly, in Reddy et al.'s (2003) study (discussed earlier in Chapter 2), students' perceptions of instrumental support from teachers were addressed by asking students how often the teachers in their schools do the following: "teachers go out of their way to help students." This question was rated on a 5-point scale ranging from one = "never" to five = "always" (p. 123).

Student Belief and Task Value Variables

Four student level belief and value variables were included in the present study: student math ability beliefs, reading ability beliefs, math value, reading value, and academic grades. I will discuss the measures used to assess these variables in the CAB study dataset next.

Student math ability beliefs. Student's ability beliefs for math were measured from waves three through nine with the same set of items that were developed by the project directors. All items and scales can be found on the Gender and Achievement Research Program's website under the CAB study data section for waves three through seven (Gender and Achievement Research Program, 2015). Internal consistency (alpha) reliabilities and CFAs were calculated for waves eight and nine for the present study using the same scales that were used in the prior waves. For each wave, all items loaded onto one factor with positive loadings above .40. Please see Table 6 for specific Cronbach's alpha reliabilities for the student ability beliefs for math scales from waves three through nine of the CAB study.

Table 6

Alpha Reliabilities for Student Perceptions of Math Ability Beliefs Scales by Wave

	Ability Beliefs in Math						
Wave	3	4	5	6	7	8	9
Alpha	.79	.84	.92	.92	.90	.92	.92

The student ability beliefs for math scale was composed of five Likert-type items with values from one to 7. The wording of each Likert ranking differed by item (see below), but one was always used to signify the least characteristic of a quality/question and seven was always used to signify the most characteristic of a quality/question. The specific Likert-range meanings are mentioned after each of the items below:

1. How good at math are you? (1 = not very good; 7 = very good)
2. If you were to list all the students from best to worst in math, where are you? (1 = one of the best; 7 = one of the worst)
3. Compared to your other subjects how good are you at math? (1 = a lot worse; 7 = a lot better)
4. How well do you expect to do in math this year? (1 = not well; 7 = very well)
5. How good would you be at learning something new in math? (1 = not very good; 7 = very good)

Student reading ability beliefs. Student's ability beliefs for reading were measured from waves three through nine with the same measure and with items identical to those used for math ability beliefs; however, for waves three and four, the items say "reading" and for waves five through nine, the items say "English". This change was made because students no longer had reading classes in middle and high school. Again, these items were developed by the creators of the CAB study and all scales, including reliabilities and items, are available on the Gender and Achievement Research Program's website under the CAB study data section for waves three through seven (Gender and Achievement Research Program, 2015). Alpha reliabilities and CFAs were calculated for waves eight and nine for the present study using the same scales that were used in the prior waves. For each wave, all items loaded positively onto one factor—these loadings were all above .40. Please see Table 7 for specific Cronbach's alpha reliabilities for the student ability beliefs for reading scales from waves three through nine of the CAB study.

Table 7

Alpha Reliabilities for Student Perceptions of Reading Ability Beliefs Scales by Wave

	Ability Beliefs in Reading/Language Arts						
Wave	3	4	5	6	7	8	9
Alpha	.84	.86	.93	-[1]	.92	.91	.92

[1] Not assessed in this wave.

The student ability beliefs for reading scale is composed of five Likert-type items with values from one to 7. The wording of each Likert ranking differed by item, but one is always used to signify the least characteristic of a quality/question and seven is always used to signify the most characteristic of a quality/question. The specific Likert-range meanings are mentioned after each of the items below:

1. How good at reading/English are you? (1 = not very good; 7 = very good)
2. If you were to list all the students from best to worst in reading/English, where are you? (1 = one of the best; 7 = one of the worst)
3. Compared to other subjects how good are you at reading/English? (1 = a lot worse; 7 = a lot better)
4. How well do you expect to do in reading/English this year? (1 = not well; 7 = very good)
5. How good would you be at learning something new in reading/English? (1 = not very good; 7 = very good)

Student math value. Student's task values for math—specifically, students' views of the importance and usefulness of math—were measured from waves three through nine with the same general measure. In some waves, additional items were added; however, to ensure a consistent set of items across the waves that I study, I only use items that were presented to students from waves three through 9. Again, these items were developed by the creators of the CAB study and all scales, including reliabilities and items, are available on the Gender and Achievement Research Program's website under the CAB study data section for waves three through seven (Gender and Achievement Research Program, 2015). Alpha reliabilities and CFAs were calculated for waves eight and nine for the present study using the same scales that were used in the prior waves. For all waves, all items loaded positively onto one factor—all loadings were above .40. Please see Table 8 for specific Cronbach's alpha reliabilities for the student value for math scales from waves three through nine of the CAB study.

Table 8

Alpha Reliabilities for Student Value of Math Scales by Wave

	Subjective Task Values in Math						
Wave	3	4	5	6	7	8	9
Alpha	.61	.70	.84	.84	.90	.87	.90

The student math value scale was composed of four Likert-type items with values from one to 7. The meaning of each Likert ranking differed by item, but one was always used to signify the least characteristic of a quality/question and seven was always used to signify the most characteristic of a quality/question. The specific Likert-range meanings are mentioned after each of the items below:

1. How useful is what you learn in math? (1 = not useful; 7 = very useful)
2. Compared to other subjects how useful is math? (1 = not useful; 7 = very useful)
3. For me being good in math is… (1 = unimportant; 7 = important)
4. Compared to other activities how important is it to be good at math? (1 = unimportant; 7 = important)

Student reading value. Student's value for reading—specifically, students' views of importance/usefulness of reading—were measured from waves three through nine with the same measure; however, for waves three and four the word "reading" was used and for waves seven through nine "English" was used. In addition, in some waves, additional items were added; however, to ensure a consistent set of items across the waves that I study, I only use items that were presented to students from waves three through 9. Again, these items were developed by the creators of the CAB study and all scales, including reliabilities and items, are available on the Gender and Achievement Research Program's website under the CAB study data section for waves three through seven (Gender and Achievement Research Program, 2015). Alpha reliabilities and CFAs were calculated for waves eight and nine for the present study using the same scales that were used in the prior waves. For all waves, all items loaded positively onto one factor with all loadings above .40. Please see Table 9 for specific Cronbach's alpha reliabilities for the student value for reading scales from waves three through nine of the CAB study.

Table 9

Alpha Reliabilities for Student Value of Reading Scales by Wave

Subjective Task Values in Reading/Language Arts							
Wave	3	4	5	6	7	8	9
Alpha	.73	.73	.84	-[1]	.87	.83	.91

[1] Not assessed in this wave.

The student reading value scale is composed of four Likert-type items with values from one to 7. The meaning of each Likert ranking differs by item, but one is always used to signify the least characteristic of a quality/question and seven is always used to signify the most characteristic of a quality/question. The specific Likert-range meanings are mentioned after each of the items below:

1. How useful is what you learn in reading/English? (1 = not useful; 7 = very useful)
2. Compared to other subjects how useful is reading/English? (1 = not useful; 7 = very useful)
3. For me being good at reading/English is… (1 = unimportant; 7 = important)
4. Compared to other activities how important is it to be good at reading/English? (1 = unimportant; 7 = important)

Student Achievement Variables

Students' grades in each subject area were used as an indicator of achievement in this study. I chose grades instead of standardized test scores because teacher-assigned grades are of greater importance to students' self-perceptions and are relevant when considering aspects of the teacher-student relationship, such as instrumental help/support, in this case.

Academic grades. Student grades in each subject area were obtained from school records in the fall and the spring for waves three and 4. Grades were then averaged for the fall and the spring semesters to create an average overall grade in each academic domain. Thus, for the purposes of this study, final math and reading/language arts grades were used with one grade for each domain for grades two through 6. In waves 5-9, students self-reported their current overall GPA on a 4.00 scale. All grades across the waves were then converted into a sixteen-point rating system with 16 signifying an A+, 15 signifying an A, 14 signifying an A-, and so on down to two signifying an E- and one signifying an F. Thus, grades were assessed separately by domain in the current analyses for grades two through six, and overall GPA was assessed in grades seven through 12—analyses were not possible separately by academic domain for GPA in grades seven through 12.

As noted above, course grades for grade two through grade six were obtained from school records, but GPA for grades seven through 12 was self-reported by students for the CAB study. Although there is some concern over the accuracy of self-reported GPA in the literature (see review in Kuncel, Crede, & Thomas, 2005), Cassady (2001) argues that the differences between actual GPA and student-reported GPA are similar enough to use for research purposes, noting that caution should be taken for students in the bottom 25% because they will likely have inflated self-reported GPA. Although Cassady (2001) hypothesized that errors of over- or under- estimation of ability might be due to social desirability to appear "smarter," he found:

> Contrary to the initial hypothesis, there were no differences in deviation from actual scores by those participants who overestimated and underestimated their performance levels. The expectation was that the deviations would be higher for overestimators, consistent with the social desirability hypothesis. However, no such trend was revealed, suggesting that the deviations from actual scores are due in part to errors in memory, and not all deviations are driven by a desire to misrepresent ability levels (Discussion section, para. 4).

Similarly, Kuncel and colleagues (2005) found in their meta-analysis that the validity of self-report GPA, via the correlation between self-reported GPA and actual GPA (r_{obs} =

.82, $N = 44,176$), was relatively high for high school students, with no significant differences in validity of GPA between males and females. However, White students were significantly more likely to have higher concordance between their actual GPA and self-reported GPA than non-White students. Students at lower achievement levels were also less likely to accurately self-report GPA than students from higher achievement levels, but no differences in this bias were found by gender or ethnicity. Thus, Kuncel and colleagues (2005) proposed that the initial differences found between White and non-White students likely was due to the fact that non-White students in their sample tended to be lower achieving; thus, any differences in validity of self-report GPA were likely due to the moderating effect of achievement/ability level on self-reported GPA, and not simply an effect of ethnicity. In sum, GPA can be reliably self-reported by high school students—these self-reports are the most accurate from students at higher achievement levels than students at lower achievement levels. Thus, self-reported GPA is suitable for analysis in the current study, although caution is be taken when interpreting GPA and relations to GPA for the lowest achieving students.

Gender as a Grouping Variable

As discussed in Chapters 1 and 2, gender differences have been an important focus in work on teacher support and on students' competence beliefs and values. Thus all of the analyses in the current study were completed using multi-group analyses, with gender as the grouping variable. Within the CAB study data, females are coded as one and males are coded as 2. This multi-group analytic approach allows models for male students to be compared to models for female students in order to determine if the two gender groups differ both on mean levels of the variables of interest as well as in the strength of the magnitude of the relations among the variables of interest. This analytic process will be described in more detail next.

Statistical Analyses

The analytic strategy for this study is described in this section, and includes various types of analyses included under the broad umbrella of structural equation modeling (SEM). The analysis plan for each hypothesis (Hypothesis 1 and Hypothesis 2) will also be discussed. All analyses were done with R version 3.2.1 (R Core Team, 2015) and the lavaan package for SEM (Rosseel, 2012). I begin with an overview of SEM and discuss the specific analyses that were used.

Structural Equation Modeling

Structural equation modeling (SEM) is the analytic method utilized to assess all of the hypotheses in the current study. SEM is an analytic technique that is utilized to assess theory-driven models of relations among latent variables (Hancock & Mueller, 2010). "Latent variables", or factors, are created from multiple observed indicators of a construct—also called *measured variables*. For example, a latent variable can be created from measured variables at either the item or scale level. If created from items from a scale, then each individual item can be used as an *indicator* for a latent variable. If created from a scale itself, then each computed scale can be used as a *manifest indicator* for a latent variable—this method is also called "parceling". Parceling can create a more reliable and powerful factor (Little, Cunningham, Shahar, & Widaman, 2002). In addition, this method can transform a *categorical* measured variable (e.g. a Likert-scale rated any whole number from 1-7) into a *continuous* measured variable (e.g., an average score taking on any value between 1-7) because a scale is created by averaging multiple independent items—thus, instead of having an item that might be rated a three, this method could allow a score of 4.58 for the scale. However, it is only appropriate to use scales for measured variables, as opposed to items, if the purpose of the study is to determine the relations among *latent factors*, as opposed to determining the relations among *item-level variables*. If this condition is met, then the use of manifest indicator variables or "parceling" is theoretically and methodologically warranted (see Little et al., 2002 for a more detailed description of appropriate situations for parceling in SEM).

After deciding whether to use item-level indicators or scale-level manifest indicators for a latent variable/factor, then these items or scales can be "loaded" onto a latent variable through regression statements from the latent variable to the items/scales. The researcher can then specify a structural model where this latent variable correlates to another latent variable, predicts another latent variable, and so on. From here, the "fit", or tenability, of the model can be assessed. Modifications to the model to improve statistical fit can then be made if theoretically plausible.

I will now discuss specific procedures for conducting a SEM analysis. SEM analyses are commonly conducted in two steps: the "measurement" step followed by the "structural" step (Mueller & Hancock, 2010). The "measurement" step entails examining the fit of the measured variables to the latent factors with a confirmatory factor analysis (CFA) model in which all of the latent variables are allowed to covary. This step ensures that any poor fit in the final structural model is due to measurement error as opposed to incorrect structural relationships among the latent variables. During this step, modifications can be made to the "measurement" model, or the CFA model, to ensure that it properly fits the data. The lavaan package for R includes modification indices to offer modification suggestions that may improve model fit (Rosseel, 2012). However, a common practice is to only make modifications to the residual covariances in the measurement model if they make theoretical sense and significantly improve the model (e.g., Mattanah, Hancock, & Brand, 2004). Once a satisfactory measurement model is obtained without introducing a significant amount of poor data model fit, the analyses can continue to the next step. Note that if all of the measured variables in a model are turned into pseudo-latent factors, where one measured variable is the only indicator for each latent factor, then this two-step process is not necessary. Thus, this measurement step can be skipped and model fit can just be assessed at the structural phase only.

In the structural phase, the constraints from the "measurement" step are released, which allow all of the latent variables to relate to each other, and then the "structural" portion of the SEM is then implemented to detail the predicted relationships among the latent variables. The SEM analysis can then be assessed for model fit. If competing models are being tested to determine the most tenable relations among factors, then the model fit among the various models could then be compared at this point in the process if the models are not nested. If the models are nested, as is the case in multi-group SEM analyses, for example, then models can be compared using χ^2 difference tests, where a statistically lower χ^2 indicates a more acceptable model. The procedures for determining model fit will be described next after a brief overview of the modeling process of multi-group SEMs.

In multi-group SEMs, various models are tested with varying levels of constraints between the two groups of interest. In the current study, multi-group analyses are conducted by gender, which means that models are fit for males and females, with varying levels of constraints placed on different parts of the model in order to determine whether males and females differ on:

1. The model overall, with a separate model for males and females (Model 1),
2. Regressions among the variables of interest in the model (Model 2),
3. Latent portions of the model (i.e., the latent variance-covariance matrix; Model 3) – also includes constraints placed in Model 2, or
4. Latent factor loadings from the measured variables of interest in the model (Model 4) – also includes constraints placed in Models 2 and 3.

The process described above moves from the least restrictive model where the two groups are allowed to be completely different (Model 1 above) to the most restrictive model where the regressions, latent portions of the model, and factor loadings for the male and female groups are constrained to be equal (i.e., the same). In the multi-group analyses in the current study, each of the four models above are conducted – the final model that is selected for each analysis is determined using χ^2 difference tests. In cases where none of the multi-group models converge (i.e., are able to be run statistically), a regular SEM – not a multi-group model – is used as the final model.[7]

To determine the tenability of various SEMs, Hu and Bentler (1999) and Mueller and Hancock (2010) suggested that researchers report indices of fit from three classes: incremental, parsimonious, and absolute. Incremental fit indices, or relative fit indices, compare the fit of the proposed structural model to a baseline model—usually the null/independence model. In incremental fit indices, a value of 0 (the null model) is indicative of the worst possible model and a value of one is indicative of the best possible model—ideally, the fit for these indices should be above .95 (Mueller & Hancock, 2010), however, numbers as low as .90 are considered acceptable (Schulz, Ainley, & Fraillon, 2011). Incremental fit indices include the comparative fit index (CFI), normed fit index (NFI; also known as the Tucker-Lewis index [TLI]), and Nonnormed fit index (NNFI).

Parsimonious fit indices assess the fit of the model by determining how closely the observed and implied covariance matrices match, while taking into account the complexity of the model. In these indices, fit tends to improve when there are more parameters in the model and when those parameters contribute to the model in a meaningful way (Mueller & Hancock, 2010). Mueller and Hancock (2010) reference the root mean square error of approximation (RMSEA) index as a useful parsimonious fit index—RMSEA, and the 90% confidence interval associate with it, should fall below .05. However, Hu and Bentler (1999) mention that an RMSEA $\leq .06$ is considered appropriate

[7] Although it is important to note that if a multi-group model does not converge, then there may be other issues with the model. Thus, multi-group models that do not converge should be interpreted with caution.

for good fit, and MacCallum, Browne, and Sugawara (1996) note that an RMSEA as high as .08 could even be considered as having mediocre, yet acceptable, fit.

Lastly, absolute fit indices assess the fit of the model by determining how closely the observed and implied covariance matrices match—fit also tends to improve as more parameters are entered into the model. Essentially, these indices determine how close the model is to a perfect fit, or a fit of 0—thus these measures usually can be thought of in terms of a measure of how bad the fit it, with bigger numbers typically meaning the fit of the model is worse. Absolute fit indices include the standardized root mean square residual (SRMR) and χ^2. SRMR is generally considered adequate if it is less than .08 (Mueller & Hancock, 2010), but Vandenberg and Lance (2000) note that values less than or equal to .10 can be adequate. χ^2 does not have a specific cut-off number, but smaller χ^2 are generally considered to have better fit.

Hu and Bentler (1999) present a number of fit indices from the three classes above that can be used to assess fit in SEMs—they do not specify the specific fit indices that are the "best" to use. As such, it is generally appropriate to choose any fit index, as long as at least one is selected from the three classes. However, Mueller and Hancock (2010) specifically mention the use of either NFI, NNFI, or CFI from the incremental fit indices, RMSEA from the parsimonious fit indices, and SRMR from the absolute fit indices. Mueller and Hancock only provide one option for the parsimonious and absolute fit indices, so I use their suggestions for those classes. However, for the incremental fit index, Mueller and Hancock (2010) provide three options: NFI, NNFI, and CFI. Since any of these three options would be acceptable, I arbitrarily selected the CFI. Thus, in the current study, I used a fit index from each of the three classes (incremental, parsimonious, and absolute), including the CFI, RMSEA, and SRMR.

The strength of SEM is that by assessing latent variables, instead of items/scales, or measured variables, the variance can be partitioned from any error resulting from measurement. As such, SEM should then result in a more accurate estimate of the true score for the construct of interest and of causal relations across time. For these reasons, SEM was chosen as the appropriate class of analyses to address the longitudinal hypotheses in the current study. Specifically, two types of SEMs are employed: multi-group SEMs with pseudo-latent variables and multi-group structural equation latent growth models (SELGM), an extension of latent growth models (LGMs). The methods described above can be used for all SEMs in my study. Specific procedures for these SEMs will be detailed more fully in Chapter 4.

Multi-group SEMs are used to assess hypotheses 1 and 2 for adjacent grade pairs with large enough sample sizes (e.g., grades two and three, grade three and four, grades seven and 8). Multi-group SELGMs are used to further address hypothesis 2 (i.e., growth from seventh through 12th grade) since the sample size and overlap among grades is at an acceptable level. SEMs have already been described above, but SELGMs will be discussed below, first with an overview of LGMs, then with specific details about SELGMs, along with descriptions of how they were used to address the hypotheses, are presented next.

Latent growth modeling. Structural equation latent growth models (SELGMs) are an extension of latent growth models (LGMs), which are all types of SEMs. LGMs allow researchers to measure change over time, or growth, in repeated measures (Duncan et al., 2006). The simplest form of a LGM assesses linear growth between a measure that is given at two different points in time (Duncan et al., 2006); for example, a measure of teacher instrumental support that is given in second grade and then again in third grade to determine growth in this factor from second to third grade. However, ideally LGMs should have at least three time points in which the measures are repeated in order for LGMs to more accurately assess growth over time (Duncan et al., 2006).

> Hancock and Lawrence (2006) define LGMs as a technique that "…can describe individuals' behavior in terms of reference levels (e.g., initial amount) and their developmental trajectories to and from those levels (e.g., linear, quadratic). In addition, they can determine the variability across individuals in both reference levels and trajectories, as well as provide a means for testing the contribution of other variables or constructs to explaining those initial levels and growth trajectories" (p. 172).

Essentially, latent growth modeling (LGM) determines the initial level of a factor at the beginning of the growth trajectory, called the *intercept*, and the rate of change over time in the repeated measures of a factor, called the *slope*[8] (Duncan et al., 2006; Hancock & Lawrence, 2006; Kline, 2011).

[8] The terms intercept and slope can be interpreted in the same way as they are defined in a regression model.

Kline (2011) notes three requirements for LGMs in SEM. Firstly, a LGM must have a continuous dependent variable that is measured during at least three different time points. Secondly, the continuous dependent variable must assess the same construct at each time point and must have the same unit of measurement across time. The last requirement is that the data must be *time structured*, which means that the participants must be tested at similar intervals; for example, in the CAB study, even though the students in each cohort were in a different grade at each wave of data collection, they were assessed at around the same time each year.

I will now discuss specific steps for using LGM. Unlike general cases of SEMs, a two-step process is not necessary for separating out the measurement model from the structural model in LGM. Instead, one can directly assess the measurement and structural portions of the model at the same time.[9] As outlined by Hancock and Lawrence (2006), change over time in the variable of interest for each individual in the sample can be expressed in the following equation:

"score at time *t* = initial score + (change in score per unit time) x (time elapsed) + error" (p. 175).

As mentioned earlier, the "initial score" is the intercept and the "change in score per unit time" is the slope. This equation could then be repeated for each time point at which the construct of interest is measured (Hancock & Lawrence, 2006). For example, I will now layout the structural equations to assess growth in students' perceptions of teacher

[9] Note that Kline (2011) mentions a two-step model for conducting LGMs: (a) specify the change model in the repeated measures, and (b) add in any additional variables that are thought to predict change. However, a basic LGM, as I am discussing here, only require the first step – I will discuss the second step when I discuss more complex modeling, through structural equation latent growth modeling (SELGM), below.

instrumental support, as measured in waves five through nine (seventh through 12th grade). The measured variables in this situation are manifest indicator variables created from the teacher instrumental support item at each time point of interest. In the current study, I examine this variable from seventh grade through 12th grade, which results in six time points, and thus six equations. Here are the equations below:

7th grade: V1 = intercept + (slope) x (0) + E1
8th grade: V2 = intercept + (slope) x (1) + E2
9th grade: V3 = intercept + (slope) x (2) + E3
10th grade: V4 = intercept + (slope) x (3) + E4
11th grade: V5 = intercept + (slope) x (4) + E5
12th grade: V6 = intercept + (slope) x (5) + E5

Note that the "time elapsed" (listed between the slope and the error term at the end) starts at 0 in seventh grade and increases by one each grade year. This occurs because the initial year of measurement for this type of instrumental help item in the current study starts at grade 7. The amount of time between grade seven and grade eight is one year, so the "time elapsed" increases to "1" in the eighth grade equation. The amount of time between grade seven and grade nine is two years, so the "time elapsed" increased to "2" in the ninth grade equation, and so on until reaching 12th grade with an elapsed time of five years from the initial measurement in second grade. Thus, as can be seen in these equations, a student's perceived instrumental support from teachers score can be understood as a function of her intercept (initial score in seventh grade), slope (change from the initial score), and error from seventh grade through 12th grade.

To continue with this example, I will now discuss what these LGM structural equations look like when portrayed visually, as can be seen in Figure 4. Specifically, the intercept (F1 in Figure 4) and the slope (F2 in Figure 4) are considered factors in LGM (Duncan et al., 2006). Typically, since the initial value is expected to be related to the slope, and vice versa, the intercept and slope are allowed to covary, as denoted by in the double-sided arrows in Figure 4 (labeled C_{F1F2}). As mentioned in the structural equations above, the intercept is a constant—thus, as can be seen in Figure 4, the factor loadings of the measured variables at each grade level to the intercept (F1) are fixed to 1. The slope, on the other hand, is allowed to change per the change in time from the initial score in seventh grade. Thus, the factor loading of the measured variables at each grade level to the slope (F2) differ based on the number of years that pass from seventh grade to eighth grade (1 year), seventh grade to ninth grade (2 years), seventh grade to 10th grade (3 years), and so on until we reach the last measurement point in 12th grade (5 years).[10]

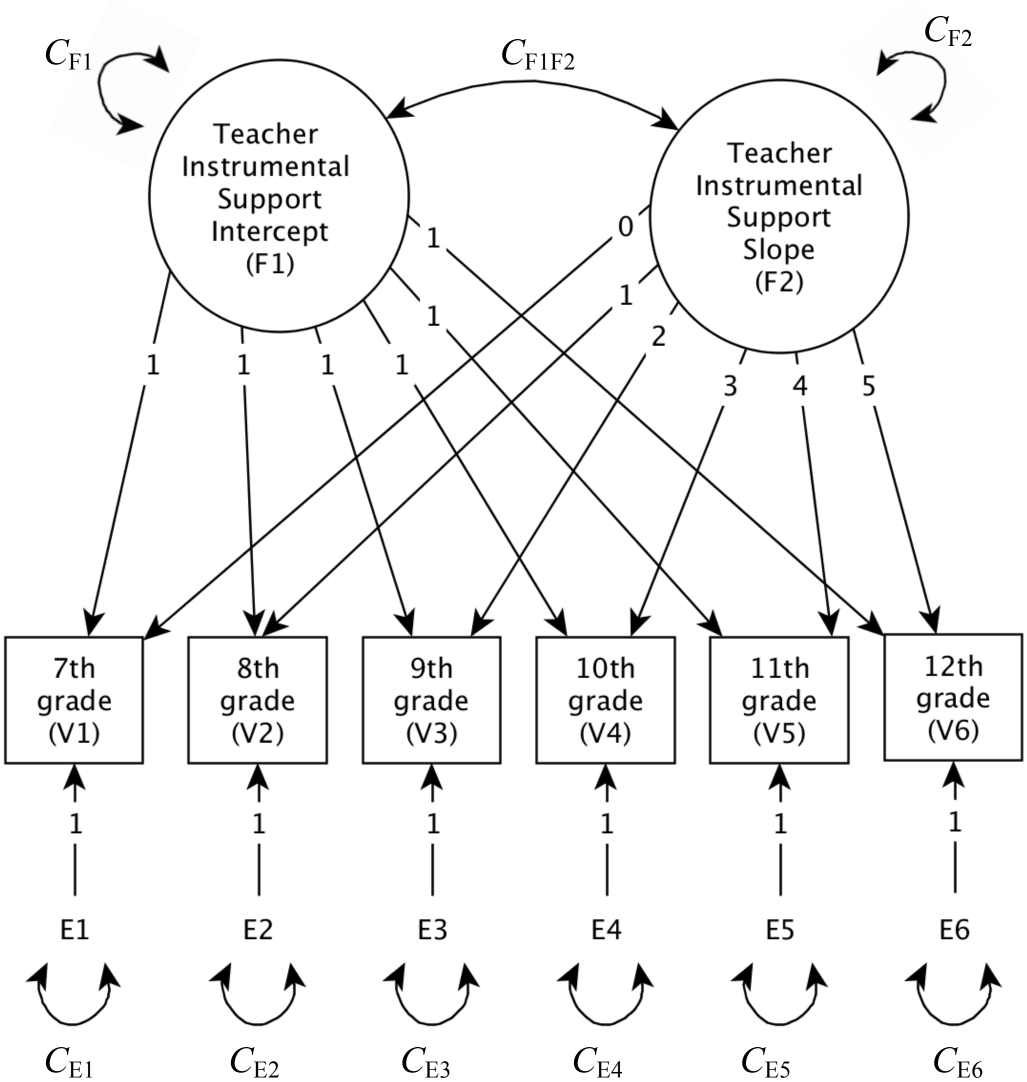

Figure 4. Latent growth model of students' perceptions of instrumental support from teachers from seventh to twelfth grade with covariance and mean structure.

[10] I have also included the intercept and slope factor variances (C_{F1} and C_{F2}), errors for the measured variables at each grade level (E1 – E6) and their covariances (C_{E1} – C_{E6}). However, I will not explain these components of the model here—I will go into a more in-depth explanation of error terms, variances, and covariances in Chapter 4 as relevant to the hypotheses of interest.

This method can be used for all LGMs in my study. In addition, the multi-group method described earlier for multi-group SEMs can also be used here for multi-group LGMs. Specific procedures for these LGMs will be detailed more fully in Chapter 4.

Hancock and Lawrence (2006) noted that LGMs utilize more information than "traditional methods" by taking into account change in mean values, variances, and covariances simultaneously. Hancock and Lawrence noted that traditional methods of assessing growth include: analysis of variance (ANOVA), analysis of covariance (ANCOVA), multivariate analysis of variance (MANOVA), multivariate analysis of covariance (MANCOVA), and cross-lagged and auto-regressive multiple regression. In addition, Hancock and Lawrence (2006) and Duncan et al. (2006) noted that LGM has an underlying assumption that the data have a common developmental trajectory, and so, Duncan et al. (2006) argued that LGM rules out cohort effects. Thus, in the current study, even though there are three cohorts of students, I can analyze all three cohorts on the same developmental trajectory from second grade through sixth grade for the first item for teacher instrumental support, seventh grade through twelfth grade for the second item for teacher instrumental support, and second grade through twelfth grade for ability beliefs in math and reading, subjective task values in math and reading, and academic grades. The reason for this is because LGM is ideally suited for analyzing growth in such designs because this method assumes an underlying developmental trajectory grounded in some "social and/or biological mechanism" (Hancock & Lawrence, 2006, p. 173).

In conclusion, given the longitudinal nature of the CAB study and the hypotheses and research question for the current study, LGM is an ideal analytic strategy for addressing hypotheses where the sample size is large enough. For example, in the current study, LGM allows change over time to be assessed from seventh through twelfth grade,[11] even though each student independently does not have data collected for every grade during that time span due to the cohort-sequential nature of the CAB study design and due to attrition.

Structural equation latent growth modeling. Structural equation latent growth models (SELGM) put two or more LGMs together—either with the LGMs all relating to each other, with one LGM predicting the others in any number of ways, and so on. In this way, one can have the intercept and slope of one factor predicting the intercept and slope of another factor, and so on. For example, for hypothesis 2 in my study I explore how the intercept and slope of perceived teacher instrumental support from seventh grade to 12th grade relates to the intercepts and slopes of ability beliefs in reading and math from seventh grade to 12th grade. Thus, using SELGM, I explore whether the initial level of perceived teacher instrumental support in seventh grade (the teacher instrumental support intercept, F1 in Figure 5) relates to the seventh grade level of ability beliefs in math and reading (the math and reading ability belief intercepts, F3 and F5, respectively, in Figure 5) and the change in ability beliefs in math and reading from seventh grade through 12th grade (the math and reading ability belief slopes, F4 and F6, respectively, in Figure 5). I also explore whether the change in teacher instrumental support from seventh grade through 12th grade (the teacher instrumental support slope, F2 in Figure 5)

[11] In particular, change over time will be assessed for perceived teacher instrumental support, ability beliefs, task values, and academic grades from seventh through twelfth grade.

relates to the change in ability beliefs in math and reading from seventh through 12th grade (the math and reading ability belief slopes, F4 and F6, respectively, in Figure 5).

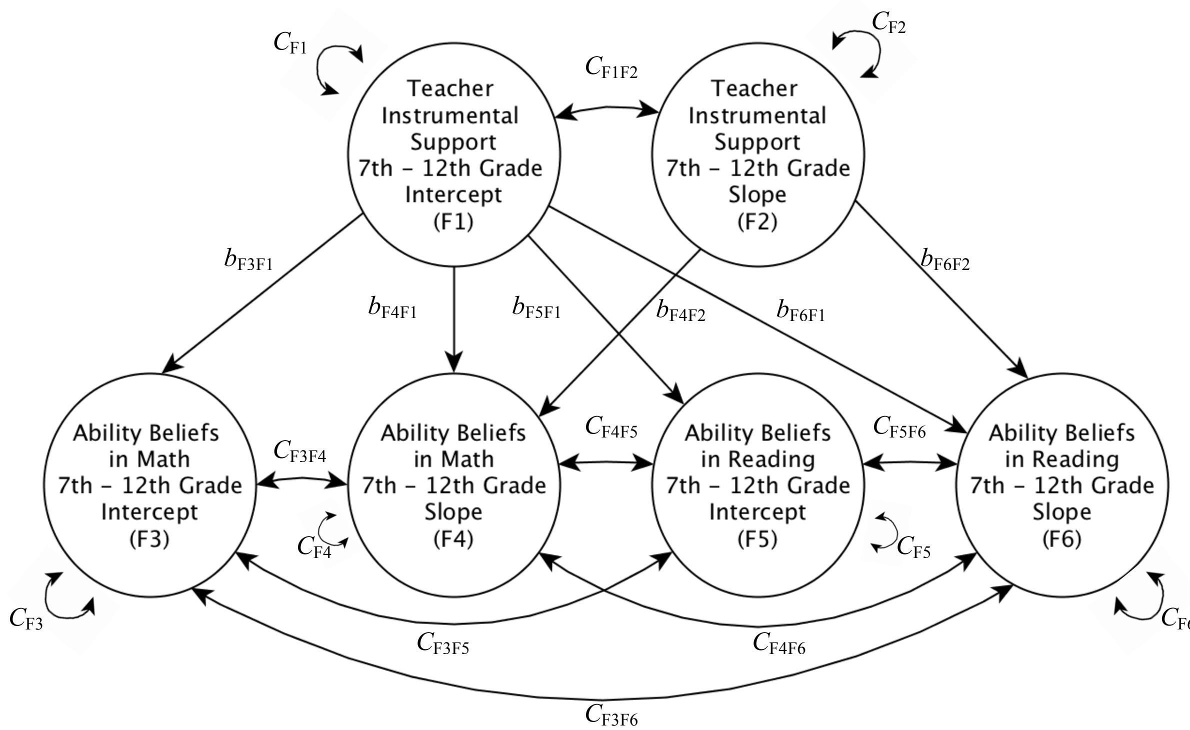

Figure 5. Structural portion of the structural equation latent growth model of students' perceptions of instrumental support from teachers in seventh through 12th grade and students' ability beliefs for math and reading from seventh through 12th grade.

This procedure was used for all SELGM analyses in my study. In addition, the multi-group method described earlier for multi-group SEMs can also be used here for multi-group SELGMs. Thus, those procedures are also used here for the multi-group SELGM analyses in the current study. Specific procedures will be detailed more fully in Chapter 4.

Analytic Plan by Hypothesis and Research Question

Hypothesis 1. In adjacent grade pairs (e.g., second and third grade) during second through sixth grade, students' perceptions of instrumental help/support from teachers will positively relate to their ability beliefs, task values, and academic course grades within the same grade-level in reading and math. These relations will differ by gender, with instrumental help/support relating to these variables more strongly for girls in the domain of math and for boys in the domain of reading.

Ideally, the first hypothesis (H_1) would be assessed with a multi-group SELGM. However, since there is very little student sample overlap of data collected between the second through sixth grade levels due to the way that data were collected in the CAB study (i.e., cohort-sequential design, as discussed earlier), H_1 was addressed with nine multi-group SEMs exploring the following:

1. Students' perceptions of instrumental support from teachers in a prior grade predicting student's perceptions of instrumental support from teachers in the following grade-level, as well as students' ability beliefs in math and reading in the following grade-level after accounting for ability beliefs in math and reading in the prior grade-level. These analyses were done separately for grades 2-3, grades 3-4, and grades 5-6 and using the multi-group procedures described earlier by gender.
2. Students' perceptions of instrumental support from teachers in a prior grade predicting student's perceptions of instrumental support from teachers in the following grade-level, as well as students' task values in math and reading in the following grade-level after accounting for task values in math and reading in the

prior grade-level. These analyses were done separately for grades 2-3, grades 3-4, and grades 5-6 and using the multi-group procedures for looking at potential gender differences described earlier.

3. Students' perceptions of instrumental support from teachers in a prior grade predicting student's perceptions of instrumental support from teachers in the following grade-level, as well as students' course grades in math and reading in the following grade-level after accounting for course grades in math and reading in the prior grade-level. These analyses were done separately for grades 2-3, grades 3-4, and grades 5-6 and using the multi-group procedures described earlier by gender.

Hypothesis 2. In adjacent grade pairs (e.g., seventh and eighth grade) during seventh-12th grade, students' perceptions of instrumental help/support from teachers will positively relate to their ability beliefs and task values in reading/language arts and math and grade-point average (GPA) within the same grade-level. Change over time in instrumental help/support from teachers and ability beliefs and task values in reading/language arts and math and GPA will also be associated with each other. All of these relations will differ by gender, with instrumental help/support relating to these variables more strongly for girls in the domain of math and for boys in the domain of reading/language arts.

The second hypothesis (H_2) was assessed with a multi-group SELGM due to sufficient student sample size overlap among the variables of interest from seventh-12th grade (excluding grade 11 due to a small sample size overlap among most of the other grade-levels). Since more waves of data collection included students from grades seven through 12, there are more students who have more complete data trajectories from grade seven through grade 12, which decreases the amount of missing data that are in the model—making it possible for the multi-group SELGM to be conducted, in this case.[12] However, in order to be comparable with the H_1 analyses, the same multi-group SEMs for H_1 were also completed for H_2 for grades seventh through eighth, eighth through ninth, ninth through 10th, 10th through 11th, and 11th through 12th.

SELGMs allow the portion of the hypothesis about change in students' perceptions of instrumental help/support from teachers being associated with change in ability beliefs and task values in reading and math and GPA to be explored. Basically, this type of analysis allows me to explore whether change (or stability) in students' perceptions of instrumental help/support from teachers is associated with change (or stability) in students' ability beliefs and task values in reading and math and GPA. Although this type of analysis will not explain why change in one variable is associated with change in another variable, it will reveal whether an association exists between these patterns of change. Multiple reasons could explain why such an association could exist, but, in general, such an association would mean that as students' instrumental help/support from teachers increases, decreases, or stays the same from seventh through 12th grade, students' ability beliefs and task values in reading and math and GPA increase, decrease, or stay the same. Although other explanations are possible, one

[12] Although FIML can handle missing data well, there is a point at which there is too much missing data for an analysis to be run. For the second through sixth grade models, this is the case. However, there is not too much missing data for FIML to be able to appropriately run the SELGM for the seventh through 12th grade years.

example for why such associations may exist is if some underlying process is impacting change in the two variables, such as poor fit between the school environment in middle/high school with a student's stage (i.e., adolescence), as predicted by Eccles and colleagues' (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011) in Stage Environment Fit theory.

The multi-group SELGM for H_2 was conducted in several steps. First, multi-group LGCs for instrumental support, ability beliefs in math, ability beliefs in reading, task values in math, task values in reading, and GPA were conducted separately for seventh through 12^{th} grade (excluding grade 11) by gender. After achieving acceptable model fit for these LGCs, three multi-group SELGMs were then conducted to individually explore the relations among the multi-group LGM of students' perceptions of instrumental support from teachers from seventh through 12^{th} grade (excluding grade 11) by gender and (a) the multi-group LGMs of students' ability beliefs in math and reading by gender, (b) the multi-group LGMs of students task values in math and reading by gender, (c) the multi-group LGM of students' overall GPA by gender. Finally, a combined multi-group SELGM was conducted to explore how the multi-group LGM of students' perceptions of instrumental support from teachers from seventh through 12^{th} grade (excluding grade 11) by gender relates to the multi-group LGMs of: students' ability beliefs in math and reading, students' task values in math,[13] and students' overall GPA by gender.

Summary

The relations among students' perceptions of support, via instrumental help/support from their teachers, and their ability beliefs and subjective task values in math and reading and academic grades, in elementary school and from middle school to the end of high school were explored in this study. As explained in this chapter, these relations were examined by gender in a sample of 1,062 students from the Childhood and Beyond (CAB) study dataset, a cohort-sequential study that followed students from elementary to high school and beyond. Multi-group structural equation model (SEM) analyses were used to explore these relations in adjacent grade pairs (e.g., second grade to third grade) in elementary school and from middle school through high school separately for males and females. In addition, multi-group latent growth curve (LGC) analyses were used to explore the associations among change in the variables of interest from middle school through high school separately for males and females.

[13] Due to a high correlation between reading ability beliefs and reading task value, it was not possible to include both in the model. Therefore, since ability beliefs have been found to predict task values in the literature (e.g., Wigfield et al., 1997), ability beliefs in reading were retained in the model.

Chapter 4: Results

The main goal for the present study was to determine whether students' perceptions of the availability of instrumental help from teachers positively relates to their ability beliefs, task value, and academic grades and to determine whether these relations are stronger for girls in the domain of math and for boys in the domain of reading/language arts. Structural equation models (SEMs) and structural equation latent growth curve (SELGC) models were conducted to address these goals. The results from these analyses are reported here by hypothesis.

Results by Hypothesis/Research Question

Before describing the results of the analyses used to address the hypotheses, I present descriptive statistics for the main variables of interest: instrumental support, ability beliefs, task values, and course grades/GPA.[14]

In Table 10, the sample size, mean, and standard deviation are displayed for instrumental support from grade one through grade 12. These descriptive statistics are also displayed separately by gender. As a reminder, the instrumental support items were completed on a 7-point Likert scale. Although there is variation in the scores from grade one through grade 12, the means generally were between four and six, with the mean scores at each grade ranging from 4.85 to 5.71 overall, from 4.92 to 5.77 for males, and from 4.75 to 5.75 for females. Thus, across grade one through grade 12, students'

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[14] Although not presented in full here, the skew and kurtosis for all composite variables are within acceptable limits (skew < 2.1; kurtosis < 7.1) per West, Finch, and Curran's (1995) guidelines. This includes composites for reading ability beliefs, math ability beliefs, reading task values, and math task values.

perceptions of instrumental support remained high with the largest decrease in the overall mean of instrumental support from teachers from grade five (5.31) to grade six (4.85). However, the overall mean went back up to 5.23 in grade seven, but this also coincides with when the instrumental support from teachers item changed (between grade six and grade seven, as discussed in Chapter 3).

Table 10

Sample Size, Mean, and Standard Deviation by Grade and Gender for Instrumental Support

	Instrumental Support								
	Overall			Males			Females		
Grade	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
1	25	5.16	2.15	12	4.92	2.39	13	5.39	1.98
2	291	5.18	2.03	149	5.09	2.09	142	5.27	1.96
3	518	5.45	1.92	258	5.15	1.99	260	5.75	1.79
4	257	5.54	1.83	124	5.51	1.86	133	5.57	1.80
5	408	5.31	1.83	195	5.14	1.95	213	5.47	1.71
6	377	4.85	2.08	180	4.97	2.07	197	4.75	2.09
7	203	5.23	1.52	105	5.10	1.64	98	5.37	1.39
8	337	5.29	1.55	160	5.22	1.65	177	5.35	1.45
9	289	5.59	1.36	132	5.59	1.38	157	5.59	1.35
10	439	5.40	1.42	205	5.47	1.37	234	5.33	1.45
11	219	5.69	1.30	90	5.77	1.22	129	5.64	1.36
12	429	5.71	1.31	181	5.68	1.31	248	5.74	1.31

Note. Items in grade one through grade six assess “help”, while items in grade seven through grade 12 assess “help with homework.” Thus, these grade bands are not directly comparable.

In Table 11, the sample size, mean, and standard deviation are displayed for ability beliefs in reading and math from grade one through grade 12. These descriptive statistics are also displayed separately by gender. As a reminder, ability beliefs were rated on a 7-point Likert scale. Although there is variation in the scores from grade one through grade 12, the means generally were between four and seven, with the mean scores at each grade ranging from 4.71 to 6.12 in math and 4.63 to 6.22 in reading overall, from 4.84 to 6.13 for males in math, from 4.48 to 6.30 for males in reading, from 4.53 to 6.11 for females in math, and from 4.91 to 6.15 for females in reading. Thus, across grade one through grade 12, students' ability beliefs in reading and math start off high in the elementary school grades with overall means between five and seven, but then these ability beliefs decline in middle school and high school, with overall means dropping down between four and 5.[15]

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[15] Note that the general pattern of these means follows the patterns found in Jacobs et al. (2002), which also used the CAB study data, from grades one through 12. However, it is important to note that the CAB study sample that was used in Jacobs et al. (2002) differs from the sample used in the current study. Specifically, in the current study: (a) Waves 1-9 are used, while Jacobs et al. (2002) uses Waves 2-7, (b) students are included in the sample as long as they have data for the variables of interest at any point in time during grades and Waves specified in Chapter 3 ($N = 1062$), while Jacobs et al. (2002) only uses students who had grade and gender data in Wave two and then follows those students to Wave seven ($N = 761$), and (c) since Waves 8-9 are used, grade 12 information is also available for Cohorts 2-3, not just Cohort 1, which results in a large sample of students in grade 12, while Jacobs et al. (2002) only have grade 12 data for Cohort 1, and thus a smaller sample size for this grade.

Table 11

Sample Size, Mean, and Standard Deviation by Grade and Gender for Ability Beliefs in Math and Reading

Math Ability Beliefs									
	Overall			Males			Females		
Grade	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
1	25	6.12	0.89	12	6.13	0.90	13	6.11	0.93
2	292	5.53	0.99	150	5.74	0.97	142	5.31	0.97
3	522	5.50	1.04	259	5.68	1.06	263	5.33	0.99
4	260	5.29	1.09	124	5.54	1.04	136	5.06	1.09
5	407	5.32	1.04	195	5.50	1.03	212	5.15	1.01
6	377	5.25	1.14	180	5.47	1.17	197	5.05	1.08
7	201	4.86	1.19	104	4.84	1.30	97	4.88	1.06
8	336	4.90	1.12	160	4.94	1.17	176	4.87	1.08
9	291	4.89	1.21	133	4.98	1.23	158	4.81	1.20
10	439	4.87	1.27	205	5.05	1.25	234	4.71	1.27
11	220	4.73	1.45	90	5.01	1.44	130	4.53	1.43
12	430	4.71	1.38	180	4.87	1.40	250	4.60	1.36

Reading Ability Beliefs									
	Overall			Males			Females		
Grade	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
1	25	6.22	1.19	12	6.30	1.40	13	6.15	1.01
2	292	5.83	1.00	150	5.72	1.00	142	5.94	1.00
3	522	5.61	1.13	259	5.49	1.24	263	5.72	1.00
4	260	5.32	1.15	124	5.27	1.10	136	5.37	1.20
5	407	5.34	1.10	195	5.10	1.15	212	5.56	1.01
6	377	5.42	1.06	180	5.25	1.08	197	5.57	1.02
7	187	4.63	1.23	98	4.48	1.28	89	4.80	1.16
8	207	4.75	1.27	97	4.56	1.32	110	4.91	1.21
9	166	4.87	1.29	81	4.78	1.33	85	4.97	1.26
10	425	5.05	1.20	200	4.92	1.20	225	5.16	1.18
11	37	5.13	1.43	15	4.60	1.62	22	5.48	1.20
12	424	5.04	1.19	178	4.85	1.16	246	5.17	1.19

In Table 12, the sample size, mean, and standard deviation are displayed for task values in reading and math by gender from grade one through grade 12. Although there is variation in the scores from grade one through grade 12, the means generally were between four and six (out of a 7-point Likert scale), with the mean scores at each grade ranging from 4.29 to 5.48 in math and 4.45 to 5.68 in reading overall, from 4.31 to 5.43 for males in math, from 4.38 to 5.54 for males in reading, from 4.27 to 5.69 for females in math, and from 4.54 to 5.83 for females in reading. Thus, across grade one through grade 12, students' subjective task values in reading and math start off high in the elementary school grades with overall means between five and six, but then these subjective task values decline in middle school and high school, with overall means generally dropping down between four and 5. However, for reading task values, the overall means increase back above five in grades 11 and 12.[16] The sample size for reading task values in grade 11 is quite small though ($N = 37$), so this mean should be interpreted cautiously.

[16] Note that the general pattern of these means (decline for math task values and curvilinear trajectory for reading task values) also follows the patterns found in Jacobs et al. (2002), which also used the CAB study data, from grades one through 12.

Table 12

Sample Size, Mean, and Standard Deviation by Grade and Gender for Task Values in Math and Reading

Math Task Value									
	Overall			Males			Females		
Grade	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
1	25	5.48	1.10	12	5.25	1.29	13	5.69	0.90
2	292	5.38	1.05	150	5.43	1.09	142	5.33	1.02
3	522	5.36	1.02	259	5.32	1.19	263	5.41	0.84
4	260	5.31	0.97	124	5.35	1.02	136	5.27	0.93
5	407	5.31	1.04	195	5.32	1.04	212	5.31	1.04
6	377	5.25	1.04	180	5.35	1.12	197	5.17	0.96
7	201	4.91	1.06	104	4.97	1.16	97	4.86	0.96
8	336	4.78	1.12	160	4.73	1.22	176	4.83	1.03
9	291	4.61	1.17	133	4.66	1.23	158	4.57	1.12
10	439	4.47	1.22	205	4.56	1.23	234	4.40	1.21
11	220	4.29	1.34	90	4.31	1.47	130	4.27	1.26
12	431	4.29	1.37	181	4.36	1.48	250	4.24	1.28
Reading Task Value									
	Overall			Males			Females		
Grade	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
1	25	5.23	1.66	12	5.04	2.08	13	5.41	1.21
2	292	5.68	1.06	150	5.54	1.17	142	5.83	0.90
3	522	5.41	1.12	259	5.26	1.26	263	5.57	0.95
4	260	5.36	0.98	124	5.21	0.98	136	5.49	0.96
5	407	5.34	1.07	195	5.24	1.12	212	5.43	1.02
6	377	5.33	1.00	180	5.27	1.08	197	5.39	0.91
7	187	4.45	1.14	98	4.38	1.27	89	4.54	0.99
8	207	4.74	1.14	97	4.57	1.15	110	4.90	1.11
9	166	4.69	1.15	81	4.59	1.19	85	4.79	1.11
10	427	4.97	1.16	200	4.80	1.18	227	5.12	1.13
11	37	5.40	1.08	15	4.85	1.25	22	5.77	0.78
12	424	5.09	1.16	178	4.83	1.18	246	5.28	1.11

In Table 13, the sample size, mean, and standard deviation are displayed for course grades in reading and math by gender from grade one through grade six and for

GPA from grade seven through grade 12. As a reminder, both course grades and GPA are on a 4.0 scale.

For course grades, although there is variation in the scores from grade one through grade six, the means generally were between two and three, with the mean scores at each grade ranging from 2.52 to 2.97 in math and 2.59 to 5.97 in reading overall, from 2.45 to 2.94 for males in math, from 2.49 to 2.91 for males in reading, from 2.46 to 2.99 for females in math, and from 2.69 to 3.03 for females in reading. Thus, across grade two through grade six, students' course grades in reading and math remained fairly stable with the largest increase in the overall mean of course grades from grade three (2.60 for math and 2.73 for reading) to grade four (2.97 for both math and reading). However, the overall mean went back down to 2.52 in math and 2.62 in reading in grade 5.

For GPA, although there is variation in the scores from grade seven through grade 12, the means generally were between three and four, with the mean scores at each grade ranging from 3.21 to 3.29 overall, from 3.08 to 3.29 for males, and from 3.27 to 3.47 for females. Thus, across grade seven through grade 12, students' GPA remained high with the largest decrease in the overall mean of GPA from grade eight (3.31) to grade nine (3.21). The overall mean stayed at this lower level in grade 10 (3.22), but then went back up to 3.35 in grade 11.

Table 13

Sample Size, Mean, and Standard Deviation by Grade and Gender for Course Grades in Math and Reading from Grade One through Grade Six and GPA from Grade Seven through Grade 12

Math Course Grades									
	Overall			Males			Females		
Grade	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
1	0	-	-	0	-	-	0	-	-
2	205	2.52	0.54	107	2.57	0.56	98	2.46	0.51
3	243	2.60	0.66	116	2.57	0.68	127	2.62	0.64
4	223	2.97	0.54	109	2.94	0.52	114	2.99	0.56
5	351	2.52	0.74	172	2.45	0.73	179	2.58	0.76
6	328	2.64	0.65	157	2.56	0.71	171	2.71	0.58

Reading Course Grades									
	Overall			Males			Females		
Grade	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
1	0	-	-	0	-	-	0	-	-
2	205	2.59	0.58	107	2.50	0.54	98	2.69	0.60
3	243	2.73	0.63	116	2.63	0.57	127	2.82	0.66
4	223	2.97	0.51	109	2.91	0.44	114	3.03	0.56
5	353	2.62	0.69	171	2.49	0.69	182	2.75	0.67
6	325	2.77	0.54	155	2.66	0.55	170	2.88	0.50

GPA (overall)									
	Overall			Males			Females		
Grade	N	Mean	Standard Deviation	N	Mean	Standard Deviation	N	Mean	Standard Deviation
7	194	3.29	0.57	100	3.12	0.61	94	3.47	0.47
8	324	3.31	0.58	156	3.20	0.62	168	3.42	0.52
9	268	3.21	0.64	125	3.08	0.67	143	3.31	0.60
10	414	3.22	0.63	195	3.15	0.66	219	3.27	0.60
11	202	3.35	0.55	88	3.25	0.63	114	3.42	0.47
12	409	3.39	0.57	174	3.29	0.58	235	3.46	0.56

Now that the descriptive statistics for the variables of interest have been reviewed, I will discuss the findings of the analyses by hypothesis/research question.

Hypothesis 1

In adjacent grade pairs (e.g., second and third grade) during second through sixth grade, instrumental help/support from teachers will positively relate to ability beliefs, task values, and academic course grades within the same grade-level in reading and math. These relations will differ by gender, with instrumental help/support relating to these variables more strongly for girls in the domain of math and for boys in the domain of reading.

Several structural equation models (SEMs) were used to address this hypothesis: three SEM for each set of adjacent grades with a large enough sample size across the two grades, including: second through third grades, third through fourth grades, and fifth through sixth grades. For each set of adjacent grades, the three models that were conducted include: (a) instrumental help from teachers predicting math and reading ability beliefs, (b) instrumental help from teachers predicting math and reading task values, and (c) instrumental help from teachers predicting math and reading course grades.

First, a correlation matrix was calculated to explore the relations among the variables of interest for H_1 (see Appendix B). Although correlations were computed for all grade pairings, only the adjacent pairings for grades two and three, grades three and four, and grades five and six will be discussed here because these are the only adjacent grade pairings that had a large enough sample size of students with data at both grade-levels (as noted earlier). The adjacent grade pairing correlations for grade four and five were conducted (as seen in Appendix B), but due to a small sample size, it was not possible to conduct SEMs for this adjacent grade pairing.

Overall, variables in the same academic domain (reading or math) significantly positively correlated with each other both within the same grade and in adjacent grades. For example, math ability beliefs, math task values, and math course grades typically were significantly positively correlated. The same was true for the reading variables. The strength of these significant relations generally ranged from weak positive ($r \geq .20$) to strong positive ($r \leq 0.48$), but sometimes the strength of these relations dipped into the negligible range ($r < 20$) for adjacent grade pairings. Overall, variables in the domain of math related less strongly to each other than variables in the domain of reading.

Reading and math course grades also tended to be positively significantly correlated both within the same grade (strong positive, $r \geq 0.52$) and across adjacent grades (moderate positive, $r \geq 0.38$, to strong positive, $r \leq 0.65$). Reading and math task values also tended to be positively significantly correlated both within the same grade (negligible strength, $r \geq 0.14$, to moderate positive, $r \leq 0.30$) and across adjacent grades (negligible strength, $r \geq 0.13$). However, math ability beliefs and reading ability beliefs typically were not significantly correlated with each other – this occurred both within the same grade and in adjacent grades.

Instrumental help typically correlated significantly positively (although with a negligible strength, $r \geq 0.12$) with math task value within the same grade and in adjacent grades, but in some cases, particularly later grades in the grade two through grade six range, instrumental help also correlated significantly positively (although with a negligible strength, $r \geq 0.11$) with reading task value. However, across this grade range, there was variability at each grade and for each adjacent grade paring in the magnitude and significance level for the correlations among instrumental help and the other variables of interest. Instrumental help was significantly positively correlated in grades three and four (although with a negligible strength, $r = 0.14$), and grades five and six (weak positive, $r = 0.28$), but was not significantly correlated in grades two and 3.

For full details on all correlations from grades two through six, please refer to Appendix B. The details for the SEMs addressing H_1 will be discussed next, starting with the SEMs for instrumental help from teachers and ability beliefs.

Students' perceptions of instrumental help from teachers in relation to their ability beliefs. Three multi-group SEMs were conducted to explore the relations among students' perceptions of instrumental help from teachers and their ability beliefs in reading and math by gender: one for grades two and three, one for grades three and four, and one for grades five and 6. Overall, these three models had adequate model fit, with CFIs ≥ 0.94, RMSEA ≤ 0.03, and SRMR ≤ 0.05 (see Table 17). The fit indices for all of the models for grades two through six will be discussed in more detail later.

The paths (i.e. standardized parameter estimates) for each of the SEMs for ability beliefs are presented in Table 14. Paths that are significant at the $p \leq 0.05$ level are highlighted in grey. For all adjacent grade pairings, students' reading ability beliefs in the prior grade significantly positively predicted their reading ability beliefs in the latter grade for both girls and boys; this was also the case for their math ability beliefs.

Students' perceptions of instrumental help in the prior grade predicted their perceptions of instrumental help in the latter grade only for the grade five to grade six adjacent grade pairing for both girls and boys.

Student's perceptions of teacher instrumental help significantly and positively predicted their math ability beliefs in two adjacent grade pairings: grades three through four and grades five through 6. In the grades three through four adjacent grade pairing, students' perceptions of teacher instrumental help in grade four was significantly positively predictive of math ability beliefs in grade four for girls only, such that a one standard deviation increase in a student's perception of instrumental help from her teacher resulted in a 0.14 standard deviation increase in a her math ability beliefs in fourth grade after controlling for all other variables and pathways in the SEM. Overall, girls' perceptions of teacher instrumental help in fourth grade and their math ability beliefs in third grade predicted 12 percent of the variance in math ability beliefs in fourth grade after controlling for the other variables in the model.

In the grades five through six adjacent grade pairing, students' perceptions of instrumental help in grade five were significantly positively predictive of math ability beliefs in grade five, such that a one standard deviation increase in a student's perception of instrumental help from her teacher resulted in a 0.07 standard deviation increase in a student's math ability beliefs in fifth grade after controlling for all other variables and variables in the SEM for both girls and boys. However, students' perceptions of instrumental help in fifth grade only predicted between 1.3 to 1.6 percent (1.3 percent for girls and 1.6 percent for boys) of the variance in their math ability beliefs in fifth grade after controlling for the other variables in the model.

As predicted in Hypothesis 1, students' perceptions of teacher instrumental help predicted their math ability beliefs within the same grade level in both fourth grade (for girls only) and fifth grade (for both girls and boys). Although the gender differences that were predicted by academic domain generally did not occur here, girls' perceptions of instrumental help from teachers in grade four predicted their math ability beliefs in the same grade, while this same relation was not found for boys – this was the only finding that matched the predictions concerning gender in hypothesis 1.

Table 14

Standardized Parameter Estimates, Standard Error, Z-Score and Significance Levels for Instrumental Help as a Predictor of Reading and Math Ability Beliefs in Grades 2-3, Grades 3-4, and Grades 5-6

Dependent Variable (to)	**Independent Variable (from)**	**Parameter Estimate (Standardized)**	**Standard Error**	**Z-Score**	**P-Value**	
Pathways in Grade 2 and Grade 3 Model						
Reading Ability (Grade 2)	Instrumental Help (Grade 2)	0.00	0.03	0.02	0.98	
Math Ability (Grade 2)	Instrumental Help (Grade 2)	0.02	0.03	0.73	0.47	
Instrumental Help (Grade 3)	Instrumental Help (Grade 2)	0.03	0.06	0.42	0.67	
Reading Ability (Grade 3)	Reading Ability (Grade 2)	0.42	0.06	6.66	0.00	***
Math Ability (Grade 3)	Math Ability (Grade 2)	0.50	0.05	9.18	0.00	***
Reading Ability (Grade 3)	Instrumental Help (Grade 2)	0.01	0.03	0.34	0.73	
Math Ability (Grade 3)	Instrumental Help (Grade 2)	-0.01	0.03	-0.17	0.86	
Reading Ability (Grade 3)	Instrumental Help (Grade 3)	0.00	0.02	0.08	0.94	
Math Ability (Grade 3)	Instrumental Help (Grade 3)	0.04	0.02	1.85	0.06	+
Pathways in Grade 3 and Grade 4 Model						
Reading Ability (Grade 3)	Instrumental Help (Grade 3)	0.00 / 0.01	0.03 / 0.04	0.12 / 0.35	0.90 / 0.73	/
Math Ability (Grade 3)	Instrumental Help (Grade 3)	0.04 / 0.05	0.03 / 0.03	1.09 / 1.54	0.28 / 0.12	/
Instrumental Help (Grade 4)	Instrumental Help (Grade 3)	0.09 / 0.15	0.08 / 0.08	1.12 / 1.84	0.26 / 0.07	/ +
Reading Ability (Grade 4)	Reading Ability (Grade 3)	0.60 / 0.35	0.08 / 0.07	7.18 / 5.28	0.00 / 0.00	*** / ***
Math Ability (Grade 4)	Math Ability (Grade 3)	0.28 / 0.58	0.09 / 0.07	3.09 / 7.76	0.00 / 0.00	*** / ***
Reading Ability (Grade 4)	Instrumental Help (Grade 3)	0.09 / -0.01	0.05 / 0.04	2.00 / -0.23	0.05 / 0.82	+ /
Math Ability (Grade 4)	Instrumental Help (Grade 3)	-0.06 / 0.05	0.05 / 0.04	-1.25 / 1.33	0.21 / 0.18	/
Reading Ability (Grade 4)	Instrumental Help (Grade 4)	0.09 / 0.02	0.05 / 0.05	1.81 / 0.41	0.07 / 0.68	+ /
Math Ability (Grade 4)	Instrumental Help (Grade 4)	0.14 / 0.06	0.05 / 0.04	2.76 / 1.41	0.01 / 0.16	* /

Dependent Variable (to)	Independent Variable (from)	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Pathways in Grade 5 and Grade 6 Model						
Reading Ability (Grade 5)	Instrumental Help (Grade 5)	0.01	0.03	0.29	0.78	
Math Ability (Grade 5)	Instrumental Help (Grade 5)	0.07	0.03	2.44	0.01	*
Instrumental Help (Grade 6)	Instrumental Help (Grade 5)	0.33	0.06	5.59	0.00	***
Reading Ability (Grade 6)	0.62	0.04	15.33	0.00	***	
Math Ability (Grade 6)	0.55	0.05	10.94	0.00	***	
Reading Ability (Grade 6)	0.01	0.03	0.29	0.77		
Math Ability (Grade 6)	0.01	0.03	0.37	0.71		
Reading Ability (Grade 6)	0.03	0.02	1.27	0.20		
Math Ability (Grade 6)	0.03	0.03	1.05	0.29		

+$p \leq 0.1$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

Note: Correlations among latent variables are not shown here for simplicity. For cells where two values are listed and separated by a slash, the value before the slash is for females and the value after the slash is for males. Per the multi-group models that were described in Chapter 3, the following models were determined to be the best models via χ^2 difference tests: Model 2 for grades two and three, Model 1 for grades three and four, and Model 2 for grades five and 6.

Students' perceptions of instrumental help from teachers in relation to their task values. Three multi-group SEMs were conducted to explore the relations among students' perceptions of instrumental help from teachers and their task values in reading and math by gender: one for grades two and three, one for grades three and four, and one for grades five and 6. Overall, these three models had adequate model fit, with CFIs ≥ 0.93, RMSEA ≤ 0.05, and SRMR ≤ 0.08 (see Table 17). The fit indices for all of the models for grades two through six will be discussed in more detail later.

The paths (i.e. standardized parameter estimates) for each of the SEMs for task values are presented in Table 15. Paths that are significant at the $p \leq 0.05$ level are highlighted in grey. For all adjacent grade pairings, students' reading task values in the prior grade significantly positively predicted their reading task values in the latter grade; this was also the case for their math task values. Students' perceptions of teacher instrumental help in the prior grade predicted their perceptions of teacher instrumental help in the latter grade for all adjacent grade pairings except for grades two through 3.

Students' perceptions of instrumental help were predictive of their reading and/or math task values in all three adjacent grade pairings. In the grades two through three adjacent grade pairing, students' perceptions of teacher instrumental help in grade three was significantly positively predictive of their reading task value in grade three for both boys and girls, such that one standard deviation increase in a student's perception of instrumental help from her teacher resulted in a 0.05 standard deviation increase in a student's reading task values in third grade after controlling for all over variables in the SEM. Overall, students' perceptions of teacher instrumental help in third grade and their reading task values in second grade predicted between 12.7 to 13.9 percent (13.9 percent for girls and 12.7 percent for boys) of the variance in their reading task values in third grade after controlling for the other variables in the model.

In the grades three through four adjacent grade pairing, students' perceptions of teacher instrumental help in grade three were still significantly positively predictive of their reading task value in grade three for both girls and boys, which is in agreement with the grades two through three adjacent grade pairing described above, such that one standard deviation increase in a student's perception of instrumental help from her teacher resulted in a 0.05 standard deviation increase in a student's reading task values in third grade after controlling for all other variables in the SEM. Overall, students' perceptions of teacher instrumental help in third grade predicted 0.7 to 1 percent (1 percent for girls and 0.7 percent for boys) of the variance in their reading task value in third grade after controlling for the other variables in the model. Similarly, students' perceptions of teacher instrumental help in grade three were significantly positively predictive of their math task values in grade four for both girls and boys, such that a one standard deviation increase in a student's perception of instrumental help from her teacher resulted in a 0.07 standard deviation increase in a student's math task values in fourth grade after controlling for all other variables pathways in the SEM. Overall, students' perceptions of teacher instrumental help in third grade and their math task value in third grade predicted between 12 to 21.2 percent (12 percent for girls and 21.2 percent for boys) of the variance in their math task values in fourth grade after controlling for the other variables in the model.

In the grades five through six adjacent grade pairing, students' perceptions of teacher instrumental help in grade five were significantly positively predictive of both reading task value and math task value in grade five for both girls and boys, such that a one standard deviation increase in a student's perception of instrumental help from her teacher resulted in a 0.08 standard deviation increase in a student's reading task values and a 0.07 standard deviation increase in a student's math task values in fifth grade after controlling for all over variables in the SEM. Overall, instrumental help in fifth grade predicted 1.9 percent of the variance in reading task value for both girls and boys and 1.7 percent of the variance in math task value for both girls and boys in fifth grade after controlling for the other pathways in the model. Similarly, students' perceptions of instrumental help in grade six were significantly positively predictive of their reading task value in grade six for girls and boys, such that a one standard deviation increase in a student's perception of instrumental help from her teacher resulted in a 0.05 standard deviation increase in a student's reading task values in sixth grade after controlling for all other variables in the SEM. Overall, students' perceptions of instrumental help in sixth grade and their reading task values in fifth grade predicted 22.6 percent of the variance in their reading task value for both girls and boys in sixth grade after controlling for the other variables in the model.

As predicted in Hypothesis 1, students' perceptions of teacher instrumental help were predictive of: (a) their reading task value in the same grade level in third, fifth, and sixth grade, and (b) their math task value in the next grade level in fourth grade (with third grade instrumental help as the predictor), and at the same grade level in fifth grade.

In addition, both girls' and boys' perceptions of teacher instrumental help in third grade predicted their math task value in the next grade (fourth grade), suggesting that students' perceptions of teacher instrumental help in a prior grade did positively impact their math task values in the next grade. However, the magnitude of this effect is small. Even so, it is clear that students' positive perceptions of instrumental help from teachers are significantly positively related to positive reading and math task values within the same grade for both girls and boys. None of the gender by academic domain predictions from the hypothesis were supported here.

Table 15

Standardized Parameter Estimates, Standard Error, Z-Score and Significance Levels for Instrumental Help as a Predictor of Reading and Math Task Values in Grades 2-3, Grades 3-4, and Grades 5-6

Dependent Variable (to)	Independent Variable (from)	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Pathways in Grade 2 and Grade 3 Model						
Reading Value (Grade 2)	Instrumental Help (Grade 2)	0.03	0.03	1.04	0.30	
Math Value (Grade 2)	Instrumental Help (Grade 2)	0.05	0.03	1.56	0.12	
Instrumental Help (Grade 3)	Instrumental Help (Grade 2)	0.02	0.06	0.36	0.72	
Reading Value (Grade 3)	Reading Value (Grade 2)	0.38	0.06	5.97	0.00	***
Math Value (Grade 3)	Math Value (Grade 2)	0.29	0.05	5.41	0.00	***
Reading Value (Grade 3)	Instrumental Help (Grade 2)	0.02	0.03	0.49	0.62	
Math Value (Grade 3)	Instrumental Help (Grade 2)	0.05	0.03	1.90	0.06	+
Reading Value (Grade 3)	Instrumental Help (Grade 3)	0.05	0.02	2.11	0.04	*
Math Value (Grade 3)	Instrumental Help (Grade 3)	0.00	0.02	0.16	0.87	
Pathways in Grade 3 and Grade 4 Model						
Reading Value (Grade 3)	Instrumental Help (Grade 3)	0.05	0.03	2.13	0.03	*
Math Value (Grade 3)	Instrumental Help (Grade 3)	0.00	0.02	0.16	0.87	
Instrumental Help (Grade 4)	Instrumental Help (Grade 3)	0.12	0.06	2.06	0.04	*
Reading Value (Grade 4)	Reading Value (Grade 3)	0.33	0.05	6.15	0.00	***
Math Value (Grade 4)	Math Value (Grade 3)	0.37	0.06	6.13	0.00	***
Reading Value (Grade 4)	Instrumental Help (Grade 3)	0.03	0.03	1.09	0.28	
Math Value (Grade 4)	Instrumental Help (Grade 3)	0.07	0.03	2.20	0.03	*
Reading Value (Grade 4)	Instrumental Help (Grade 4)	-0.03	0.03	-0.85	0.39	
Math Value (Grade 4)	Instrumental Help (Grade 4)	0.01	0.03	0.47	0.64	

Dependent Variable (to)	Independent Variable (from)	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Pathways in Grade 5 and Grade 6 Model						
Reading Value (Grade 5)	Instrumental Help (Grade 5)	0.08	0.03	2.83	0.00	***
Math Value (Grade 5)	Instrumental Help (Grade 5)	0.07	0.03	2.66	0.01	*
Instrumental Help (Grade 6)	Instrumental Help (Grade 5)	0.33	0.06	5.63	0.00	***
Reading Value (Grade 6)	Reading Value (Grade 5)	0.43	0.04	9.49	0.00	***
Math Value (Grade 6)	Math Value (Grade 5)	0.35	0.05	7.19	0.00	***
Reading Value (Grade 6)	Instrumental Help (Grade 5)	0.01	0.03	0.38	0.71	
Math Value (Grade 6)	Instrumental Help (Grade 5)	0.05	0.03	1.72	0.09	+
Reading Value (Grade 6)	Instrumental Help (Grade 6)	0.05	0.02	2.27	0.02	*
Math Value (Grade 6)	Instrumental Help (Grade 6)	0.02	0.02	0.89	0.38	

+$p \leq 0.1$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

Note: Correlations among latent variables are not shown here. For cells where two values are listed and separated by a slash, the value before the slash is for females and the value after the slash is for males. Per the multi-group models that were described in Chapter 3, the following models were determined to be the best models via χ^2 difference tests: Model 2 for grades two and three, Model 2 for grades three and four, and Model 3 for grades five and 6.

Students' perceptions of instrumental help from teachers in relation to their course grades. Three SEMs were conducted to explore the relations among instrumental help from teachers and course grades in reading and math: one for grades two and three, one for grades three and four, and one for grades five and 6. In all models, reading and math grades were loaded onto one "course grade" factor since these grades shared a significant amount of variance. The sample size for students who had reading and math course grades in both second grade and third grade was not high enough to conduct a SEM, so this adjacent grade pairing was not possible for course grades. However, overall, the remaining two models (grades three through four and grades five through 6) had adequate model fit, with CFIs ≥ 0.98, RMSEA ≤ 0.05, and SRMR ≤ 0.07 (see Table 17). The fit indices for all of the models for grades two through six will be discussed in more detail later.

The paths (i.e. standardized parameter estimates) for each of the SEMs for course grades are presented in Table 16. Paths that are significant at the $p \leq 0.05$ level are highlighted in grey. For both adjacent grade pairings, students' reading and math course grades in the prior grade significantly positively predicted their reading and math course grades in the latter grade for both boys and girls. Students' perceptions of teacher instrumental help in the prior grade predicted their perceptions of teacher instrumental help in the latter grade for both adjacent grade pairings as well for both boys and girls. Students' perceptions of teacher instrumental help was not predictive of reading and math course grades in either of the adjacent grade pairings for girls or boys at any grade level.

The Hypothesis 1 prediction that second through sixth grade students' perceptions of teacher instrumental help would be predictors of reading and math course grades was not supported here for any adjacent grade pairing. In addition, none of the gender by academic domain predictions from the hypothesis were supported either.

Table 16

Standardized Parameter Estimates, Standard Error, Z-Score and Significance Levels for Instrumental Help as a Predictor of Reading and Math Course Grades in Grades 2-3, Grades 3-4, and Grades 5-6

Dependent Variable (to)	Independent Variable (from)	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Pathways in Grade 2 and Grade 3 Model						
Reading and Math Course Grades (Grade 2)	Instrumental Help (Grade 2)	-	-	-	-	
Instrumental Help (Grade 3)	Instrumental Help (Grade 2)	-	-	-	-	
Reading and Math Course Grades (Grade 3)	Reading and Math Course Grades (Grade 2)	-	-	-	-	
Reading and Math Course Grades (Grade 3)	Instrumental Help (Grade 2)	-	-	-	-	
Reading and Math Course Grades (Grade 3)	Instrumental Help (Grade 3)	-	-	-	-	
Pathways in Grade 3 and Grade 4 Model						
Reading and Math Course Grades (Grade 3)	Instrumental Help (Grade 3)	-0.01	0.02	-0.73	0.47	
Instrumental Help (Grade 4)	Instrumental Help (Grade 3)	0.13	0.06	2.17	0.03	*
Reading and Math Course Grades (Grade 4)	Reading and Math Course Grades (Grade 3)	0.47	0.07	6.42	0.00	***
Reading and Math Course Grades (Grade 4)	Instrumental Help (Grade 3)	0.00	0.01	0.13	0.90	
Reading and Math Course Grades (Grade 4)	Instrumental Help (Grade 4)	0.01	0.01	0.88	0.38	
Pathways in Grade 5 and Grade 6 Model						
Reading and Math Course Grades (Grade 5)	Instrumental Help (Grade 5)	0.01	0.02	0.79	0.43	
Instrumental Help (Grade 6)	Instrumental Help (Grade 5)	0.33	0.06	5.59	0.00	***
Reading and Math Course Grades (Grade 6)	Reading and Math Course Grades (Grade 5)	0.66	0.05	13.60	0.00	***
Reading and Math Course Grades (Grade 6)	Instrumental Help (Grade 5)	0.00	0.01	0.10	0.92	
Reading and Math Course Grades (Grade 6)	Instrumental Help (Grade 6)	0.01	0.01	0.94	0.35	

+$p \leq 0.1$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

Note: Correlations among latent variables are not shown here.

Note: In grades two and three, the overlap of students who had both reading and math course grades was only one each, so analyses could not be conducted here for reading and math course grades. Per the multi-group models that were described in Chapter 3, the following models were determined to be the best models via χ^2 difference tests: Model 4 for grades three and four and Model 4 for grades five and 6.

Fit of models for hypothesis 1. As mentioned above, the fit indices for all of these models are in Table 17. All of the fit indices suggest that the models have acceptable incremental, parsimonious, and absolute fit, which means that the models are tenable (i.e., possible).

Table 17

Fit Indices for SEM Fit for Instrumental Help as a Predictor of Reading and Math Ability beliefs, Task Values, and Course Grades in Grades 2-3, Grades 3-4, and Grades 5-6

Model	df	$\chi 2$	*p*-value ($\chi 2$)	CFI	RMSEA	Lower C.I. RMSEA	Upper C.I. RMSEA	SRMR
Three Ability Beliefs Models								
Grades 2nd-3rd	17	22.532	0.165	0.943	0.034	0.000	0.067	0.054
Grades 3rd-4th	8	5.857	0.663	1.000	0.000	0.000	0.057	0.029
Grades 5th-6th	17	18.360	0.366	0.996	0.019	0.000	0.066	0.046
Three Task Value Models								
Grades 2nd-3rd	17	12.199	0.788	1.000	0.000	0.000	0.036	0.046
Grades 3rd-4th	17	26.218	0.071	0.931	0.045	0.000	0.077	0.069
Grades 5th-6th	25	36.048	0.071	0.945	0.046	0.000	0.076	0.079
Three Reading and Math Course Grades Models								
Grades 2nd-3rd	-	-	-	-	-	-	-	-
Grades 3rd-4th	23	23.646	0.424	0.998	0.010	0.000	0.051	0.065
Grades 5th-6th	23	37.253	0.031	0.978	0.054	0.017	0.084	0.070

Note: In grades two and three, the overlap of students who had both reading and math course grades was only one each, so analyses could not be conducted here for reading and math course grades. Power for each model is greater than or equal to 0.74.

Summary of results for hypothesis 1. In summary, Across the three adjacent grade pairings from grade two through grade six, girls' and boys' perceptions of their teachers' instrumental help, reading ability beliefs, math ability beliefs, reading task values, math task values, and reading and math course grades in a prior grade were predictive of the same variable in the adjacent latter grade, except students' perceptions of teacher instrumental help from grade two to grade three in the ability belief and task value models and their perceptions of teacher instrumental help from grade three to grade four in the ability belief model. Although girls' and boys' perceptions of teacher instrumental help was not a significant predictor of reading and math course grades for any adjacent grade pairing, girls' and boys' perceptions of teacher instrumental help were predictive of: (a) their math ability beliefs within the same grade level in both fourth grade and fifth grade, (b) their reading task value in the same grade level in third, fifth, and sixth grade, and (c) their math task value in the next grade level in fourth grade (with third grade instrumental help as the predictor), and at the same grade level in fifth grade. Both girls' and boys' perceptions of teacher instrumental help in third grade predicted their math task value in the next grade (fourth grade), suggesting that students' perceptions of teacher instrumental help in a prior grade did positively impact their math task values in the next grade. However, the magnitude of this effect is small. Even so, it is clear that students' positive perceptions of instrumental help from teachers are significantly positively related to positive math ability beliefs and reading and math task values within the same grade for both girls and boys.

Hypothesis 2

In adjacent grade pairs (e.g., seventh and eighth grade) during seventh through 12th grade, students' perceptions of instrumental help/support from teachers will positively relate to their ability beliefs and task values in reading/language arts and math and grade-point average (GPA) within the same grade-level. Change over time in instrumental help/support from teachers and

ability beliefs and task values in reading/language arts and math and GPA will also be associated with each other. All of these relations will differ by gender, with instrumental help/support relating to these variables more strongly for girls in the domain of math and for boys in the domain of reading/language arts.

Both SEMs and SELGC models were used to address H_2. SEMs were conducted to be comparable with the analyses conducted for H_1. However, the sample size and overlap of students across grades is large enough from seventh through 12th grade to use SELGC models to address the hypothesis longitudinally from seventh through 12th grade. Thus, SELGC models were also used to address this hypothesis. While the SEMs allow examination of adjacent grade pairs (e.g., seventh and eighth grade, eighth and ninth grade, and so on), as we did for H_1, SELGC models allow examination of change over time from seventh grade through 12th grade, which provides a more complete picture of how students' perceptions of instrumental support from teachers may relate to ability beliefs, task values, and grades for girls and boys in the domains of math and reading during this grade range. For example, while SEMs among adjacent grade pairs can determine if grade seven variables predict other grade seven variables and grade eight variables, along with whether grade eight variables predict other grade eight variables after controlling for grade 7 variables, and so on, SELGC models can determine whether students who experience an increase (or decrease or no change) in their perceptions of instrumental help from teachers also experience an increase (or decrease or no change) in their ability beliefs in math and reading, task values in math and reading, and/or overall

GPA from seventh grade through 12th grade. Possible explanations for such relations were discussed earlier in Chapter 3.

First, a correlation matrix was calculated to explore the relations among the variables of interest for H_2 (see Appendix C). Although correlations were conducted for all grade pairings, only the adjacent pairings for grades seven and eight, grades eight and nine, grades nine and 10, grades 10 and 11, and grades 11 and 12 will be discussed here.

Overall, variables in the same academic domain (reading or math) significantly strongly positively correlated ($r \geq 0.45$ to $r \leq 0.61$) with each other within the same grade. For example, in the case of the domain of math, math ability beliefs and math task values typically were significantly positively correlated. These significant correlations within the same domain in the same grade also occurred in adjacent grades for the domain of math (ranging in strength from moderate positive, $r \geq 0.30$, to very strong positive, $r \leq 0.87$)—many of the sample sizes for reading ability beliefs and reading task values across adjacent grades were not large enough to obtain correlation coefficients.[17]

Students' GPA also tended to be strongly ($r \geq 0.66$) to very strongly ($r \leq 0.75$) positively significantly correlated across adjacent grades. Students' reading and math task values were not significantly correlated with each other in the same grade, except for a moderately strongly positive significant correlation ($r = 0.36$) in grade seven and a negative significant correlation in grade 12 with a negligible strength ($r = -0.16$). In adjacent grades, students' reading task values in the prior grade were significantly

[17] However, since FIML is used to conduct the SEM and LGC analyses, in some cases, there is enough overlap among reading variables to explore the relation among reading variables in adjacent grades.

correlated with their math task values in the latter grade for both grades seven and grades eight (with moderately positive strength, $r = 0.36$) and grade eight and grade nine (with weak positive strength, $r = 0.23$), strongly significantly negatively correlated ($r = -0.65$) in grade nine and grade 10, and not significantly correlated in grade 10 and grade 11 and grade 11 and grade 12. This same trend was not present for students' prior math task values and their latter reading task values. Students' math ability beliefs and their reading ability beliefs were typically not significantly correlated with each other, except in grade 10 (with negligible strength, $r = -0.14$) and grade 12 (with negligible strength, $r = -0.19$), when these variables were significantly negatively correlated with each other within the same grade-level. In adjacent grades, students' math and reading ability beliefs typically were not significantly correlated with each other, except in grade 11 and grade 12, when students' prior math ability beliefs were significantly weakly negatively correlated ($r = -0.21$) with their latter reading ability beliefs.

Students' perceptions of teacher instrumental help typically correlated significantly positively with their math task value (ranging from negligible strength, $r \geq 0.11$, to weak positive strength, $r \leq 0.29$), math ability beliefs (ranging from negligible strength, $r \geq 0.14$, to weak positive strength, $r \leq 0.28$), and GPA (ranging from negligible strength, $r \geq 0.14$, to moderate positive strength, $r \leq 0.31$) within the same grade and in adjacent grades. However, across this grade range, there was variability at each grade and for each adjacent grade paring in the magnitude and significance level for the correlations among students' perceptions of teacher instrumental help and the reading variables of interest. Students' perceptions of teacher instrumental help were significantly positively correlated (ranging from weak positive strength, $r \geq 0.29$, to strong positive strength, $r \leq 0.43$) in all adjacent grades from grade seven through grade 12.

For full details on all correlations from grades seven through 12, please refer to Appendix C. The details for the SEMs addressing H_2 will be discussed next, followed by SELGC models for H_2.

Hypothesis 2: SEMs for seventh through 12th grade. As mentioned earlier, to be comparable with the analyses for H_1, multi-group SEMs for each pair of adjacent grades with large enough sample sizes were completed for grades seventh through 12th by gender. This includes three SEM for each set of adjacent grades with a large enough sample size across the two grades, including: seventh through eighth grades, eighth through ninth grades, ninth through 10th grades, 10th through 11th grades, and 11th through 12th grades. For each set of adjacent grades, the three models that were conducted include: (a) students' perceptions of instrumental help from teachers predicting their math and reading ability beliefs, (b) students' perceptions of instrumental help from teachers predicting their math and reading task values, and (c) students' perceptions of instrumental help from teachers predicting their GPA.

Students' perceptions of instrumental help from teachers in relation to their ability beliefs. Five multi-group SEMs were conducted to explore the relations among students' perceived instrumental help from teachers and students' ability beliefs in reading and math by gender: one for grades seven and eight, one for grades eight and nine, one for grades nine and 10, one for grades 10 and 11, and one for grades 11 and 12.

Overall, these five models had adequate model fit, with CFIs ≥ 0.97, RMSEA ≤ 0.04, and SRMR ≤ 0.07[18]; however, the SRMR was slightly higher for grades nine and 10 (SRMR = 0.111), grades 10 and 11 (SRMR = 0.121), and grades 11 and 12 (SRMR = 0.126; see Table 21). The fit indices for all of the models for grades seven through 12 will be discussed in more detail later.

The paths (i.e. standardized parameter estimates) for each of the SEMs for students' ability beliefs are presented in Table 18. Paths that are significant at the $p \leq 0.05$ level are highlighted in grey. For all adjacent grade pairings, students' math ability beliefs in the prior grade significantly positively predicted their math ability beliefs in the latter grade for both girls and boys. However, students' reading ability beliefs in the prior grade did not significantly predict their reading ability beliefs in the latter grade for either boys or girls in the grade seven and eight, grade eight and nine, and grade nine and 10 adjacent grade pairing models.[19] The only adjacent grade pairing where students' reading ability beliefs in a prior grade significantly predicted their reading ability beliefs in a latter grade was in the grade 11 and grade 12 adjacent pairing, such that reading ability beliefs in the prior grade significantly positively predicted reading ability beliefs in the latter grade for both girls and boys. Students' perceptions of teacher instrumental help in the prior grade significantly positively predicted their perceptions of teacher instrumental help in the latter grade for all adjacent grade pairings for both girls and boys.

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[18] For adjacent grade pairings for grades seven and eight and grades eight and nine only.

[19] The sample size among students' reading ability beliefs in grade 10 and grade 11 was not large enough for analysis, so the relation among this variable in grades 10 and 11 is unknown in this study.

Girls' and boys' perceptions of teacher instrumental help were predictive of their math ability beliefs in all five adjacent grade pairings and of their reading ability beliefs in two adjacent grade pairings: grades seven and eight and grades 11 and 12. In the grades seven through eight adjacent grade pairing, students' perceptions of teacher instrumental help were significantly positively predictive of their ability beliefs, such that a one standard deviation increase in students' perceptions of instrumental help from teachers in seventh grade resulted in a 0.14 standard deviation increase in their math ability beliefs in seventh grade and a -0.55 standard deviation decrease in a their reading ability beliefs in eighth grade, while a one standard deviation increase in students' perceptions of instrumental help from teachers in eighth grade resulted in a 0.14 standard deviation increase in their math ability beliefs in eighth grade and a 0.17 standard deviation increase in their reading ability beliefs in eighth grade, after controlling for all other variables in the SEM for both girls and boys. Overall, students' perceptions of teacher instrumental help in seventh grade predicted between 3.0 and 3.3 percent (3.0 percent for girls and 3.3 percent for boys) of the variance in their math ability beliefs in seventh grade after controlling for the other variables in the model. In addition, students' perceptions of teacher instrumental help in eighth grade and their math ability beliefs in seventh grade predicted between 44.9 to 57.2 percent (44.9 percent for girls and 57.2 percent for boys) of the variance in their math ability beliefs in eighth grade after controlling for the other variables in the model. Lastly, students' perceptions of teacher instrumental help in seventh and eighth grade predicted between 33.7 and 40.6 percent

(33.7 percent for girls and 40.6 percent for boys) of the variance in their reading ability beliefs in eighth grade after controlling for the other variables in the model.

In the grades eight through nine adjacent grade pairing, in addition to students' perceptions of teacher instrumental help in grade eight predicting their math ability beliefs in grade eight for both girls and boys, as occurred in the grades seven through eight SEM, students' perceptions of teacher instrumental help in grade nine significantly positively predicted their math ability beliefs in grade nine, such that a one standard deviation increase in students' perceptions of instrumental help from teachers resulted in a 0.12 standard deviation increase in their math ability beliefs in ninth grade for both girls and boys after controlling for all other variables in the SEM. In addition, students' perceptions of teacher instrumental help in ninth grade and their math ability beliefs in eighth grade predicted 42 percent of the variance in their math ability beliefs in ninth grade for both girls and boys after controlling for the other variables in the model.

In the grades nine through 10 adjacent grade pairing, students' perceptions of teacher instrumental help in grade nine predicted their math ability beliefs in grade nine for both girls and boys, as occurred in the grades eight through nine SEM. In addition, for girls only (not boys), students' perceptions of teacher instrumental help in grade 10 significantly positively predicted their math ability beliefs in grade 10, such that a one standard deviation increase in a girls' perceptions of instrumental help from teachers resulted in a 0.18 standard deviation increase in their math ability beliefs in 10^{th} grade after controlling for all other variables in the SEM. Overall, this means that girls' perceptions of teacher instrumental help in 10^{th} grade and their math ability beliefs in ninth grade predicted 69.5 percent of the variance in their 10^{th} grade math ability beliefs after controlling for the other variables in the model. No other relations between instrumental help and ability beliefs were significant.

In the grades 10 through 11 adjacent grade pairing, students' perceptions of teacher instrumental help in grade 10 predicted their math ability beliefs in grade 10 for both girls and boys – in the grades nine through 10 SEM, this relation only occurred in grade 10 for girls. The reason that boys' perceptions of teacher instrumental help in 10^{th} grade might not have been predictive of their math ability beliefs in 10^{th} grade could be because their math ability beliefs in ninth grade predicted 67.7 percent of the variance in their math ability beliefs in 10^{th} grade after controlling for all other variables in the model. As is evident in the grades 10 through 11 adjacent grade pairing, both girls' and boys' perceptions of teacher instrumental help in grade 10 is predictive of their math ability beliefs in grade 10, where a one standard deviation increase in students' perceptions of teacher instrumental help results in a 0.14 standard deviation increase in math ability beliefs (predicting 2.3 percent of the variance in their grade 10 math ability beliefs for both boys and girls), when their math ability beliefs in grade nine are not included in the model.

This same phenomenon occurs in the grade 11 through grade 12 adjacent grade pairing. Although students' perceptions of teacher instrumental help in grade 11 did not significantly predict their math ability beliefs in grade 11 in the grades 10 through 11 SEM, in the grades 11 through 12 SEM, students' perceptions of teacher instrumental help in grade 11 significantly predicts their grade 11 math ability beliefs for girls and boys, such that a one standard deviation increase in students' perceptions of teacher instrumental help in grade 11 results in a 0.21 standard deviation increase in their math ability beliefs in grade 11 (predicting 4 percent of the variance in grade 11 math ability beliefs for girls and boys), when their math ability beliefs in grade 10 are not included in the model (which predicts 57.3 percent of the variance in their math ability beliefs in grade 11 in the grades 10 through 11 SEM). It is important to note that the SRMR is a bit high for the grades 10 through 11 SEM and the grades 11 through 12 SEM, so the findings for these models should be interpreted with caution.

For the grade 11 and grade 12 SEM, students' perceptions of teacher instrumental help in grade 11 is also significantly predictive of their grade 11 reading ability beliefs for both girls and boys, such that a one standard deviation increase in their perceptions of teacher instrumental help results in a 0.33 standard deviation increase in their reading ability beliefs in grade 11—students' perceptions of teacher instrumental help predicts 9.9 percent of the variance in both girls' and boys' reading ability beliefs in grade 11 in this model.[20] Students' perceptions of teacher instrumental help in grade 12 also significantly predicted their reading ability beliefs and their math ability beliefs in grade 12 for both girls and boys, such that a one standard deviation increase in students' perceptions of teacher instrumental help in grade 12 resulted in a 0.15 and 0.13 standard deviation increase in their reading and math ability beliefs, respectively. Students' perceptions of teacher instrumental help in grade 12 and their reading ability beliefs in

[20] However, it is notable that the relation between grade 11 instrumental help and grade 11 reading ability beliefs was not able to be calculated in the grade 10 and grade 11 SEM. In addition, since the SRMR was also a bit high for the grade 11 and grade 12 SEM, the findings for this model should be interpreted with caution.

grade 11 predicted 96.7 percent[21] of the variance in their reading ability beliefs in grade 12 for both girls and boys and students' perceptions of teacher instrumental help in grade 12 and their math ability beliefs in grade 11 predicted 73.8 percent of the variance in their math ability beliefs in grade 12 for both girls and boys.

As predicted in Hypothesis 2, across the five adjacent grade pairings from grade seven through grade 12, students' perceptions of teacher instrumental help generally predicted their math ability beliefs within the same grade level and sometimes students' reading ability beliefs in the same grade level. In addition, as predicted, for girls only (not boys), students' perceptions of teacher instrumental help in grade 10 significantly positively predicted their math ability beliefs in grade 10 in the grades nine and 10 model; however, these relations occurred for both girls and boys in grade 10 in the grades 10 and 11 model. It is possible that this difference between the models occurred because boys' math ability beliefs in ninth grade predicted a large amount of the variance in their math ability beliefs in 10th grade after controlling for all other variables in the grade nine through 10 model, which may have masked the influence of boys' perceptions of instrumental help in grade 10 on their math ability beliefs in the same grade. The gender by academic domain predictions from the hypothesis were not supported in the other instrumental help and ability belief analyses.

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[21] Note that one of the goals of SEM analyses is to maximize the amount of variance predicted by the variables in the model (Kline, 2011). For example, error is partitioned out from the relations among factors. Thus, the amount of variance predicted in a SEM will likely be more than the amount of variance predicted in a standard regression analysis, for example. Thus, comparisons should not be made between variance predicted in a SEM as compared to standards for variance predicted in other types of analyses.

Table 18

Standardized Parameter Estimates, Standard Error, Z-Score and Significance Levels for Instrumental Help as a Predictor of Reading and Math Ability Beliefs in Grades 7-8, Grades 8-9, Grades 9-10, Grades 10-11, and Grades 11-12

Dependent Variable (to)	**Independent Variable (from)**	**Parameter Estimate (Standardized)**	**Standard Error**	**Z-Score**	**P-Value**	
Pathways in Grade 7 and Grade 8 Model						
Reading Ability (Grade 7)	Instrumental Help (Grade 7)	0.11	0.06	1.93	0.05	+
Math Ability (Grade 7)	Instrumental Help (Grade 7)	0.14	0.05	2.65	0.01	*
Instrumental Help (Grade 8)	Instrumental Help (Grade 7)	0.35	0.08	4.59	0.00	***
Reading Ability (Grade 8)	Reading Ability (Grade 7)	-0.02	0.01	-1.82	0.07	+
Math Ability (Grade 8)	Math Ability (Grade 7)	0.66	0.05	14.28	0.00	***
Reading Ability (Grade 8)	Instrumental Help (Grade 7)	-0.55	0.14	-3.94	0.00	***
Math Ability (Grade 8)	Instrumental Help (Grade 7)	-0.08	0.05	-1.71	0.09	+
Reading Ability (Grade 8)	Instrumental Help (Grade 8)	0.17	0.08	2.15	0.03	*
Math Ability (Grade 8)	Instrumental Help (Grade 8)	0.14	0.04	3.93	0.00	***
Pathways in Grade 8 and Grade 9 Model						
Reading Ability (Grade 8)	Instrumental Help (Grade 8)	-0.02	0.06	-0.26	0.80	
Math Ability (Grade 8)	Instrumental Help (Grade 8)	0.16	0.04	4.22	0.00	***
Instrumental Help (Grade 9)	Instrumental Help (Grade 8)	0.26	0.06	4.73	0.00	***
Reading Ability (Grade 9)	Reading Ability (Grade 8)	0.00	0.00	0.00	1.00	
Math Ability (Grade 9)	Math Ability (Grade 8)	0.67	0.05	13.30	0.00	***
Reading Ability (Grade 9)	Instrumental Help (Grade 8)	0.00	0.08	-0.02	0.98	
Math Ability (Grade 9)	Instrumental Help (Grade 8)	-0.02	0.04	-0.42	0.67	
Reading Ability (Grade 9)	Instrumental Help (Grade 9)	0.04	0.08	0.58	0.56	
Math Ability (Grade 9)	Instrumental Help (Grade 9)	0.12	0.04	2.74	0.01	*

Dependent Variable (to)	Independent Variable (from)	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Pathways in Grade 9 and Grade 10 Model						
Reading Ability (Grade 9)	Instrumental Help (Grade 9)	0.14 / -0.04	0.10 / 0.10	1.39 / -0.44	0.16 / 0.66	/
Math Ability (Grade 9)	Instrumental Help (Grade 9)	0.13 / 0.29	0.07 / 0.07	1.95 / 4.14	0.05 / 0.00	+ / ***
Instrumental Help (Grade 10)	Instrumental Help (Grade 9)	0.53 / 0.36	0.09 / 0.15	5.54 / 2.47	0.00 / 0.01	*** / *
Reading Ability (Grade 10)	Reading Ability (Grade 9)	0.00 / 0.01	138.66 / 125.58	0.00 / 0.00	1.00 / 1.00	/
Math Ability (Grade 10)	Math Ability (Grade 9)	0.82 / 0.89	0.06 / 0.07	14.50 / 12.75	0.00 / 0.00	*** / ***
Reading Ability (Grade 10)	Instrumental Help (Grade 9)	0.17 / -0.20	19.73 / 5.38	0.01 / -0.04	0.99 / 0.97	/
Math Ability (Grade 10)	Instrumental Help (Grade 9)	-0.01 / -0.06	0.07 / 0.10	-0.14 / -0.58	0.89 / 0.56	/
Reading Ability (Grade 10)	Instrumental Help (Grade 10)	0.02 / 0.11	0.08 / 0.09	0.29 / 1.24	0.77 / 0.21	/
Math Ability (Grade 10)	Instrumental Help (Grade 10)	0.18 / -0.05	0.06 / 0.06	3.08 / -0.85	0.00 / 0.40	*** /
Pathways in Grade 10 and Grade 11 Model						
Reading Ability (Grade 10)	Instrumental Help (Grade 10)	0.07	0.04	1.78	0.08	+
Math Ability (Grade 10)	Instrumental Help (Grade 10)	0.14	0.04	3.26	0.00	***
Instrumental Help (Grade 11)	Instrumental Help (Grade 10)	0.34	0.06	5.60	0.00	***
Reading Ability (Grade 11)	Reading Ability (Grade 10)	1.22	-	-	-	
Math Ability (Grade 11)	Math Ability (Grade 10)	0.84	0.04	18.62	0.00	***
Reading Ability (Grade 11)	Instrumental Help (Grade 10)	-0.10	-	-	-	
Math Ability (Grade 11)	Instrumental Help (Grade 10)	-0.01	0.05	-0.20	0.84	
Reading Ability (Grade 11)	Instrumental Help (Grade 11)	0.32	-	-	-	
Math Ability (Grade 11)	Instrumental Help (Grade 11)	0.08	0.05	1.38	0.17	

Dependent Variable (to)	Independent Variable (from)	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Pathways in Grade 11 and Grade 12 Model						
Reading Ability (Grade 11)	Instrumental Help (Grade 11)	0.33	0.08	4.18	0.00	***
Math Ability (Grade 11)	Instrumental Help (Grade 11)	0.21	0.07	3.21	0.00	***
Instrumental Help (Grade 12)	Instrumental Help (Grade 11)	0.33	0.07	4.58	0.00	***
Reading Ability (Grade 12)	Reading Ability (Grade 11)	0.87	0.05	17.35	0.00	***
Math Ability (Grade 12)	Math Ability (Grade 11)	0.83	0.04	22.34	0.00	***
Reading Ability (Grade 12)	Instrumental Help (Grade 11)	-0.42	-	-	-	
Math Ability (Grade 12)	Instrumental Help (Grade 11)	0.01	0.05	0.32	0.75	
Reading Ability (Grade 12)	Instrumental Help (Grade 12)	0.15	0.07	2.31	0.02	*
Math Ability (Grade 12)	Instrumental Help (Grade 12)	0.13	0.04	3.29	0.00	***

$+p \leq 0.1$, $*p \leq 0.05$, $**p \leq 0.01$, $***p \leq 0.001$

Note: Correlations among latent variables are not shown here. Standard errors, z-scores, and p-values could not be calculated for certain pairings due to little (e.g., less than 15 cases) or no (e.g., zero) overlap where participants had data for both the independent and dependent variables at the specified grade level. These cells are blank in the table above. For cells where two values are listed and separated by a slash, the value before the slash is for females and the value after the slash is for males. Note that for Grade 10 and 11 and Grade 11 and 12, these models could not be split by gender. Per the multi-group models that were described in Chapter 3, the following models were determined to be the best models via χ^2 difference tests: Model 2 for grades seven and eight, Model 3 for grades eight and nine, Model 1 for grades nine and 10, not multi-group for grades 10 and 11, and not multi-group for grades 11 and 12.

Students' perceptions of instrumental help from teachers in relation to their task values. Five SEMs were conducted to explore the predictive relations of students' perceptions of instrumental help from teachers and their task values in reading and math by gender: one for grades seven and eight, one for grades eight and nine, one for grades nine and 10, one for grades 10 and 11, and one for grades 11 and 12. Overall, these five models had adequate model fit, with CFIs ≥ 0.94,[22] RMSEA ≤ 0.06, and SRMR ≤ 0.09; however, the SRMR was slightly higher for grades seven and eight (SRMR = 0.122), grades nine and 10 (SRMR = 0.135), and grades 10 and 11 (SRMR = 0.123; see Table 21). The fit indices for all of the models for grades seven through 12 will be discussed in more detail later.

The paths (i.e. standardized parameter estimates) for each of the SEMs for students' task values are presented in Table 19. Paths that are significant at the $p \leq 0.05$ level are highlighted in grey. For all adjacent grade pairings, students' math task values in the prior grade significantly positively predicted their math task values in the latter grade. For students' reading task values, this same significant relation only occurred in the grades 10 through 11 adjacent grade pairing, such that students' reading task values in grade 10 significantly negatively predicted their reading task values in grade 11. Students' perceptions of teacher instrumental help in the prior grade significantly positively predicted students' perceptions of teacher instrumental help in the latter grade for all adjacent grade pairings.

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[22] Except for the grades seven and eight adjacent grade pairing, which only has a CFI of 0. 87. This CFI is a little lower than the lowest acceptable range of 0.90 for CFI, which suggests that this model should be interpreted with caution.

Students' perceptions of teacher instrumental help predicted their math task value in all five adjacent grade pairings and of their reading task value in three adjacent grade pairings: grades seven and eight, grade nine and 10, and grades 10 and 11. In the grades seven through eight adjacent grade pairing, students' perceptions of teacher instrumental help significantly positively predicts their task values for both girls and boys, such that a one standard deviation increase in a student's perception of instrumental help from her teacher in seventh grade resulted in a 0.17 standard deviation increase in a students' reading task values in seventh grade, a 0.10 standard deviation increase in a students' math task values in seventh grade, and a 0.52 decrease in students' reading task values in eighth grade, after controlling for all other variables in the SEM. Also in the grade seven through eight adjacent grade pairing, a one standard deviation increase in students' perception of instrumental help from teachers in eighth grade resulted in a 0.27 standard deviation increase in their reading task values in eighth grade for both girls and boys and a 0.19 standard deviation increase in their math task values in eighth grade for both girls and boys, after controlling for all other variables in the SEM. Overall, students' perceptions of teacher instrumental help in seventh grade predicted 4.6 percent of the variance in reading task value in seventh grade for both girls and boys, 34.8 percent of the variance in their math task value in eighth grade when including the influences of their math task value in seventh grade and students' perceptions of teacher instrumental help in eighth grade for both girls and boys, and 42.4 percent of the variance in their reading task values in eighth grade for both girls and boys when including the influence of students' perceptions of teacher instrumental help in seventh and eighth grade after controlling for the other variables in the model.

In the grades eight through nine adjacent grade pairing, only students' perceptions of teacher instrumental help in grade eight predicts their math task values in grade eight for both girls and boys, as present in the grades seven through eight SEM. No other relations between students' perceptions of teacher instrumental help and their task values occurred.

In the grades nine through 10 adjacent grade pairing, students' perceptions of teacher instrumental help in grade nine significantly positively predicts their math task values in grade nine, even though this relation was not significant in the grade eight through nine SEM. The reason that students' perceptions of teacher instrumental help in ninth grade might not have predicted math task values in ninth grade in the grade nine through 10 SEM could be because students' math task values in eighth grade in the grade eight through nine SEM already predicted 28.6 percent of the variance for both girls' and boys' math task values in ninth grade after controlling for all other variables in the model. In addition, in the grades nine through 10 SEM, a one standard deviation increase in 10th grade students' perceptions of teacher instrumental help resulted in a 0.14 standard deviation increase (5.9 percent of the variance) in their 10th grade reading task values for both girls and boys after controlling for other variables in the model.

In the grade 10 through grade 11 SEM, all pathways in the model are significant except for the pathway from students' perceptions of teacher instrumental help in grade 10 to their math task value in grade 11 (see Table 19). For pathways from students' perceptions of teacher instrumental help to their task values, all pathways were significantly positive, except for the pathway from students' perceptions of teacher instrumental help in grade 11 to their reading task value in grade 11, which was negative (-0.34) for both girls and boys. For the grade 10 variables, the variance predicted was 1.6 percent for students' math task value and 2.5 percent for their reading task value for both girls and boys. For the grade 11 variables, the variance predicted was 52.7 percent for students' math task values and 48.4 for their reading task values for both girls and boys.

For the grade 11 and grade 12 SEM, only students' perceptions of teacher instrumental help in grade 11 predicted their math task values in grade 11 for both girls and boys, as present in the grades 10 through 11 SEM. No other relations between students' perceptions of teacher instrumental help and their task values were present.

As predicted in Hypothesis 2, across the five adjacent grade pairings from grade seven through grade 12, students' perceptions of teacher instrumental help generally predicted students' math task value within the same grade level, sometimes predicted students' math task value in the next grade level, and sometimes predicted students' reading task value in the same or next grade level. None of the gender by academic domain predictions from the hypothesis were supported in the other instrumental help and task value analyses.

Table 19

Standardized Parameter Estimates, Standard Error, Z-Score and Significance Levels for Instrumental Help as a Predictor of Reading and Math Task Values in Grades 7-8, Grades 8-9, Grades 9-10, Grades 10-11, and Grades 11-12

Dependent Variable (to)	**Independent Variable (from**	**Parameter Estimate (Standardized)**	**Standard Error**	**Z-Score**	**P-Value**	
Pathways in Grade 7 and Grade 8 Model						
Reading Value (Grade 7)	Instrumental Help (Grade 7)	0.17	0.05	3.06	0.00	***
Math Value (Grade 7)	Instrumental Help (Grade 7)	0.10	0.05	2.05	0.04	*
Instrumental Help (Grade 8)	Instrumental Help (Grade 7)	0.35	0.08	4.61	0.00	***
Reading Value (Grade 8)	Reading Value (Grade 7)	0.17	0.40	0.42	0.67	
Math Value (Grade 8)	Math Value (Grade 7)	0.57	0.06	9.11	0.00	***
Reading Value (Grade 8)	Instrumental Help (Grade 7)	-0.52	0.16	-3.24	0.00	***
Math Value (Grade 8)	Instrumental Help (Grade 7)	-0.09	0.05	-1.76	0.08	+
Reading Value (Grade 8)	Instrumental Help (Grade 8)	0.27	0.08	3.59	0.00	***
Math Value (Grade 8)	Instrumental Help (Grade 8)	0.19	0.04	4.87	0.00	***
Pathways in Grade 8 and Grade 9 Model						
Reading Value (Grade 8)	Instrumental Help (Grade 8)	0.10	0.05	1.93	0.05	+
Math Value (Grade 8)	Instrumental Help (Grade 8)	0.19	0.04	5.05	0.00	***
Instrumental Help (Grade 9)	Instrumental Help (Grade 8)	0.26	0.06	4.70	0.00	***
Reading Value (Grade 9)	Reading Value (Grade 8)	-0.01	34.10	0.00	1.00	
Math Value (Grade 9)	Math Value (Grade 8)	0.55	0.06	9.51	0.00	***
Reading Value (Grade 9)	Instrumental Help (Grade 8)	0.04	3.48	0.01	0.99	
Math Value (Grade 9)	Instrumental Help (Grade 8)	0.01	0.04	0.17	0.86	
Reading Value (Grade 9)	Instrumental Help (Grade 9)	0.05	0.07	0.75	0.45	
Math Value (Grade 9)	Instrumental Help (Grade 9)	0.05	0.05	1.00	0.32	

Dependent Variable (to)	Independent Variable (from	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Pathways in Grade 9 and Grade 10 Model						
Reading Value (Grade 9)	Instrumental Help (Grade 9)	0.07	0.06	1.08	0.28	
Math Value (Grade 9)	Instrumental Help (Grade 9)	0.13	0.05	2.64	0.01	*
Instrumental Help (Grade 10)	Instrumental Help (Grade 9)	0.47	0.08	6.04	0.00	***
Reading Value (Grade 10)	Reading Value (Grade 9)	-0.18	0.95	-0.19	0.85	
Math Value (Grade 10)	Math Value (Grade 9)	0.67	0.06	10.99	0.00	***
Reading Value (Grade 10)	Instrumental Help (Grade 9)	0.00	0.12	0.04	0.97	
Math Value (Grade 10)	Instrumental Help (Grade 9)	0.06	0.07	0.83	0.41	
Reading Value (Grade 10)	Instrumental Help (Grade 10)	0.14	0.06	2.42	0.02	*
Math Value (Grade 10)	Instrumental Help (Grade 10)	0.04	0.05	0.85	0.40	
Pathways in Grade 10 and Grade 11 Model						
Reading Value (Grade 10)	Instrumental Help (Grade 10)	0.13	0.04	3.30	0.00	***
Math Value (Grade 10)	Instrumental Help (Grade 10)	0.11	0.04	2.66	0.01	*
Instrumental Help (Grade 11)	Instrumental Help (Grade 10)	0.34	0.06	5.74	0.00	***
Reading Value (Grade 11)	Reading Value (Grade 10)	-0.35	0.07	-4.82	0.00	***
Math Value (Grade 11)	Math Value (Grade 10)	0.78	0.05	15.80	0.00	***
Reading Value (Grade 11)	Instrumental Help (Grade 10)	0.63	0.09	6.85	0.00	***
Math Value (Grade 11)	Instrumental Help (Grade 10)	0.02	0.05	0.37	0.71	
Reading Value (Grade 11)	Instrumental Help (Grade 11)	-0.34	0.10	-3.29	0.00	***
Math Value (Grade 11)	Instrumental Help (Grade 11)	0.14	0.05	2.52	0.01	*

Dependent Variable (to)	Independent Variable (from	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Pathways in Grade 11 and Grade 12 Model						
Reading Value (Grade 11)	Instrumental Help (Grade 11)	0.00	0.16	0.01	0.99	
Math Value (Grade 11)	Instrumental Help (Grade 11)	0.25	0.07	3.90	0.00	***
Instrumental Help (Grade 12)	Instrumental Help (Grade 11)	0.32	0.07	4.39	0.00	***
Reading Value (Grade 12)	Reading Value (Grade 11)	-0.27	0.36	-0.74	0.46	
Math Value (Grade 12)	Math Value (Grade 11)	0.72	0.05	13.95	0.00	***
Reading Value (Grade 12)	Instrumental Help (Grade 11)	0.06	0.09	0.71	0.48	
Math Value (Grade 12)	Instrumental Help (Grade 11)	0.08	0.06	1.26	0.21	
Reading Value (Grade 12)	Instrumental Help (Grade 12)	0.01	0.05	0.22	0.82	
Math Value (Grade 12)	Instrumental Help (Grade 12)	0.04	0.05	0.83	0.41	

+$p \leq 0.1$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

Note: Correlations among latent variables are not shown here. For cells where two values are listed and separated by a slash, the value before the slash is for females and the value after the slash is for males. Note that for Grade 10 and 11, this model could not be split by gender. The chi-square difference test showed that the model for Grade 11 and 12 was best when not separated by gender, so this model is presented here. Per the multi-group models that were described in Chapter 3, the following models were determined to be the best models via χ^2 difference tests: Model 3 for grades seven and eight, Model 3 for grades eight and nine, Model 3 for grades nine and 10, not multi-group for grades 10 and 11, and Model 2 for grades 11 and 12.

Students' perceptions of instrumental help from teachers in relation to their GPA. Five SEMs were conducted to explore the relations among students' perceptions of instrumental help from teachers and GPA by gender: one for grades seven and eight, one for grades eight and nine, one for grades nine and 10, one for grades 10 and 11, and one for grades 11 and 12. Overall, these five models had adequate model fit, with CFIs $\geq$ 0.97, RMSEA $\leq$ 0.05, and SRMR $\leq$ 0.08; however, the CFI was a little low (CFI = 0.933) and the RMSEA was high for grades eight and nine (RMSEA = 0.100; see Table 21), and the SRMR was a little high for grades 11 and 12 (SRMR = 0.103). The fit indices for all of the models for grades seven through 12 will be discussed in more detail later.

The paths (i.e. standardized parameter estimates) for each of the SEMs for students' GPA are presented in Table 20. Paths that are significant at the $p \leq 0.05$ level are highlighted in grey. For all adjacent grade pairings, students' GPA in the prior grade significantly positively predicted students' GPA in the latter grade for both girls and boys. Students' perceptions of teacher instrumental help in the prior grade predicted their perceptions of teacher instrumental help in the latter grade for all adjacent grade pairings for both girls and boys, except in the grade 10 and 11 adjacent grade pairing, when this relation is only marginally significant ($p \leq 0.10$) for boys but is significant at the $p \leq 0.05$ level for girls.

Students' perceptions of teacher instrumental help significantly positively predicted GPA within the same grade-level in all five adjacent grade pairings. This includes students' perceptions of teacher instrumental help and GPA for both girls and boys in seventh grade in the grades seven through eight adjacent grade pairing, students' perceptions of teacher instrumental help and GPA for both girls and boys in eighth grade and ninth grade in the grades eight through nine adjacent grade pairing, students' perceptions of teacher instrumental help and GPA for both girls and boys in ninth grade and only for girls in 10^{th} grade in the grades nine through 10 adjacent grade pairing, students' perceptions of teacher instrumental help and GPA for only girls in 10^{th} grade and only boys in 11^{th} grade in the grades 10 through 11 adjacent grade pairing, and students' perceptions of teacher instrumental help and GPA for both girls and boys in the grades 11 through 12 adjacent grade pairing. The standardized parameter estimates for these paths ranged from 0.04 standard deviations to 0.17 standard deviations in GPA for every one standard deviation increase in students' perceptions of teacher instrumental help. In addition, the amount of variance predicted in GPA by students' perceptions of teacher instrumental help and any other variables in the model (e.g., prior GPA) ranged from 1.1 percent to 72.5 percent.

As predicted in Hypothesis 2, across the five adjacent grade pairings from grade seven through grade 12, students' perceptions of teacher instrumental help generally predicted students' GPA at the same grade level. Gender differences were also present, with only girls' perceptions of instrumental help from teachers predicting GPA in grade 10 (in both the grades nine and 10 and grades 10 and 11 models) and with only boys' perceptions of instrumental help from teachers predicting GPA in grade 11 in the grades 10 and 11 model. However, students' perceptions of instrumental help from teachers predicted GPA in grade 11 for both boys and girls' in the grades 11 and 12 model. As noted in an earlier model, it is possible that this difference between the models occurred because boys' GPA in 10^{th} grade predicted a large amount of the variance in their GPA in 11^{th} grade after controlling for all other variables in the grade 10 through 11 model, which may have masked the influence of boys' perceptions of instrumental help in grade 11 on their math ability beliefs in the same grade. The gender predictions from the hypothesis were not supported in the other instrumental help and GPA analyses.

Table 20

Standardized Parameter Estimates, Standard Error, Z-Score and Significance Levels for Instrumental Help as a Predictor of GPA in Grades 7-8, Grades 8-9, Grades 9-10, Grades 10-11, and Grades 11-12

Dependent Variable (to)	Independent Variable (from)	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Pathways from Grade 7 and Grade 8 Model						
GPA (Grade 7)	Instrumental Help (Grade 7)	0.07	0.03	2.53	0.01	*
Instrumental Help (Grade 8)	Instrumental Help (Grade 7)	0.37	0.07	5.06	0.00	***
GPA (Grade 8)	GPA (Grade 7)	0.70	0.05	13.35	0.00	***
GPA (Grade 8)	Instrumental Help (Grade 7)	0.01	0.03	0.25	0.80	
GPA (Grade 8)	Instrumental Help (Grade 8)	0.03	0.02	1.42	0.16	
Pathways from Grade 8 and Grade 9 Model						
GPA (Grade 8)	Instrumental Help (Grade 8)	0.06	0.02	2.86	0.00	***
Instrumental Help (Grade 9)	Instrumental Help (Grade 8)	0.27	0.05	4.85	0.00	***
GPA (Grade 9)	GPA (Grade 8)	0.83	0.05	15.30	0.00	***
GPA (Grade 9)	Instrumental Help (Grade 8)	0.01	0.02	0.32	0.75	
GPA (Grade 9)	Instrumental Help (Grade 9)	0.04	0.02	2.04	0.04	*
Pathways from Grade 9 and Grade 10 Model						
GPA (Grade 9)	Instrumental Help (Grade 9)	0.17 / 0.13	0.03 / 0.04	4.89 / 3.05	0.00 / 0.00	*** / ***
Instrumental Help (Grade 10)	Instrumental Help (Grade 9)	0.55 / 0.40	0.09 / 0.13	6.25 / 3.04	0.00 / 0.00	*** / ***
GPA (Grade 10)	GPA (Grade 9)	0.64 / 0.79	0.08 / 0.06	8.42 / 12.94	0.00 / 0.00	*** / ***
GPA (Grade 10)	Instrumental Help (Grade 9)	0.02 / 0.01	0.04 / 0.05	0.49 / 0.27	0.63 / 0.79	/
GPA (Grade 10)	Instrumental Help (Grade 10)	0.08 / -0.01	0.03 / 0.03	2.42 / -0.19	0.02 / 0.85	* /

Dependent Variable (to)	Independent Variable (from)	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value
Pathways from Grade 10 and Grade 11 Model					
GPA (Grade 10)	Instrumental Help (Grade 10)	0.17 / 0.05	0.03 / 0.03	6.70 / 1.47	0.00 / 0.14 *** /
Instrumental Help (Grade 11)	Instrumental Help (Grade 10)	0.46 / 0.18	0.08 / 0.10	5.95 / 1.84	0.00 / 0.07 *** / +
GPA (Grade 11)	GPA (Grade 10)	0.65 / 0.63	0.07 / 0.07	9.91 / 8.54	0.00 / 0.00 *** / ***
GPA (Grade 11)	Instrumental Help (Grade 10)	-0.03 / -0.03	0.03 / 0.04	-1.12 / -0.80	0.26 / 0.42 /
GPA (Grade 11)	Instrumental Help (Grade 11)	0.04 / 0.10	0.03 / 0.04	1.38 / 2.45	0.17 / 0.01 / *
Pathways from Grade 11 and Grade 12 Model					
GPA (Grade 11)	Instrumental Help (Grade 11)	0.10	0.03	3.51	0.00 ***
Instrumental Help (Grade 12)	Instrumental Help (Grade 11)	0.34	0.07	4.85	0.00 ***
GPA (Grade 12)	GPA (Grade 11)	0.77	0.05	14.68	0.00 ***
GPA (Grade 12)	Instrumental Help (Grade 11)	-0.02	0.03	-0.86	0.39
GPA (Grade 12)	Instrumental Help (Grade 12)	0.03	0.02	1.23	0.22

+$p \leq 0.1$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

Note: Correlations among latent variables are not shown here. For cells where two values are listed and separated by a slash, the value before the slash is for females and the value after the slash is for males. Per the multi-group models that were described in Chapter 3, the following models were determined to be the best models via χ^2 difference tests: Model 2 for grades seven and eight, Model 2 for grades eight and nine, Model 1 for grades nine and 10, not Model 1 for grades 10 and 11, and Model 3 for grades 11 and 12.

Fit of SEMs for hypothesis 2. As mentioned above, the fit indices for all of these models are in Table 21. All of the fit indices suggest that the models, except for the grades seventh through eighth task values model, have adequate fit for at least two of the three classes of fit (incremental, parsimonious, and absolute fit), which means that the models are tenable (i.e., possible).

Table 21

Fit Indices for SEM Fit for Instrumental Help as a Predictor of Reading and Math Ability beliefs, Task Values, and GPA in Grades 7-8, Grades 8-9, Grades 9-10, Grades 10-11, and Grades 11-12

Model	**df**	**$\chi2$**	***p*-value ($\chi2$)**	**CFI**	**RMSEA**	**Lower C.I. RMSEA**	**Upper C.I. RMSEA**	**SRMR**
Five Ability Beliefs Models								
Grades 7th-8th	19	8.826	0.976	1.000	0.000	0.000	0.000	0.057
Grades 8th-9th	26	30.901	0.232	0.973	0.031	0.000	0.067	0.073
Grades 9th-10th	10	15.092	0.129	0.974	0.041	0.000	0.080	0.111
Grades 10th-11th	4	0.000	1.000	1.000	0.000	0.000	0.000	0.121
Grades 11th-12th	4	0.000	1.000	1.000	0.000	0.000	0.000	0.126
Five Task Value Models								
Grades 7th-8th	25	44.629	0.009	0.869	0.063	0.031	0.092	0.122
Grades 8th-9th	26	34.307	0.127	0.935	0.040	0.000	0.073	0.094
Grades 9th-10th	25	25.217	0.450	0.998	0.005	0.000	0.046	0.135
Grades 10th-11th	5	0.000	1.000	1.000	0.000	0.000	0.000	0.123
Grades 11th-12th	4	1.403	0.844	1.000	0.000	0.000	0.038	0.084
Five GPA Models								
Grades 7th-8th	7	4.374	0.736	1.000	0.000	0.000	0.063	0.042
Grades 8th-9th	7	20.732	0.004	0.933	0.100	0.052	0.151	0.079
Grades 9th-10th	2	3.723	0.155	0.990	0.053	0.000	0.137	0.032
Grades 10th-11th	2	0.076	0.962	1.000	0.000	0.000	0.000	0.006
Grades 11th-12th	11	14.049	0.230	0.973	0.033	0.000	0.079	0.103

Note. Power for each model is greater than or equal to 0.77, except for the following four models: task values grades 7-8 (0.45), GPA grades 8-9 (0.26), 9-10 (0.22), and 10-11 (0.48). Note that power is calculated from the RMSEA and df, so RMSEA values closer to 0.06 and lower df values result in lower power calculations. Note that a prior power analyses suggested that the sample sizes for these models were all appropriate.

Summary of SEM results for hypothesis 2. In summary, across the five adjacent grade pairings from grade seven through grade 12, students' perceptions of teacher instrumental help, students' reading ability beliefs, students' math ability beliefs, students' reading task values, students' math task values, and students' GPA in a prior grade generally predicted the same variable in the adjacent latter grade. Students' perceptions of teacher instrumental help generally predicted: (a) students' math ability beliefs within the same grade level and sometimes students' reading ability beliefs in the same grade level, (b) students' math task value within the same grade level, sometimes students' math task value in the next grade level, and sometimes students' reading task value in the same or next grade level, and (c) students' GPA at the same grade level.

Hypothesis 2: SELGCs for seventh through 12th grade. A multi-group SELGC was also used to address this hypothesis in order to explore the relations among students' perceptions of teacher instrumental help longitudinally from seventh through 12^{th} grade by gender, as opposed to only looking at two grade-levels at a time, as was done in the SEMs. In order to conduct this analysis, multi-group LGC models for each variable of interest were conducted first, followed by several smaller multi-group SELGC models before conducting the final full multi-group SELGC model. Thus, these SELGC models are presented first, and then the final full SELGC model that was built from these SELGC models is presented next.

The LGC models for the constructs of interest mostly[23] had adequate model fit, with at least two of the three fit indices being within the acceptable limits of CFI ≥ 0.90,[24] RMSEA ≤ 0.06, and SRMR ≤ 0.09 (see Table 26), indicating tenable model fit. Thus, I continued with these LGC models to create three SELGC models with students' perceptions of teacher instrumental help predicting their ability beliefs, task values, and GPA by gender.

Students' perceptions of instrumental help in relation to their ability beliefs. The multi-group SELGC model to explore the relations among students' perceived instrumental help from teachers and students' ability beliefs in seventh from 12th grade (excluding grade 11 due to a low sample size overlap) for both girls and boys had adequate model fit, with CFI ≥ 0.95, RMSEA ≤ 0.06, and SRMR slightly above the ≤ 0.09 criteria (SRMR = 0.117; see Table 26). The fit indices for all of the models for grades seven through 12 will be discussed in more detail later.

The latent paths (i.e. standardized parameter estimates), latent correlations, and values for latent factors are presented in Table 22. Notably, only students' perceptions of teacher instrumental help had a significant slope for both girls and boys,[25] meaning that students' perceptions of instrumental help increased by 0.07 standard deviations for girls

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[23] The model fit for the GPA LGC model was slightly beyond these limits, but still close enough to justifiably use.
[24] As discussed in Chapter 3, a CFI of 0.90 can still be considered an indicator of tenable model fit.
[25] As a reminder, note that although the general pattern of the means for math and reading ability beliefs follows the patterns found in Jacobs et al. (2002), which also used the CAB study data, from grades one through 12, the statistically significant declines that Jacobs et al. found from grades one through 12 did not occur here. This is likely due to this model in the current study only mapping change from grade seven through grade 12. As noted earlier in this chapter, the biggest drop in mean reading and math ability belief scores happened from grade six to grade seven, so this model is not taking that drop into account here.

and 0.09 standard deviations for boys from seventh grade through 12th grade. Also notable, the intercept and slope for each construct, respectively, were unrelated, meaning that the starting value for each construct in seventh grade was not related to the slope, or rate of change, in the construct over time.

Similar to the SEM models that were conducted, the intercept of students' perceptions of teacher instrumental help was significantly predictive of the intercept for both students' reading ability and math ability beliefs for both girls and boys. Specifically, this means that students' perceptions of teacher instrumental help in seventh grade are predictive of their reading and math ability beliefs in seventh grade. However, there is no evidence of students' perceptions of teacher instrumental help in a prior grade predicting their future ability beliefs in this model. The gender by academic domain prediction in the hypothesis is also not supported in this model.

Table 22

Standardized Parameter Estimates, Standard Error, Z-Score, and Significance Levels for the Intercept and Slope of Instrumental Help as a Predictor of the Intercept and Slope of Reading and Math Ability Beliefs from Grade Seven through Grade 12

		Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Predicted Latent Pathways in Model						
Dependent Variable (to)	**Independent Variable (from)**					
Reading Ability (Intercept)	Instrumental Help (Intercept)	0.24	0.10	2.31	0.02	*
Reading Ability (Slope)	Instrumental Help (Intercept)	-0.02	0.03	-0.96	0.34	
Reading Ability (Slope)	Instrumental Help (Slope)	0.25	0.26	0.65	0.52	
Math Ability (Intercept)	Instrumental Help (Intercept)	0.37	0.09	4.23	0.00	***
Math Ability (Slope)	Instrumental Help (Intercept)	0.00	0.04	-0.25	0.80	
Math Ability (Slope)	Instrumental Help (Slope)	0.95	0.73	1.24	0.21	
Correlations Among Latent Intercepts and Slopes for each Construct in Model						
First Latent Factor	**Second Latent Factor**					
Instrumental Help (Intercept)	Instrumental Help (Slope)	-0.03	0.04	-0.80	0.42	
Reading Ability (Intercept)	Reading Ability (Slope)	-0.06	0.04	-1.66	0.10	
Math Ability (Intercept)	Math Ability (Slope)	-0.01	0.02	-0.68	0.50	

	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value
Values for Latent Factors in Model				
Instrumental Help (Intercept)	5.25 / 5.19	0.09 / 0.10	59.44 / 50.35	0.00 / 0.00 *** / ***
Instrumental Help (Slope)	0.07 / 0.09	0.02 / 0.03	3.25 / 3.14	0.00 / 0.00 *** / ***
Reading Ability (Intercept)	3.71 / 3.43	0.54 / 0.53	6.87 / 6.46	0.00 / 0.00 *** / ***
Reading Ability (Slope)	0.17 / 0.15	0.13 / 0.13	1.23 / 1.12	0.22 / 0.26 /
Math Ability (Intercept)	2.92 / 3.03	0.50 / 0.49	5.89 / 6.19	0.00 / 0.00 *** / ***
Math Ability (Slope)	-0.13 / -0.08	0.20 / 0.20	-0.64 / -0.43	0.52 / 0.60 /

+$p \leq 0.1$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

NOTE. This model includes Grades 7-10 and Grade 12 - Grade 11 is excluded. For cells where two values are listed and separated by a slash, the value before the slash is for females and the value after the slash is for males. Per the multi-group models that were described in Chapter 3, the following model was determined to be the best model via χ^2 difference tests: Model 3.

Students' perceptions of instrumental help in relation to their task values. The multi-group SELGC model to explore the relations among students' perceptions of instrumental help from teachers and their task values from seventh from 12th grade (excluding grade 11 due to a low sample size overlap) for both girls and boys had adequate model fit on at least two of the three model fit indices, with CFI ≥ 0.90, RMSEA ≤ 0.06, and SRMR ≤ 0.09; however, the SRMR was a bit high (0.13, see Table 26). The fit indices for all of the models for grades seven through 12 will be discussed in more detail later.

The latent paths (i.e. standardized parameter estimates), latent correlations, and values for latent factors are presented in Table 23. Students' perceptions of teacher instrumental help and students' reading task value both had significantly positive slopes for both girls and boys, meaning that students' perceptions of instrumental help from teachers increased by 0.08 standard deviations for girls and 0.10 standard deviations for boys and students' reading task value increased[26] by 0.32 standard deviations for girls and 0.27 standard deviations for boys from seventh grade through 12th grade. Notably, the intercept and slope for students' perceptions of teacher instrumental help and students' math task value, respectively, were significantly negatively correlated for boys

[26] As a reminder, note that although the general pattern of the means for math (i.e., declines) and reading (i.e., curvilinear trajectory declining through elementary school and then dipping back up at the end of high school) task values follows the patterns found in Jacobs et al. (2002), which also used the CAB study data, from grades one through 12, the statistically significant declines that Jacobs et al. (2002) found from grades one through 12 did not occur here. This is likely due to this model in the current study only mapping change from grade seven through grade 12. As noted earlier in this chapter, the biggest drop in mean math task value scores happened from grade six to grade seven, so this model is not taking that drop into account here.

and girls, meaning that the starting value for these two constructs in seventh grade were negatively correlated with the slope, or rate of change, in the construct over time.

Similar to the SEM models that were conducted, the intercept of students' perceptions of teacher instrumental help significantly positively predicted the intercept for both students' reading task value and math task value. Specifically, this means that students' perceptions of teacher instrumental help in seventh grade predict students' reading and math task values in seventh grade. However, there is no strong[27] evidence of instrumental help in a prior grade predicting future task values in this model. The gender by academic domain prediction in the hypothesis is also not supported in this model.

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[27] The slope of students' perceptions of teacher instrumental help marginally significantly predicts the slope of students' math task value. However, this significance level is outside of the 0.05 *p*-value threshold, so it will not be considered a significant finding here.

Table 23

Standardized Parameter Estimates, Standard Error, Z-Score, and Significance Levels for the Intercept and Slope of Instrumental Help as a Predictor of the Intercept and Slope of Reading and Math Task Values from Grade Seven through Grade 12

		Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Predicted Latent Pathways in Model						
Dependent Variable (to)	**Independent Variable (from)**					
Reading Value (Intercept)	Instrumental Help (Intercept)	0.29	0.09	3.33	0.00	***
Reading Value (Slope)	Instrumental Help (Intercept)	-0.04	0.02	-1.56	0.12	
Reading Value (Slope)	Instrumental Help (Slope)	0.07	0.13	0.58	0.56	
Math Value (Intercept)	Instrumental Help (Intercept)	0.39	0.09	4.62	0.00	***
Math Value (Slope)	Instrumental Help (Intercept)	-0.04	0.03	-1.49	0.14	
Math Value (Slope)	Instrumental Help (Slope)	0.36	0.20	1.80	0.07	+
Correlations Among Latent Intercepts and Slopes for each Construct in Model						
First Latent Factor	**Second Latent Factor**					
Instrumental Help (Intercept)	Instrumental Help (Slope)	-0.08	0.04	-2.05	0.04	*
Reading Value (Intercept)	Reading Value (Slope)	-0.01	0.04	-0.25	0.80	
Math Value (Intercept)	Math Value (Slope)	-0.08	0.03	-2.79	0.01	*

	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value
Values for Latent Factors in Model				
Instrumental Help (Intercept)	5.23 / 5.18	0.09 / 0.10	57.81 / 49.39	0.00 / 0.00 *** / ***
Instrumental Help (Slope)	0.08 / 0.10	0.02 / 0.03	3.47 / 3.26	0.00 / 0.00 *** / ***
Reading Value (Intercept)	3.16 / 2.98	0.46 / 0.45	6.86 / 6.57	0.00 / 0.00 *** / ***
Reading Value (Slope)	0.32 / 0.27	0.13 / 0.13	2.46 / 2.11	0.01 / 0.04 * / *
Math Value (Intercept)	2.83 / 2.89	0.46 / 0.45	6.20 / 6.43	0.00 / 0.00 *** / ***
Math Value (Slope)	0.05 / 0.07	0.16 / 0.16	0.33 / 0.42	0.74 / 0.67 /

+$p \leq 0.1$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

NOTE. This model includes Grades 7-10 and Grade 12 - Grade 11 is excluded. For cells where two values are listed and separated by a slash, the value before the slash is for females and the value after the slash is for males. Per the multi-group models that were described in Chapter 3, the following model was determined to be the best model via χ^2 difference tests: Model 3.

Students' perceptions of instrumental help in relation to their GPA. The multi-group SELGC model to explore the relations among students' perceptions of instrumental help from teachers and their GPA from seventh through 12th grade (excluding grade 11 due to a low sample size overlap) for both girls and boys had adequate model fit for RMSEA (≤ 0.06), but the CFI was a little low (CFI = 0.88) and the SRMR was a little high (SRMR = 0.11; see Table 26). The fit indices for all of the models for grades seven through 12 will be discussed in more detail later.

The latent paths (i.e. standardized parameter estimates), latent correlations, and values for latent factors are presented in Table 24. Only students' perceptions of teacher instrumental help had a significant slope, meaning that students' perceptions of instrumental help increased by 0.08 standard deviations for girls and 0.09 standard deviations for boys from seventh grade through 12^{th} grade. Notably, the intercept and slope for each construct, respectively, were unrelated, meaning that the starting value for each construct in seventh grade was not related to the slope, or rate of change, in the construct over time.

Similar to the SEM models that were conducted, the intercept of students' perceptions of teacher instrumental help significantly predicted the intercept for students' GPA. Specifically, this means that students' perceptions of teacher instrumental help in seventh grade positively predicts GPA in seventh grade for both girls and boys. However, there is no evidence of students' perceptions of teacher instrumental help in a prior grade predicting students' future GPA in this model. The gender by academic domain prediction in the hypothesis is also not supported in this model.

Table 24

Standardized Parameter Estimates, Standard Error, Z-Score, and Significance Levels for the Intercept and Slope of Instrumental Help as a Predictor of the Intercept and Slope of GPA from Grade Seven through Grade 12

		Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Predicted Latent Pathways in Model						
Dependent Variable (to)	**Independent Variable (from)**					
GPA (Intercept)	Instrumental Help (Intercept)	0.30	0.06	5.31	0.00	***
GPA (Slope)	Instrumental Help (Intercept)	-0.02	0.01	-1.62	0.10	
GPA (Slope)	Instrumental Help (Slope)	0.14	0.33	0.41	0.68	
Correlations Among Latent Intercepts and Slopes for each Construct in Model						
First Latent Factor	**Second Latent Factor**					
Instrumental Help (Intercept)	Instrumental Help (Slope)	-0.01	0.03	-0.18	0.86	
GPA (Intercept)	GPA (Slope)	0.00	0.01	-0.30	0.76	
Values for Latent Factors in Model						
Instrumental Help (Intercept)		5.23 / 5.17	0.09 / 0.10	59.70 / 50.38	0.00 / 0.00	*** / ***
Instrumental Help (Slope)		0.08 / 0.09	0.02 / 0.03	3.49 / 3.16	0.00 / 0.00	*** / ***
GPA (Intercept)		1.80 / 1.60	0.30 / 0.30	6.00 / 5.40	0.00 / 0.00	*** / ***
GPA (Slope)		0.11 / 0.11	0.07 / 0.07	1.54 / 1.67	0.12 / 0.10	/

+$p \leq 0.1$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

NOTE. This model includes Grades 7-10 and Grade 12 - Grade 11 is excluded. For cells where two values are listed and separated by a slash, the value before the slash is for females and the value after the slash is for males. Per the multi-group models that were described in Chapter 3, the following model was determined to be the best model via χ^2 difference tests: Model 3.

Students' perceptions of instrumental help in relation to their ability beliefs, task values, and GPA. The multi-group SELGC model to explore the relations among students' perceptions of instrumental help from teachers and students' ability beliefs, math task values,[28] and GPA from seventh through 12th grade (excluding grade 11 due to a low sample size overlap) for girls and boys had adequate model fit for RMSEA ($\leq$ 0.06), with a low CFI = 0.87 and a slightly high SRMR = 0.11 (see Table 26). The fit indices for all of the models for grades seven through 12 will be discussed in more detail later.

The latent paths (i.e. standardized parameter estimates), latent correlations among the intercept and slope for the same construct, and values for latent factors are presented in Table 25. As present in the prior SELGC models, students' perceptions of teacher instrumental help had a significant slope, meaning that students' perceptions of instrumental help increased by 0.08 standard deviations for girls and 0.09 standard deviations for boys from seventh grade through 12th grade. Notably, the intercept and slope for each construct, respectively, were unrelated for girls and boys, except for students' math task value, which were significantly negatively correlated for both girls and boys.

Also similar to the SEM models and the earlier SELGC models that were conducted, the intercept of students' perceptions of teacher instrumental help significantly predicted the intercept for students' reading ability beliefs, math ability

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[28] Due to multicollinearity among reading ability beliefs and reading task value, reading task value was excluded from this model. Since ability beliefs are shown to be predictive of task values, ability beliefs were retained in the model instead of reading task values.

beliefs, math task values, and GPA. Specifically, this means that students' perceptions of teacher instrumental help in seventh grade predict students' reading ability beliefs, math ability beliefs, math task value, and GPA in seventh grade. However, there is no evidence of students' perceptions of teacher instrumental help in a prior grade predicting students' future reading ability beliefs, math ability beliefs, math task value, or GPA in this model. The gender by academic domain prediction in the hypothesis is also not supported in this model.

Table 25

Standardized Parameter Estimates, Standard Error, Z-Score, and Significance Levels for the Intercept and Slope of Instrumental Help as a Predictor of the Intercept and Slope of Reading and Math Ability Beliefs, Math Task Value, and GPA from Grade Seven through Grade 12

		Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Predicted Latent Pathways in Model						
Dependent Variable (to)	**Independent Variable (from)**					
Reading Ability (Intercept)	Instrumental Help (Intercept)	0.23	0.10	2.36	0.02	*
Reading Ability (Slope)	Instrumental Help (Intercept)	-0.02	0.02	-0.93	0.35	
Reading Ability (Slope)	Instrumental Help (Slope)	0.16	0.21	0.78	0.44	
Math Ability (Intercept)	Instrumental Help (Intercept)	0.42	0.09	4.52	0.00	***
Math Ability (Slope)	Instrumental Help (Intercept)	-0.01	0.03	-0.32	0.75	
Math Ability (Slope)	Instrumental Help (Slope)	0.77	0.47	1.64	0.10	
Math Value (Intercept)	Instrumental Help (Intercept)	0.40	0.09	4.41	0.00	***
Math Value (Slope)	Instrumental Help (Intercept)	-0.04	0.03	-1.18	0.24	
Math Value (Slope)	Instrumental Help (Slope)	0.53	0.37	1.44	0.15	
GPA (Intercept)	Instrumental Help (Intercept)	0.27	0.05	5.35	0.00	***
GPA (Slope)	Instrumental Help (Intercept)	-0.02	0.01	-1.58	0.11	
GPA (Slope)	Instrumental Help (Slope)	0.07	0.10	0.72	0.47	

First Latent Factor	Second Latent Factor	Parameter Estimate (Standardized)	Standard Error	Z-Score	P-Value	
Correlations Among Latent Intercepts and Slopes for each Construct in Model						
Instrumental Help (Intercept)	Instrumental Help (Slope)	-0.05	0.03	-1.29	0.20	
Reading Ability (Intercept)	Reading Ability (Slope)	-0.05	0.04	-1.48	0.14	
Math Ability (Intercept)	Math Ability (Slope)	-0.04	0.02	-1.85	0.06	+
Math Value (Intercept)	Math Value (Slope)	-0.11	0.03	-3.78	0.00	***
GPA (Intercept)	GPA (Slope)	0.00	0.01	-0.47	0.64	
Values for Latent Factors in Model						
Instrumental Help (Intercept)		5.22 / 5.18	0.09 / 0.10	58.66 / 49.91	0.00 / 0.00	*** / ***
Instrumental Help (Slope)		0.08 / 0.09	0.02 / 0.03	3.47 / 3.09	0.00 / 0.00	*** / ***
Reading Ability (Intercept)		3.72 / 3.44	0.52 / 0.52	7.09 / 6.64	0.00 / 0.00	*** / ***
Reading Ability (Slope)		0.15 / 0.14	0.13 / 0.13	1.20 / 1.09	0.23 / 0.28	/
Math Ability (Intercept)		2.76 / 2.91	0.49 / 0.49	5.61 / 5.96	0.00 / 0.00	*** / ***
Math Ability (Slope)		-0.11 / -0.08	0.18 / 0.18	-0.62 / -0.45	0.54 / 0.65	/
Math Value (Intercept)		2.78 / 2.86	0.49 / 0.48	5.70 / 5.91	0.00 / 0.00	*** / ***
Math Value (Slope)		0.01 / 0.02	0.18 / 0.18	0.03 / 0.11	0.97 / 0.92	/
GPA (Intercept)		1.94 / 1.74	0.27 / 0.27	7.13 / 6.47	0.00 / 0.00	*** / ***
GPA (Slope)		0.08 / 0.08	0.06 / 0.06	1.27 / 1.40	0.21 / 0.16	/

+$p \leq 0.1$, *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

NOTE. Full model excludes Reading Task Value. This model includes Grades 7-10 and Grade 12 - Grade 11 is excluded. For cells where two values are listed and separated by a slash, the value before the slash is for females and the value after the slash is for males. Per the multi-group models that were described in Chapter 3, the following model was determined to be the best model via χ^2 difference tests: Model 3.

Fit of SELGC models for hypothesis 2. As mentioned above, the fit indices for all of these models are in Table 26. All of the fit indices suggest that the models have adequate fit for at least two of the three classes of fit (incremental, parsimonious, and absolute fit), except for GPA, instrumental help and GPA, and the full model, which only have acceptable model fit for one class of fit, with close fit for the other two classes of fit. However, taken together, these fit indices suggest that the models are tenable (i.e., possible), but some models should be interpreted with caution.

Table 26

Fit Indices for SELGC Model Fit for the Intercept and Slope of Instrumental Help as a Predictor of the Intercept and Slope of Reading and Math Ability beliefs, Task Values, and GPA in Grade Seven through Grade 12

Model	df	χ2	*p*-value (χ2)	CFI	RMSEA	Lower C.I. RMSEA	Upper C.I. RMSEA	SRMR
Instrumental Help	23	38.456	0.023	0.901	0.043	0.016	0.066	0.088
Reading Ability Beliefs	23	18.550	0.727	1.000	0.000	0.000	0.033	0.144
Math Ability Beliefs	23	36.548	0.036	0.981	0.040	0.010	0.064	0.078
Reading Task Value	23	23.211	0.449	1.000	0.005	0.000	0.044	0.135
Math Task Value	23	22.829	0.471	1.000	0.000	0.000	0.043	0.082
GPA	20	92.026	0.000	0.879	0.101	0.080	0.122	0.104
Instrumental Help & Ability Beliefs	209	263.833	0.006	0.959	0.027	0.015	0.036	0.117
Instrumental Help & Task Values	209	279.070	0.001	0.911	0.030	0.020	0.039	0.133
Instrumental Help & GPA	93	193.747	0.000	0.876	0.055	0.044	0.065	0.111
Full Model	579	988.144	0.000	0.874	0.044	0.039	0.049	0.111

NOTE. Full model excludes Reading Task Value. All of the models include Grades 7-10 and Grade 12 - Grade 11 is excluded. Power for each model is greater than or equal to 0.78.

Summary of SELGC model results for hypothesis 2. In summary, across the SELGC models, and as evident in the final full SELGC model from grade seven through grade 12, the intercept of students' perceptions of instrumental help is predictive of the intercept for students' reading ability beliefs, math ability beliefs, reading task value, math task value, and GPA. However, no relations were present between the slope of students' perceptions of teacher instrumental help and the slopes of the other constructs.

Summary of all results for hypothesis 2. As mentioned above, although there was evidence in the SEM analyses of students' perceptions of teacher instrumental help predicting students' ability beliefs, task values, and GPA in an adjacent grade, the most common significant pathways were from students' instrumental help to ability beliefs, task values, and GPA within the same grade for both girls and boys. This was also supported by the SELGC models. Overall, these models suggest that students' perceptions of teacher instrumental help positively predicted students' reading and math ability beliefs, reading and math task values, and GPA within the same grade-level, but that lasting effects across grades typically do not occur. It is important to note that most of the significant relations are present within the same grade level. Even so, it is clear that students' positive perceptions of instrumental help from teachers significantly positively predict positive reading and math ability beliefs, reading and math task values, and GPA within the same grade for both girls and boys.

Chapter 5: Discussion

The main goal for the present study was to determine whether students' perceptions of instrumental help from teachers positively relates to ability beliefs, task value, and academic grades and to determine whether these relations are stronger for girls in the domain of reading and for boys in the domain of reading/language arts.

Overview and Summary of Major Results

The major finding of this study concerning Hypothesis 1 is that students' perceptions of instrumental help from teachers significantly positively predict their math ability beliefs and reading and math task values in elementary school within the same grade for both girls and boys. With respect to Hypothesis 2, the major findings were that students' perceptions of their teachers' instrumental help related positively to their reading and math ability beliefs, reading and math task values, and GPA in middle and high school within the same grade for both girls and boys. Overall, students' perceptions of instrumental help from teachers more consistently and strongly predicted ability beliefs and task values in the academic domain of math than in the academic domain of reading. Although there were some statistically significant gender differences in the models of these relations, the direction and significance of relations in the models were generally the same for both girls and boys.

Hypothesis 1

For Hypothesis 1, I predicted that during second through sixth grade, students' perceptions of instrumental help/support from teachers would positively relate to their ability beliefs, task values, and academic course grades in reading and math within the same grade-level in adjacent grade pairs (e.g., second and third grade). This hypothesis was generally supported. Although students' perceptions of teacher instrumental help did not significantly predict reading and math course grades for any adjacent grade pairing, students' perceptions of teacher instrumental help were predictive of: (a) their math ability beliefs within the same grade level in both fourth grade and fifth grade, (b) their reading task value in the same grade level in third, fifth, and sixth grade, and (c) their math task value in the next grade level in fourth grade (with third grade instrumental help as the predictor), and at the same grade level in fifth grade.

I also expected that these relations would differ by gender, with instrumental help/support relating to these variables more strongly for girls in the domain of math and for boys in the domain of reading. I made this prediction because prior work (discussed below) suggests that the relations of interest in the current study differ by gender and academic domain. This prediction was not often supported; however, in certain adjacent grade models (e.g., grade 10 to grade 11) these gender differences did occur. For the ability beliefs models, girls' perceptions of instrumental help from teachers in grade four predicted their math ability beliefs in the same grade, while this same relation was not found for boys – this was the only finding in the ability beliefs models that matched the gender predictions that were made in the hypothesis. For the subjective task value models and the course grades models, none of the gender by academic domain predictions from the hypothesis were supported.

Hypothesis 2

For Hypothesis 2, I predicted that during seventh-12th grade, students' perceptions of instrumental help/support from teachers would positively relate to their ability beliefs and task values in reading/language arts and math and grade-point average (GPA) within the same grade-level in adjacent grade pairs (e.g., seventh and eighth grade). Change over time in instrumental help/support from teachers and ability beliefs and task values in reading/language arts and math and GPA were also predicted to be associated with each other. As noted earlier, the results generally supported the hypothesis. Overall, the results show that although students' perceptions of teacher instrumental help positively predict students' reading and math ability beliefs, reading and math task values, and GPA within the same grade-level; however, these effects do not extend over the longer term (e.g., change in instrumental help/support from teachers was not associated with change in ability beliefs, task values, and/or GPA).

I also expected that these relations would differ by gender, with instrumental help/support relating to these variables more strongly for girls in the domain of math and for boys in the domain of reading/language arts. In contrast to this hypothesis and results of other work on perceived teacher support (see below) these predicted gender differences in the domains of reading and math were generally not supported; however, there are a few instances when these gender differences did occur. Specifically, only girls' perceptions of teacher instrumental help in grade 10 significantly positively predicted their math ability beliefs in grade 10 in the grades nine and 10 adjacent grade pairing model.[29] In addition, only girls' perceptions of instrumental help from teachers predicted their GPA in grade 10 in both the grades nine and 10 and grades 10 and 11 adjacent grade pairing models. Lastly, only boys' perceptions of instrumental help from teachers predicted their GPA in grade 11 in the grades 10 and 11 adjacent pairing model.[30] No other gender differences were found for the other instrumental help and GPA analyses. No gender differences were observed in students' subjective task values from seventh-12th grade.

Comparisons of the Strength and Frequency of the Relations in Elementary, Middle, and High School

As a reminder, the measures of instrumental help and grades/GPA in second through sixth grade (Hypothesis 1) and seventh-12th grade (Hypothesis 2) are different,[31] and thus direct comparisons cannot be made between elementary school and middle/high school. However, I will discuss general findings for elementary school and middle/high school and the strength of the relations at each respective schooling level.

The biggest difference between the elementary school and middle/high school models are that students' perceptions of teacher instrumental help were not predictive of

[29] However, it is important to note that these relations occurred for both girls and boys in grade 10 in the grades 10 and 11 model, so the gender difference in the grades nine and 10 model should be interpreted with caution. In addition, this gender difference was not found in the SELGMs, so this finding may just be a grade-specific finding and may not reflect overall trends from middle school through high school.

[30] However, students' perceptions of instrumental help from teachers predicted GPA in grade 11 for both boys and girls' in the grades 11 and 12 model, thus the gender difference finding for grade 11 in the grades 10 and 11 SEM for boys should be interpreted with caution. In addition, this gender difference was not found in the SELGMs, so this finding may just be a grade-specific finding and may not reflect overall trends from middle school through high school.

[31] Note also that students' beliefs/perceptions are not measured as reliably in early elementary school (see Wigfield et al., 1997), which could impact any comparisons made from elementary school to middle school and high school. This note is relevant for some of the measures used in the current study, such as students' perceptions of instrumental help from their teachers, their ability beliefs, and their subjective task values.

reading or math grades in elementary school, but that these perceptions generally were predictive of GPA in middle/high school within the same grade-level for girls and boys. In addition, although students' perceptions of teacher instrumental help were not predictive of their reading ability beliefs in elementary school, students' perceptions of teacher instrumental help were sometimes predictive of students' reading ability beliefs in middle/high school at the same grade-level. Overall, students' perceptions of teacher instrumental help more often predicted students' math ability beliefs, math task values, and reading task values in middle/high school within the same grade-level for both girls and boys than in the elementary school models. However, as noted earlier, since the students' perceptions of instrumental help/support items are different in elementary school and middle/high school, the elementary and middle/high school analyses are not comparable and thus conclusions cannot be made by looking at the elementary and middle/high school models in comparison to each other.

Explanation of Key Findings and Connections to Findings From Previous Work

The key findings will be explained here as organized thematically, similar to the structure of Chapter 2, starting with findings for students' perceptions of instrumental help/support from teachers. Then the relations among students' perceptions of instrumental help/support from teachers and their ability beliefs, subjective task values, and grades will be reviewed.

Students' Perceptions of Instrumental Help/Support from Teachers: Relations Across Grades and Change Over Time

As noted in Chapter 2, prior empirical work shows that students' early general aspects of relationships with teachers may predict later general aspects of teacher-student relationships up through late elementary school (Howes et al., 1998; Hughes et al., 2008). Although Howes et al.'s (1998) and Hughes et al.'s (2008) studies looked at these relations from different grades (e.g., preschool, first grade, and third grade), the current study is unique in that these relations were explored from second through third grade, third through fourth grade, fifth through sixth grade, and in every adjacent grade pairing from seventh through 12th grade (e.g., seventh through eighth grade, eighth through ninth grade). Thus, the findings are not directly comparable. Even so, in the current study, these findings were generally supported, and extended, with students' perceptions of instrumental support from teachers in the prior grade predicting students' perceptions of instrumental support from teachers in the next grade from second grade to sixth grade and with different items from seventh grade to 12th grade for both girls and boys.

What explains the results of the earlier studies and this one? Perhaps students' just generally think of their teachers in the same way (as proposed by Erickson & Pianta, 1989),[32] and thus perceive similar amounts of instrumental help/support from their teachers from one grade to the next, or their perceptions of the help that a prior teacher provided may influence the amount of help that they perceive from their next teacher. On the other hand, although not studied previously, it is also possible that teachers offer similar amounts of *actual help* to students from grade to grade, and thus *students perceive*

[32] Erickson and Pianta (1989) cleverly state this with the title of their article, "New Lunchbox, Old Feelings," suggesting that students come in to each new academic year with expectations for how their teacher will to act towards them—whether positive or negative.

similar amounts of help from one grade to the next. If the actual help that teachers provide to students is consistent across teachers, then this translation from actual help from teachers to students' perceptions of help from their teachers could explain why students' prior perceptions of instrumental help from teachers relate to their perceptions of instrumental help from teachers in the next grade. However, empirical work is needed to uncover the mechanisms behind *why* students' perceptions of instrumental help from teachers predict their perceptions of instrumental help from teachers at the next grade, and how the actual help provided by teachers may impact these relations.

As discussed in Chapter 2, studies show that students' perceptions of general teacher support decline, during both middle school (Reddy et al., 2003), and from late elementary school through the middle of high school (Bru et al., 2010). Instrumental help/support from teachers has also been found to decline during the transition from elementary school to middle/junior high school (Seidman et al., 1994). However, as noted above, in the current study, the SELGM from seventh grade to 12th grade showed significant, but small in magnitude, *increases* in students' perceptions of instrumental help from teachers during this grade range. This conflicting finding may be present because students' perceptions of instrumental help from teachers appear to increase markedly from 10th grade to 11th grade and 12th grade in the current study, which are grades that were not explored in the prior work (i.e., Bru et al., 2010; Reddy et al., 2003; Seidman et al., 1994). For the earlier grades in this study, the means for instrumental help are fairly consistent, but appear to slightly increase from grades one through four and then slightly decrease during grades five and six. However, the significance of this pattern was not explored statistically due to small sample sizes across these grades, as explained earlier in Chapter 3.

The relations among students' perceptions of instrumental help/support from teachers and their ability beliefs, subjective task values, and grades will be reviewed next.

Students' Perceptions of Instrumental Help/Support as Predictors of their Ability Beliefs, Subjective Task Values, and Grades

Ability beliefs and subjective task values. Researchers also have looked at how students' perceptions of general teacher support[33] relate to their expectancies and subjective task values. Both Goodenow (1993) and Midgley et al. (1989) found positive relations from late elementary school to middle school in their studies. However, Goodenow (1993) explored these relations in the domain of English in sixth through eighth grade students together—separate analyses were not conducted to compare the relations across grades. In addition, Midgley et al. (1989) explored these relations in the domain of math from sixth through seventh grade in a one-year longitudinal analysis across grades. Thus, these studies and the results of the current study are not directly comparable—the relations that are explored are similar, but the specific grades and academic domains that are explored in each analysis differ. Overall, these models for Hypothesis 2 support this prior work and extend it – specifically, in the current study, students' perceptions of domain-general teacher instrumental help positively predicted

[33] Note that none of this work looks at students' perceptions of instrumental support from teachers though. It is also important to note that studies published by researchers using the CAB study data also do not look at students' perceptions of instrumental support specifically—rather, these studies only examine general teacher support.

students' reading and math ability beliefs and reading and math task values within the same grade-level from seventh through 12th grade for both girls and boys.

In addition, in the current study, students' perceptions of instrumental help did not predict ability beliefs or task values in second grade. This suggests that students' perceptions of instrumental support from teachers may not be as important for students' ability beliefs and task values in second grade as they are in later elementary grades. Although not explored yet empirically, perhaps other supports, such as instrumental help/support from parents, may be more important for ability beliefs and subjective task values at this grade? More work is needed to understand how students' perceptions of instrumental support relate to their ability beliefs and task values at the beginning of elementary school.

Course grades and GPA. Prior studies show that general teacher support is positively related to grades from middle school to high school (Hamre & Pianta, 2001; Jia et al., 2009; Lam et al., 2012; J. C. Perry et al., 2010; Strøm et al., 2013). The current study supports these findings in the Hypothesis 2 models from seventh grade through 12th grade, with students' perceptions of teacher instrumental help positively predicting students' GPA within the same grade-level generally. However, in the Hypothesis 1 models from second grade through sixth grade, students' perceptions of teacher instrumental help were not significant predictors of reading and math course grades for any adjacent grade pairing. Although the instrumental help from teachers items were different, and also not comparable in elementary and middle/high school, this difference in findings for elementary school and middle/high school may have occurred because of the increasing importance of grades as students near the end of their secondary education. In general, middle schools and high schools focus more on grades than in elementary school (e.g., Eccles & Midgley, 1989; Wigfield, Eccles, et al., 2006), so it is possible that younger students' perceptions of instrumental help from teachers may not matter as much for their grades as they do when students get older. As noted earlier, as students' age, instrumental help from teachers may become more important for course grades/GPA as academic material becomes more challenging, which may explain why the relations among students' instrumental support from teachers and GPA become significant in middle and high school, but are not significant in elementary school.

In addition, since students' own beliefs about themselves are changing in elementary school (e.g., Wigfield et al., 1997), it is possible that students' beliefs about their teachers are changing too. This could also explain why the relations among students' perceptions of instrumental help and ability beliefs and task values were not always significant in elementary school, which ultimately could lead to the lack of significant relations observed among students' perceptions of instrumental help and grades in elementary school. Ultimately, this may occur because, in EEVT (Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994), the influence of students' perceptions of socializers (i.e., instrumental help from teachers) is expected to predict academic achievement, such as grades, through their ability beliefs and subjective task values.

Ability beliefs, subjective task values, and grades from elementary through high school. Although the items used in elementary school were not the same as those used in middle/high school, and thus are not directly comparable, the relations among students' perceptions of instrumental help and ability beliefs, task values, and grades/GPA were more often significant in the elementary school models than in the middle/high school models. As mentioned in Chapter 2, this pattern of relations may have occurred in the current study because middle school and high school is a time when students need support from teachers due to changes in school structure, developmental changes due to going through adolescence, and so on (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011; Wigfield, Byrnes, et al., 2006; Wigfield, Eccles, et al., 2006). Importantly, the findings in the current study suggest that students' perceive *increases* in instrumental help/support from their teachers during this time when they may be in most need of it. Thus, since instrumental support from teachers may be especially important while students are undergoing these changes, these perceptions could be relating more strongly to ability beliefs, values, and achievement in middle school and high school.

The relations among students' perceptions of instrumental help/support from teachers and their ability beliefs, subjective task values, and grades by gender and the academic domains of reading and math will be reviewed next.

Gender and Academic Domain Differences

Gender. As noted in Chapter 2, prior work shows that relations among teacher support, ability beliefs, subjective task values, and grades differ by gender (Archambault et al., 2010; Fredricks & Eccles, 2002; Goodenow, 1993; Jacobs et al., 2002; Watt, 2004; Wigfield et al., 1997). However, in the current study, the only differences by gender were generally either mean level differences in the variables of interest (generally showing somewhat higher levels of students' perceptions of instrumental help from teachers, reading ability beliefs and task values, and grades/GPA for girls and somewhat higher math ability beliefs and task values for boys) or sometimes slight magnitude differences in the strength of the relations among students' perceptions of instrumental help from teachers and ability beliefs, task values, or course grades/GPA in the models, generally showing the relations were stronger for girls in the domain of math.

Also noted in Chapter 2, prior work has also found, in some cases, that gender influences domain-general teacher support (Reddy et al., 2003; Roorda et al., 2011; Rueger et al., 2010; Suldo et al., 2009), but the findings on gender differences in teacher support are mixed (Bru et al., 2010; Reddy et al., 2003). However, the current study is different from the prior studies mentioned in that the relations in the current study among students' perceptions of instrumental help/support from teachers to their ability beliefs, subjective task values, and grades were examined from one grade to the next – not across several years at a time – throughout most of elementary school and throughout middle school and high school. For instance, Suldo et al. (2009) explored students' perceptions of general support from teachers in middle school students generally – they did not separate their findings by grade. Thus, even though significant gender differences were not found in these relations from third grade to fourth grade or eighth grade to ninth grade in the current study, for example, this does not mean that gender differences do not exist in the strength of these relations across a wider grade gap (e.g., how teacher support in third grade relates to outcomes in eighth grade). The current study adds to this work by systematically exploring possible gender differences in these relations grade by grade and in adjacent grades (e.g., seventh to eighth grade).

Academic domain: Reading and math. As noted in Chapter 2, prior work shows that relations among teacher support, ability beliefs, subjective task values, and grades differ by academic domain (Bill and Melinda Gates Foundation, 2010; Fredricks & Eccles, 2002; Goodenow, 1993; Hughes, 2011; Jacobs et al., 2002; Midgley et al., 1989; Rowan et al., 2002; Watt, 2004; Wigfield et al., 1997). In general these researches find that the relations among students' perceptions of teacher support and ability beliefs, subjective task values, and grades are stronger in the domain of math than in the domain of reading. As noted earlier, some domain differences were found in the current study, with math variables being predicted more consistently by students' perceptions of instrumental help from teachers than reading variables, a finding consistent with some of the earlier work.

For instance, researchers at the Bill and Melinda Gates Foundation (2010) speculated that students' math achievement may be more influenced by teachers than reading achievement because students' families have a stronger impact on students' reading and verbal achievement than their teachers. Thus, in situations where students' perceptions of instrumental help were not predictive of their reading ability beliefs or task values in a certain grade, it may be because other social supports for students' could be more important than instrumental support from teachers (e.g., Lempers & Clark-Lempers, 1992). For example, in the current study, student's perceptions of instrumental help may not have been predictive of reading ability beliefs in elementary school because instrumental help from parents or other family members may be more important for reading at this time period than instrumental help from teachers. Thus, the reading that students do at home with their parents may be more important for their ability beliefs in reading than the reading that students might do with their teachers in the classroom. More work is needed in this area to explore such a hypothesis.

In some cases in the current study, student's perceptions of teacher instrumental help in a prior grade-level also predicted their math and reading task values in the next grade-level in middle/high school. One possible reason that this may have happened could be that in middle school and high school, students' may have the same teacher in multiple grades (e.g., Eccles & Midgley, 1989; Wigfield, Byrnes, et al., 2006; Wigfield, Eccles, et al., 2006). Thus, if a student has the same math teacher in grades eight and nine, then it is possible that the instrumental support that they perceived from that teacher in grade eight might predict their valuing of math in grade nine as well.

Lastly, although students' perceptions of instrumental help/support in the domains of reading and math (e.g., separately for reading teachers and math teachers) were not explored in the current study, this could be an interesting extension for future work. Specifically, future work could explore whether the finding in the current study that students' prior perceptions of instrumental help/support predict their perceptions of instrumental help/support in the next grade holds when students' perceptions of instrumental help are measured from multiple teachers in different academic domains. For example, do students perceive higher mean levels of instrumental help from reading/language arts teachers than math teachers?

Summary

In summary, the current study extends prior work by showing that (a) students' prior perceptions of teacher instrumental help/support positively relate to their latter adjacent perceptions of teacher instrumental help/support for both girls and boys from grade-to-grade, (b) both girls' and boys' perceptions of instrumental help/support from teachers positively predicts their math ability beliefs within the same grade level in both fourth grade and fifth grade, their reading task values in the same grade level in third, fifth, and sixth grade, and their math task values at the same grade level in fifth grade and that both girls' and boys' perceptions of teacher instrumental help positively predict students' reading and math ability beliefs, reading and math task values, and GPA within the same grade-level from seventh through 12^{th} grade.

Theoretical Contributions

The theoretical contributions of this study will be discussed in this section. Specifically, I will review the contributions of this work to EEVT, Stage Environment Fit Theory, and SDT.

Expectancy-Value Theory

In their EEVT model Eccles and her colleagues (Eccles et al., 1983; Eccles & Wang, 2012; Wigfield et al., 2009; Wigfield, 1994) proposed how students' ability-related beliefs expectancies and subjective task values (both components of academic achievement motivations) relate to their achievement outcomes in different achievement domains. Applying Eccles and colleagues EEVT to the goals of the current study, I predicted that teachers (i.e., socializers), including students' perceived instrumental help/support from teachers, positively impact students' ability beliefs, values, and achievement outcomes, such as earning good course grades. In the current study, these predictions based in EEVT were mostly supported, as noted earlier.

This study is the first study using the CAB study data, and based in EEVT, to directly and specifically explore how students' perceptions of their socializers (in this case, teachers) relate to particular student outcomes in the model. As discussed earlier, this study provides overall support for the predictions from EEVT, but shows that there is variability in these relations across the academic domains of reading and math and across gender. Thus, more work is needed in other domains (e.g., science) and with other groups of students, such as students from more varied backgrounds than those in the CAB study data and with more recently collected data, to explore how extensively these general theoretical predictions apply. Some specific possible extensions are noted in the Future Directions section below.

Stage Environment Fit Theory

Eccles and colleagues (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011) stage-environment fit theory complements' EEVT by adding in a developmental component explaining how socialization contexts, such as schools, can influence students' motivational beliefs and values positively or negatively across development based on stage-environment fit. In Stage-Environment Fit Theory, Eccles and colleagues (e.g., Eccles & Midgley, 1989; Eccles & Roeser, 2011) note how teachers are better able to support students' developmental needs in elementary school than in middle or high school due to class size and school structure, which may result in higher academic motivation and achievement in elementary school than in middle or high school. Although Stage Environment Fit theory may predict that students' relationships with teachers may be closer in elementary school due to structural changes that may make strong teacher-student relationships more difficult in middle and high school (e.g., Eccles & Midgley, 1989; Wigfield, Byrnes, et al., 2006; Wigfield, Eccles, et al., 2006), that does not necessarily mean that instrumental help from teachers is no longer important after that.

Thus, I predicted that support from teachers would have positive relations to ability beliefs, values, and achievement in middle school and high school—a time when student's may need more support from teachers but according to previous work (e.g., Eccles & Midgley, 1989; Wigfield, Byrnes, et al., 2006; Wigfield, Eccles, et al., 2006) may not receive it. In other words, because stage-environment fit can be poor during the transition to middle school, instrumental help/support from teachers may be even more important for students' ability beliefs, subjective task values, and grades in middle school and high school than it is before this transition. As noted earlier, the findings in the current study suggest that students' perceptions of instrumental help across middle and high school are quite high, and that these perceptions actually increase slightly from grades 10 through 12 at the end of high school. This is an interesting finding since prior Stage Environment Fit Theory work (e.g., Eccles & Midgley, 1989; Wigfield, Byrnes, et al., 2006; Wigfield, Eccles, et al., 2006) suggests that teacher-student relationships become less close and less supportive in middle school and high school. One possibility could be the sample from the CAB study data that was used in the current study, which is fairly homogenous and drawn from middle class public schools in primarily white urban and suburban communities in the Midwest. Thus, possible extensions for this work in other populations is discussed in the Future Directions section below.

Self Determination Theory (SDT)

In SDT (e.g., Deci & Ryan, 2008; R. M. Ryan & Deci, 2002), and particularly through Connell and Wellborn's (1991) Self System Model of Motivational Development (SSMMD) that is based in SDT, teacher behaviors, such as instrumental help, are expected to predict student's self-system motivational processes, such as students' feelings of competence and subjective task values, which then impact student behavior/action that could result in positive academic outcomes, such as academic achievement. Thus, when discussed in conjunction with EEVT, SDT and the related SSMMD explain the "why" behind how students' relationships with teachers may influence academic motivation and achievement. Specifically, via SSMMD, teacher behaviors predict students' self-system processes, which then impact how students perceive and interpret teacher behaviors, how students engage in the school context, and ultimately how all of the above factors impact students' academic motivation and achievement. In the current study, these aspects of this theory were generally supported, with students' perceptions of instrumental help, a component of structure in the classroom, predicting their ability beliefs (which is similar in concept to competence beliefs in SDT) and subjective task values (another component of academic motivation) throughout most of elementary school and in middle school and high school, and grades, an indicator of academic achievement, in middle/high school. However, the process components of self-system processes was not explored explicitly in the current study.

Future Directions

Several directions for future research were noted above as directly related to the hypotheses in the current study and the theoretical contributions of the current study. In this section, additional areas of future inquiry are discussed.

Firstly, future research could explore how students' perceptions of instrumental help from teachers relate to ability beliefs, task values, and achievement grades for students from different achievement levels. For example, Mercer, Nellis, Martinez, and Kirk (2011) assessed relations among student-reported academic self-efficacy, student perceptions of teacher support, and curriculum-based measures (CBM) of reading and math in a sample of 193 fifth-grade students. Mercer et al. (2011) found that students' with the lowest math CBM scores in the fall, and the smallest rates of growth in math, perceived the most teacher support. Mercer et al. (2011) interpreted this finding as evidence that teachers provide support for students who need it the most. In other words, low-performing students in math seem to perceive more support from their teachers, while high-performing students might not perceive as much teacher support in math. However, Newman and Schwager (1993) suggest that students' who are low achievers may actually be less likely to ask for help, even though they might need more of it. In addition, it is also possible that these relations flow in the opposite direction. For example, students who are already high achievers may then have high ability beliefs and task values, which then may result in students being more likely to seek help from their teachers when they need it, resulting in teachers being more likely to help those students. This cycle may then continue so students who are high achievers remain high achievers and receive more help, while students who are low achievers continue to be low achievers and receive less help.

Future work could also explore if the relations among students' perceptions of instrumental help from teachers and ability beliefs, task values, and grades vary at the classroom level (i.e., overall means of these variables across all students in a classroom), and whether these relations differ from classroom to classroom. For example, Hughes, Zhang, and Hill (2006) studied first and second grade students and found that normative teacher support, or classroom teacher support, was predictive of student engagement above and beyond individual teacher support, child gender, and child ethnic-minority status. Both individual and normative teacher support were derived from a peer-nominated measure of teacher support. Individual teacher support ratings were for each student, and normative teacher support ratings were derived from the individual teacher support ratings for each classroom. Hughes et al.'s (2006) findings suggest that the influence of teacher support in early elementary school classrooms might be more impactful at the classroom support level instead of on the individual level.

In addition, another area for further research is to explore whether these relations differ for students perceptions of individual teachers across different domains and classrooms within a single year. For example, do students' perceptions of instrumental help from math teachers predict ability beliefs, task values, and grades differently than students' perceptions of instrumental help from reading teachers? How about science teachers? Some interesting extensions could be done here, especially since math and reading may typically be taught by the same teacher since students typically only have one teacher in elementary school, but then may be taught by different teachers in middle school and high school when students typically have more than one teacher (e.g., Eccles & Midgley, 1989; Wigfield, Byrnes, et al., 2006; Wigfield, Eccles, et al., 2006),

Another future avenue for this work could be to explore how students' perceptions of instrumental help from teachers relates to student help-seeking and how these variables then relate to ability beliefs, task values, and achievement grades in different academic domains. For example, Newman and Schwager (1993) found that fifth and seventh grade students' perceptions of encouragement from their teachers were related to help-seeking intentions in math. Seventh grade students were less likely to seek help in math as well if they felt that their teacher would think they were "dumb" if they asked questions in class. However, students in all three grades (third, fifth, and seventh) reported that they preferred seeking math help from their teachers than classmates because they felt their teachers would be less likely to think they were "dumb" if they asked questions. Gender differences were not found in these relationships. Thus, future work could explore how help-seeking behaviors relate to students' perceptions of instrumental help from teachers, and how these ultimately relate to students' ability beliefs, subjective task values, and grades.

Lastly, future work could explore the relations of interest in the current study in more diverse samples of students, as mentioned earlier when discussing EEVT. For example, since prior research does suggest that support (either general support or emotional support) from teachers is especially important for children who are ethnic minorities, particularly for children who are of Hispanic backgrounds (e.g., Crosnoe, Johnson, & Elder, 2004; Wentzel, Russell, & Baker, 2015), it is important for future work to explore whether the relations of focus in the current study are impacted by such student characteristics.

Limitations

Although the current study extends understanding in the field about how trajectories of students' perceptions of teacher support relate to ability beliefs, values, and grades in math and reading, there are some limitations to this work. Specifically, as noted in Chapter 3, the CAB dataset sample is not diverse—mostly white, middle class, suburban students—and so I was unable to address how these relations among students' perceptions of instrumental support from teachers and ability beliefs and task values in reading and math and grades might vary by ethnic groups, socioeconomic status, or geographic location. As noted above, future work could explore if the relations of interest in the current study differ by these student characteristics.

Another limitation of the current study is that it utilizes data from a cohort-sequential design instead of a single-cohort longitudinal dataset. Although cohort-sequential designs are useful for reducing cohort-effects, it also limits a researchers ability to explore how change occurs throughout the entire span of time during which data were collected. For example, in the current study, the youngest cohort has data from second through twelfth grade; however, data are not available for this cohort at the end of elementary school, the very beginning of middle school, and the middle of high school. The other cohorts do not have data from the early years of elementary school. Instead, I used SEMs and SELGMs to sew together a complete picture of how students' perceptions of instrumental help from teachers, ability beliefs and task values in reading and math, and grades change over time from second through sixth grade and seventh through twelfth grade.

Given this limitation of not having data across all years from second to twelfth grade for one cohort, and not having data for kindergarten and first grade, the present study does not have the full trajectory of students' perceptions of instrumental help from teachers from the beginning of schooling through twelfth grade from one cohort. It will be important for future work to explore these changes over time from the beginning of schooling to the end of secondary school in one cohort of students. For example, it will be important to explore how students' first perceptions of instrumental help from teachers influence students' later perceptions of instrumental help from teachers and future student outcomes due to previous research supporting the importance of these first relationships with teachers (e.g. Howes et al., 1998). It will also be important to understand how students' perceptions of instrumental help from teachers continue to evolve into college.

The instrumental help from teachers items in the current study are also not the same across all grades. In waves three and four (elementary school), students' were asked about a specific teacher providing help to the student in the classroom, while in waves five through nine (middle/high school), students were asked about how many of their teachers help with their homework. It will be important for future work to use the same measure across all grades to be able to track change in this variable over time from elementary school, to middle school, to high school.

In addition, as noted in Chapter 3, it is not clear whether students' had the same or different math and reading/language arts teachers in elementary school. Thus, it is not possible to disentangle effects of individual teachers from academic domain effects in elementary school in the current study. In addition, questions about students' perceptions of instrumental help from teachers were not consistently asked separately by academic domain. Possible directions for future research in this regard were discussed earlier in this chapter.

As with most longitudinal designs, the current study has missing data due to attrition. Given that the data used in the current study spans from second through twelfth grade, all of the students who started in the study did not necessarily continue with the study to the end. However, statistical techniques were utilized to take full advantage of the data that were collected and to adjust for "missingness" in ways that are considered appropriate for the field of social science, as discussed in Chapter 3.

Another limitation is that the fit of the analytical models did not always meet the standards for adequate model fit. Specifically, for the SEMs addressing Hypothesis 2 from seventh through 12th grade, the fit of these models was adequate for all models except for the grades seven through eight task values model. However, although the model fit was only acceptable for one fit index and was somewhat close for two fit indices, this does not mean that the model is not tenable (i.e., possible). What this means is that the model is not adequately explaining the variables that are included in the model. There are many ways to deal with less-than-adequate model fit, including increasing the sample size, including other variables that may be better predictors of the variables of interest, and so on. In this model, the “bad” model fit indices are close to the recommended cut-offs, so this might mean that the model fit could be improved just with a slightly larger sample size. On the other hand, this could also mean that the modeled relations are just not appropriate, and that might be why the data-model fit is less-than-ideal. Given that the relations in the seventh through eighth grade task values model are consistent with the findings of the other task values models, and that the model fit is not completely out-of-bounds, it is ok to interpret this model as-is, with caveats about the confidence of this model and the conclusions that are made from the model.

Lastly, the dataset that was used in the current study was collected in the late 1980s and the early 1990s. It is possible that students’ perceptions of instrumental help from teachers and their ability beliefs and task values in reading and math and grades might relate to each other in different ways today then they did when this data were collected. It will be important for future work to corroborate the current findings to ensure historical effects are not obscuring relations among these variables.

Conclusion

This work is unique in that it explores students’ perceptions of instrumental support from teachers and students’ ability beliefs, task values, and grades from second through sixth grade and seventh through 12^{th} grade. In addition, there are not many studies that look at how aspects of teacher-student relationships, especially students' perceptions of instrumental help from teachers, relate to ability beliefs and task value, and so the current study adds to this research. Specifically, the current study found that students' positive perceptions of instrumental help from teachers significantly positively predict: (a) positive math ability beliefs and reading and math task values in elementary school within the same grade for both girls and boys, and (b) reading and math ability beliefs, reading and math task values, and GPA in middle and high school within the same grade for both girls and boys. Overall, students' perceptions of instrumental help from teachers more consistently predicted ability beliefs and task values in the academic domain of math than in the academic domain of reading. Although there were some statistically significant model differences for girls and boys, the direction and significance of relations in the models were generally the same for both girls and boys. Thus, the only differences by gender were generally either mean level differences in the variables of interest or sometimes slight magnitude differences in the strength of the relations among students' perceptions of instrumental help from teachers and reading and math ability beliefs, reading and math task values, reading and math course grades, or GPA in the models.

Appendix A: Frequencies by Wave, Cohort, and Grade

Wave	Cohort	Grade											All Grade (Waves 3-9)			Grades 2-6 (Waves 3-4) Grade 7-12 (Waves 5-9)		
													Total by Cohort	Missing Data		Total by Cohort	Missing Data	
		2	3	4	5	6	7	8	9	10	11	12		N	%		N	%
3	**1 - Oldest**			1	402	1							404	3	0.74%	404	3	0.74%
	2 - Middle	3	298										301	2	0.66%	301	2	0.66%
	3 - Youngest	281											281	4	1.40%	281	4	1.40%
	No Cohort			14		12							26	3	10.34%	26	3	10.34%
	Total	284	298	15	402	13	0	0	0	0	0	0	1012	12	1.17%	1012	12	1.17%
4	**1 - Oldest**				2	372	1						375	32	7.86%	374	32	7.88%
	2 - Middle		4	251	1								256	47	15.51%	256	47	15.51%
	3 - Youngest	5	244										249	36	12.63%	249	36	12.63%
	No Cohort	20			14		12						46	2	4.17%	34	2	5.56%
	Total	25	248	251	17	372	13	0	0	0	0	0	926	117	11.22%	913	117	11.36%
5	**1 - Oldest**								2	276			278	129	31.70%	278	129	31.70%
	2 - Middle						1	190	3				194	109	35.97%	194	109	35.97%
	3 - Youngest					3	184						187	98	34.39%	184	98	34.75%
	No Cohort			1	18	16			10		9		54	13	19.40%	19	13	40.63%
	Total	0	0	1	18	19	185	190	15	276	9	0	713	349	32.86%	675	349	34.08%
6	**1 - Oldest**									3	183	1	187	220	54.05%	187	220	54.05%
	2 - Middle							2	125	2			129	174	57.43%	129	174	57.43%
	3 - Youngest						2	129					131	154	54.04%	131	154	54.04%
	No Cohort				1	15	14			8		6	44	23	34.33%	28	23	45.10%
	Total	0	0	0	1	15	16	131	125	13	183	7	491	571	53.77%	475	571	54.59%
7	**1 - Oldest**										2	195	197	208	51.36%	197	208	51.36%
	2 - Middle								1	151	3		155	148	48.84%	155	148	48.84%
	3 - Youngest							3	151				154	131	45.96%	154	131	45.96%
	No Cohort					1	17	15			6		39	24	38.10%	38	24	38.71%
	Total	0	0	0	0	1	17	18	152	151	11	195	545	511	48.39%	544	511	48.44%

Wave	Cohort	Grade											All Grade (Waves 3-9)			Grades 2-6 (Waves 3-4) Grade 7-12 (Waves 5-9)		
													Total by Cohort	Missing Data		Total by Cohort	Missing Data	
		2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**		**N**	**%**		**N**	**%**
8	**1 - Oldest**												-*	-*	-*	-*	-*	-*
	2 - Middle										1	114	115	187	61.92%	115	187	61.92%
	3 - Youngest										1		1	284	99.65%	1	284	99.65%
	No Cohort												0	67	100.00%	0	67	100.00 %
	Total	0	0	0	0	0	0	0	0	0	2	114	116	538	82.26%	116	538	82.26%
9	**1 - Oldest**												-*	-*	-*	-*	-*	-*
	2 - Middle											1	1	-*	-*	1	-*	-*
	3 - Youngest										7	114	121	163	57.39%	121	163	57.39%
	No Cohort								1	14	11		26	40	60.61%	26	40	60.61%
	Total	0	0	0	0	0	0	0	1	14	18	115	148	203	57.83%	148	203	57.83%
Total by Grade		309	546	267	438	420	231	339	293	454	223	431	**N/A**					
Total by Grade Split out by Wave Range		**Wave 3 and 4 ONLY**					**Waves 5-9 ONLY**											
		309	**546**	**266**	**419**	**385**	**218**	**339**	**293**	**454**	**223**	**431**						

* Cohort was not targeted in this wave for data collection as these students were thought to be out of high school by this time.

Appendix B: Correlations for Hypothesis 1

			1	2	3	4	5	6	7	8	9	10	11	12	13	14
Grade 2	1	Inst. Help														
	2	Re. Abil.	0.01													
	3	Ma. Abil.	0.03	0.1												
	4	Re. Val.	0.07	0.45****	0.01											
	5	Ma. Val.	0.1	0.11	0.33****	0.18**										
	6	Re. Grade	0.03	0.13	-0.13	-0.04	-0.11									
	7	Ma. Grade	0.02	0.04	0.20**	-0.01	0.05	0.52****								
Grade 3	8	Inst. Help	0.04	-0.02	-0.02	0.03	-0.04	0.17*	0.07							
	9	Re. Abil.	-0.01	0.33****	0.07	0.25****	-0.01	0.20**	0.09	0.03						
	10	Ma. Abil.	-0.04	-0.08	0.48****	-0.05	0.23****	-0.04	0.32****	0.05	-0.04					
	11	Re. Val.	0.07	0.18**	-0.02	0.31****	0.14*	0.1	0.15*	0.11*	0.48****	0				
	12	Ma. Val.	0.15*	0.05	0.11	0.05	0.33****	0.02	0.13	0.02	0.02	0.40****	0.30****			
	13	Re. Grade	-	-	-	-	-	-	-	-0.02	0.21**	0.04	0.14*	0.01		
	14	Ma. Grade	-	-	-	-	-	-	-	-0.04	0.03	0.26****	0.01	0.1	0.69****	
Grade 4	15	Inst. Help	-	-	-	-	-	-	-	0.14*	0.07	0.1	0.15*	0.07	0.06	0.1
	16	Re. Abil.	-	-	-	-	-	-	-	0.11	0.49****	-0.06	0.34****	0.01	0.22**	0.09
	17	Ma. Abil.	-	-	-	-	-	-	-	-0.01	0.03	0.43****	0.06	0.23****	0.05	0.27****
	18	Re. Val.	-	-	-	-	-	-	-	0.12	0.27****	-0.14*	0.36****	-0.02	0.12	0.03
	19	Ma. Val.	-	-	-	-	-	-	-	0.15*	0.07	0.22****	0.16*	0.35****	-0.05	0.08
	20	Re. Grade	-	-	-	-	-	-	-	0.01	0.16*	0.11	0.17*	0.11	0.41****	0.38****
	21	Ma. Grade	-	-	-	-	-	-	-	-0.01	0.05	0.22**	0.06	0.07	0.38****	0.45****
Grade 5	22	Inst. Help	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	23	Re. Abil.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	24	Ma. Abil.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25	Re. Val.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	26	Ma. Val.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27	Re. Grade	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28	Ma. Grade	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grade 6	29	Inst. Help	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30	Re. Abil.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31	Ma. Abil.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	32	Re. Val.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	33	Ma. Val.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	34	Re. Grade	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	35	Ma. Grade	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			15	16	17	18	19	20	21	22	23	24	25	26	27	28
Grade 2	1	Inst. Help														
	2	Re. Abil.														
	3	Ma. Abil.														
	4	Re. Val.														
	5	Ma. Val.														
	6	Re. Grade														
	7	Ma. Grade														
Grade 3	8	Inst. Help														
	9	Re. Abil.														
	10	Ma. Abil.														
	11	Re. Val.														
	12	Ma. Val.														
	13	Re. Grade														
	14	Ma. Grade														
Grade 4	15	Inst. Help														
	16	Re. Abil.	0.13*													
	17	Ma. Abil.	0.19**	0.03												
	18	Re. Val.	0	0.47****	-0.03											
	19	Ma. Val.	0.07	0.01	0.39****	0.16*										
	20	Re. Grade	0.1	0.23****	0.22**	0.13	0.12									
	21	Ma. Grade	0.09	0.06	0.37****	-0.02	0.13	0.66****								
Grade 5	22	Inst. Help	0.35	0	-0.21	0.11	-0.46	-	-							
	23	Re. Abil.	0.2	0.23	-0.35	0.28	-0.15	-1.00****	-	0.03						
	24	Ma. Abil.	0.3	-0.01	0.27	-0.33	-0.16	-1.00****	-	0.10*	-0.05					
	25	Re. Val.	-0.03	-0.44	-0.69**	0.61*	-0.13	-1.00****	-	0.15**	0.47****	0.04				
	26	Ma. Val.	-0.06	-0.3	-0.53	0.17	0.07	-1.00****	-	0.13**	0.12*	0.37****	0.20****			
	27	Re. Grade	-0.15	-0.16	-0.19	0.3	0.45	-	-	0.01	0.20****	0.06	-0.01	0.04		
	28	Ma. Grade	0.05	-0.21	-0.01	0.03	0.06	-	-	0.09	0.07	0.20****	0	0.03	0.69****	
Grade 6	29	Inst. Help	-	-	-	-	-	-	-	0.28****	-0.03	0.08	0.07	0.12*	0.05	0.08
	30	Re. Abil.	-	-	-	-	-	-	-	0.05	0.61****	-0.08	0.34****	-0.07	0.16**	-0.01
	31	Ma. Abil.	-	-	-	-	-	-	-	0.07	-0.04	0.52****	0.06	0.20****	0.18**	0.26****
	32	Re. Val.	-	-	-	-	-	-	-	0.1	0.33****	-0.03	0.46****	0.14**	0.01	-0.02
	33	Ma. Val.	-	-	-	-	-	-	-	0.13*	0.05	0.22****	0.13*	0.37****	0.01	0.11
	34	Re. Grade	-	-	-	-	-	-	-	0.04	0.22****	0.15**	0.08	0.02	0.65****	0.55****
	35	Ma. Grade	-	-	-	-	-	-	-	0.08	0.09	0.26****	0.06	0.06	0.58****	0.61****

			29	30	31	32	33	34
Grade 6	29	Inst. Help						
	30	Re. Abil.	0.05					
	31	Ma. Abil.	0.1	-0.09				
	32	Re. Val.	0.14**	0.43****	-0.1			
	33	Ma. Val.	0.12*	-0.04	0.33****	0.14**		
	34	Re. Grade	0.06	0.22****	0.21****	0.01	0.08	
	35	Ma. Grade	0.1	0.05	0.27****	0.03	0.1	0.64****

*$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$, ****$p \leq 0.001$

Note. Inst. Help = Students' Perceptions of Instrumental Help from Teachers, Re. Abil. = Students' Reading Ability Beliefs, Ma. Abil. = Students' Math Ability Beliefs, Re. Val. = Students' Reading Task Value, Ma. Val. = Students' Math Task Value, Re. Grade = Students' Reading Course Grade, and Ma. Grade = Students' Math Course Grade.

Appendix C: Correlations for Hypothesis 2

			1	2	3	4	5	6	7	8	9	10	11	12
Grade 7	1	Inst. Help												
	2	Re. Abil.	0.16*											
	3	Ma. Abil.	0.14*	0.06										
	4	Re. Val.	0.19*	0.50****	0.14									
	5	Ma. Val.	0.11	0.21**	0.45****	0.43****								
	6	GPA	0.17*	0.28****	0.47****	0.16*	0.22**							
Grade 8	7	Inst. Help	0.37****	0.03	0.07	0.09	0.05	0.08						
	8	Re. Abil.	-0.57*	-	-0.27	-	-0.41	-0.05	-0.03					
	9	Ma. Abil.	0.08	0	0.72****	0.05	0.40****	0.33****	0.22****	-0.02				
	10	Re. Val.	-0.32	-	0.01	-	-0.14	0.28	0.12	0.59****	0			
	11	Ma. Val.	0.07	0.08	0.34****	0.36****	0.56****	0.1	0.26****	-0.09	0.48****	0.08		
	12	GPA	0.15	0.22*	0.39****	0.02	0.19*	0.69****	0.14*	0.30****	0.42****	0.14*	0.16**	
Grade 9	13	Inst. Help	0.32****	0.06	0.04	0.08	0.09	0.16	0.29****	0.15	0.19**	0.14	0.21**	0.29****
	14	Re. Abil.	0.14	0.45****	-0.01	0.22**	0.08	0.12	0.04	-	0.04	-	0	0.31**
	15	Ma. Abil.	0.02	0	0.52****	0.03	0.30****	0.29****	0.14*	0.01	0.66****	0.06	0.32****	0.35****
	16	Re. Val.	0.06	0.22**	0.07	0.30****	0.1	0.18*	0.07	-	0.1	-	0.14	0.13
	17	Ma. Val.	0.03	0.07	0.32****	0.14	0.48****	0.09	0.14*	0	0.34****	0.23*	0.53****	0.16*
	18	GPA	0.29****	0.23**	0.34****	0.17	0.13	0.68****	0.18**	0.32****	0.41****	0.31**	0.22**	0.74****
Grade 10	19	Inst. Help	-	-	-	-	-	-	0.26**	0.09	0.17*	0.06	0.09	0.24**
	20	Re. Abil.	-	-	-	-	-	-	-0.06	0.57****	0.05	0.38****	0.02	0.32****
	21	Ma. Abil.	-	-	-	-	-	-	0.09	0.06	0.65****	0.05	0.28****	0.38****
	22	Re. Val.	-	-	-	-	-	-	0.07	0.19*	0.12	0.32****	0.27**	0.14
	23	Ma. Val.	-	-	-	-	-	-	0.12	0	0.35****	0.08	0.38****	0.13
	24	GPA	-	-	-	-	-	-	0.01	0.28****	0.47****	0.12	0.24**	0.69****
Grade 11	25	Inst. Help	0.08	-	0.12	-	-0.04	0.11	-0.17	0.29	0.36	-0.04	-0.03	0.29
	26	Re. Abil.	-0.18	0.37	-0.22	-0.25	-0.04	0.64*	-0.11	0.68**	0	0.32	-0.2	0.55*
	27	Ma. Abil.	0.18	-0.21	0.78****	0.4	0.31	0.1	-0.04	0.15	0.54*	-0.12	0.35	0.16
	28	Re. Val.	-0.2	-0.86	-0.2	-1	-0.25	0.39	-0.03	0.22	-0.18	0.41	-0.09	0.47
	29	Ma. Val.	0.36	0.23	0.51	0.76	0.29	-0.42	0.29	-0.29	0.4	0.07	0.58*	-0.37
	30	GPA	-0.4	-	0.62*	-	-0.02	0.57	-0.46	0.83****	0.44	0.54	0.11	0.82****
Grade 12	31	Inst. Help	0.29**	0.14	0.16	-0.05	0.04	0.24*	0.22**	0.22*	0.14*	0.05	-0.03	0.30****
	32	Re. Abil.	0.13	0.44****	-0.06	0.29**	0.13	0.12	0	0.54****	-0.08	0.32****	0.01	0.21**
	33	Ma. Abil.	-0.03	-0.03	0.54****	-0.06	0.22*	0.38****	0	0.09	0.63****	0.09	0.25****	0.46****
	34	Re. Val.	-0.03	0.21*	0	0.28**	0.16	0.03	0.09	0.15	0	0.18	0.19**	0.08
	35	Ma. Val.	-0.13	-0.06	0.39****	0.02	0.21*	0.14	0.03	-0.08	0.33****	0.06	0.33****	0.14*
	36	GPA	0.19*	0.20*	0.26**	0.1	0.13	0.63****	-0.03	0.40****	0.33****	0.32****	0.09	0.65****

			13	14	15	16	17	18	19	20	21	22	23	24
Grade 7	1	Inst. Help												
	2	Re. Abil.												
	3	Ma. Abil.												
	4	Re. Val.												
	5	Ma. Val.												
	6	GPA												
Grade 8	7	Inst. Help												
	8	Re. Abil.												
	9	Ma. Abil.												
	10	Re. Val.												
	11	Ma. Val.												
	12	GPA												
Grade 9	13	Inst. Help												
	14	Re. Abil.	0.05											
	15	Ma. Abil.	0.24****	-0.06										
	16	Re. Val.	0.08	0.55****	0.11									
	17	Ma. Val.	0.16**	0.01	0.50****	0.1								
	18	GPA	0.28****	0.24**	0.48****	0.29****	0.20**							
Grade 10	19	Inst. Help	0.43****	0.17	0.09	-0.02	0.23*	0.21*						
	20	Re. Abil.	0.1	-	-0.08	-	-0.09	0.35****	0.08					
	21	Ma. Abil.	0.28**	0.27	0.81****	-0.03	0.30****	0.45****	0.16****	-0.14**				
	22	Re. Val.	0.08	-	-0.03	-	0.03	0.17	0.16**	0.53****	-0.06			
	23	Ma. Val.	0.25**	-0.41	0.41****	-0.65*	0.63****	0.26**	0.15**	-0.09	0.53****	-0.02		
	24	GPA	0.31****	0.49	0.40****	-0.19	0.26**	0.75****	0.25****	0.20****	0.42****	0.07	0.23****	
Grade 11	25	Inst. Help	0.09	0.48	0.35	0.64*	0.1	0.39	0.38****	-0.1	0.23**	0.06	0.22**	0.11
	26	Re. Abil.	0.29	0.77**	0.17	0.70**	-0.11	0.17	0	-	0.16	-	-0.65	-0.05
	27	Ma. Abil.	-0.06	-0.14	0.80****	0.22	0.18	0.64*	0.11	-0.11	0.77****	-0.14	0.41****	0.46****
	28	Re. Val.	0.18	0.21	-0.09	0.38	0.22	0.39	-0.25	-	-0.49	-	0.08	-0.48
	29	Ma. Val.	-0.29	0	0.08	0.22	0.45	0.06	0.16*	-0.05	0.46****	-0.01	0.70****	0.30****
	30	GPA	0.24	0.43	0.49	0.57	0.29	0.92****	0.16*	0.13	0.44****	0.02	0.28****	0.69****
Grade 12	31	Inst. Help	0.36****	0.18	0.14*	0.05	0.08	0.14	0.37****	0.13*	0.12*	0.08	0.11	0.13*
	32	Re. Abil.	0.13	0.59****	-0.06	0.31**	-0.05	0.18*	0.01	0.73****	-0.15**	0.44****	-0.14*	0.16**
	33	Ma. Abil.	0.21**	0.1	0.69****	0.03	0.41****	0.44****	0.1	-0.15*	0.75****	-0.1	0.45****	0.39****
	34	Re. Val.	0.07	0.31**	0	0.37****	0.02	0.04	0.04	0.24****	-0.15**	0.49****	-0.08	0.02
	35	Ma. Val.	0.07	-0.07	0.39****	-0.05	0.55****	0.14	0.11	-0.19**	0.42****	-0.09	0.63****	0.23****
	36	GPA	0.21**	0.19	0.43****	0.07	0.16*	0.77****	0.11	0.25****	0.37****	0.16**	0.24****	0.59****

			25	26	27	28	29	30	31	32	33	34	35
Grade 11	25	Inst. Help											
	26	Re. Abil.	0.25										
	27	Ma. Abil.	0.20**	-0.08									
	28	Re. Val.	-0.03	0.61****	-0.02								
	29	Ma. Val.	0.26****	-0.05	0.59****	0.27							
	30	GPA	0.22**	0.48**	0.55****	0.52**	0.34****						
Grade 12	31	Inst. Help	0.33****	-0.02	0.12	-0.37	0.12	0.13					
	32	Re. Abil.	-0.1	-	-0.21*	-	-0.07	0.1	0.11*				
	33	Ma. Abil.	0.21**	-0.16	0.87****	0.45	0.51****	0.60****	0.21****	-0.19****			
	34	Re. Val.	0.07	-	-0.22**	-	-0.04	0.02	0.03	0.55****	-0.21****		
	35	Ma. Val.	0.29****	-0.14	0.50****	0.44	0.71****	0.42****	0.11*	-0.23****	0.61****	-0.16**	
	36	GPA	0.07	0.02	0.40****	0.2	0.27****	0.66****	0.14**	0.15**	0.42****	0	0.19****

*$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$, ****$p \leq 0.001$

Note. Inst. Help = Students' Perceptions of Instrumental Help from Teachers, Re. Abil. = Students' Reading Ability Beliefs, Ma. Abil. = Students' Math Ability Beliefs, Re. Val. = Students' Reading Task Value, Ma. Val. = Students' Math Task Value, and GPA = Students' Grade Point Average.

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