African American Boys' and Girls' Causal Attributions about Math, English, and Science are Shaped by Gender Stereotypes, Influence Classroom Engagement, and Change across the High School Years

Akilah D. Swinton

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Psychology (Developmental Psychology)

Chapel Hill
2011

Approved by:

Dr. Beth Kurtz-Costes (Chair)

Dr. Jean-Louis Gariepy

Dr. Vonnie C. McLoyd

Dr. Judith Meece

Dr. Antonio Morgan-Lopez

ABSTRACT

AKILAH SWINTON: African American Boys' and Girls' Causal Attributions about Math, English, and Science are Shaped by Gender Stereotypes, Influence Classroom Engagement, and Change across the High School Years
(Under the direction of Beth Kurtz-Costes)

This doctoral dissertation investigates developmental, gender, and academic domain differences in causal attributions; the influence of perceptions of gender group competence on attributions; and the impact of attributions on classroom engagement in a sample of African American adolescents (N = 381). Two studies were conducted using attribution theory as the guiding framework. The first study utilized a variable-centered approach to assess attributions, while the second study utilized a person-centered clustering approach. Data for the study were drawn from the Youth Identity Project, a longitudinal project with measurement waves in Grades 5, 7 and 10.

In the first study, results from the latent curve models accounting for the influence of gender and achievement indicated that there was no significant decline over time in ability attributions. There were some gender-stereotypic differences in the intercepts of math and science attributions, with boys having more adaptive math and science ability attributions than girls in Grades 7 and 10. Results from the path models demonstrated that Grade 7 math and science ability attributions influenced domain-specific classroom engagement in Grade 10, while Grade 7 English ability attributions were not related to Grade 10 English engagement. Lastly, accounting for domain-specific achievement, seventh grade boys' perception of the competence of boys in math and science was related to their endorsement of ability in explaining math success and science failure. In addition, girls' perception of girls' math competence was negatively related to their math failure ability attributions.

In the second study, results from the latent profile models indicated that at least two clusters of attributions emerged within each academic domain. The "adaptive" clusters were characterized by high levels of success ability and success effort attributions, and the "maladaptive" clusters were characterized by relatively low levels of success ability attributions and high levels of failure ability attributions. Significant gender differences for the math and English clusters emerged, with boys more likely to be in the adaptive math clusters in Grade 5 and Grade 7 and girls more likely to be in the adaptive English cluster in Grade 5. Higher classroom engagement in all domains was typically associated with membership in the adaptive clusters compared to the maladaptive clusters.

TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

Figure

INTRODUCTION

Research has consistently documented developmental, domain and gender differences in achievement outcomes and motivation. Specifically, previous research has reported that there is a decline in achievement motivation occurring throughout adolescence, particularly for math and science (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). In addition, boys tend to rate their math and science abilities more positively than girls, who rate their verbal abilities more positively (Fredricks & Eccles, 2002; Jacobs et al., 2002). However, this research has typically been conducted with predominantly European American samples and few longitudinal projects have examined developmental, domain, and gender differences in the achievement motivation of African American adolescents. Studies that have examined gender differences within African American samples (e.g., Graham, Taylor & Hudley, 1998; Saunders, Davis, Williams, & Williams, 2004) have not considered how gender differences may emerge for domain-specific motivation or how this motivation changes over time.

Gaining a more nuanced understanding of the achievement motivation of African American youth may be helpful in identifying factors that positively influence the educational outcomes of African American youth. Furthermore, attribution theory has proven to be a useful framework for understanding the achievement motivation of African American youth (Graham, 1988).Thus, the primary goal of the present research was to better understand the attributional beliefs of African American youth by conducting two studies. Several models, all grounded in attributional theory of motivation (Weiner, 1985, 1992), were tested. The models were aimed at explaining the developmental trajectory of ability attributions, determining clusters of participants based on their endorsement of multiple causal categories, as well as examining predictors and outcomes of these attributions.

In the sections that follow, I will explain how the present research tested and expanded attribution theory in significant ways. First, I will provide a brief overview of attribution theory, discuss attribution measurement issues, and summarize prior attribution research conducted with African American youth. Next, I will discuss what prior research suggests about developmental differences in achievement attributions and why changes in attributions would be expected across the transitions to middle school and high school. I will then summarize prior research on gender and domain differences in motivation and how research and theory led to my hypotheses about gender differences in domain-specific attributions among African American youth. Lastly, I will discuss the theory and research regarding the relationships among motivation, perceptions of the in-group and classroom engagement that guided my hypotheses regarding the influences and outcomes of attributional beliefs.

Attribution Theory

A central assumption of attribution theory (Weiner, 1985, 1992) is that individuals try to master their environment by understanding the causal determinants of their behavior. Furthermore, the theory explains how individuals' interpretations of their successes and failures influence their subsequent motivation. The locus, stability, and controllability of the causes attributed to successes and failures (e.g., luck, low ability, high effort) determine the psychological and behavioral consequences of attributions (Weiner, 1985, 1992). *Locus* refers to whether or not a cause is internal or external to the individual, while *stability* refers to whether or not a cause is stable or unstable. Lastly, a cause may either be controllable or uncontrollable. For example, effort is often considered an internal, unstable, and controllable cause while luck is considered to be an external, unstable, and uncontrollable cause (Weiner, 1985, 1992). Because expectancies in achievement-related contexts are often determined by perceived ability and planned effort expenditure, ability and effort are the most salient and dominant causes of success and failure endorsed within the achievement domain (Weiner, 1985).

According to attribution theory, perceptions of the causes of successes and failures are influenced by environmental factors as well as personal factors. Environmental influences can include factors such as teacher feedback and social norms (Schunk, Pintrich, & Meece, 2002). Teacher feedback influences students' perceptions of their ability and effort. For example, Pintrich and Blumenfeld (1985) found that teachers' praise for work positively affected both effort and ability perceptions. In addition, information about task difficulty is a common way that individuals use social norms to make attributions, as individuals' knowledge about the relative success of others on a certain task influences whether or not personal success or failure for that task is attributed to internal causes or to external causes. For instance, for tasks that most people find difficult, personal failure is typically attributed to the task being difficult, while personal success is typically attributed to internal causes like effort or ability (Weiner, 1992). It is likely that other social norms such as those related to gender or race also influence attribution formation. Lastly, prior knowledge about specific tasks, domains, and the self can influence attribution formation (Schunk et al., 2002). For example, a student who believes he or she is very competent in math may be more likely to attribute math failure to a lack of effort than to a lack of ability compared to a student who believes he or she is not competent in math.

The influence of attributions on an individual's motivation and behavior is called the *attributional process*. Weiner (1985, 1992) posited that the stability of an attribution is most strongly linked to expectancy for future success, while the locus of an attribution is linked to self-efficacy and esteem. These expectancies and perceptions of self, in turn, influence behavioral consequences such as persistence, choice, and engagement (Weiner, 1985, 1992). Attribution theorists argue that when explaining success, internal and stable attributions (i.e., ability) promote future engagement because in that case individuals are more likely to anticipate future success compared to when success is attributed to an external, uncontrollable factor such as luck (Weiner, 1985, 1992). Thus, high achieving adolescents emphasize the contribution of their own ability in shaping their academic successes, while low achievers emphasize how variables external to themselves, such as luck, are instrumental to their academic successes (O'Sullivan & Howe, 1996). When explaining failure, attributions to causes that are external and unstable (i.e., task difficulty or low effort) are considered to be the most adaptive (Weiner, 1985, 1992). Attributing failure to an internal, stable factor such as low ability is posited to have detrimental effects on future behavior because individuals may assume that future effort is unlikely to result in success.

The research regarding the benefits of success effort attributions is mixed. There is some evidence that attributing success to effort is positively linked to motivational outcomes (Georgiou, 1999; Graham & Long, 1986; Schunk, 1982). However, several factors may determine whether success effort attributions are adaptive. First, beliefs about effort change over time. While younger children tend to view effort as just as important as ability for success, adolescents tend to perceive ability and effort as inversely related to each other (Nicholls, 1990). Adolescents may believe that if they have to put forth high effort to succeed this means they do not possess high ability. Dweck and Leggett (1988) argue that students' views on effort differ depending on their theories of intelligence. Entity theorists, who view ability as innate and fixed, may believe that exerting high effort for a task is an indication that they lack ability. Incremental theorists, who view intelligence as a malleable attribute that can be improved with effort, may benefit positively from attributing success to effort. Lastly, although effort is typically considered unstable since individuals' effort may vary from situation to situation, the stability of effort is variable. In fact, distinctions are often made between unstable effort and stable effort, with stable effort considered an internal, stable cause like ability (Forsyth, Story, Kelley & McMillan, 2009; Russell, 1982). Therefore, attributing success to stable effort should be adaptive like attributing success to ability. Given that success effort attributions are not always clearly adaptive, more research is needed to examine how success effort attributions influence motivation. The present research will explore whether success effort attributions positively benefit engagement in Study 2.

Measuring Attributions

Vispoel and Austin (1995) discuss three main approaches that have been used to assess attributions: situational, dispositional, and critical incident. In the situational approach, attributions are measured in one of two ways. Either participants are asked to make attributions about hypothetical others after reading a scenario, or participants engage in a laboratory task in which success/failure outcomes are manipulated, and their attributions for these outcomes are assessed. In the dispositional approach, participants are asked to rate the relative importance of various attributions for a hypothetical series of events that happen within an achievement domain. In the critical incident approach, participants evaluate successes or failures in naturally-occurring events or recall successes and failures for an event and form attributions for those outcomes. Within each approach, attributions are typically measured with open-ended, ranking, and rating scales. Elig and Frieze (1979) demonstrated that rating scales were superior to open-ended and ranking techniques in providing reliable and valid assessment of attributional response. For the present research, attributions were assessed using rating-scales within a dispositional approach by asking African American adolescents to rate the importance of effort and ability in their successes and failures in math, English and science.

If rating scales are not forced-choice, respondents may endorse multiple causes for an outcome. For instance, individuals who strongly endorse ability for their success might also strongly endorse effort as well. Maruyama (1982) argues that this may present a dilemma for researchers in that it may be difficult to interpret an individual's response to a particular attribution category. However, endorsement of multiple categories probably has greater external validity than forced-choice methods because students are likely to view outcomes as due to a combination of factors rather than a single cause (Forsyth et al., 2009). Consideration of the multiple causes that individuals endorse may provide us with a better understanding of how attributions influence later motivation. A latent profile model can be used to account for the multidimensionality of achievement attributions. Latent profile analysis is a person-centered analytic approach that allows for the identification of clusters of observations that have similar values on cluster indicators (Lubke & Muthén, 2005). I used this approach in Study 2 to examine common patterns in the ways that African American adolescents endorse both ability and effort for success and failures.

Attributions of African American Youth

Little research has been conducted on the achievement attributions of African American adolescents. The race-comparative research that has been done has shown that racial differences between White and African American students are not very large in regard to attribution endorsement and how attributions influence behavior (Graham, 1994; Graham & Long, 1986). Graham and Long (1986) found that both African American and European American adolescents tended to rate causes similarly with regard to stability, locus, and controllability. For example, all viewed ability as an internal, stable and controllable cause. In addition, adolescents of both racial groups were more certain of future success when endorsing stable causes for success and failure; however, African Americans, especially those from a low SES background, tended to be more optimistic of future success even when the causes were unstable.

Van Laar (2000) found that African American college students were likely to make more external attributions over time, even though prior to college, their attributions and expectancies were very similar to those of White students. It was argued that this developmental change came as a result of academic disappointment and perhaps pessimism about the payoff of effort. Both White and African American students lowered their expectancies as their attributions became more external. However, African American students who made external attributions for failure tended to be higher in academic motivation and self-esteem than those African American students who endorsed internal attributions for failure.

Swinton, Kurtz-Costes, Okeke and Rowley et al. (in press) examined developmental, gender, and domain differences in African American adolescents' attributions and how these attributions influenced later engagement. They found that African American adolescents experienced declines in adaptive ability attributions for math from eighth to eleventh grade. In addition, boys were more likely than girls to attribute math successes to high ability and to attribute English failures to low ability. Lastly, attributions of math failure to lack of ability in Grade 8 were negatively related to Grade 11 teacher-rated math classroom engagement.

The majority of the achievement attribution research conducted on African Americans has focused on how African Americans compare to European Americans and has typically examined the psychological consequences of attributions by exploring the relationships of attributions to self-esteem and expectancies (Graham & Long, 1986; van Laar, 2000). The present studies extended attribution research and theory in several ways. The research examined within-group differences in attributions among African Americans and how these beliefs change over time. In addition, the present research tested hypotheses about linkages between academic domain-specific gender stereotypes and students' attributions about their own successes and failures within domains where their gender group was positively or negatively stereotyped. Finally, the present research tested a long-standing assumption of attribution theory: namely, that achievement attributions shape subsequent motivational behavior.

In Study 1, I extended Swinton et al. (in press) by examining the developmental trajectories of African American adolescents' ability attributions for math, English, and science across three time points (Grade 5, Grade 7, and Grade 10) and gender differences in these trajectories. I also examined the relationships between Grade 7 attributions and Grade 10 classroom engagement within the domains of math, English, and science. Lastly, I examined the relation between adolescents' Grade 7 perceptions of their gender in-group's competence in math, English and science and Grade 10 math, English, and science ability attributions, respectively.

In Study 2, I used a person-centered, latent variable approach to classify African American adolescents into clusters on the basis of common patterns of attribution endorsement by examining whether or not adolescents' endorsement of multiple causes for their successes and failures in math, English and science occur in meaningful clusters. After determining whether meaningful clusters exist for the youth for each domain, I examined whether these clusters differed by gender and Grade 10 math, English, and science classroom engagement level.

Developmental Differences in Attributional Beliefs

Understanding achievement motivation during adolescence is important because adolescence is a key developmental period characterized by important psychological, cognitive, and physical changes (Erikson, 1968). During adolescence, the most important cognitive change is the increasing ability of youth to think abstractly, engage in more complex information-processing strategies, and reflect on the self (Keating, 1990; Piaget, 1952). These cognitive changes also affect adolescents' self-concepts, thoughts about their future, and understanding of others (Erikson, 1968). Therefore, as individuals begin to better understand themselves and their skills, attributions may become more closely related to future behavior. For example, Nicholls (1979) found that the relationship between ability attributions and actual performance was stronger among older children than younger children in a sample of 6-, 8-, 10-, and 12-year old children.

In addition to cognitive changes, age differences in attributions may result from developmental changes concerning beliefs about the nature of ability and effort and the relations between them. Research by Nicholls (1978, 1990) established that children's understanding of the relations among ability, effort, and task difficulty changes across the primary school years. Before the age of 6, effort is equated with ability. After age 6, children are able to differentiate effort and outcome: Children are able to understand that more effort leads to better outcomes. Around age 8 or 9, children begin to understand that people who try equally hard may not get the same outcomes if they are at different ability levels. By about age 13, most youth view effort and ability as inversely related such that given equal performance outcomes, individuals who exert greater effort are presumed to have less ability than individuals who exert less effort. There is also an understanding that low ability may limit the effect of high effort (Nicholls, 1990).

Changes in the environment may also influence developmental differences in the attributional process. The school context is particularly important during adolescence; the school setting is one of the more influential environments during this time period (Stevenson, 2001). The middle school transition is associated with mean-level declines in academic-motivational outcomes (Eccles & Midgley, 1989). Eccles and Midgley (1989) argue that the changes that typically occur with the middle school transition, including changes in task complexity, evaluation techniques, locus of responsibility for learning, and quality of teacher-student and peer relationships, are developmentally inappropriate changes and thus contribute to the negative declines in motivation and achievement that many adolescents experience during early adolescence. These changes, according to Eccles and Midgley(1989), do not meet young adolescents' needs for autonomy and control, and this mismatch between the environment and adolescents' psychological needs results in declines in motivation and interest in school. In addition, most middle schools are substantially larger than elementary schools and instruction is more likely to be organized departmentally, such that middle school teachers are teaching several different groups of students (Simmons & Blyth, 1987). This change in structure may result in a high likelihood that students who are struggling academically will begin negative motivational and performance trajectories, as it may be harder for them to get individualized help and instruction.

Like the transition to middle school, the transition to high school may negatively affect students' achievement motivation. In comparison to middle schools, high schools typically have more academic tracking, greater visibility of class rank, and greater importance placed on academic performance (Berkner & Chavez, 1997; Eccles & Midgley, 1989; Lee & Bryk, 1989). Research on the transition to high school has found that students' grade point averages, attendance, and school engagement significantly decline from eighth to ninth grade (Reyes, Gillock, & Kobus, 1994; Roeser, Eccles, & Freedman-Doan, 1999). However, the high school transition appears to be less disruptive than the middle school transition (Barber & Olsen, 2004).

Other changes are also occurring during adolescence in addition to the changes in cognition and in the school environment. Adolescents are often preoccupied with how others perceive them (Harter, 1990). This preoccupation may result in pressure to conform to traditional gender norms (Ruble, Martin, & Berenbaum, 2006), leading to causal attributions that reflect traditional academic gender stereotypes. Adolescence is also a time when self-perceptions become more differentiated such that adolescents evaluate themselves along several distinct dimensions (Harter, 1990; Marsh, 1986; Marsh & Ayote, 2001). These developmental changes may lead to changes in attributions that are moderated by gender and academic domain.

With the exception of Swinton et al. (in press) and van Laar (2000), there is almost no research examining how the achievement attributions of African Americans change over time. I addressed this gap in Study 1 by exploring changes in attributions across the middle school and high school transitions using latent growth modeling. I hypothesized that adaptive ability attributions would decrease across time. I also hypothesized that these decreases would differ by gender and academic domains. The hypotheses related to gender and domain differences are discussed in the following section.

Domain and Gender Differences in Attributions

A great deal of research has distinguished science, technology, engineering, and mathematics (STEM) academic domains from language arts (reading, writing) domains. This research suggests that students view STEM domains as more difficult than language arts domains and experience motivational declines in mathematics and science, more than in language arts (Chouinard & Roy, 2008; Jacobs et al., 2002; Meece, Wigfield, & Eccles, 1990; Osborne, Simon, & Collins, 2003). In addition to the general declines that occur in motivational beliefs, research on youths' perceptions of competence consistently shows gender differences in STEM and language arts domains. Compared to girls, boys tend to rate their math and science abilities more positively and their verbal abilities less positively (Andre, Whigham, Hendrickson, & Chambers, 1999; Eccles & Jacobs, 1986; Jacobs & Bleeker, 2004; Jacobs et al., 2002; Meece, Glienke, & Burg, 2006; Meece et al., 1990; Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991). There is also some evidence that these gender differences do not increase over time but instead remain stable for English and decrease over time for math, almost disappearing by the high school years (i.e., Jacobs et al., 2002). However, most of this research has been conducted with predominantly European American samples.

Research on the general achievement motivation of African American adolescents has shown that African American girls tend to report higher levels of academic self-efficacy and school valuing than boys (Graham et al., 1998; Saunders et al., 2004). Only limited research has examined domain-specific beliefs in African Americans, whether motivational beliefs change over time, and whether they differ by gender. Swinton et al. (in press) found that African American adolescents experienced declines in adaptive ability attributions for math from middle to high school, but did not experience declines in science and English. In addition, African American boys were more likely than girls to attribute math success to high ability and English failure to low ability. The results of two studies examining academic gender stereotypes of African American youth reflect traditional gendered views, with children of both genders rating girls as more competent in literacy than in math/science, and the opposite pattern in ratings for boys (Evans, Copping, Rowley, & Kurtz-Costes, 2011; Rowley, Kurtz-Costes, Mistry, & Feagans, 2007). Evans et al. (2011) also measured students' self-concepts, and found that whereas the academic self-concepts of boys did not differ across domains, girls had higher English self-concepts than math/science self-concepts. If ability attributions are consistent with perceptions of group competence, African American boys will be more likely than girls to endorse high ability when explaining math and science success and less likely than girls to endorse low ability when explaining math and science failure. African American girls, in turn, will be more likely than boys to endorse high ability when explaining English success and less likely than boys to endorse low ability when explaining English failure. However, the results of Evans et al. (2011), like research with

White students, would indicate that gender differences in attributions might be more likely to emerge in the domains of math and science than in the verbal domain.

In line with the results of Swinton et al. (in press) and traditional gender stereotypes, I hypothesized in Study 1 that African American boys would hold more adaptive ability attributions for math and science compared to African American girls, and that African American girls would hold more adaptive ability attributions for English compared to African American boys. I also hypothesized that while both boys and girls would experience declines in adaptive attributions for all three domains across time, boys would experience less decline compared to girls for math and science and girls would experience less decline compared to boys for English. In Study 2, I hypothesized that for English, girls would be more likely than boys to be in clusters that include the high endorsement of multiple adaptive attributions (i.e., high levels of success ability attributions; high levels of success effort attributions; low levels of failure ability attributions). Similarly, I hypothesized that for math and science, more boys than girls would be in clusters that include high endorsement of adaptive attributions (i.e., high levels of success ability attributions; high levels of success effort attributions; low levels of failure ability attributions).

Perceptions of Group Competence and Academic Stereotypes

According to attribution theory, many personal and environmental factors influence attribution formation (Weiner, 1985). Because research indicates that gender differences in academic self-concepts are consistent with traditional gender stereotypes, it seems reasonable that perceptions of the gender in-group or gender stereotype endorsement would have an influence on attribution formation. For the remainder of this proposal, the term "perceptions of gender group competence" will be used to refer to general views of the competence of one’s gender in-group in a certain domain (e.g., a girl's perception of the math ability of girls), while the term “gender stereotype endorsement” will be used to refer to the endorsement of traditional academic stereotypes (e.g., a student's belief that girls are better than boys in English). Stereotype endorsement differs from perceptions of group competence in that it refers to beliefs about one’s in-group competence relative to perceptions of an out-group’s competence.

These two concepts may be theoretically distinct and have differing importance across tasks and contexts. For example, a male student with relatively positive perceptions of gender group academic competence may also endorse the idea that girls are generally more academically competent than boys. However, because his perceptions of gender group competence are positive, this stereotype endorsement may not be as harmful to his self-concept compared to another male student with less positive perceptions of gender group competence. Although it is likely to be most beneficial to have both positive perceptions of in-group competence and to not endorse negative stereotypes of one’s group, it also seems likely that having at least positive perceptions of in-group competence should positively benefit one’s self-perceptions. Therefore, in Study 1, I examined the relations between perceptions of gender group competence and attributions, and not the relations between gender stereotype endorsement and attributions. However, research examining both types of beliefs will be discussed as both are helpful to understanding the relationship between perceptions of gender group competence and attributions.

According to social identity theory, individuals are motivated to maintain a positive view of their social group (Tajfel & Turner, 1986).Thus, individuals have a tendency to hold views favoring their in-group, and these positive views are presumed to enhance their views of themselves. In addition, when making in-group vs. out-group comparisons, individuals are often biased against the out-group. In Hewstone's (1990) review of research on inter-group attributions, he concluded that internal attributions for positive acts were stronger for the in-group than for the out-group, whereas the reverse was true for negative acts. Hewstone also concluded that out-group failure was more strongly attributed to lack of ability than was in-group failure and that individuals show a preference for in-group-serving attributions for group differences.

On the other hand, the social stratification of America may affect low status groups such that stigma associated with being a member of a low-status group results in "automatic activation of negative in-group stereotypes" (Major & O' Brien, 2005, p. 397). Furthermore, members of low-status groups have been known to show less in-group favoritism than members of high-status groups, especially on domains relevant to group status differences (Mullen, Brown, & Smith, 1992), and display more ambivalence toward their in-group than do members of high-status groups (Jost & Burgess, 2000). Knowledge of stereotypes in academic domains may lead students to endorse stereotypes about their own group. Rowley et al. (2007) found that the endorsement of traditional academic stereotypes in an African American sample increased with age, with fourth graders showing in-group bias, and with sixth and eighth graders rating Whites as more academically competent than Blacks. However, the Black students were more likely to endorse positive stereotypes of Black performance in music and sports than negative stereotypes about academic domains. These findings suggest that with age, adolescents are increasingly aware of areas in which their in-group is stereotyped, both negatively and positively.

Research that has examined stereotype effects on attributions has found that stereotype-inconsistent performance is often attributed to external causes (i.e., luck) or to internal unstable causes (i.e., effort), whereas stereotype consistent performance is often attributed to internal stable causes (i.e., ability) (Jackson, Sullivan, & Hodge, 1993). For example, the success of women and Blacks is more often attributed to good luck, task ease, or high effort than is the success of men and Whites, respectively (Deaux & Emswiller, 1979; Jackson et al. 1993). Kiefer and Shih (2006) examined the influence of gender stereotypes on attributions in two experiments that tested whether or not environments that primed gender stereotypes guided men's and women's reactions to feedback on a verbal or math test. They found that gender stereotypes regarding math and verbal domains shaped men and women's attributions for performance such that women were more likely than men to attribute math failure to a lack of ability, and men were more likely than women to attribute verbal failure to a lack of ability.

Most of the research examining stereotype effects on attributions has typically focused on attributions about hypothetical others (Kiefer & Shih, 2006, is an exception), has been conducted with predominantly White college aged samples in a laboratory setting, and has not explicitly measured participants' perceptions of gender (or racial) group competence. To my knowledge, no research has explored the influence of perceptions of group competence on the personal attributions of African American adolescents. The present research redressed this gap by examining the influence of African American adolescents' perceptions of gender group competence on their attributions. Given the evidence discussed above, positive perceptions of gender group competence in a certain domain should positively influence personal attributions formed in that domain. In Study 1, I expected

Grade 7 positive perceptions of gender group competence in math, English, and science to be positively related to Grade 10math, English, and science success ability attributions with student achievement in those domains controlled.

Attributions as a Predictor of Classroom Engagement

According to attribution theory, the dimensions that underlie perceived causes influence affect and expectancies, two key mediators that guide achievement-related behaviors (Weiner, 1985, 1986). For instance, the locus dimension tends to be related to esteem-related affect, such as self-concept, while the stability dimension is typically associated with expectancies for success (Weiner, 1985, 1986). Hence, forming adaptive attributions should result in positive self-concept and high expectancies of success, which in turn should result in more positive achievement behaviors.

Most research has focused on the relationship of attributions to affect and expectancies (i.e., Graham & Long, 1986; Graham, 1994); little recent research has explored the relationship between attributions and achievement-related behaviors. In particular, little research has examined how attributions influence classroom engagement. There are several types of classroom engagement, but for the purposes of the present research, classroom engagement refers to the student's involvement in learning and includes behaviors such as effort, persistence, attention, and asking questions (Skinner & Belmont, 1993). Engagement appears to be important for school success because high levels of this engagement are linked to positive achievement-related outcomes (Connell, Spencer, & Aber, 1994; Marks, 2000) while disengagement has been linked to poor achievement outcomes, including dropping out of school (Fredricks, Blumenfeld, & Paris, 2004; Marks, 2000). In fact, engagement is argued to be a critical mediator between changes made in the school environment (e.g., instructional reform) and achievement. For example, many school-based interventions focus on increasing engagement as a means to increase achievement and decrease school dropout rates (Fredricks et al., 2004).

The few older studies that have explored the relationship between attributions and engagement found that maladaptive attributions are linked to lower persistence and engagement (see Bar-Tal, 1978 for a review). However, these studies typically assessed attributions using hypothetical situations rather than individual responses to real-life academic experiences. In addition, most of the studies were conducted with White college-aged students and often neglected African Americans. In a sample of mostly White high school students, Glasgow, Dornbusch, Troyer, Steinberg, and Ritter (1997) found that attributing successes to external causes and failures to external causes and low ability was negatively related to classroom engagement one year later for adolescents. However, when exploring the relationship between these same attributions and engagement within the subgroup of African Americans and Latinos, the relationship between maladaptive attributions and engagement was no longer significant. On the other hand, Swinton et al. (in press) reported that African American adolescents' endorsement of lack of ability for math failures in the eighth grade was associated with lower math engagement, as reported by the teacher, in the eleventh grade. In addition, Liu, Cheng, Chen, and Wu (2009) used hierarchical linear modeling to show that Grade 7 effort attributions were significantly related to changes in achievement from Grade 7 to Grade 11 in Taiwanese youth.

In both studies, I examined the relation between attributions and subsequent classroom engagement. In Study 1, I hypothesized that Grade 7 math, English, and science success ability attributions would be positively related to Grade 10 math, English, and science classroom engagement, respectively, and that math, English, and science failure ability attributions would be negatively related to Grade 10 math, English, and science classroom engagement. In Study 2, I hypothesized that students in those clusters that include the high endorsement of multiple adaptive attributions (i.e., high mean levels of success ability and success effort attributions; low mean level of failure ability attributions) would have higher mean levels of classroom engagement compared to students in clusters that include the endorsement of maladaptive attributions (i.e., low success ability attributions and high failure ability attributions). I expected these results for math, English, and science.

Hypotheses

Study 1: Developmental Trajectories of African American Adolescents' Ability Attributions, Gender Differences, and Predictors and Outcomes of These Attributions.

The first hypothesis for Study 1 pertained to the developmental trajectories of math, English, and science ability attributions for African American adolescents across three time points: Grade 5, Grade 7, and Grade 10.

- Hypothesis 1: Adaptive attributions for success and failure will decrease over time, with math, English, and science success ability attributions decreasing from Grade 5 to Grade 10 and math, English and science failure ability attributions increasing from Grade 5 to Grade 10.

The next set of hypotheses for Study 1 pertained to gender differences in the trajectories of math, English, and science ability attributions. Because of gender differences in STEM and English motivation, I expected to find gender stereotype-consistent differences in both the means of math, English, and science adaptive ability attributions in Grade 5, Grade 7 and Grade 10, and in their rates of change.

- Hypothesis 2: There will be gender stereotype-consistent differences in the intercepts of math, English, and science ability attributions. For each grade, boys will have higher success ability attribution means and lower failure ability attribution means for math and science compared to girls, and girls will have higher success ability attribution means and lower failure ability attribution means for English attributions than boys.
- Hypothesis 3: Compared to girls, math and science success ability attributions will decrease at a slower rate and math and science failure ability rates will increase at a slower rate for boys. Compared to boys, English success ability attributions will decrease at a slower rate and English failure ability rates will increase at a slower rate for girls.

The next set of hypotheses pertained to the relation between levels of Grade 7 math, English, and science ability attributions and Grade 10 math, English, science classroom engagement. According to attribution theory, attributing success to ability should result in positive motivation and academic behavior, while attributing failure to lack of ability should result in less engagement (Wiener, 1985). Therefore, with Grade 5 achievement controlled, I anticipated the following relations between Grade 7 attributions and Grade 10 classroom engagement:

- Hypothesis 4:The endorsement of math, English, and science success ability attributions in Grade 7 will be positively related to math, English, and science classroom engagement, respectively (as reported by the student and by the teacher) in Grade 10, above and beyond Grade 5 achievement.

- Hypothesis 5: The endorsement of math, English, and science failure ability attributions in Grade 7 will be negatively related to math, English, and science classroom engagement, respectively (as reported by the student and by the teacher) in Grade 10, above and beyond Grade 5 domain-specific achievement.

The final set of hypotheses pertained to the relation between perceptions of gender group competence and ability attributions. For both boys and girls, regardless of the domain, I expected the following:

- Hypothesis 6: Controlling for Grade 5 domain-specific achievement and Grade 7 out-group perceptions, perceptions in Grade 7 of gender group math, English, science competence will be positively related to Grade 10 math, English and science success ability attributions and negatively related to Grade 10 math, English, and science failure ability attributions.

Study 2: Latent Profile Analysis of African American Adolescents' Math, Science, and English Ability and Effort Attributions

The first hypothesis for Study 2 was concerned with whether or not African American adolescents could be classified in groups based on common patterns of attribution endorsement (e.g., high endorsement of effort, low endorsement of ability) for successes and failures in math, English, and science. These analyses were conducted separately for the three academic domains (i.e., math, English, and science). I expected to find some similarities in identified clusters across the three academic domains, and for each of the three time points.

- Hypothesis 1: At least two clusters for each domain, grouped on the basis of success ability, success effort, and failure ability attributions, will fit the data. The first latent class will be characterized by participants who highly endorse success ability and success effort attributions and have relatively low scores on failure ability attributions ("adaptive"). The second latent class will be characterized by a high endorsement of failure ability attributions, and a low endorsement of success ability attributions ("maladaptive").

The next set of hypotheses pertained to differences among the clusters in gender and classroom engagement. Gender was examined as a predictor of cluster membership while classroom engagement was examined as a distal outcome of cluster membership. I expected gender-stereotype consistent differences to occur in cluster membership and that for each domain, membership in the adaptive latent class would result in higher Grade 10 classroom engagement compared to the maladaptive latent class.

- Hypothesis 2: For the English latent profile analysis, a higher proportion of girls compared to boys will be members of the adaptive latent class, while a higher proportion of boys compared to girls will be in the maladaptive latent class. For the math and science latent class analyses, I expected the reverse gender pattern.
- Hypothesis 3: For each domain, membership in the adaptive cluster will result in higher Grade 10 classroom engagement (as reported by teacher and student) compared to the maladaptive cluster.

Method

Participants

Data for this research were drawn from the Youth Identity Project (YIP). YIP is a longitudinal study that focuses on the development of achievement motivation in African American youth. The project began when students were in fifth grade with data collected from three cohorts of fifth graders. Cohort 1 Grade 5 data were collected in 2002-2003, Cohort 2 Grade 5 data were collected in 2003-2004, and Cohort 3 Grade 5 data were collected in 2004-2005. Families were recruited from 7 elementary schools in an urban school district in the southeastern United States. Additional waves of data were collected from the three cohorts when participants were in Grades 7, 10, and 12. During Wave 2 the participants were attending 17 middle schools, and during Waves 3 and 4 they were attending 11 high schools that were either part of or close in proximity to the urban school district where data collection was initiated. Data for the present study were drawn from Wave 1 (Grade 5), Wave 2(Grade 7), and Wave 3 (Grade 10) of YIP.

For Wave 1 data collection, 78% of African American 5th grade students invited to participate returned signed consent forms; of those, 97% (N = 381; 166 boys;215 girls) agreed to participate. The retention rate between Waves 1 and 2 of YIP was 79% (N = 301; 126 boys; 175 girls). At Wave 1, the mean age of these students was 11.1 years (SD = 0.73). At Wave 2, the mean age of these students was 13.0 years (SD = 0.69). The retention rate for African American youth between Waves 1 and 3 of YIP was 65% and between Waves 2 and 3 was 82% (N = 246; 101 boys; 145 girls). At Wave 3, the mean age of participating students was 15.7 years (SD = 1.23). Comparisons between those who participated in Wave 2 and those who did not revealed that the two groups did not differ in regard to Grade 5 attributions, Grade 5 math, English, and science achievement or Grade 5 teacher-rated engagement, all F's < 2.0. Comparisons between those who participated in Wave 3 and those who did not revealed that the two groups did not differ in Grade 5 attributions, but those who did not participate in Wave 3 did have significantly lower Grade 5 math achievement and English achievement and lower Grade 5 teacher-rated engagement compared to those who participated, $F(1, 155) = 4.62$, $F(1, 155) = 4.59$ and $F(1, 326) = 6.85$, p's< .05, respectively.

Of the youth who participated in Wave 1 of YIP, caregiver data were obtained for 72% (*N* = 277) of the sample. Parents reported a median annual household income of $30,000-$39,999 (range = less than $10,000 to $100,000 or greater). About 15% of parents had not completed high school, whereas 25% had earned a high school diploma, 37% had earned some technical school or junior college education, 7% had earned an associate's degree and 16% had completed a bachelor's degree or higher.

When students were in Grade 10, their classroom teachers in math (*n* = 55), English (*n* = 47), and science (*n* = 42), completed brief rating scales of the students' classroom engagement. The average number of years taught by the teachers was 4.7 years (*SD* = 7.15; range = 1 to 27 years) for the math teachers, 7.16 years (*SD* = 7.56; range = 1 to 30 years) for the English teachers, and 7.49 years (*SD* = 10.06; range = Less than 1 year to 35 years) for the science teachers. Sixty-five percent of the math teachers were female, 82% of the English teachers were female, and 83% of the science teachers were female. Thirty-three percent of the math teachers were African American, 54% were White, 2% were Latino, and 11% were members of other racial/ethnic groups. Of the English teachers, 38% were African American, 58% were White, 2% were Latino and 2% were members of other racial/ethnic groups. Thirty-four percent of the science teachers were African American, 61% were White, and 5% were members of other racial/ethnic groups.

Procedure

At all waves of data collection, the students were administered self-report questionnaires in small groups at their school in a single session. At each session, trained undergraduate and graduate research assistants were available to instruct students on how to complete each measure and to answer questions. At the end of each session, the research assistant thanked the participants and gave each student a small incentive. For Wave 3, participants' math, English, and science teachers completed measures about the classroom engagement of the target student as well as demographic data. Teachers were sent questionnaires to complete by mail or through email and received an incentive (check or gift card) based on the number of students for whom they completed questionnaires.

Measures

Causal Attributions. Attributions were assessed in fifth, seventh and tenth grade with 24 items. Students were asked to rate the reasons underlying their success and failure in four domains: math, science, writing, and English. Each item had three attribution possibilities (success/failure due to effort, ability, or teacher characteristics), and students rated the importance on a 4-point Likert scale of each of the three in explaining their success/failure. In Grade 10, attributions were assessed using a 7-point Likert scale. Grade 5 and Grade 7 attributions ratings were re-coded so that they corresponded with the 7-point scale. Sample items are: "When I do well in math, it is because I am really good at math" and "When I get a poor grade in science, it is because I didn't work hard enough." English and writing items were combined to create a verbal domain score, which is referred to below as "English." Only success ability, failure ability, and success effort attributions were used in the current report. Alpha reliabilities for English success ability, failure ability, and success effort attributions were .53, .40, and .68 for Grade 5; .67, .50, and .70 for Grade 7; and .83, .60, and .77 for Grade 10.

Classroom Engagement. Grade 10 classroom engagement in math, science and English was assessed with student (5 items) and teacher (15 items) ratings of students' classroom engagement. On a 4-point Likert scale, students and students' Grade 10 English, science, and mathematics teachers rated the extent to which each statement was true (e.g., “If I (this student) can’t get a problem right the first time, I (s/he) just keeps trying” and “ I (this student) work(s) hard when we start something new in class”). To obtain a classroom engagement rating, negatively worded items were reverse coded and all items were averaged. Scale reliabilities for math, English, and science engagement were .71, .75 and .77 for student ratings and .97, .91 and .94 for teaching ratings.

Perceptions of Gender Group Competence. In Grade 7, perceptions of gender group competence were assessed using visual analogue scales (VAS) featuring a 100-millimeter line for each item (Rowley et al., 2007).Descriptive anchors at each end captured how the students believed boys, girls, Blacks, Whites, and Latinos perform in a variety of academic and non-academic domains(e.g., sports, reading, math). Testing group competence beliefs using formats like Likert scales may increase social desirability effects because respondents may feel uncomfortable assigning a group the lowest rating. A VAS format allows participants to give a group a relatively low rating without choosing the lowest category.

Students were asked to make a mark on each line to show the competence of each social group in each academic domain. For example, the item “I think that in math boys do this well” was followed by a scale with “not good at all” on the far left (0 millimeters) and “very good” on the right (100 millimeters). Separate items were used to assess group competence in math, science, reading, writing, music, sports, school grades, and general “smartness.” Students rated each social group (e.g., girls, boys, Blacks) on all eight items before proceeding to the next social group. The social groups were arranged in three different sequences in order to control for response bias. In addition, the two members of each social category were never adjacent to one another in the protocol (e.g., “boys” was not adjacent to “girls”). Perceived group competence scores represented how far in millimeters along the 100-millimeter line a student marked each group for that item, with lower scores representing lower competence ratings. Only the competence ratings for boys and girls in reading, writing, math and science, were used in the present research. The scores for the two reading and writing items were averaged, yielding “English” competence scores. Scale reliabilities were .76 for boys’ perception of boys’ English competence and .67 for girls’ perception of girls’ English competence.

Achievement. Students’ end of the year grades for math, science and English were used to control for achievement. These data were obtained from school records at all time points. Grades were on a 5-point scale, where *5* = “A,” *4*= “B,” *3* = “C,” *2* = “D,” and *1* = “F.” Copies of all research measures can be found in the Appendix.

RESULTS

Hypotheses for both studies were tested using Mplus Version 5.21 software package (Muthén & Muthén, 2007). Mplus was chosen for several reasons. First, Mplus is able to estimate several types of models, such as structural equation models, latent growth curve models and latent class models, which simultaneously test all parameters included in a proposed model. In addition, Mplus handles missing data using full information maximum likelihood (FIML), which allows all available data to be included in the analyses. Under maximum likelihood, the model is estimated by summing over the individual contributions of each case such that observations with a larger number of data points are weighted more heavily than observations with a smaller number of data points. FIML yields parameter estimates that tend to be less biased compared to those yielded by other techniques for handling missing data, such as listwise deletion (Collins, Schafer, & Kam, 2001). FIML assumes that data are missing at random (MAR; cases are missing as a function of other observed measures), which is the most common missing data issue with longitudinal data, while listwise deletion assumes data are missing completely at random (MCAR; cases are missing truly at random and missingness is not related to any other observed variables).

Preliminary Analyses

Prior to testing Study 1 and 2 hypotheses, several preliminary analyses were conducted. First, data were checked for possible outliers; none were found. Next, the means and standard deviations of the primary study variables were examined. Means and standard deviations for key study variables are presented in Table 1.1, with gender differences noted. The means for the math, English, and science success ability and success effort attributions were relatively high and were negatively skewed. Across domains, the success ability and success effort attribution means were also much higher than the failure ability attributions means, which tended to be positively skewed. The success effort means tended to be the highest compared to the other types of attributions for science and English, whereas the success ability attribution means were higher compared to the other types of attribution means for math.

In regard to change over time, the means for the ability attribution variables for Wave 1, Wave 2, and Wave 3 suggested that the math success ability and science failure ability attribution growth trajectories were linear since the means were consistently decreasing or increasing over time. However, the means for the math failure ability, English success and failure ability, and science success ability attributions suggested a non-linear growth trajectory because these means did not consistently increase or decrease from Grade 5 to Grade 10. It is possible that the slope for this trajectory and similar trajectories still, on average, decreased over time for the participants. Unconditional latent growth curve models were used to further examine the growth trajectories. These results are discussed below. Plots for the means of success ability and failure ability attributions are displayed in Figures 1.1 and 1.2, respectively.

In addition to examining the means, bivariate correlations between key study variables were examined. First, relations between domain-specific attributions were examined within and across waves of data. Within each wave, the correlations between math success ability attributions and math success effort attributions ranged from .16 to .35, all *p*'s < .05. In addition, the relations between math success ability and math failure ability attributions ranged from -.34 to -.46, all *p*'s < .01. Across time, math success ability attributions were not correlated with math success effort attributions, *r*'s < .12; *p'*s > .10 and the relation between math success ability attributions and math failure ability attributions ranged from -.20 to -.29, *p*'s < .01, with the exception of the non-significant correlation between Grade 5 math failure ability attributions and Grade 10 math success ability attributions, $r(240) = -.11$, $p > .10$.

Within each wave, the correlations between English success ability attributions and English success effort attributions ranged from .37 to .42, all *p*'s < .01. In addition, the relations between English success ability and English failure ability attributions ranged from -.27 to -.37, all *p*'s < .01. Across time, the majority of the correlations between English success ability attributions and English success effort attributions ranged from .16 to .20, all *p*'s <.01 with the exception of the non-significant relations between Grade 5 success ability and Grade 10 success effort attributions, $r(241) = -.03$, $p > .10$, and Grade 5 success effort and Grade 10 success ability attributions, $r(240) = -.03$, $p > .10$. The relation between English success ability attributions and English failure ability attributions ranged from -.15 to

-.23, p's < .05, with the exception of the non-significant correlation between Grade 5 English failure ability attributions and Grade 10 English success ability attributions, $r(243) = .00$, $p > .10$.

For science, the correlations between success ability attributions and success effort attributions ranged from .17 to .32, all p's < .01. The relations between success ability and failure ability attributions ranged from -.14 to -.32, all p's < .01. Across time, the relations between science success ability attributions and science success effort attributions were non-significant, r's < .11; p's > .10, with the exception of a weak correlation between Grade 7 science success ability attributions and Grade 10 success effort attributions, $r(218) = .15$, $p < .05$. Several of the relations between science success ability attributions and science failure ability attributions were non-significant, r's < .09; p's > .10; however, there were significant associations between Grade 7 science success ability and Grade 10 science failure ability attributions, $r(217) = -.16$, $p < .05$ and Grade 7 science failure ability attributions and Grade 10 success ability attributions, $r(219) = -.15$, $p < .05$.

Bivariate correlations between Grade 10 student-reported domain-specific classroom engagement and Grade 10 teacher-reported domain-specific classroom engagement as well as between Grade 7 ability attributions and Grade 10 engagement were also examined. Grade 10 student-rated classroom engagement was moderately correlated with Grade 10 teacher-rated classroom engagement, in math and science, $r(91) = .41$, and $r(94) = .33$,p's < .01. Grade 10 student-rated and teacher-rated classroom engagement were not significantly correlated for English, $r(88) = .01$, $p > .01$. Grade 7 ability attributions were weakly correlated with Grade 10 engagement for each domain. Those six correlations using student reports of classroom engagement ranged in magnitude from $r(200) = .16$ to .23 in absolute value. Using teacher reports of classroom engagement, Grade 7 math failure ability attributions was the only ability attribution significantly related to Grade 10 engagement, $r(101) = -22$, $p < .05$. The other five correlations between Grade 7 domain-specific attributions and Grade 10 teacher-reported classroom engagement were non-significant.

There were only a few significant correlations between Grade 7 perceptions of group competence and Grade 10 ability attributions for both boys and girls. For boys, Grade 7 perceptions of girls' competence in science was negatively related to Grade 10 science success ability attributions, $r(88) = -.25$, $p < .05$. For girls, Grade 7 perceptions of girls' competence in math were related to Grade 10 math success and failure ability attributions, $r(132) = .20$ and -.25, respectively, *p's* < .05. Girls' perceptions of girls' science competence in Grade 7 were correlated with Grade 10 science success ability attributions, $r(132) = -.19$, $p < .05$. These results illustrated that there were significant relations between some of the key path model variables. However, of the 48 correlations, only those four were significant at the alpha level of .05.

Lastly, a series of ANOVAs were used as exploratory analyses to test for gender differences on key variables. Significant gender differences are noted in Table 1.1. The results from the ANOVAs indicated that boys fared worse than girls on some of the indicators of motivation and achievement, with the exception of Grade 5 math failure ability attributions. Overall, girls had significantly higher grades compared to boys in math (Grades 7 and 10), English (Grades 5, 7, and 10), and science (Grade 7). In addition, girls were more likely than boys to endorse math success effort (Grade 7), English success ability (Grade 10), English success effort (Grades 5 and 7), and science success effort (Grade 7). In Grade 5, girls were more likely than boys to attribute math failures to lack of ability. These preliminary analyses explored differences in group means with no covariates. In the analyses below, gender differences are explored while controlling for other variables.

Study 1 Results

Data for Study 1 analyses were drawn from Waves 1, 2 and 3 (Grades 5, 7, and 10). The following measures were included: Grades 5, 7 and 10 achievement (covariates); Grades 5, 7 and 10 math, English, and science success and failure ability attributions; Grade 7 perceptions of gender group competence in math, English, and science; and Grade 10 math, English, and science classroom engagement as reported by students and teachers. The first three hypotheses were tested using latent growth modeling (Bollen & Curran, 2006). The hypothesized latent growth curve models are depicted in Figures 1.3 and 1.4.

Latent growth curve modeling is a statistical method that allows for the estimation of inter-individual variability in intra-individual change over time or, in other words, the estimation of between-person differences in within-person change (Bollen & Curran, 2006). The within-person patterns of change are referred to as *latent trajectories.* The latent growth model (LGM) comprises of fixed and random effects that capture the collection of individual trajectories. The fixed effects represent the mean of the trajectory pooled over all the individuals (i.e., the mean intercept and the mean slope) within the sample, and the random effects represent the variance (between-person variability) of the individual trajectories around the group mean (Bollen & Curran, 2006). Latent growth curve modeling differs from other key traditional approaches for assessing repeated measures, like repeated-measures ANOVA, because it is highly flexible to many issues common with longitudinal data, such as missing data, unequally spaced time points, non-normally distributed repeated measures, non-linear trajectories, and multivariate growth processes (Bollen & Curran, 2006). Latent growth curve modeling also allows for the incorporation of predictors of the latent trajectory in the model.

Path analysis was used to address the remaining hypotheses concerning the relationships between ability attributions, and perceptions of gender group competence and classroom engagement. The overall model fit for all models was assessed by examining the root-mean-square error of approximation (RMSEA) index, with values around .05 or lower indicating adequate fit (Bollen & Long, 1993); and the comparative fit index (CFI) and the Tucker-Lewis index (TLI). For the CFI and TLI, values around .90 or greater indicate adequate fit (McDonald & Ho, 2002).

Changes in Attributions over Time

The first goal of the study was to examine the growth trajectories of the ability attributions using latent growth curve modeling. This goal was first addressed with six unconditional latent growth curve models in order to examine the growth trajectories of math, English, and science ability attributions without gender and Grade 5, Grade 7 and Grade 10 achievement as covariates. I conducted these analyses first without controlling for gender or achievement because testing an unconditional LGM is a common first step in latent growth model building. The unconditional LGM allows for an examination of the characteristics of the growth trajectory prior to incorporating explanatory variables to predict growth. In other words, the unconditional LGM provides information about the general characteristics of individual differences in development while the conditional LGM allows for the prediction of individual differences in development (Bollen & Curran, 2006).

Developmental Changes in Success Attributions. According to Hypothesis 1, African American adolescents' adaptive ability attributions for all domains would decline from Grade 5 to Grade 10. This would mean that the means of success ability attributions would decrease over time and the failure ability attributions would increase over time. This hypothesis was tested by assessing the average slopes for math, English, and science ability attributions, respectively. The results from the models are presented in Tables 1.2 and 1.3. The model fit indices for the success ability models indicated that the math model fit well to the data (Math:χ^2 (1) = .95, $p > .05$, RMSEA =.00, CFI= 1.00, TLI =1.00), but the English and science models did not yield acceptable fit indices (English:χ^2 (8) = 10.64, $p < .05$, RMSEA =.16, CFI = .77, TLI = .31; Science:χ^2 (3) = 13.06, $p < .05$, RMSEA =.09, CFI= .63, TLI =.63). The results from the math, English, and science success ability LGMs indicated that attributions of success to ability significantly declined over time. The slope for math success ability attributions was -.41 (*SE* = .06, $p < .05$), the slope for English success ability attributions was -.24 (*SE* = .06, $p < .01$), and the slope for science ability attributions was -.28 (*SE* = .07, $p < .01$). These results are consistent with the hypothesis that these attributions would decline over time. However, the results for the English and science models must be taken with caution because both models had a less than adequate fit to the data and because of an error with the slope variance for the science model. The poor model fit for the English analysis could be because the means for English ability attributions did not change in an entirely linear way as discussed above. The error for the science success ability model was from a negative variance and might be due to the same pattern in the change in means as the English success ability means (i.e., a decrease from Grade 5 to Grade 7 and slight increase from Grade 7 to Grade 10). After correcting for the error by constraining the slope variance to zero, the results indicated that the science slope decreased over time on average.

Developmental Changes in Failure Attributions. The model fit indices for the failure ability models indicated that the math model had a poor fit to the data (χ^2 (1) = 15.49, $p < .05$, RMSEA =.20, CFI= .79, TLI =.36) and the hypothesized English and science models fit well to the data (English:χ^2 (1) = .23, p > .05, RMSEA =.00, CFI = 1.00, TLI = 1.09; Science:χ^2 (3) = 4.12,p > .05, RMSEA =.03, S, CFI= .96, TLI =.96). Results from the failure math ability attribution LGM indicated that failure ability attributions for math, on average, significantly increased over time (B = .19, SE = .07, p < .01). The slopes for English failure ability (B = -.21, SE = .18, p > .05) and science failure ability attributions (B = .09, SE = .07, p > .05) were not significant. Thus, only the results for math success attributions provided clear support for Hypothesis 1. Although results for the other five variables were generally in the direction anticipated, the non-significant slopes for the English and science failure ability attributions and the poor model fits for some of the models indicated that change for some of the attributions from Grade 5 to Grade 10 may be better represented by a non-linear model. Unfortunately, testing a non-linear LGM would require more than three waves of data. Next, I will discuss the six conditional LGMs that were tested to examine the influence of gender and achievement on the math, English, and science success and failure ability growth trajectories. Results of these analyses, which tested the first three hypotheses, are discussed separately for success and failure attributions.

Gender Differences in Success Ability Attributions without Achievement Controlled. Additional analyses were conducted to assess gender differences in ability attributions without controlling for achievement; three additional conditional LGMs with gender (0 = girls; 1 = boys) as a time invariant covariate (TIC) and achievement as a time-varying covariate (TVC; Grade 5, Grade 7 and Grade 10 domain-specific achievement). The model fit indices for the three success ability attribution models indicated there was a good fit between the hypothesized model and the observed data for the math model only (Math: χ^2 (2)

= 1.41, $p > .05$, RMSEA =.00, CFI= 1.00, TLI =1.03; English: χ^2 (2) = 10.70, $p > .05$, RMSEA =.11, CFI = .80 TLI = .40; Science: χ^2 (4) = 16.08, $p < .05$, RMSEA =.08, CFI= .63, TLI =.45). Similar to the results from the unconditional models, the slopes for the success ability attribution model were significant. The slope for math success ability attributions was -.39 (*SE* = .08, $p < .01$), the slope for English success ability attributions was -.20 (*SE* = .07, $p < .01$), and the slope for science ability attributions was -.32 (*SE* = .09, $p < .01$). The results were somewhat consistent with the hypothesis that success ability attributions would decline in a linear pattern over time. However, the results from the English and science models are not trustworthy due to their poor model fit so there was only weak support for Hypothesis 1.

The results for the analyses on success attribution scores partially supported Hypothesis 2. For the math model, gender was not significantly related to any of the intercepts, indicating that math success ability attribution means did not differ by gender in Grades 5, 7 or 10. For the English model, gender was significantly related to the Grade 7 (*B* = -.23, *SE* = .12, $p < .05$) and Grade 10 intercepts (*B* = -.35, *SE* = .17, $p < .05$). Girls had higher English success ability attribution means than boys in Grade 7 and Grade 10. For the science model, gender was significantly related to the Grade 7 (*B* = .34, *SE* = .15, $p < .05$) and Grade 10 intercepts (*B* = .43, *SE* = .22, $p < .05$). Boys had higher science success ability attribution means than girls in Grades 7 and 10. There was no support for Hypothesis 3. Gender was not significantly related to the slope for either model.

Gender Differences in Failure Ability Attributions without Achievement Controlled. Three additional conditional LGMs with gender as a TIC were tested without achievement added as a TVC. The model fit indices for the three failure ability attribution models indicated there was good fit between the hypothesized models and the observed data for the

English and science models (Math: χ^2 (2) = 15.96, p < .05, RMSEA =.14, CFI= .81, TLI =.42; English: χ^2 (2) = 1.98, p> .05, RMSEA =.00, CFI =1.00, TLI = 1.03; Science: χ^2 (4) = 4.32, p > .05, RMSEA =.02, CFI= .99, TLI =.98). The slope for math failure ability attributions was .13 (*SE* = .09, *p* = .15), the slope for English failure ability attributions was -.02 (*SE* = .07, *p* = .76), and the slope for science failure ability attributions was .07 (*SE* = .09, *p* = .45). Thus, Hypothesis 1 was not supported.

The results for the analyses on success attribution scores partially supported Hypothesis 2. For the math model, gender was significantly related to the Grade 5 (*B* = -.49, *SE* = .20, *p* < .05) and Grade 7 (*B* = -.38, *SE* = .15, *p* < .05) intercepts. Girls had higher math failure ability attribution means than boys in Grade 5 and Grade 7. There were no gender differences in either English or science failure ability means in Grades 5, 7 or 10. There was no support for Hypothesis 3: Gender was not significantly related to the slope for either model.

Gender Differences in the Ability Attributions

Conditional latent growth models with gender as a TIC and achievement as a TVC were used to address the first three hypotheses. For each model, the intercept was set at Grade 5, Grade 7 and Grade 10, respectively, in order to fully examine how the intercept varied for boys versus girls at various time points. The results for these analyses are presented in Tables 1.4 and 1.5. Results will be discussed for the three success ability attribution models (Table 1.4) followed by a discussion of the three failure ability attribution model results (Table 1.5).

Gender Differences in Success Ability Attributions. The model fit indices for the three success ability attribution models indicated a good fit between the hypothesized models and the observed data (Math: χ^2 (8) = 5.08, $p > .05$, RMSEA =.00, CFI= 1.00, TLI =1.05; English: χ^2 (8) = 5.72, $p > .05$, RMSEA =.00, CFI = 1.00, TLI = 1.09; Science: χ^2 (10) = 23.66, $p < .05$, RMSEA =.06, CFI= .75, TLI =.63). It is important to note that the science model had an error with the slope variance parameter leading to a "non positive definite matrix" error. This type of error results in the model results not being trustworthy. This error was corrected by constraining the slope residual variance parameter to zero. The first hypothesis that African American adolescents' adaptive ability attributions for all domains would decline over time was examined within these conditional models. In the case of success ability attributions, this would mean that the means would decrease over time. The slope for math success ability attributions was -.44 (*SE* = .25, $p < .10$), the slope for English success ability attributions was -.31 (*SE* = .27, $p = .26$), and the slope for science ability attributions was -.04 (*SE* = .35, $p = .91$). These slopes were not significant, and thus the results were not consistent with the hypothesis that success ability attributions declined in a linear pattern over time.

The second goal of the study was to examine the relationship of gender to success ability and failure ability growth trajectories for each domain. It was hypothesized that there would be gender stereotype-consistent differences in the intercepts of math, science and English ability attributions (Hypothesis 2). This means that boys would have higher math and science success ability attributions at each time point compared to girls, and that girls would have higher English success ability attributions than boys at each time point. This hypothesis was tested by assessing the relationship of gender to the intercept of the attributions at Grade 5, Grade 7 and Grade 10.

The results for the analyses on success attribution scores partially supported the hypothesis. For the math model, gender was significantly related to the Grade 7 (B = .36, SE = .13, p< .01) and Grade 10 intercepts (B = .41, SE = .19, p< .05). Boys had higher math success ability attribution means than girls in Grade 7 and Grade 10. For the English model, gender was not significantly related to any of the intercepts, indicating that English success ability attribution means did not differ by gender in Grades 5, 7 or 10. For the science model, gender was significantly related to the Grade 7 (B = .42, SE = .15, p< .01) and Grade 10 intercepts (B = .57, SE = .21, p< .01). Boys had higher science success ability attribution means than girls in Grades 7 and 10.

According to the third hypothesis, gender was predicted to be related to the slope of students' success attributions, with adaptive math and science attributions decreasing at a slower rate for boys than for girls, and adaptive English attributions decreasing at a slower rate for girls compared to boys. Gender was not significantly related to the slope for either model, suggesting that boys' and girls' math, English, and science success ability attributions changed at the same rate. These results were above and beyond the influence of domain-specific achievement on success ability attributions at each time point.

Gender Differences in Failure Ability Attributions. Similar conditional latent growth models were conducted on the three (math, English, science) failure ability attribution scores with gender (0 = girls; 1 = boys) as a time invariant covariate (TIC) and achievement as a time-varying covariate (TVC; Grade 5, Grade 7 and Grade 10 domain-specific achievement). The model fit indices for those three failure ability attribution models indicated a good fit between the hypothesized models and the observed data (Math:χ^2 (8) = 5.84, p> .05, RMSEA =.00, CFI= 1.00, TLI =1.04; English:χ^2 (8) = 8.93, p> .05, RMSEA =.02, CFI = .97, TLI =

.95; Science: χ^2 (10) = 9.14, $p > .05$, RMSEA =.00, CFI= 1.00, TLI =1.04). Similar to the science success model, the science failure model had an error with the slope parameter because the residual variance was close to zero, but this was corrected by constraining the slope residual variance parameter to zero.

Because African American adolescents' adaptive ability attributions for all domains were hypothesized to decline over time, I anticipated that failure ability attributions would increase over time. This hypothesis was tested by assessing the average slopes for math, English, and science failure ability attributions. The slope for the math failure model was -.13 (*SE* = .29, $p = .67$), the slope for the English failure model was -.38 (*SE* = .27, $p = .16$), and the slope for the science failure model was -.22 (*SE* = .35, $p = .52$). Because the slope coefficients were non-significant, these results were not consistent with the hypothesis that failure ability attributions would increase over time.

The second hypothesis was that boys would be less likely than girls to attribute math and science failure to lack of ability at each time point, and that girls would have lower English failure ability attributions than boys at each time point. This hypothesis was tested by assessing the relationship of gender to the intercepts of the attributions at Grades 5, 7, and 10. The results for math failure ability attributions supported the hypothesis. Gender was significantly related to the Grade 5 (*B* = -.64, *SE* = .20, $p < .01$) and Grade 7 intercepts (*B* = -.53, *SE* = .15, $p < .01$), with a marginal relationship with the Grade 10 intercept (*B* = -.42, *SE* = .23, $p < .06$). Boys had lower math failure ability attribution means than girls in Grades 5 and 7, and a marginally lower intercept in Grade 10. For the English model, gender was not significantly related to any of the intercepts, indicating that English failure ability attributions did not differ by gender in Grades 5, 7, or 10. For the science model, gender was significantly related to the Grade 7 intercept (*B* = -.29, *SE* = .15, $p < .05$). Boys were less likely than girls in Grade 7 to attribute science failure to lack of ability.

For the third hypothesis, gender was predicted to be related to the slopes of the attribution scores, with math and science failure ability attributions increasing at a slower rate for boys compared to girls, and English failure ability attributions increasing at a slower rate for girls than for boys. Gender was not significantly related to the slope for either model, suggesting that boys and girls were changing at the same rate for math, English, and science failure ability attributions. These results were above and beyond the influence of achievement on failure ability attributions at each time point.

In summary, the results did not support Hypothesis 1. Although the unconditional growth models yielded significant slopes in the expected directions for all three success attributions and for math failure attributions, the data provided a poor fit to those models. Slopes were non-significant in the failure science and failure English models. Moreover, results from the conditional LGMs indicated that including gender and achievement as covariates accounted for the change in attributions over time because the slopes for math, English, and science ability attributions were no longer significant. Thus, Hypothesis 1 was not supported.

Gender differences in the intercepts of math attributions were consistent with gender stereotypes as predicted in Hypothesis 2, and boys were more likely than girls to attribute science successes to ability in Grades 7 and 10, and were less likely to attribute science failures to lack of ability in Grade 7. Gender differences were not found at any of the three grades in English success and failure ability attributions. Thus Hypothesis 2 (of stereotype-consistent attributions at the three time points) had strong support in the domain of math, partial support in the domain of science, and no support in English. Hypothesis 3 was not supported: There were no gender differences in how attributions changed over time.

The Influence of Ability Attributions on Classroom Engagement

Another goal of Study 1 was to examine the relations between Grade 7 ability attributions and Grade 10 classroom engagement within academic domains. Hypotheses 4 and 5 were that adaptive math, science, and English attributions would be related to math, science, and English classroom engagement, respectively, as reported by the student and teacher. In other words, it was predicted that success ability attributions would be positively related to classroom engagement and failure ability attributions would be negatively related to classroom engagement within each domain with domain-specific achievement controlled. Hypotheses 4 and 5 were tested with the path model depicted in Figure 1.5.

The first model tested the relationship of ability attributions to student-reported engagement. A multiple-group path analysis was initially used to test the hypotheses and whether the relationships differed by gender. To test whether there were gender differences in how math, English, and science attributions influence subsequent classroom engagement, several models were tested. The first model was freely estimated across groups, meaning that the relationships between attributions and engagement were allowed to be freely estimated for boys and girls. Next, several models were tested constraining each path of interest one by one to be equal across groups. In other words, each alternative model consisted of a different constrained path. Each model with a constrained path was compared to the initial model using a likelihood ratio test, a statistical test used to compare the fit of two models, to test whether the constrained path affected model fit. If the likelihood ratio test is non-significant, then the restriction made by the alternative model is not false and there is no difference between boys and girls for that particular relationship. All of the likelihood ratio tests were non-significant, indicating that there were no gender differences in any of the paths of interest and thus no evidence for moderation.

Therefore, the final path model was a single-group model with Grade 5 math, English, and science achievement entered as control variables. The results from the final path model are presented in Table 1.6. The model fit indices indicated that the model fit well to the data, χ^2 (18) = 32.38, *p*< .05, RMSEA =.05, CFI= .91, TLI =.84. The results using student reports of Grade 10 classroom engagement partially supported the hypotheses. Consistent with the hypotheses, Grade 7 math success ability and math failure ability attributions were significantly related to later math classroom engagement, β = .17, *SE* = .07, *p*< .01 and β = -.14, *SE* = .07, *p*< .05, respectively, and Grade 7 science failure ability attributions were significantly related to Grade 10 science classroom engagement, β = -.18, *SE* = .06, *p*< .01. English success ability attributions and science success ability attributions were not related to later English and science engagement; however, the relationship between Grade 7 English failure ability attributions and later English engagement was marginally significant (β = -.12, *SE* = .07, *p*< .10). As expected, those seventh graders who endorsed adaptive math ability attributions (i.e., success due to ability) tended to have higher math classroom engagement in Grade 10, while those seventh graders who endorsed maladaptive math and science ability attributions (i.e., failure due to low ability) tended to have lower math and science classroom engagement, respectively. These results were above and beyond the influence of Grade 5 math and science grades.

The second model tested the influence of Grade 7 ability attributions on Grade 10 teacher-reported classroom engagement in math, science, and English with Grade 5 achievement entered as a covariate. A multiple-group path analysis was initially used to test the hypotheses and whether the relationships differed by gender. However, there were no significant relationships between ability attributions and teacher-reported classroom engagement for either boys or girls. The final model results are displayed in Table 1.6 as a single-group model. The model fit indices indicated that the hypothesized model had an average fit to the data, χ^2 (18) = 30.89, $p< .05$, RMSEA =.05, CFI= .81, TLI =.68. Accounting for Grade 5 achievement, Grade 7 ability attributions were unrelated to Grade 10 teacher-rated classroom engagement in any of the three domains.

In summary, some support was found for Hypotheses 4 and 5. Grade 7 math success ability attributions were positively related to Grade 10 math student-rated classroom engagement (Hypothesis 4). Grade 7 math failure ability attributions and Grade 7 science failure ability attributions were negatively related to Grade 10 math and science classroom engagement (Hypothesis 5). English ability attributions and failure ability attributions and science success ability attributions were not related to later English and science engagement. Finally, there were no significant relations between Grade 7 ability attributions and Grade 10 teacher-rated engagement for any domain.

The Influence of Perceptions of Group Competence on Ability Attributions

The final goal of Study 1 was to examine whether perceptions of gender group competence in Grade 7 were related to ability attributions in Grade 10. Hypothesis 6 was that positive perceptions of gender in-group competence in math, English, and science would be positively related to Grade 10 adaptive ability attributions within domains. That is, I hypothesized that seventh grade girls who endorsed positive perceptions of the competence of girls and seventh grade boys who endorsed positive perceptions of the competence of boys in all three domains would endorse success ability attributions for that same domain in Grade 10, and would be less likely to endorse failure ability attributions for that domain in Grade 10. To test these hypotheses, separate path models were conducted for boys and girls, controlling for Grade 5 domain-specific achievement and Grade 7 out-group domain-specific perceptions of gender group competence. The hypothesized model is depicted in Figure 1.6.

The results from the boys' model are displayed in Table 1.7. The model fit indices suggested that the hypothesized model fits well with the data, $\chi^2(36) = 53.91$, $p < .05$, RMSEA =.06, CFI= .98, TLI =.76, and the results provided some support for the hypothesis. Seventh grade boys' perception of boys' math competence was significantly related to Grade 10 math success ability attributions ($\beta = .22$, $SE = .10$, $p < .05$) and marginally related to Grade 10 math failure ability attributions ($\beta = -.19$, $SE = .11$, $p < .10$). Seventh grade boys' perception of boys' science competence was significantly related to Grade 10 science failure ability attributions ($\beta = -.24$, $SE = .09$, $p < .01$). Interestingly, seventh grade boys' perception of girls' science competence was negatively related to boys' science success ability attributions in Grade 10 ($\beta = -.40$, $SE = .10$, $p < .001$) and positively related to failure science ability attributions ($\beta = .22$, $SE = .11$, $p < .05$). Thus, boys who viewed girls as relatively more competent in science tended to be less likely to attribute their own science successes to ability and more likely to attribute their science failures to low ability. Boys' Grade 7 perceptions of boys' English competence was marginally related to Grade 10 English success ability attributions ($\beta = .18$, $SE = .11$, $p < .10$) but not related to English failure ability attributions.

Results for the girls' model are displayed in Table 1.8. The model fit indices suggested that the model has a good fit to the data, $\chi 2(36) = 54.49$, $p < .05$, RMSEA =.05, CFI= .90, TLI =.81. Girls' perception of girls' math competence in Grade 7 was marginally related to their Grade 10 math success ability attributions ($\beta = .16$, $SE = .08$, $p < .06$) and significantly related to Grade 10 math failure ability attributions ($\beta = -.22$, $SE = .08$, $p < .01$). However, there were no significant relationships between girls' perceptions of girls' competence in English and science and their corresponding ability attributions. Overall, there was some evidence that students' Grade 7 perceptions of their gender in-group's competence in math were related to Grade 10 math attributions, providing partial support for Hypothesis 6. However, most analyses involving science and English were non-significant.

Summary of Study 1 Results

The results provided partial support for the study hypotheses. There was no support for Hypothesis 1 as there was no evidence of significant change over time for either success or failure ability attributions for math, English, and science when testing the conditional models and taking in account gender and achievement. Consistent with Hypothesis 2, boys were more likely than girls to endorse ability in explaining math and science success in Grades 7 and 10, and were less likely than girls to endorse low ability when explaining math failure in Grades 5 and 7 and science failure in Grade 7. There were no gender differences for the English intercepts. Gender was not related to change over time for any of the ability attributions, providing no support for Hypothesis 3.

Consistent with Hypotheses 4 and 5, Grade 7 math success ability attributions were related to Grade 10 math classroom engagement, and Grade 7 math failure and science failure ability attributions were negatively related to subsequent math and science classroom engagement. However, these relationships only existed when using student-reported engagement and not teacher-reported engagement, and the hypothesized relations were not found for English success or failure attributions, or for science success attributions. Support for Hypothesis 6 was also primarily in the domain of math. Whereas the hypothesized relations between Grade 7 gender group competence perceptions and Grade 10 attributions were found for boys in positively predicting math success ability attributions and in negatively predicting science failure ability attributions, the other four Grade 10 attributions were not predicted by boys' earlier group competence perceptions. For girls, only one of the six hypothesized relations was significant: girls’ positive perception of girls' math competence in Grade 7 was negatively related to their Grade 10 math failure ability attributions.

Study 2 Results

Data for Study 2 analyses were drawn from Waves 1, 2 and 3 (Grades 5, 7 and 10). The following measures were included: Grades 5, 7 and 10 math, science and English success and failure ability attributions; Grade 5, 7 and 10 math, science and English success effort attributions; and Grade 10 student and teacher ratings of math, science and English classroom engagement. Models were run separately for each academic domain.

Hypotheses 1, 2 and 3 were tested using a latent profile analysis (LPA) model. LPA is a corresponding technique to latent class analysis (LCA) that allows for the use of continuous observed variables (Muthén, 2001). The goal of latent class models is to identify clusters of observations that have similar values on cluster indicators (Lubke & Muthén, 2005). In this instance, the cluster indicators are various types of attribution endorsement. The goal of LPA is the same as that of traditional cluster analysis; however, LPA is model-based, whereas most other traditional methods cluster analysis are not. LPA provides estimates of the proportion of weight given to each cluster in the population. Once latent classes are determined, latent class models make it possible to examine predictors and outcomes of class membership (Lubke & Muthén, 2005). When examining the relationship between external variables and cluster membership, external variables can be specified to either predict cluster membership or be specified as outcomes of cluster membership. The hypothesized model is depicted in Figure 2.1.The goal of Study 2 was to use latent profile analysis (LPA) to classify African American adolescents into clusters on the basis of common patterns of attribution endorsement. After determining whether meaningful clusters existed for the youth for each domain, the next goal was to determine whether these clusters differed by gender and Grade 10 math, science, and English classroom engagement.

Determining Model Fit

There is not a single statistical indicator of model fit for latent profile models. Instead, several indicators and substantive theory are used to decide on the best-fitting model. The most commonly used indicators are the Bayesian information criterion (BIC; Schwartz, 1978) and the sample-size adjusted BIC. Lower values of both the BIC and the sample-size adjusted BIC are indicative of better model fit. In addition, a significant test, the Lo-Mendell-Rubin likelihood test (LMR, Lo Mendell & Rubin, 2001) can be used to compare the fit of latent profile models that specify different numbers of clusters but have the same parameterization. The test compares two models using the null hypothesis that the data have been generated by a model with $K - 1$ clusters. A small p-value supports the retention of the more complex model with at least K clusters. While the BIC allows the comparison of any model, the LMR provides a significance test, and thus both methods/procedures should be used to determine the best-fitting model. In addition, the entropy statistic provides an indicator of classification utility or how well the model classifies people. The statistic ranges from 0 to 1 with higher values indicating a higher classification utility and is calculated using the posterior probabilities (i.e., the probabilities of belonging in each cluster, the sample size, and the number of clusters). The final latent profile class models for each domain were determined by consulting the BIC's, LMR's, and entropy statistics. It is also recommended that theory, sample size, and cluster uniqueness be considered when deciding on the number of clusters and in cases where the model fit statistics do not clearly point to a cluster solution, these will be used to make the final decision.

The results will be presented in three parts. First, I will discuss the results for the latent profile models that were used to determine the appropriate number of clusters for math, English, and science attributions as well as the structure of these classes. Next, I will discuss gender differences in latent profile membership. Lastly, I will discuss latent profile differences in Grade 10 classroom engagement in order to establish the predictive validity of the models. These results will be presented separately for each domain

Identifying the Cluster Solutions for Math, English, and Science LPA Models

The first goal of Study 2 was to determine the optimal cluster solution for math, English, and science attribution endorsement in each grade. To do this, latent profile analysis (LPA) models were run by first testing a one-cluster model and then exploring two-, three- and four cluster models on attribution scores at each grade level. Because of the sample size and the small number of cluster indicators, model testing stopped at four clusters because more than four clusters would result in model identification problems as well as make clusters less meaningful and their interpretation difficult.

Overall, three-cluster models were the best fitting models, with the exception of the English LPA models in which two-cluster models were the best fitting models. For each model, testing more than three clusters resulted in issues with model identification and a fourth cluster that was not distinct which provided further support for stopping at four clusters. It is also important to note that for the Grade 7 math LPA three-cluster model and the Grades 5 and 7 science LPA three-cluster models, several constraints were made to address a “non-positive definite matrix” error, which typically means that the model estimates may not be trustworthy and thus cannot be interpreted. In each of these cases, there was an issue with the estimation of one of the cluster indicators, so the problem variable was identified and then fixed at the mean that was obtained in the original model. This procedure resulted in an error-free model and allowed for interpretation. Besides these constraints, means and covariances were allowed to vary across clusters and cluster indicators in each model.

Table 2.1 includes model fit information for the math LPA models. For Grade 5, the lowest BIC and sample-adjusted BIC were associated with the three-cluster model. The results from the Lo–Mendell–Rubin likelihood ratio test for the four-class model (p = .1521) also indicated that the three-cluster model was the best fitting model. For Grade 7, the lowest BIC was associated with the three-cluster model. The LMR results for the three-cluster and four-cluster models could not be consulted because the parameterization of the models differed; however, the four-cluster model included a fourth cluster that was not distinct from the other clusters, thus supporting the retention of the three-cluster model. The three-cluster solution was also retained as the best-fitting model for Grade 10. The BIC and sample-adjusted BIC for the three-cluster model was not lower than the four-cluster model, and the significant LMR test (p< .0001) for the four-class solution suggested that the four-class solution should be retained. However, the fourth cluster was not distinct from the other clusters and only a small number of participants were assigned to it. Thus, the three-cluster model was retained as the best-fitting model.

A two-cluster solution consistently fit the data for all three waves for the English LPA models. Table 2.2 shows model fit information for the English LPA models. In Grades 5 and 7, the lowest BIC's and sample-adjusted BIC's were associated with the three-cluster model; however, the non-significant LMR (p =.0876 and p =.0539, respectively) for the three-cluster models suggested that the two-cluster solution was the best fitting model for Grade 5 and Grade 7. Because the model fit statistics provided somewhat conflicting information, the third cluster for the Grade 5 and Grade 7 models was examined and the third clusters for both models had similar means to another cluster in the models. Therefore, the two-cluster models were retained for Grade 5 and Grade 7. For Grade 10, the lowest BIC's and sample-adjusted BIC's were associated with the two-cluster model. The results from the Lo–Mendell–Rubin likelihood ratio test for the three-class model (p = .5432) further supported the retention of the two-cluster model.

Table 2.3 includes model fit information for the science LPA models. A three-cluster solution fit the data for all three waves for the science LPA models. In Grades 5 and 7, the lowest BICs and sample-adjusted BICs were associated with the four-cluster model; however, the fourth clusters for each model were not distinct from the other clusters. In addition, the difference between the BICs for the Grade 5 three-cluster and four-cluster models were minimal. Therefore, the three-cluster-models were retained as the best-fitting models for Grade 5 and Grade 7. For the Grade 10 science LPA model, the lowest BIC's and sample-adjusted BIC's were associated with the three-cluster model. The results from the

Lo–Mendell–Rubin likelihood ratio test for the four-class model (p = .8457) further supported the retention of the three-cluster model.

Descriptions of Clusters

For all of the final models, the entropy statistics were typically high in value, with moderate values for the Grade 7 and Grade 10 English final models and indicated that the models were highly accurate in their classification of individuals into clusters. It was hypothesized that at least two clusters would fit the data (Hypothesis 1). The first cluster would be characterized by participants who highly endorsed success ability and success effort attributions and had relatively low scores on failure ability attributions. The second cluster would be characterized by a high endorsement of failure ability attributions, and a low endorsement of success ability attributions. These clusters would exist across domains. The results were consistent with Hypothesis 1 with an “adaptive” cluster and a “maladaptive” cluster emerging within each model. In addition, a third cluster emerged for the math and science models.

Means and standard errors for math, English, and science clusters are displayed in Table 2.4, Table 2.5, and Table 2.6 respectively. Means for the models are displayed in Figure 2.2, Figure 2.3, and Figure 2.4 respectively. Across domains and models, Cluster 1 consistently represented the highest proportion of the students, ranging from 40% to 80% of participants. This cluster was characterized by higher than average mean levels of success ability attributions and success effort ability attributions, and low failure ability attribution means. For the science and English clusters, these clusters had relatively high success effort attribution means compared to the success ability attribution means. For the remainder of the paper, Cluster 1 will be referred to as the “adaptive” cluster.

Across domains and models, Cluster 2 typically represented the lowest proportion of the students, with a few exceptions and ranged from 15% to 59% of the participants. This cluster was typically characterized by moderately low success ability and success effort attribution means and relatively high failure ability attribution means. For the remainder of the paper, Cluster 2 will be referred to as the “maladaptive” cluster. For the math and science models, Cluster 3 typically represented the second highest proportion of students, ranging from 12% to 43% of students. This cluster was characterized by moderate means on all three indicators. Compared to the other clusters, this cluster typically had lower success ability and success effort attribution means than the adaptive clusters, higher success ability attribution means than the maladaptive clusters and failure ability means that were higher than the adaptive clusters and lower than the maladaptive clusters. Cluster 3 will be referred to as the “moderate” cluster.

The proportion of students in the adaptive cluster declined with each wave for each domain with the greatest change in proportion occurring for science. For math, 65% of students were members of the adaptive cluster in Grade 5, 63% were members of the adaptive cluster in Grade 7 and 53% were members of the adaptive cluster in Grade 10. Sixty-one percent of students were members of the adaptive English cluster in Grade 5, compared to 55% in Grade 7 and 41% in Grade 10. For science, 80% of students were members of the adaptive cluster in Grade 5 compared to 66% in Grade 7 and 40% in Grade 10. The proportion of students in the maladaptive cluster increased with each wave for English and science. For English, the proportion of students emerging as members of the maladaptive cluster increased from 39% in Grade 5 to 45% in Grade 7 and 59% in Grade 10. In regard to science, the proportion of students emerging as members of the maladaptive cluster increased from 7% in Grade 5 to 10% in Grade 7 and 18% in Grade 10. For the math maladaptive clusters, the proportion decreased from 23% of students emerging as members in Grade 5 to 15% of students being members in Grade 7 and then increased from Grade 7 to Grade 10, with 22% of students emerging as members.

Gender Differences in Group Classification

Another goal of the study was to examine whether there were gender difference in the math, English, and science LPA classes. According to Hypothesis 2, a higher proportion of girls compared to boys would be members of the adaptive English cluster, while a higher proportion of boys compared to girls would be in the maladaptive English cluster. The reverse gender pattern was expected for the math and science clusters. To test these hypotheses, gender (0=girls, 1= boys) was included as a covariate in the next set of analyses. Gender was entered as a covariate for the three-cluster model for math and science and for the two-cluster model for English for each wave. The results from the analyses partially supported this hypothesis and are presented in Table 2.7.

For math, gender differences emerged in Grade 5 and Grade 7. Using the adaptive class as the comparison group, girls were significantly more likely than boys to be in the maladaptive cluster in both models ($B_5 = -.78$, $SE = .33$, $p < .001$; $B_7 = -.73$, $SE = .34$, $p < .05$). There were no gender differences in math clusters in Grade 10. There was a significant gender difference in cluster membership for English in Grade 5, but cluster membership did not differ by gender in Grade 7 or Grade 10. In Grade 5, boys were more likely than girls to be in the maladaptive English cluster ($B = .53$, $SE = .23$, $p < .05$). Contrary to my hypothesis, there were no gender differences between adaptive and maladaptive cluster membership in any of the science clusters. However, compared to membership in the adaptive science cluster, boys were more likely than girls to be in the moderate science cluster in Grade 10 ($B = .98$, $SE = .28$, $p < .01$).

Cluster Differences in Domain-Specific Classroom Engagement

The last goal of the study was to determine whether Grade 10 classroom engagement differed across clusters. To examine this, student-reported and teacher-reported classroom engagement were added as a distal outcome to the LPA models. According to Hypothesis 3, membership in the adaptive latent cluster in each domain at each grade level would result in higher Grade 10 classroom engagement (as reported by teacher and student) compared to the maladaptive latent class within each domain. To test which attribution clusters differed in their mean classroom engagement, the Mplus Auxillary option was used. This option allows for a test of the equality of means across clusters using posterior probability-based multiple imputation and is a recommended analysis to use to test for cluster membership differences in distal outcome means (Clark & Muthén, 2009). The results are displayed in Table 2.8.

The math results indicated several significant differences across clusters in classroom engagement means. The Grade 5 math adaptive cluster had a marginally significant higher teacher-reported Grade 10 math classroom engagement mean compared to the Grade 5 maladaptive cluster ($\chi^2 = 2.87$, $p < .10$). The Grade 7 cluster with adaptive attributions was more engaged in Grade 10 math than the Grade 7 maladaptive cluster according to both student- ($\chi^2 = 7.05$, $p < .01$) and teacher reports ($\chi^2 = 6.44$, $p < .01$). In addition, the Grade 7 adaptive cluster had higher Grade 10 classroom engagement (student-rated) than the Grade 7 moderate cluster ($\chi^2 = 5.61$, $p < .05$). For the Grade 10 clusters, math engagement did not differ across clusters according to teacher reports; however, the Grade 10 adaptive cluster had a higher Grade 10 mean in student-reported math engagement than the Grade 10 maladaptive (χ^2 = 10.76, p < .05) and moderate clusters (χ^2 = 9.51, p < .01).

For English, similar patterns emerged; however, engagement in English class did not differ according to teacher ratings. Using student reports of engagements, the Grade 7 and Grade 10 adaptive clusters had higher Grade 10 English classroom engagement than the Grade 7 (χ^2 = 6.23, p < .01) and Grade 10 maladaptive clusters (χ^2 = 5.33, p< .05), and there was a marginal difference between the Grade 5 adaptive and maladaptive clusters (χ^2 = 3.50, p < .10).

There were similar differences in engagement for the science clusters. For student-rated engagement, the Grade 7 and Grade 10 adaptive clusters had significantly higher means than the Grade 7 (χ^2 = 4.41, p < .05) and Grade 10 (χ^2 = 14.85, p < .01) maladaptive clusters with a marginal difference emerging between the Grade 5 adaptive and maladaptive clusters (χ^2 = 3.39, p < .10). According to teacher reports, the Grade 10 adaptive cluster was more engaged in science than the Grade 10 maladaptive cluster (χ^2 = 6.29, p < .05). In addition, the Grade 10 science adaptive cluster had a higher student-rated classroom engagement mean than the Grade 10 science moderate cluster (χ^2 = 7.44, p < .01) and the Grade 10 moderate cluster had a significantly higher engagement mean than the Grade 10 science maladaptive cluster (χ^2 = 4.68, p < .05).

Summary of Study 2 Results

Overall, the results supported the study hypotheses. The LPA analyses indicated that three-cluster models were the best fitting models for math and science, and two-cluster models were the best fitting models for English. Consistent with Hypothesis 1, an adaptive cluster and a maladaptive cluster emerged within each model. In addition, a third moderate cluster emerged for the math and science models. Less support was found for Hypothesis 2: Cluster membership differed by gender in predicted ways for Grade 5 and Grade 7 math clusters and Grade 5 English clusters; other anticipated gender differences were non-significant. Partial support was provided for Hypothesis 3. Clusters based on attributions in Grades 7 and 10 differed in anticipated ways on student-reported Grade 10 classroom engagement in all three academic domains. In regard to teacher-rated classroom engagement differences in clusters, the Grade 7 adaptive math cluster and the Grade 10 adaptive science cluster had higher means than the Grade 7 maladaptive math cluster and the Grade 10 maladaptive science cluster, respectively. Analyses using Grade 5 cluster membership to predict Grade 10 classroom engagement were non-significant.

DISCUSSION

The purpose of the present research was to use attribution theory as a framework to better understand the motivational beliefs of African American adolescents. The results contributed to the research literature on the motivation of African American adolescents through the examination of gender differences in African American adolescents’ attributions, the influence of attributional beliefs on subsequent achievement-related behavior, and the impact of perceptions of students' gender in-group on attributions. Additional unique features of the present research were the longitudinal examination of attributions and the examination of the multidimensionality of attribution endorsement. The results were consistent across the two studies, supporting the importance of examining attributions using multiple analytic methods and the validity of examining the endorsement of multiple causes. Overall, African American adolescents’ attributions were generally adaptive across domains as evidenced by the negatively skewed success ability attribution means, the positively skewed failure ability attribution means, and the high proportion of students belonging to the adaptive clusters.

These results suggest that African American adolescents generally have positive views about the role of ability and effort in shaping their academic performance. This is consistent with previous research that suggests African American students generally endorse positive achievement-related beliefs (e.g., Mickelson, 1990).

The results indicated that gender differences in attributions were somewhat consistent with traditional academic gender stereotypes; adolescents' perceptions of their gender in-group in math and science were related to motivation in some instances; and math and science ability attributions had implications for later engagement. Compared to girls, boys endorsed more adaptive math and science ability attributions on average, and were more likely to be in the math adaptive clusters. Seventh grade boys' perception of boys' math and science competence predicted tenth grade math and science ability attributions, while seventh grade girls' positive perception of girls' math competence was related to their Grade 10 ability attributions. Using both types of analytic approaches, Grade 7 attributions were related in anticipated ways to Grade 10 classroom engagement. In Study 1, Grade 7 adaptive math ability attributions were positively related to Grade 10 math classroom engagement, and Grade 7 science failure ability attributions were negatively related to subsequent science classroom engagement. In Study 2, the results from LPA analyses indicated that for each domain, the adaptive clusters based on Grade 7 and Grade 10 attributions typically had higher Grade 10 domain-specific engagement compared to students in the maladaptive clusters.

Changes in Motivational Beliefs across the Middle School and High School Transitions

One of the goals of Study 1 was to examine changes in attributional beliefs from Grade 5 to Grade 10. Previous research has noted a decline in motivation and achievement across both the middle school and high school transition, especially for math and science (Barber & Olsen, 2004; Chouinard & Roy, 2008; Jacobs et al., 2002). However, most of this research has been conducted with majority European-American samples. The present study addressed this gap in the literature by providing information on the development of African American adolescents' achievement beliefs across the middle school and high school transitions.

A variety of explanations have been proposed to explain declines in motivational beliefs in adolescence. First, cognitive changes that occur as individuals get older may allow adolescents to better understand themselves and their skills (Keating, 1990), thus making motivational beliefs more realistic and ultimately less positive. Changes in beliefs about ability that result in adolescents tending to view ability as fixed may also explain declines in motivational beliefs (Eccles, Midgley, & Adler, 1984; Nicholls, 1990). In addition, theorists argue that this decline may be explained by the changing nature of the school environment across adolescence, which results in students feeling less academically competent and attitudes towards school becoming increasingly negative, particularly across the middle school transition (Eccles et al., 1984). Eccles and colleagues (1984) propose that schools contribute to this decline through an increased focus on relative ability assessments and decreases in providing students with a sense of control and autonomy. However, more recent research has shown that students do not show motivational declines across the middle school transition, particularly if their teachers have mastery learning goals (Friedel, Cortina, Turner, & Midgley, 2010).

The results from the analyses in Study 2 did suggest there were decreases in adaptive attribution endorsement over time as there were declines in the number of students who were members of the adaptive clusters for all domains; however, these results should not be over-interpreted because significant change over time in clusters was not explicitly examined. Analyses from Study 1 provided no evidence for change in attributions over time. Instead, changes in attribution slopes seemed to be driven by achievement.

An alternative explanation for the lack of evidence for change over time is that the ability attribution trajectories may be best explained by models that account for non-linear change in attributions over the time span covered in this study. Previous research has found that declines in motivational beliefs are best represented by non-linear models, with steeper declines occurring at different times across childhood and early adolescence for some domains (e.g., Jacobs et al., 2002). For example, the rate of decline in language arts competence beliefs slowed over time with greater declines occurring during elementary school and less decline occurring later on in adolescence (Jacobs et al., 2002). As demonstrated by the attribution means, changes in motivational beliefs over time were not entirely linear. Specifically, the changes in the math failure ability, English success and failure ability and science success ability means suggested that a latent growth piecewise model, which includes more than one slope in a model accounting for increases and decreases in means over time, (Bollen & Curran, 2006) may have been more appropriate to address the changes occurring in these African American adolescents' attributional beliefs. Unfortunately, because only three waves of data were available in the present research, non-linear models could not be tested (Bollen & Curran, 2006).

Aspects of the high school environment such as tracking may account for declines in motivation leveling off by late adolescence. Scholars argue that sorting students according to their achievement level may lead to *assimilation effects* that will enhance the motivation of students in advanced tracks and undermine the motivation of students in less advanced tracks (see Oakes, 1985). There is some evidence that tracking negatively influences motivation, and students in low-achievement tracks are likely to receive low quality teaching and develop low educational aspirations compared to students in high-achievement tracks (Lucas, 1999). Other researchers contend that since students tend to use their peers in the immediate context as a reference to form their self-views, a phenomenon known as the frame of reference hypothesis, tracking may lead to *contrast effects* such that students in high-achieving groups may make less favorable comparisons and students in low-achieving groups may make more favorable comparisons (Marsh & Parker, 1984). In fact, it has been documented that being placed in a high-achievement group has a negative effect on self-concept while being placed in a low-achievement group has a positive effect on self-concept (Marsh & Craven, 2002; Marsh & Hua, 2003). It is likely that the changes that occur in ability grouping as students enter high school as well as the complexity by which high school students are forming their motivational beliefs may account for declines in attributions leveling off by high school.

In addition to the non-linear change over time, the spacing of the waves may have prevented me from capturing important changes in attributions. Wigfield et al. (1991) found that students experienced a decline in motivation from fifth grade to sixth grade but an increase in motivation by seventh grade, a finding that suggests that students may experience a decrease in motivation immediately after school transitions but may also experience a rebound in later motivation. Because I did not have data for Grade 6 or Grade 9, it is difficult to know whether the current results were because students' motivation remained stable across time, or if students experienced a rebound in achievement-related beliefs after becoming better adjusted to the middle school and high school environments. Alternatively, as shown by Friedel and colleagues (2010), it is possible that change was dependent upon the learning goals of teachers and parents, and therefore varied for youth across the sample. It would be of interest to examine changes in attributions with more waves of data and more closely spaced measurement points as well as examining family and school factors that predict motivational change in future research.

Gender Differences in Math, English, and Science Attributions

Previous research has shown that girls tend to view themselves as more competent in verbal domains compared to boys, who tend to view themselves as more competent in math and science (e.g., Jacobs & Bleeker, 2004; Jacobs et al., 2002). The implications of these gender differences in math and science motivational beliefs are illustrated through the persistent gender differences in advanced course enrollment in math and science in college as well as in STEM careers (Hill, Corbett, & Rose, 2010). Though previous research demonstrates that English is also gender-typed, gender differences in the domains of math and science are more frequently the focus of attention. However, boys tend to have lower reading test scores compared to girls (National Center for Education Statistics [NCES], 2009), and early reading and writing skills are important for academic and school success (Christian, Morrison, Frazier, & Massetti, 2000; Morrison & Cooney, 2002). Thus, examining the implications of verbal stereotypes for adolescent African American boys is an important factor to consider in future research.

Some research has examined whether gender differences in math, English, and science motivational beliefs exist for African American youth (McClendon & Wigfield, 1998; Swinton et al., in press); however, most research examining gender differences in African American samples has focused on general motivation such as achievement values and academic self-efficacy (e.g., Graham et al., 1998; Saunders et al., 2004; Wood, Kurtz-Costes, & Copping, in press). This research has found that African American boys tend to fare worse than African American girls on motivational outcomes. The consistency of these research findings may lead researchers to believe that traditional gender stereotypes may not be as influential for the motivation of African American youth as they appear to be for European American youth. The present research; however, demonstrated that there are differences in how African American boys and girls view themselves in math, English, and science, with boys endorsing more adaptive math and science attributions than girls and girls sometimes endorsing more adaptive English attributions than boys. More specifically, results from the LGMs indicated that boys were more likely to endorse math and science success ability attributions in seventh and tenth grade and were less likely to endorse math failure ability attributions in fifth and seventh grade and science failure ability attributions in seventh grade compared to girls. Furthermore, the LPA analyses illustrated that boys were significantly more likely than girls to be in the adaptive math clusters in fifth and seventh grade and fifth grade boys were significantly more likely than fifth grade girls to be in the maladaptive English cluster.

Besides the influence of gender stereotypes on motivational beliefs, which will be discussed below, there may be several explanations for these gender differences, including differential parental gender socialization, the influence of parental beliefs, and the schooling environment (Eccles, 1987; Jacobs, 1991; Jacobs & Eccles, 1992; Meece, 1987). For example, mothers’ beliefs about their sixth and seventh graders’ abilities in math were related to their children’s math and science career efficacy in early adulthood, and gender differences in offsprings' career decisions were consistent with mothers' math and science gender stereotypes (Bleeker & Jacobs, 2004). In a recent study of African American middle schoolers, parents who endorsed traditional academic gender stereotypes were more likely than other parents to attribute their sons' literacy failures to lack of ability, their sons' math/science successes to ability, and their daughters' math/science failures to lack of ability. Parents' attributions, in turn, were related to youths' own attributions and domain-specific self-concept (Rouland, Rowley, Kurtz-Costes, DeSousa, & Wachtel, 2011).

At school, students may observe images that confirm traditional gender roles. For instance, Weiss, Banilower, McMahon and Smith (2001) reported that while most of high school humanities and English teachers were women, only half of the science teachers were women. Teachers' perceptions of their students' abilities may also have implications for gender differences in motivation (Meece et al., 2006). For instance, results from one study indicated that there was a tendency for math teachers to overemphasize girls' effort versus boys' effort in math performance (Madon et al., 1998). Thus, parental and schooling influences may explain the gender differences that emerged in the present research. Future research should explicitly examine the link between aspects of the school environments as well as parental influences on African American adolescents' gender-typed attribution endorsement.

Another goal of the research was to examine whether there were gender differences in the rate of change over time in math, English, and science ability attributions. The results from the LGM analyses did not support the hypothesis that the magnitude of gender differences would change over time. Contrary to my prediction, girls did not show greater declines in adaptive math and science attributions compared to boys, and boys did not show greater declines in adaptive English attributions than girls. These results are consistent with previous research (Fredricks & Eccles, 2002; Jacobs et al., 2002; Watt, 2008) that shows that gender differences in motivation for gender-typed domains tend to stay stable or narrow by high school. The "gender intensification hypothesis," which posits that boys and girls experience an intensification of gender-related expectations in early adolescence, (Hill & Lynch, 1983) suggests that gender differences in male- and female-typed domains should increase over time as a result of increased pressure to conform to traditional gender roles. In the present research, gender differences did not increase over time. However, boys were more likely than girls to endorse math and science success ability attributions in Grade 7 and Grade 10 but not in Grade 5, providing some evidence that in some instances gender differences in attributions emerge later on in adolescence.

Interestingly, African American boys endorsed more adaptive attributions for math and science although African American girls had higher achievement than boys in both subjects. In addition, most of the hypotheses concerning gender differences in English adaptive attribution endorsement were not confirmed. In Study 1, English success ability and failure ability attributions did not differ by gender, and gender differences in adaptive English cluster membership occurred only in Grade 5, with boys being more likely than girls to be a member of the maladaptive English cluster. Perhaps because African Americans girls have higher overall achievement than African American boys, and African American boys are more likely to be associated with negative racial academic stereotypes compared to African American girls (Hudley & Graham, 2001; Wood, Kurtz-Costes, Rowley, & Okeke-Adeyanju, 2010), African American boys in the present research may be benefitting from the positive gender stereotypes about boys' competence in math and science more than the African American girls are benefiting from the positive verbal stereotypes about girls.

Influence of Gender In-Group Beliefs on Ability Attributions

Attribution theory posits that environmental and personal factors influence attribution formation (Weiner, 1985, 1992); another contribution of the present research was the examination of the influence of African American adolescents' perceptions of their gender in-group on their subsequent attributions for success and failure within academic domains. Social identity theory posits that positive beliefs about the in-group may result in positive self-beliefs (Tajfel & Turner, 1986). In addition, performance can even be boosted by the awareness that an out-group is negatively stereotyped, a phenomenon referred to as *stereotype lift* (Walton & Cohen, 2003). According to Walton and Cohen (2003), this performance boost can occur without a specific reference to the stereotyped outgroup because there may be an automatic link of stereotypes to intellectual performance if the negative stereotype is widely known. In line with these arguments, research has shown that positive beliefs about the in-group can influence motivation and achievement (e.g., Evans et al., 2011) and that negative stereotypes negatively affect performance (Steele & Aronson, 1995).

The present research found that African American seventh grade boys who viewed boys as competent in math and science tended to endorse more math ability attributions for success and less science failure ability attributions three years later, while for seventh grade African American girls, this relationship only existed for math failure ability attributions. Surprisingly, perceptions of gender group English competence were unrelated to attributions regarding English successes and failures. It is argued that perceptions of the in-group influence domain-specific motivation the most when individuals value the particular domain or strongly identify with the in-group (Steele, 1992; Walton & Cohen, 2003). It may be that the hypothesized relationship did not exist for English because many students might not place a great value on English achievement. It would be worthwhile in future research to examine identity and values as a moderator of the relationship between perceptions of group competence and attributions.

Interestingly, boys' positive perception of girls' competence in science was negatively related to subsequent science motivation. In fact, in the case of success ability attributions, this perception of girls was more strongly related to boys' motivation than boys' perception of in-group competence in science. According to Tajfel (1982), positive views of the in-group may serve to build up positive self-beliefs, and having out-group preferences may negatively influence self-beliefs. It is probable that merely viewing the out-group positively in areas in which the in-group is typically viewed more competent can negatively influence motivation.

Endorsement of Multiple Causes - The Influence of Effort Attributions

Another contribution of the present research was the examination of the multidimensionality of attribution endorsement in Study 2 accounting for the complexity that often accompanies individuals' interpretations of their performance. Study 2 not only differed from Study 1 in the analytic procedure used to assess attributions, but also in the inclusion of effort attributions for success. Students usually indicate that both effort and ability are the reasons they succeed or fail on achievement tasks (Brophy & Good, 1986). Although effort attributions are sometimes considered unstable and may not always have a positive influence on behavioral outcomes as ability attributions, attributing success to high effort is still considered an adaptive attribution (Weiner, 1985, 1992). Previous research has positively linked effort success attributions to motivational outcomes such as self-efficacy (e.g., Anderson, 1983; Georgiou, 1999; Schunk, 1982). Schunk (2003) argues that success effort attributions are adaptive because individuals who succeed at a task and believe that they can continue to work hard are likely to expect future success and be more motivated in future work. Furthermore, he suggests that providing effort attributional feedback (i.e., providing feedback linking an outcome with effort) can help prevent students from endorsing maladaptive attributions.

Consistent with hypotheses, the adaptive clusters that emerged for math, English, and science in Study 2 included high levels of both success ability and success effort attributions. Interestingly, the adaptive clusters for English and science typically had higher success effort attribution means than success ability attribution means, while the reverse pattern emerged for the adaptive math clusters. Perhaps math is considered a more difficult subject compared to other subjects, and thus more importance is placed on ability than effort for success in math. Previous research has shown that individuals tend to believe difficult tasks require more ability compared to easier tasks and that students tend to view science and mathematics as subjects that require higher levels of ability compared to other subjects (Parsons et al. 1983; Nicholls, 1983).

It is surprising that clusters with similar structures emerged for English and science and not science and math given that math and science are considered more similar to each other than science and English. Because the items assessing science attributions did not specify the type of science, African American adolescents may have been thinking about different types of sciences when reporting on their attributions for science successes and failures. Research has shown that students tend to feel more competent in the life sciences (e.g., biology) compared to the physical sciences (e.g., chemistry) (Andre et al., 1999) and thus may view effort as more essential for success depending on the type of science. The similarity in structure between the English and science adaptive clusters may also be explained by similarities in course instruction between science and English courses because science teachers are often encouraged to incorporate literacy in their teaching (e.g, Norris & Phillips, 2003), and research has shown the benefits of using literacy-based science instruction (Guzzetti & Bang, 2011). Thus, science teachers are more likely to require students to read and write than math teachers.

Ability Attributions and Classroom Engagement

According to attribution theory, the causes to which individuals attribute academic successes and failures have consequences for their subsequent motivation and behavior (Weiner, 1985, 1992). In line with this supposition, adaptive attributions were related to Grade 10 classroom engagement in certain domains across both studies. In Study 1, Grade 7 math success ability attributions were positively related to Grade 10 math classroom engagement, and Grade 7 science and math failure ability attributions were negatively related to subsequent science and math classroom engagement. In Study 2, the Grade 7 and Grade 10 adaptive clusters in math, English, and science had higher Grade 10 student-rated engagement means compared to the Grade 7 and Grade 10 maladaptive math, English, and science clusters. This is consistent with previous research that has linked attributional beliefs to motivational outcomes in both African American and European American samples (see Graham, 1994; van Laar, 2000).

When examining only the influence of seventh grade ability attributions on student-rated tenth grade engagement in Study 1, the relationship between math ability attributions and math classroom engagement was stronger than relationships between attributions and engagement in other domains. In fact, no relationships were found between Grade 7 English ability attributions and Grade 10 English engagement. Given that motivational beliefs become more domain-specific over time, it is possible that adolescents' beliefs about the nature of ability are domain-specific as well. Stipek and Gralinksi (1996) argued that theories of intelligence may vary depending on domain. Thus it is probable that students may view their verbal ability as more malleable and their math and science ability as fixed. These differences in beliefs about ability may account for the non-significant relationship between English ability attributions and later engagement in English class. In addition, this relatively stronger relationship between math ability attributions and math engagement compared to English and science could be explained by the structure of the adaptive clusters in Study 2.In particular, the largest differences between math clusters appeared on their ability attributions, whereas science and English clusters differed more on effort attributions than on ability attributions. It appears that English and science success effort attributions may be as important or more important than English and science success ability attributions in terms of impact on subsequent English and science engagement.

No relationships were found in Study 1 between Grade 7 attributions and Grade 10 engagement as rated by the teachers. In Study 2, a few differences were found and only when examining the endorsement of multiple causes in Study 2. The Grade 7 adaptive math cluster and the Grade 10 adaptive science cluster had higher teacher-rated engagement means than the Grade 7 maladaptive math cluster and the Grade 10 maladaptive science cluster. In Study 1, these non-significant relations could be because the relationship between seventh grade adolescents' views about the importance of ability and their tenth grade teachers' views of engagement was not sufficiently strong to hold up across several years and changes in school environment. In addition, the high school setting is often an anonymous setting for students

(Newman, Myers, Newman, Lohman, & Smith, 2000) particularly because high school teachers are more likely to teach a much larger number of students compared to elementary and middle school. Thus, high teachers may not be able to make accurate distinctions between their various students' engagement in class.

It is apparent from the weak to moderate correlations between teacher-reported and student-reported domain-specific engagement that agreement between the two reporters is minimal. This lack of congruence is commonly found across multiple reporters (Achenbach, McConaughy, & Howell, 1987; Winsler & Wallace, 2002). Using multiple informant assessment is beneficial as each informant contributes unique information leading to a better understanding of the phenomenon of interest. Given that teachers and students may have different perceptions of students' engagement, a more objective measure of engagement such as an observational technique may be needed as well. Observational measures have been used to assess classroom engagement (e.g., Lee & Anderson, 1993; Stipek, 2002); however, these measures may also provide limited information on student behavior because observers might make inaccurate judgments of students' effort and participation. For instance, an observer may judge a student to not be on task or participating when he or she is in fact reflecting quietly about the material. Fredricks and colleagues (2004) argue that the use of multiple methods is ideal to fully capture the multidimensionality of engagement. Researchers may want to consider including multiple methods of assessing classroom engagement in future research.

Although the results supported the influence of Grade 7 math attributions on Grade 10 math engagement, no mediators were examined, and it is possible that several variables mediate this relationship. Attribution theory posits that attributions influence factors such as expectancies and self-efficacy, which in turn influence behavior (Weiner, 1985). Expectancy-value theory (Eccles et al., 1983) provides another explanation for the influence of attributions on engagement. According to the expectancy-value model (Eccles et al., 1983), factors such as gender stereotypes influence causal attributions (i.e., interpretations of previous achievement outcomes), attributions influence self-perceptions of competence, self-perceptions influence expectancies and values, and expectancies and values directly influence subsequent behavior. While attribution theory considers causal attributions and the locus, stability and controllability of the causes endorsed as central to driving future achievement-related behavior, expectancy-value theory considers expectancies and values as more central, with causal attributions being one of the many influences on expectancies and values. Thus, it is possible that attributions do not directly influence engagement or other achievement-behaviors and that many factors mediate the relationship between the two. Previous research has provided evidence for the influence of ability attributions on expectancies (e.g., Graham & Long, 1986), but little research has examined the influence of other possible mediators. Future research should explore the possibility of other mediators such as self-concept (Rouland et al., 2011).

Limitations and Future Directions

In addition to those already mentioned, the present research has several limitations that should be addressed in future research. The African American adolescents in our sample attended schools in which the majority of the students were African American. It is likely that the racial composition of the school context has an influence on the development of motivational beliefs. For example, in a majority African American setting, gender may emerge as a dominant identity because race may not be as salient. Gender stereotypical differences in math, English, and science attributions may be more pronounced in this sample compared to in a sample of African American adolescents attending a more racially diverse school where race may be more salient. In addition, the sample consisted of urban youth, many of whom came from lower-SES family backgrounds. Motivational beliefs may develop differently in higher-SES environments. Parents who endorse more traditional gender attitudes tend to have lower income and be less educated compared to parents who endorse more egalitarian views about gender, and these views are likely to be reinforced through differential treatment of sons and daughters (Lytton & Romney, 1991; McHale, Crouter, & Tucker, 1999). Further, there is some evidence that gender differences in achievement are less likely to emerge among children from higher-income and highly-educated families (Burkam et al., 1997; Leaper & Friedman, 2007). Future researchers should investigate how these processes vary across contexts and samples.

Another limitation of the research presented here is related to the measurement of attributions. Single-item measures were used to assess success effort, success ability, and failure ability attributions for math and science. Single-item measures are often criticized because they cannot yield estimates of internal consistency reliability and may be more prone to problems such as content validity. Therefore, researchers typically assess psychological constructs using multiple Likert-type items (Gardner, Cummings, Dunham, & Pierce, 1998). However, it has been argued that single-item measures might be better than or equally as valid for measuring certain psychological constructs as multiple item measures (Gardner et al., 1998). Future research should explicitly compare the benefits of measuring attributions with single items versus multiple items in order to gain a better understanding of which method is more appropriate and precise.

The present study focused on the influence of internal attributions for success and failure; however, these students may also be endorsing external attributions such as attributing failure to teacher discrimination. Graham (1994) found some evidence that African Americans have a more external locus of control than European Americans. Although external attributions for success tend to not have a positive influence on motivation, they are often adaptive in cases of failure because they are protective of self-perceptions (Graham, 1994; van Laar, 2000). Exploring external failure attributions may shed more light on how students who are likely to endorse adaptive success attributions make sense of their failures.

Examining external attributions in a sample of African American students may be particularly meaningful because of the possibility that they are victims of institutional racism and discrimination within the middle and high school settings. African American students are disproportionately tracked into lower ability classes and tend to experience more teacher bias and unfair school disciplinary practices than their White peers, (Losen & Orfield, 2002; Ruck & Wortley, 2002; Utley, Kozleski, Smith, & Draper, 2002), and in general African American adolescents are likely to experience racial discrimination (Fisher, Wallace, & Fenton, 2000; Simons et al., 2002). These racialized experiences may lead African American students to form more external attributions about their performance, particularly in racially integrated settings. Perceived discrimination has been linked to school functioning both indirectly through psychological functioning (e.g., Schmeelk-Cone, & Zimmerman, 2003) and directly (Wong, Eccles & Sameroff, 2003). Both racial and gender discrimination may influence African American adolescents' interpretations of their successes and failures in school.

Implications of the Present Research

The research presented here contributes to the research literature in several significant ways. Garcia-Coll and colleagues (1996) noted that there was a need for more longitudinal research examining the normative development of minority children as well as a need for more attention to intragroup variability. Over two decades later, these issues are being addressed, but more research is still needed (Mcloyd, 2006). The majority of research on achievement motivation conducted with African American adolescents has been race-comparative focusing on racial differences in motivational outcomes, while the present research examined the motivation of African American adolescents using a within-group design. In addition, the longitudinal design of the present research provides information on the normative development of African American students' achievement-related beliefs across early to late adolescence.

The results have several implications, particularly related to gender differences in course enrollment and career choices and to the importance of beliefs about ability. The gender differences in adaptive attributions for math and science have implications for the high school and post-graduate academic choices girls may make. Girls are less likely than boys to enroll in advanced math and science courses in college and pursue STEM-related careers (Hill et al., 2010). Gender differences among African Americans in STEM post-graduate academic choices typically mirror this pattern. For example, African American men were more likely than African American women to earn bachelor's degrees in engineering and the computer sciences in 2007 (Hill et al., 2010). Results of the current study show that one reason for these gender differences might be students' attributional beliefs about the reasons they succeed and fail in math and science.

According to the Hill et al. (2010), because scientists and engineers are working to solve very important problems that we face as a society, such as finding cures for diseases, attracting more women to STEM-related careers would maximize American productivity. Further, without women involved in these fields to a greater extent, needs that may be unique to women may be overlooked. Unfortunately, women who pursue STEM-related careers often face many challenges such as feeling isolated and perceiving the work environment as unsupportive, that often contribute to them leaving careers in STEM industries (Hewlett et al. 2008). Therefore, it is important to attract and retain women in these STEM-related fields, and intervention programs and policies designed to promote gender equity in STEM careers are extremely important.

Because the mean levels of success ability attributions for math declined over time, greater efforts should be made by schools and teachers to help students adjust to the increasingly difficult academic demands made on them in math courses as they advance through middle and high school. It is also clear from the results of Study 1 and Study 2 that students who endorsed adaptive beliefs in middle school about how their ability and effort shaped their academic performances were more likely to be engaged in high school classes compared to those students who endorsed maladaptive beliefs about the role of ability and effort in their successes and failures. The results depict that perceptions of ability have a particularly powerful influence on classroom behaviors and suggest that attempts to modify students' negative beliefs about their academic abilities as well as beliefs about intelligence may be worthwhile. Indeed, interventions aimed at modifying attributional beliefs and beliefs about intelligence have been successful. These interventions, which encourage minority students to view intelligence as malleable and to attribute failure to external factors tend to increase the performance of those students (Aronson, Fried, & Good, 2002; Good, Aronson, & Inzlicht, 2003).

Table 1.1

Descriptive Data for Key Study 1 and 2 Variables, by Gender

	5th Grade			7th Grade			10th Grade		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
	Mean (SD)	Mean (SD)	Mean (SD	Mean (SD)	Mean (SD)	Mean (SD	Mean (SD)	Mean (SD)	Mean (SD
Math									
S Ability	5.67(1.64)	5.44(1.72)	5.54(1.68)	5.10(1.66)	4.99(1.75)	5.03(1.71)	4.79(1.63)	4.70(1.62)	4.74(1.62)
S Effort [b]	5.45(1.79)	5.55(1.80)	5.50(1.79)	4.39(1.87)	4.86(1.94)	4.67(1.92)	4.11(1.62)	4.08(1.72)	4.09(1.68)
F Ability [a]	2.03(1.86)	2.60(2.16)	2.36(2.05)	1.95(1.51)	2.26(1.86)	2.13(1.72)	2.54(1.70)	2.77(1.96)	2.67(1.86)
Achiev. [b, c]	3.61(.96)	3.85(.82)	3.74(.89)	2.49(1.18)	3.18(1.23)	2.90(1.26)	2.34(1.15)	2.75(1.26)	2.57(1.22)
Engag. (SR)							3.29(.46)	3.38(.50)	3.34(.49)
Engag. (TR)							2.65(.91)	2.91(.81)	2.80(.86)
Boys' PGC [b]				67.32(20.80)	58.82(19.22)	60.06(20.81)			
Girls' PGC				70.17(18.84)	71.69(18.24)	71.05(18.48)			
English									
S Ability [c]	5.30(1.51)	5.41(1.49)	5.37(1.50)	4.66(1.46)	4.95(1.58)	4.83(1.53)	4.63(1.27)	5.03(1.42)	4.87(1.38)
S Effort [a, b]	5.25(1.91)	5.73(1.72)	5.52(1.81)	4.65(1.71)	5.09(1.74)	4.91(1.74)	4.29(1.34)	4.61(1.43)	4.48(1.40)
F Ability	2.65(1.63)	2.55(1.59)	2.59(1.60)	2.54(1.46)	2.59(1.67)	2.57(1.58)	2.80(1.41)	2.51(1.28)	2.63(1.34)
Achiev. [a, b, c]	3.53(1.01)	3.95(.86)	3.76(.95)	2.79(1.15)	3.26(1.19)	3.07(1.20)	2.58(1.13)	3.24(1.19)	2.96(1.21)
Engag. (SR) [c]							3.31(.56)	3.49(.51)	3.34(.49)
Engag. (TR)							2.80 (.76)	3.01(.82)	2.91(.80)
Boys' PGC [b]				63.27(19.65)	50.03(18.92)	55.57(20.29)			
Girls' PGC				72.11(16.55)	72.95(15.76)	72.60(16.08)			

Table 1.1 continued

	5th Grade			7th Grade			10th Grade		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
	Mean (SD)	Mean (SD)	Mean (SD	Mean (SD)	Mean (SD)	Mean (SD	Mean (SD)	Mean (SD)	Mean (SD
Science									
S Ability	5.08(1.89)	4.73(1.97)	4.88(1.94)	4.30(1.69)	4.21(1.95)	4.24(1.84)	4.56(1.73)	4.13(1.92)	4.30(1.85)
S Effort [b]	6.33(1.44)	6.44(1.30)	6.40(1.36)	5.75(1.64)	6.29(1.34)	6.07(1.49)	4.85(1.55)	4.88(1.71)	4.86(1.64)
F Ability	2.56(2.08)	2.82(2.15)	2.71(2.12)	2.70(1.72)	2.85(2.09)	2.79(1.94)	2.78(1.60)	2.94(1.84)	2.88(1.74)
Achiev. [b]	4.04(.96)	4.12(.68)	4.09(.82)	2.96(1.23)	3.38(1.27)	3.21(1.27)	2.75(1.18)	3.10(1.24)	2.94(1.22)
Engag.(SR)							3.39(.50)	3.35(.55)	3.37(.55)
Engag. (TR) [c]							2.63(.82)	3.08(.72)	280(.79)
Boys' PGC[b]				65.03(22.37)	52.95(22.17)	58.03(23.00)			
Girls' PGC				69.19(20.42)	66.45(20.61)	67.60(20.54)			
	n =166	n =215	n = 374	n =126	n =175	n = 301	n =101	n =145	n = 246

Note. [a] Girls differed from boys at p <.05 in Grade 5; [b] Girls differed from boys at p <.05 in Grade 7; [c] Girls differed from boys at p <.05 in Grade 10; S = Success; F= Failure; Engag. = Engagement; Achiev. = Achievement; PGC = Perceptions of Gender Group Competence; SR = Student Report; TR = Teacher Report.

Table 1.2

Unconditional Latent Growth Models for Math, English, and Science Success Ability Attributions

	Model 1 - Math	**Model 2 - English**	**Model 3 - Science**
Variable	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
Grade 5 Intercept	5.52(.08)**	5.29(.08)**	4.77(.10)**
Attribution slope	-.41(.06)**	-.24(.06)**	-.28(.07)**
Slope with Grade 5 Intercept	-.11(.19)	-.28(.17)[†]	[a]
Slope Variance	.37(.18)*	.40(.15)**	[a]
Grade 5 Intercept Variance	.77(.31)*	.76(.28)**	.68(.15)**
Model Fit Indices			
$\chi 2$ (df)	.95(1)	10.64(1)**	13.06(3)**
RMSEA	.00	.16	.09
CFI/TLI	1.00/1.00	.77/.31	.63/.63

Note. [†]$p < .10$; * $p < .05$; **$p < .01$; [a] path constrained to zero.

Table 1.3

Unconditional Latent Growth Models for Math, English, and Science Failure Ability Attributions

	Model 1 - Math	**Model 2 - English**	**Model 3 - Science**
Variable	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
Grade 5 Intercept	2.18(.10)**	2.58(.08)**	2.70(.10)**
Attribution slope	.19(.07)**	.02(.06)	.09(.07)
Slope with Grade 5 Intercept	.16(.27)	-.21(.18)	[a]
Slope Variance	.07(.25)	.19(.15)	[a]
Grade 5 Intercept Variance	.71(.42)[†]	.75(.30)*	.71(.16)**
Model Fit Indices			
$\chi 2$ (df)	15.49(1)**	.23(1)	4.12 (3)
RMSEA	.20	.00	.03
CFI/TLI	.79/.36	1.00/1.09	.96/.96

Note. [†]$p < .10$; * $p < .05$; **$p < .01$; [a] path constrained to zero.

Table 1.4

Conditional Latent Growth Models for Math, English, and Science Success Ability Attribution with Gender as a Covariate

Variable	Model 1 - Math Coefficient (SE)	Model 2 - English Coefficient (SE)	Model 3 - Science Coefficient (SE)
Grade 5 Intercept	4.05(.39)**	5.06(.40)**	3.29(.52)**
Grade 7 Intercept	3.61(.22)**	4.75(.22)**	3.25(.27)**
Grade 10 Intercept	3.17(.26)**	4.44(.30)**	3.21(.36)**
Attribution slope	-.44(.25)[†]	-.31(.27)	-.04(.35)
Slope with Grade 5 Intercept	-.15(.18)	-.33(.16)*	[a]
Grade 5 Intercept on Gender	.32(.17)[†]	-.10(.16)	.28(.19)
Grade 7 Intercept on Gender	.37(.13)**	-.16(.12)	.42(.15)**
Grade 10 Intercept on Gender	.42(.19)*	-.23(.18)	.57(.22)**
Slope on Gender	.05(.12)	-.07(.12)	.14(.14)
Grade 5 Intercept Residual Variance	.76(.30)**	.82(.27)**	.71(.15)**
Grade 7 Intercept Residual Variance	.80(.13)**	.59(.10)**	.71(.15)**
Grade 10 Intercept Residual Variance	1.53(.35)**	1.23(.29)**	.71(.15)**
Slope Residual Variance	.34(.17)*	.43(.14)**	[a]
Gr. 5 Attribution on Gr. 5 Achievement	.37(.10)**	.09(.10)	.36(.12)**
Gr.7 Attribution on Gr. 7 Achievement	.44(.07)**	.05(.06)	.26(.08)**
Gr. 10 Attribution on Gr. 10 Achievement	.56(.08)**	.18(.09)*	.31(.11)**
Model Fit Indices			
$\chi 2$ (df)	5.08(8)	5.72(8)	23.66(10)
RMSEA	.00	.00	.06
CFI/TLI	1.00/1.05	1.00/1.01	.75/.63

Note . [†]$p < .10$; * $p < .05$; **$p < .01$; [a] path constrained to zero.

Table 1.5

Conditional Latent Growth Models for Math, English, and Science Failure Ability Attributions with Gender as a Covariate

Variable	**Model 1 - Math** Coefficient (SE)	**Model 2 - English** Coefficient (SE)	**Model 3 - Science** Coefficient (SE)
Grade 5 Intercept	3.56(.43)***	3.50(.40)***	4.11(.53)**
Grade 7 Intercept	3.43(.24)***	3.12(.22)***	3.89(.28)**
Grade 10 Intercept	3.31(.32)***	2.73(.29)***	3.66(.34)**
Attribution slope	-.13(.29)	-.38(.27)	-.22(.35)
Slope with 5th Grade Intercept	.10(.26)	-.16(.18)	[a]
Grade 5 Intercept on Gender	-.64 (.20)***	-.08(.16)	-.28(.21)
Grade 7 Intercept on Gender	-.53(.15)***	.05(.12)	-.29(.15)*
Grade 10 Intercept on Gender	-.42(.23)†	.19(.18)	-.32(.21)
Slope on Gender	.11(.15)	.13 (.12)	-.03(.14)
Grade 5 Intercept Residual Variance	.69(.39)†	.64(.30)*	.70(.16)**
Grade 7 Intercept Residual Variance	1.04(.17)**	.49(.11)**	.70(.16)**
Grade 10 Intercept Residual Variance	1.69(.44)**	.69(.29)*	.70(.16)**
Slope Residual Variance	.15(.24)	.17(.15)	[a]
Gr. 5 Attribution on Gr. 5 Achievement	-.25(.11)*	-.24(.10)*	-.31(.12)**
Gr.7 Attribution on Gr. 7 Achievement	-.37(.07)***	-.19(.06)**	-.31(.08)**
Gr. 10 Attribution on Gr. 10 Achievement	-.18(.11)†	-.06(.09)	-.24(.11)*
Model Fit Indices			
$\chi 2$ (df)	5.84(8)	8.93(8)	9.14(10)
RMSEA	.00	.02	.00
CFI/TLI	1.00/1.04	.97/.95	1.00/1.05

Note .†$p < .10$; * $p < .05$; **$p < .01$; [a] path constrained to zero.

Table 1.6

Final Path Models for Grade 7 Attributions Predicting Grade 10 Classroom Engagement in Math, English, and Science

	Outcome			**Outcome**		
	Student Reported Classroom Engagement			Teacher Reported Classroom Engagement		
	Math	English	Science	Math	English	Science
Predictor	β(SE)	β(SE)	β(SE)	β(SE)	β(SE)	β(SE)
Success Ability	.17(.07)**	.09(.07)	.06(.07)	.14(.10)	.07(.08)	-.03(.09)
Failure Ability	-.14(.07)*	-.12(.07)†	-.18(.06)**	-.02(.10)	.05(.09)	.03(.08)
Covariate						
Grade 5 Achievement	-.02(.09)	.06(.08)	.07(.09)	.23(.14)†	-.09(.20)	.52(.09)**
Model Fit Indices						
χ2 (df)	32.34(18)*			30.89(18)*		
RMSEA	.05			.05		
CFI/TLI	.91/.84			.81/.68		

Note. †$p < .10$; * $p < .05$; **$p < .01$.

Table 1.7

Final Path Model for Grade 7 Perceptions of Gender Group Competence Predicting Grade 10 Ability Attributions for Boys

	Boys' Model					
	Outcome					
	Math		English		Science	
	Success Ability	Failure Ability	Success Ability	Failure Ability	Success Ability	Failure Ability
Predictor	β(SE)	β(SE)	β(SE)	β(SE)	β(SE)	β(SE)
Boys' Gender PC	.22(.10)*	-.19(.11)†	.18(.11)†	-.08(.10)	.16(.10)	-.22(.10)*
Girls' Gender PC	-.16(.11)	.14(.12)	-.09(.12)	-.08(.11)	-.40(.10)**	.22 (.11)*
Covariate						
Grade 5 Achievement	.31(.15)*	-.31(.13)*	.17(.16)	.11(.13)	.21(.14)	-.09(.14)
Model Fit Indices						
$\chi 2$ (df)	53.92(36)*					
RMSEA	.06					
CFI/TLI	.87/.75					

Note .†p < .10; * p < .05; **p < .01; PC = Perceptions of Competence.

Table 1.8

Final Path Model for Grade 7 Perceptions of Gender Group Competence Predicting Grade 10 Ability Attributions for Girls

	Girls' Model					
	Outcome					
	Math		English		Science	
	Success Ability	Failure Ability	Success Ability	Failure Ability	Success Ability	Failure Ability
Predictor	β(SE)	β(SE)	β(SE)	β(SE)	β(SE)	β(SE)
Girls' Gender PC	.16(.09)[†]	-.22(.08)**	.07(.08)	-.12(.08)	.07(.09)	-.05(.10)
Boys' Gender PC	.14(.09)[†]	-.15(.08)[†]	-.03(.09)	-.03(.09)	.10(.08)	-.12(.08)
Covariate						
Grade 5 Achievement	.17(.12)	.05(.12)	.18(.12)	.10(.11)	.19(.12)	.06(.14)
Model Fit Indices						
$\chi2$ (df)	54.49(36)*					
RMSEA	.05					
CFI/TLI	.90/.81					

Note. [†]$p < .10$; * $p < .05$; **$p < .01$; PC = Perceptions of Competence.

Table 2.1

Model Fit Indices for Math Latent Profile Models

	Math			
Model Fit Indices	1 cluster	2 clusters	3 clusters	4 clusters
		Grade 5		
No. of free parameters	9	16	**23**	21
BIC	4503.68	4234.35	**4126.21**	4113.34
Adjusted BIC	4475.12	4183.59	**4053.24**	4046.71
Entropy	[a]	.99	**.99**	.92
LMR LRT *P*-value for k-1	[a]	.0000	**.0136**	.1521
		Grade 7		
No. of free parameters	9	16	**20**	26
BIC	3566.79	2450.98	**3230.24**	3235.90
Adjusted BIC	3538.24	3400.23	**3166.79**	3153.44
Entropy	[a]	.98	**1.00**	.98
LMR LRT *P*-value for k-1	[a]	.0000	[b]	[b]
		Grade 10		
No. of free parameters	9	16	**23**	30
BIC	2870.09	2828.77	**2802.48**	2761.24
Adjusted BIC	2841.56	2778.05	**2729.58**	2666.15
Entropy	[a]	.87	**.96**	.98
LMR LRT *P*-value for k-1	[a]	.0000	**.0065**	.0000

Note. Bold indicates best fit. Lowest BIC and adjusted BIC indicate better fit. All entropy ratings indicate acceptable fit. BIC - Bayesian information criterion; LMR LRT = Lo-Mendell-Rubin likelihood ratio test.[a] Value not obtained for a one-cluster model; [b] Not able to use as an indication of model fit due to the two models having different parameterizations.

Table 2.2

Model Fit Indices for English Latent Profile Models

	English			
Model Fit Indices	1 cluster	2 clusters	3 clusters	4 clusters
		Grade 5		
No. of free parameters	9	**16**	23	17
BIC	4220.00	**3984.66**	3788.48	3686.44
Adjusted BIC	4191.45	**3933.90**	3715.50	3632.51
Entropy	[a]	**.92**	.99	.93
LMR LRT *P*-value for k-1	[a]	**.0045**	.0876	.5258
		Grade 7		
No. of free parameters	9	**16**	23	26
BIC	3390.73	**3353.91**	3177.30	3042.73
Adjusted BIC	3362.18	**3303.17**	3104.35	2960.28
Entropy	[a]	**.79**	1.00	1.00
LMR LRT *P*-value for k-1	[a]	**.0001**	.0539	.1450
		Grade 10		
No. of free parameters	9	**16**	23	21
BIC	2519.09	**2513.58**	2536.64	2521.40
Adjusted BIC	2490.56	**2462.86**	2463.73	2426.30
Entropy	[a]	**.71**	.71	.76
LMR LRT *P*-value for k-1	[a]	**.0010**	.5432	.2653

Note. Bold indicates best fit. All entropy ratings indicate acceptable fit. BIC - Bayesian information criterion; LMR LRT = Lo-Mendell-Rubin likelihood ratio test; [a] Value not obtained for a one-cluster model; [b] Not able to use as an indication of model fit due to the two models having different parameterizations.

Table 2.3

Model Fit Indices for Science Latent Profile Models

	Science			
Model Fit Indices	1 cluster	2 clusters	3 clusters	4 clusters
		Grade 5		
No. of free parameters	9	16	**20**	26
BIC	4436.37	4181.29	**3731.99**	3696.93
Adjusted BIC	4407.82	4181.07	**3668.54**	3614.44
Entropy	[a]	1.00	**1.00**	.96
LMR LRT *P*-value for k-1	[a]	.0000	[b]	[b]
		Grade 7		
No. of free parameters	9	16	**14**	17
BIC	3464.89	3450.73	**3077.25**	2732.16
Adjusted BIC	3414.15	3409.51	**3032.85**	2678.24
Entropy	[a]	.98	**.99**	.99
LMR LRT *P*-value for k-1	[a]	.0001	[b]	[b]
		Grade 10		
No. of free parameters	9	16	**23**	30
BIC	2886.09	2860.32	**2845.41**	2883.62
Adjusted BIC	2857.57	2809.60	**2773.03**	2788.52
Entropy	[a]	.87	**.90**	.81
LMR LRT *P*-value for k-1	[a]	.0031	**.0053**	.8457

Note. Bold indicates best fit. All entropy ratings indicate acceptable fit. BIC - Bayesian information criterion; LMR LRT = Lo-Mendell-Rubin likelihood ratio test; [a] Value not obtained for a one-cluster model; [b] Not able to use as an indication of model fit due to the two models having different parameterizations.

Table 2.4

Means, Standard Errors, and Proportions for Math Clusters

	Latent Profiles		
	Adaptive	Maladaptive	Moderate
	Grade 5		
Attributions	Mean (SE)	Mean (SE)	Mean (SE)
Success Ability	5.97(.09)	4.68(.21)	4.92(.25)
Success Effort	5.57(.11)	5.33(.21)	5.52(.24)
Failure Ability	1.00(.00)	5.82(.11)	2.99(.00)
Cluster Proportions	.65	.23	.12
	Grade 7		
	Mean (SE)	Mean (SE)	Mean (SE)
Success Ability	5.49(.11)	3.83(.27)	4.51(.20)
Success Effort	4.82(.14)	4.42(.32)	4.39(.22)
Failure Ability	1.00[a]	5.67[a]	3.00[a]
Cluster Proportions	.63	.15	.22
	Grade 10		
	Mean (SE)	Mean (SE)	Mean (SE)
Success Ability	5.44(.14)	3.81(.20)	4.07(.17)
Success Effort	4.21(.15)	4.19(.24)	3.76(.20)
Failure Ability	1.18(.04)	5.63(.12)	3.31(.08)
Cluster Proportions	.53	.22	.26

Note. [a]Mean was fixed to a particular value in order to achieve model convergence without error. The value used was the mean obtained in the initial three-cluster model.

Table 2.5

Means, Standard Errors, and Proportions for English Clusters

	Latent Profiles	
	Adaptive	Maladaptive
	Grade 5	
Attributions	Mean (SE)	Mean (SE)
Success Ability	5.71(.11)	4.82(.13)
Success Effort	6.84(.11)	3.42(.19)
Failure Ability	2.46(.11)	2.80(.14)
Cluster Proportions	.61	.39
	Grade 7	
	Mean (SE)	Mean (SE)
Success Ability	5.06(.12)	4.59(.13)
Success Effort	6.33(.13)	3.40(.16)
Failure Ability	2.59(.14)	2.55(.14)
Cluster Proportions	.55	.45
	Grade 10	
	Mean (SE)	Mean (SE)
Success Ability	5.18(.13)	4.65(.12)
Success Effort	5.79(.13)	3.55(.10)
Failure Ability	2.58(.17)	2.67(.15)
Cluster Proportions	.41	.59

Table 2.6

Means, Standard Errors, and Proportions for Science Clusters

	Latent Profiles		
	Adaptive	Maladaptive	Moderate
	Grade 5		
Attributions	Mean (SE)	Mean (SE)	Mean (SE)
Success Ability	5.08(.11)	3.98(.40)	4.17(.23)
Success Effort	6.99[a]	2.28[a]	5.00 [a]
Failure Ability	2.68(.12)	3.22(.48)	2.60(.26)
Cluster Proportions	.80	.07	.13
	Grade 7		
	Mean (SE)	Mean (SE)	Mean (SE)
Success Ability	4.65(.13)	3.00(.20)	3.64(.20)
Success Effort	7.00 [a]	2.47 [a]	5.00 [a]
Failure Ability	2.69(.14)	3.53(.36)	2.72(.19)
Cluster Proportions	.66	.10	.24
	Grade 10		
	Mean (SE)	Mean (SE)	Mean (SE)
Success Ability	4.86(.17)	3.28(.25)	4.17(.20)
Success Effort	6.64(.06)	2.52(.17)	4.09(.09)
Failure Ability	2.81(.17)	3.15(.37)	2.86(.19)
Cluster Proportions	.40	.18	.43

Note. [a] Mean was fixed to a particular value in order to achieve model convergence without error. The value used was the mean obtained in the initial three-cluster model.

Table 2.7

Latent Profile Models with Gender as a Covariate using the Adaptive Class as the Comparison Group

Math Latent Profiles

		Maladaptive	Moderate
Wave	Covariate	Estimate (SE)	Estimate (SE)
Grade 5	Gender	-.78(.27)**	-.17(.33)
Grade 7	Gender	-.73(.37)*	.25(.29)
Grade 10	Gender	-.07 (.32)	-.40(.40)

English Latent Profiles

		Maladaptive
		Estimate (SE)
Grade 5	Gender	.46(.23)*
Grade 7	Gender	.28(.31)
Grade 10	Gender	.46(.33)

Science Latent Profiles

		Maladaptive	Moderate
		Estimate (SE)	Estimate (SE)
Grade 5	Gender	.37(.40)	.02(.31)
Grade 7	Gender	.64(.40)	.98(.28)**
Grade 10	Gender	-.04(.43)	.08(.30)

Table 2.8

Comparisons of Grade 10 Domain-Specific Student- and Teacher-Reported Classroom Engagement Means Based on Earlier and Concurrent Cluster Membership

		Math Latent Profiles				
		1 Adaptive	2 Maladaptive	3 Moderate	Overall Test	Significant Class Comparisons
Attribution Cluster Wave	Grade 10 Variable	Mean (SE)	Mean (SE)	Mean (SE)	χ^2	
Grade 5	Engagement (SR)	3.37(.04)	3.26(.06)	3.36(.08)	2.03	None
	Engagement (TR)	2.91(.10)	2.54(.20)	2.62(.23)	3.25	1 vs. 2†
Grade 7	Engagement (SR)	3.43(.04)	3.14(.10)	3.23(.07)	6.56*	1 vs. 2** 1 vs. 3*
	Engagement (TR)	2.94(.10)	2.34(.21)	2.75(.18)	5.06†	1 vs. 2**
Grade 10	Engagement (SR)	3.47(.04)	3.22(.06)	3.20(.08)	13.53**	1 vs. 2** 1 vs. 3*
	Engagement (TR)	2.91(.12)	2.60(.17)	2.75(.16)	2.16	None
		English Latent Profiles				
		1 Adaptive	2 Maladaptive			
		Mean (SE)	Mean (SE)		χ^2	
Grade 5	Engagement (SR)	3.48(.05)	3.33(.06)		3.50†	1 vs. 2†
	Engagement (TR)	2.89(.10)	2.99(.14)		.57	None
Grade 7	Engagement (SR)	3.55(.06)	3.34(.05)		6.23**	1 vs. 2**
	Engagement (TR)	2.99(.13)	2.87(.10)		.41	None
Grade 10	Engagement (SR)	3.52(.05)	3.34(.05)		5.33*	1 vs. 2*
	Engagement (TR)	2.97(.14)	2.90(.10)		.16	None
		Science Latent Profiles				
		1 Adaptive	2 Maladaptive	3 Moderate		
		Mean (SE)	Mean (SE)	Mean (SE)	χ^2	
Grade 5	Engagement (SR)	3.40(.04)	3.12(.14)	3.31(.08)	3.83	1 vs. 2†
	Engagement (TR)	2.96(.08)	2.70(.32)	2.66(.22)	2.10	None
Grade 7	Engagement (SR)	3.35(.08)	3.15(.12)	3.41(.05)	4.57	1 vs. 2*
	Engagement (TR)	3.10(.13)	2.72(.91)	2.99(.22)	.29	None
Grade 10	Engagement (SR)	3.53(.05)	3.01(.13)	3.32(.06)	10.54**	1 vs. 2** 1 vs. 3** 2 vs. 3*
	Engagement (TR)	3.10(.11)	2.34(.28)	2.85(.12)	3.18	1 vs. 2**

Note. †$p < .10$; * $p < .05$; **$p < .01$; SR = Student Report; TR = Teacher Report.

Figure 1.1. Changes in means for math, English, and science success ability attributions from Grade 5 to Grade 10.

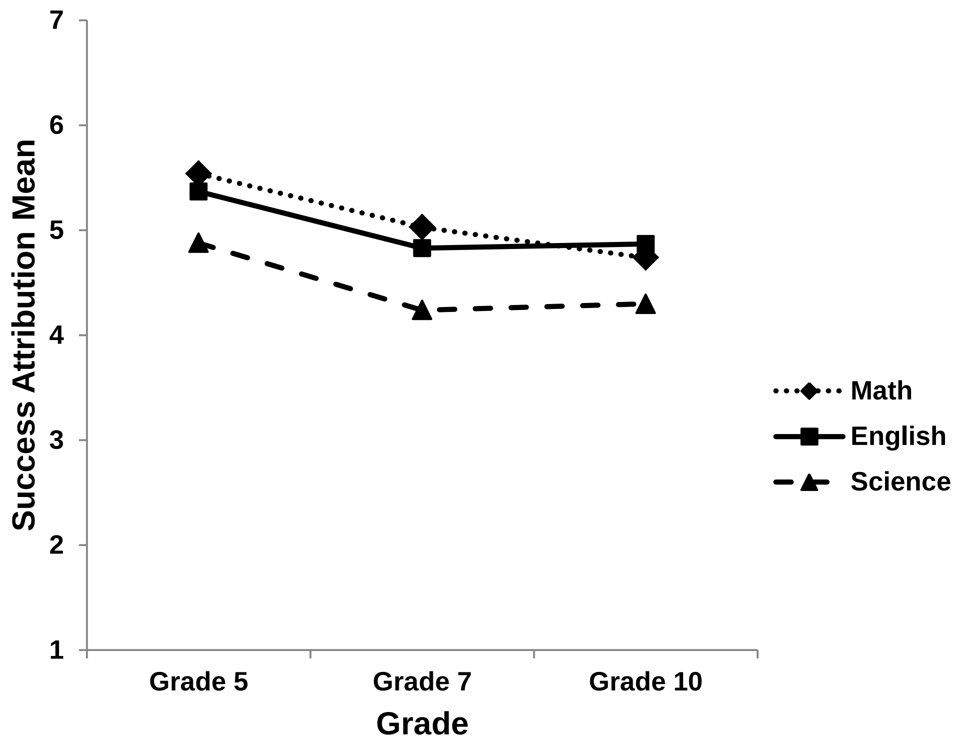


Figure 1.2. Changes in means for math, English, and science failure ability attributions from Grade 5 to Grade 10.

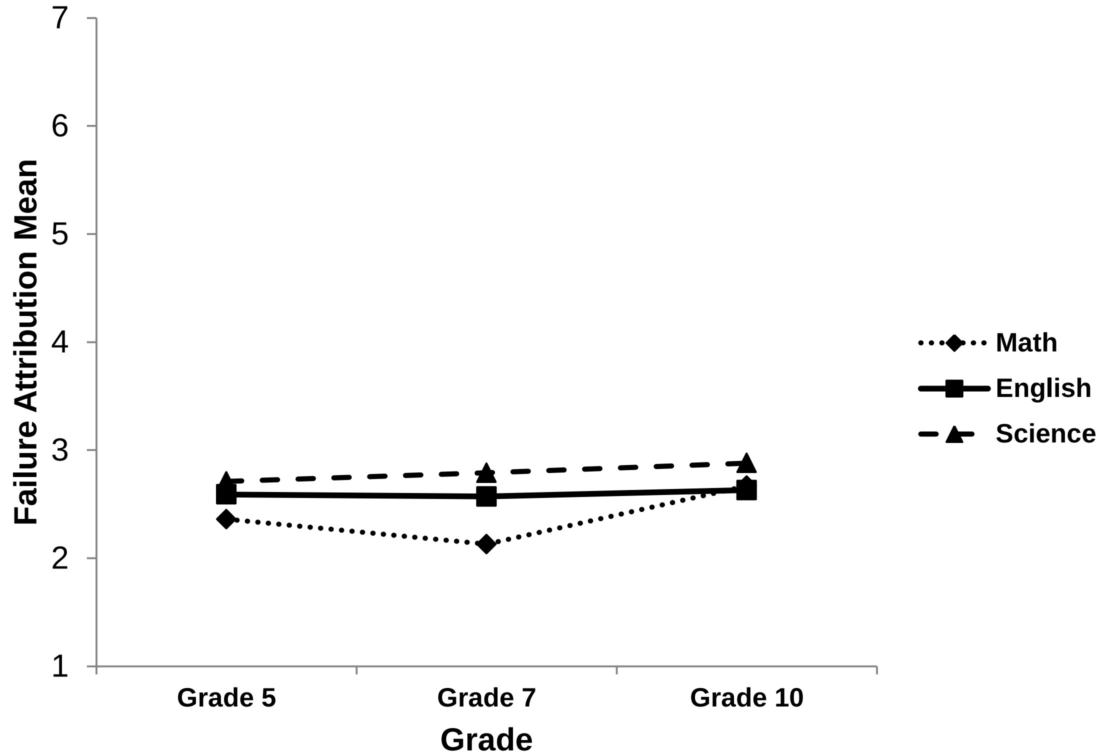


Figure 1.3. Hypothesized latent growth curve model for success ability attributions. Identical models were tested for each domain (i.e., math, English, and science).

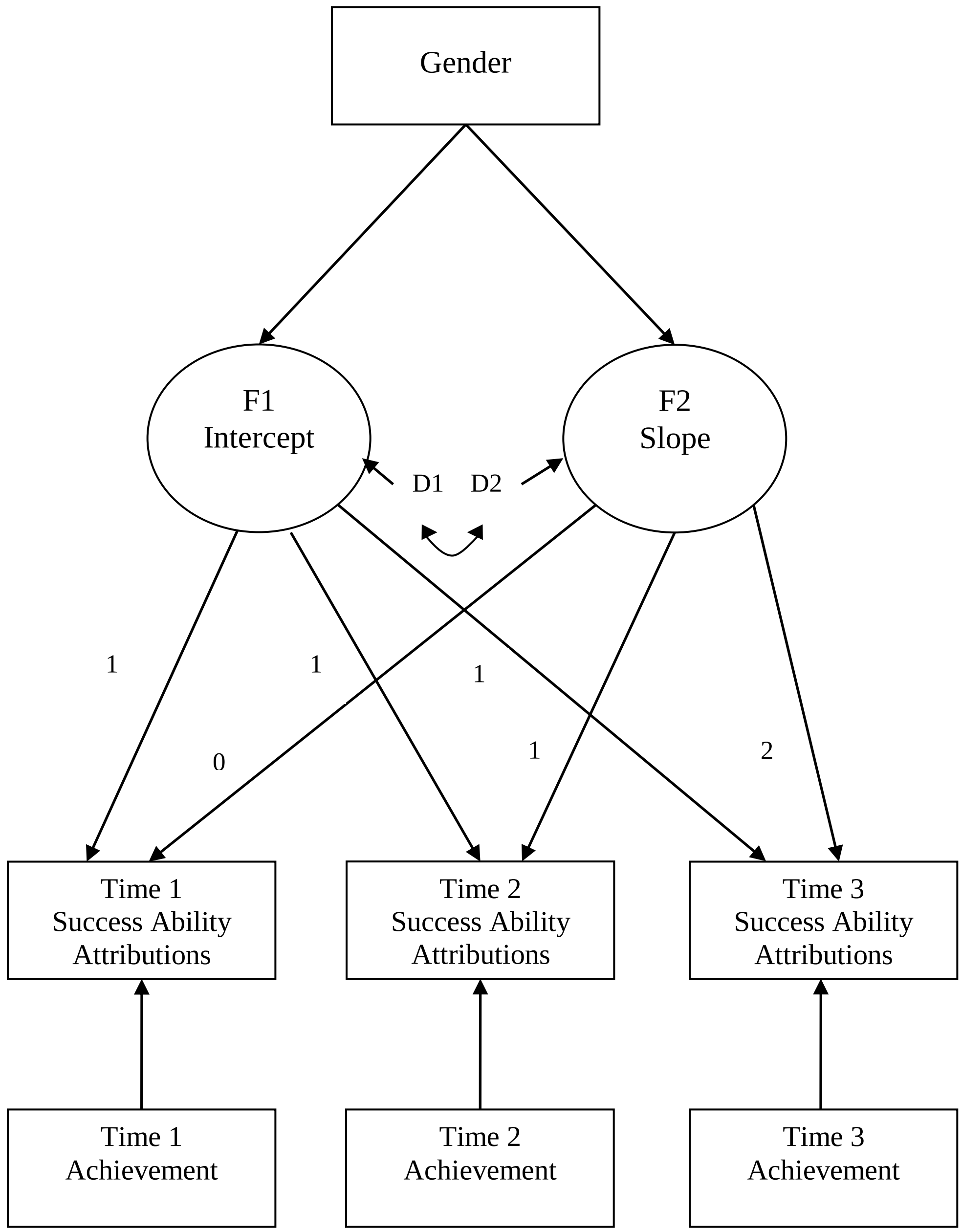


Figure 1.4. Hypothesized latent growth curve model for failure ability attributions. Identical models were tested for each domain (i.e., math, English, and science). Grade 5, Grade 7 and Grade 10 achievement were entered as covariates.

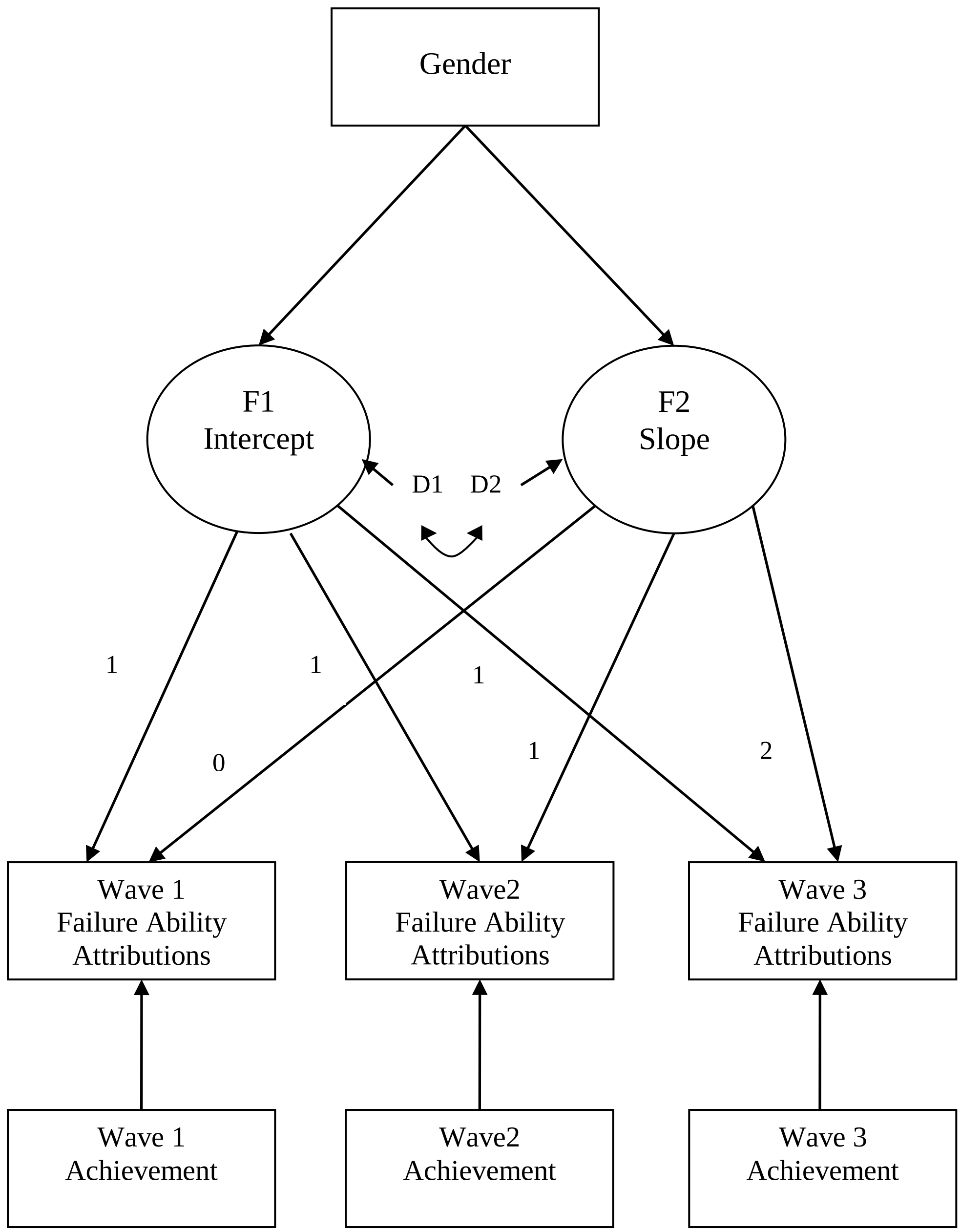


Figure 1.5. Hypothesized multiple-group path model for the relations of Grade 7 math, English, and science success and failure ability attributions with Grade 10 math, English, and science classroom engagement. Grade 5 domain-specific achievement was entered as a covariate in each analysis.

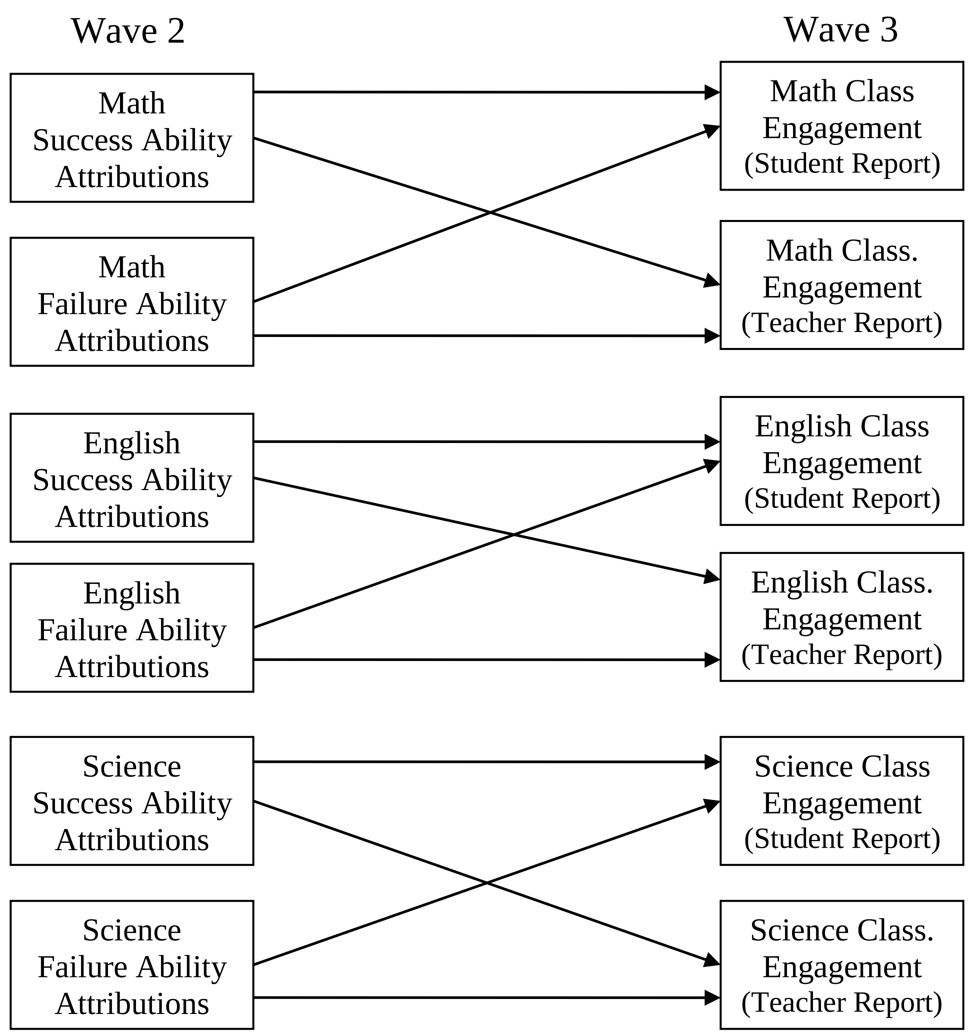


Figure 1.6. Hypothesized path model for the relations of Grace 7 math, English, and science perceptions of gender group competence and Grade 10 math, English, and science success and failure ability attributions. Models were tested separately for boys and girls. Grade 5 Achievement was entered as a covariate. GC = Group Competence.

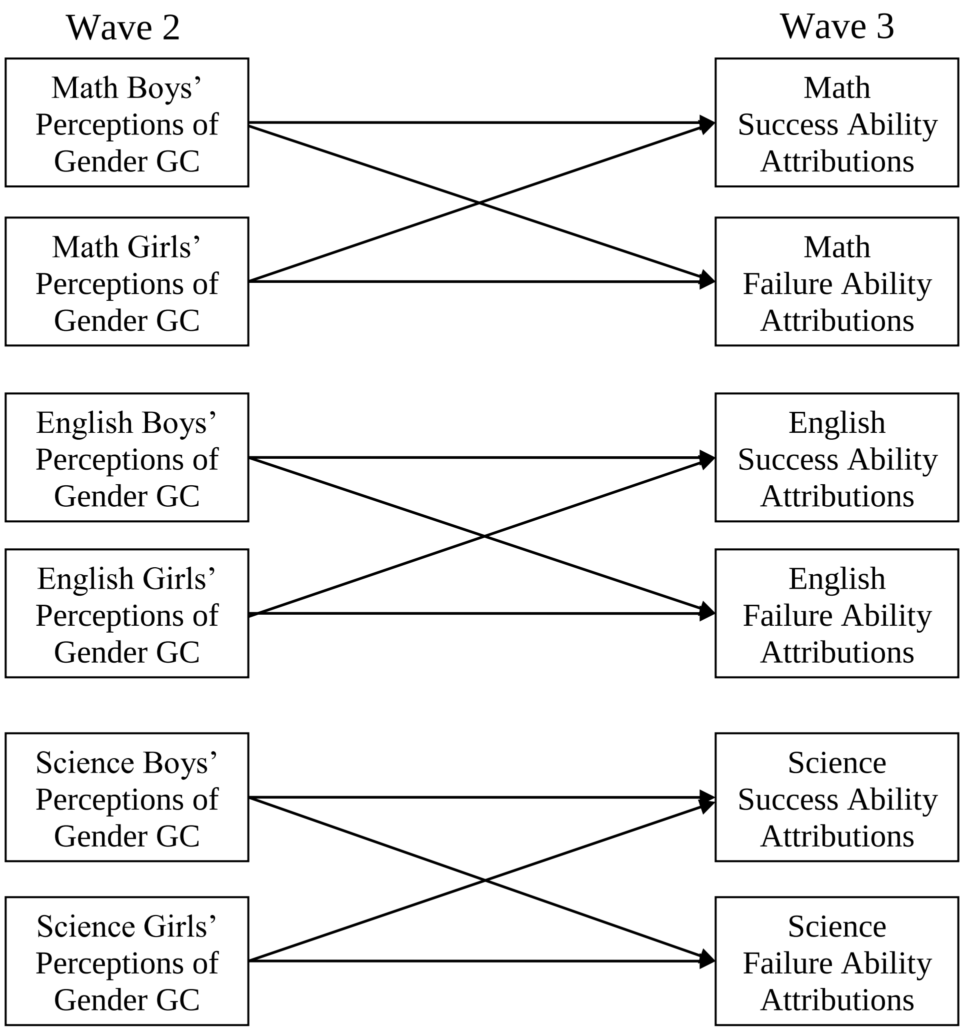


Figure 2.1. Hypothesized latent profile class model of success ability, success effort, and failure ability attributions. Identical models will be tested for math, English, and science attributions; Rep = Report.

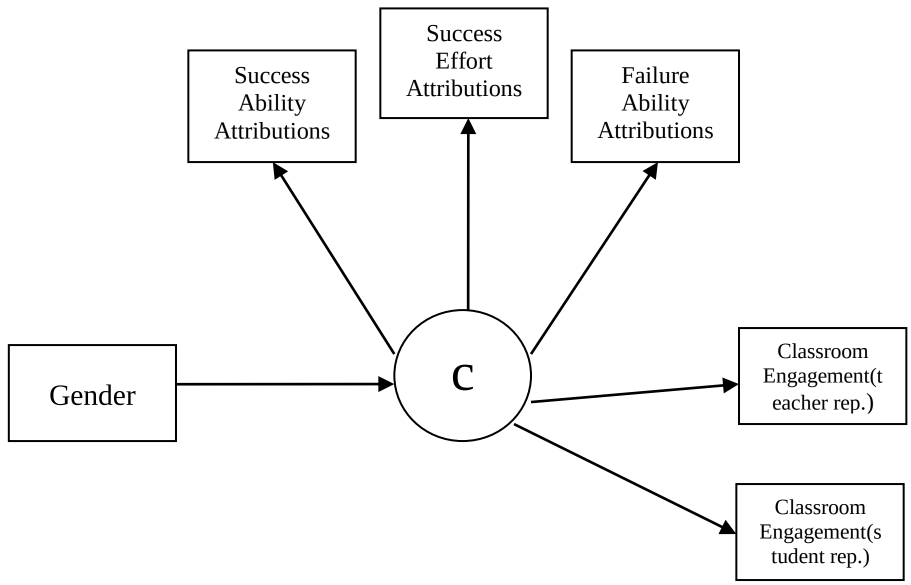


Figure 2.2. Estimated attribution means for Grade 5, Grade 7 and Grade 10 math three-cluster LPA models

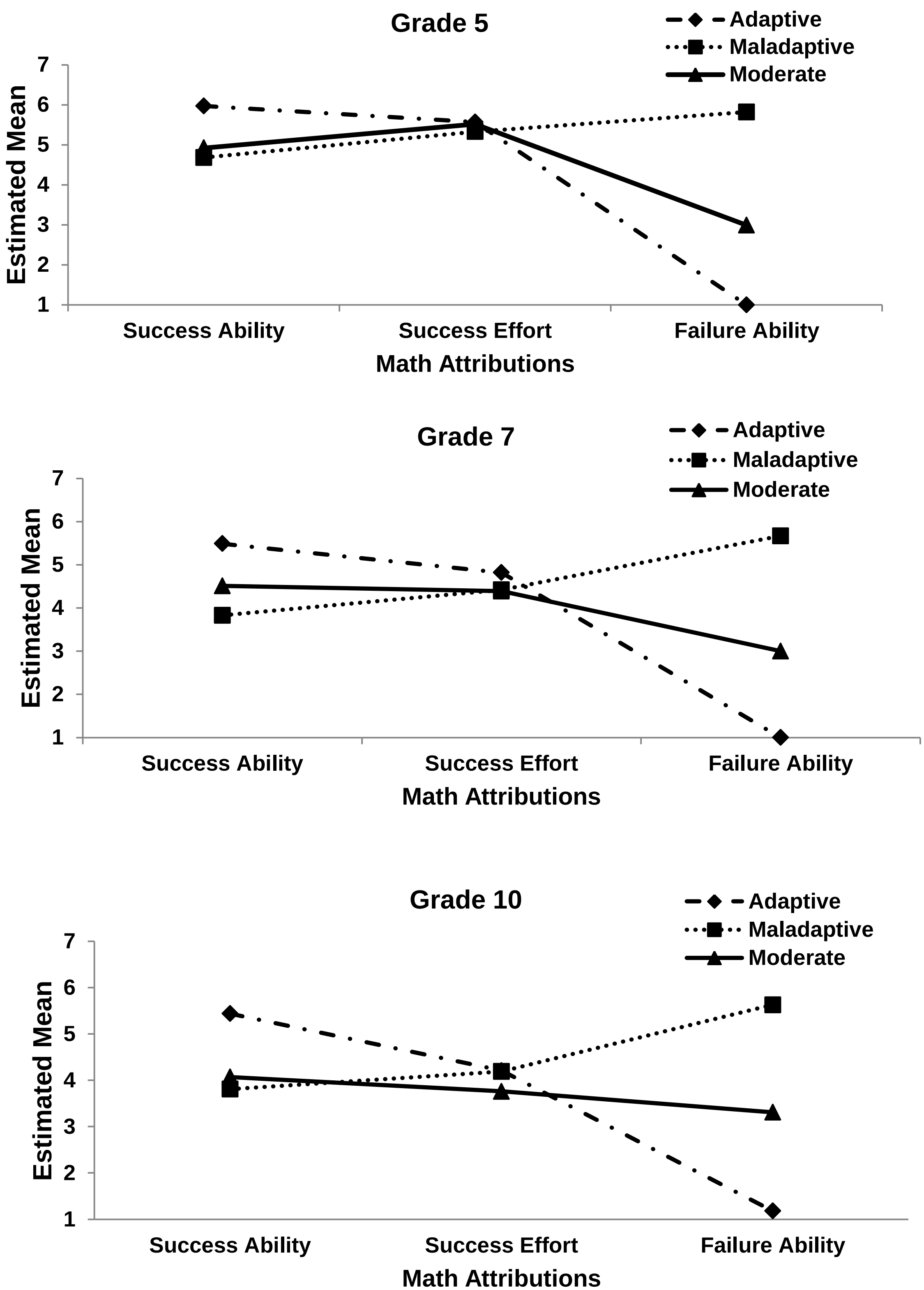


Figure 2.3. Estimated attribution means for the Grade 5, Grade 7 and Grade 10 English two-cluster LPA models

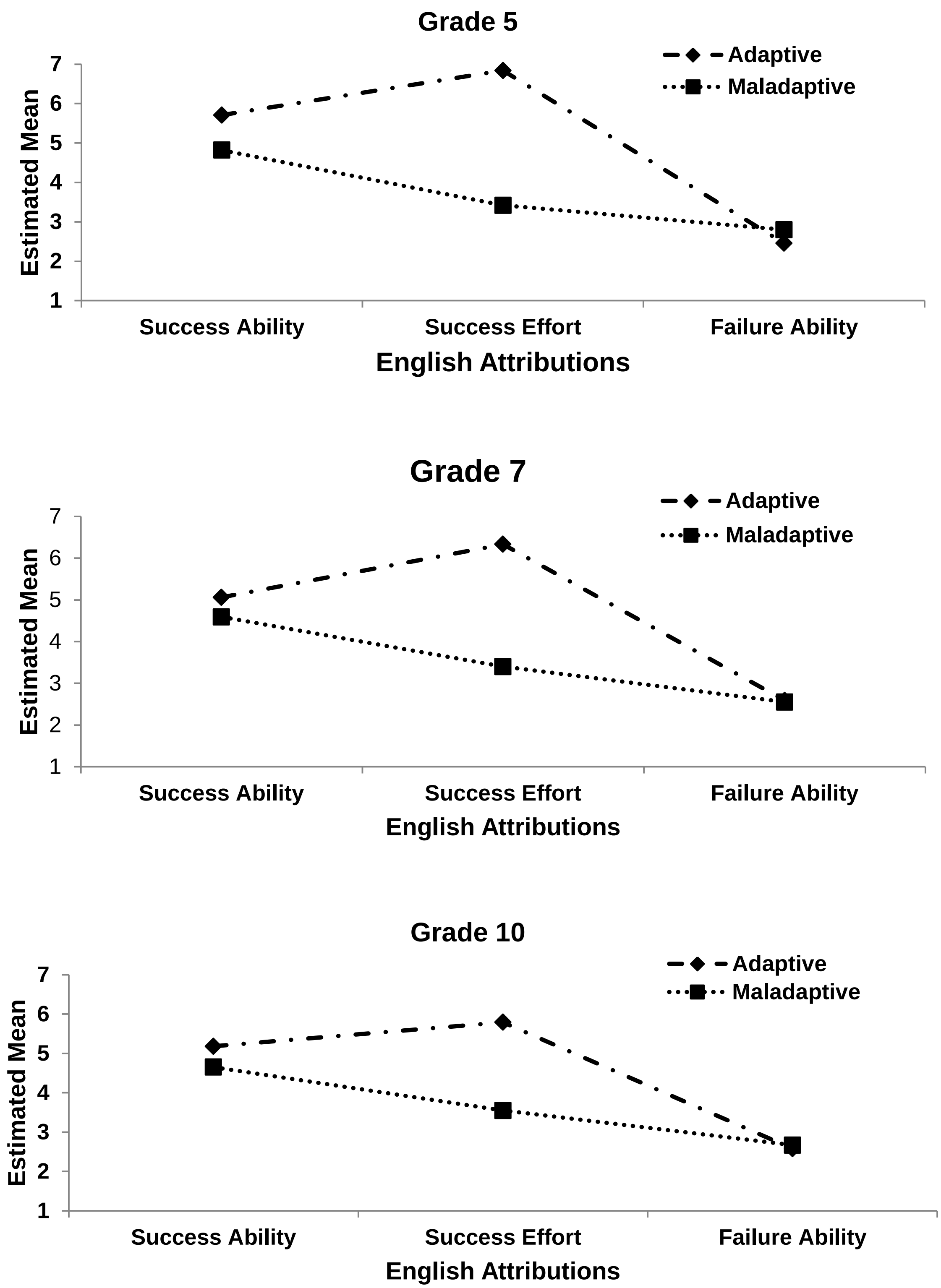
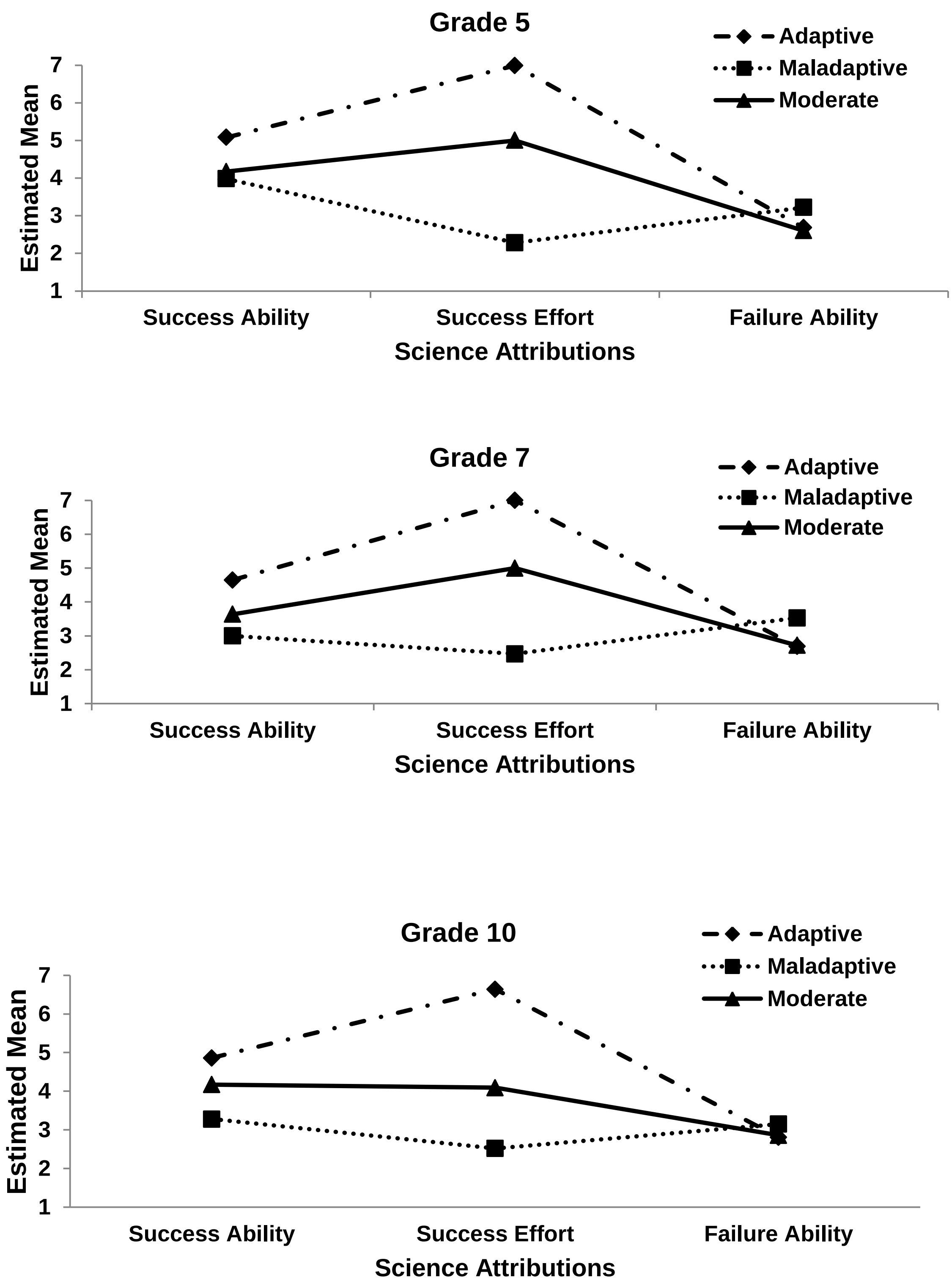


Figure 2.4. Estimated attribution means for Grade 5, Grade 7 and Grade 10 science three-cluster LPA models



Appendix

[1] Assessed in Grade 5; [2]Assessedin Grade 7; [3] Assessed in Grade 10

Attributions for Mathematics, English, and Science[1, 2, 3]

Items	Response Options
Mathematics	
When I do well in math, it is because I am really good at math.	1 = Not at all likely; 2 = Somewhat likely; 3 = Quite likely;4 = Extremely likely[1,2]
When I do well in math, it is because I studied hard for the test.	1 = Not at all likely; 4 = Neutral; 7 = Extremely likely[3]
When I receive a poor grade in math, it is because I am not good at math.	
Science	
When I get an excellent grade on a science test, it is because I worked very hard at it.	
When I do not do well on a science test, it is because I am not good at science.	
When I get an excellent grade on a science test, it is because I am talented in science.	
English	
When I do exceptionally well in English, it is because I am very smart in verbal areas.	
When I do exceptionally well in English, it is because I worked really hard.	
When I receive a low grade in English, it is because English is hard for me.	
When I do very well on a writing assignment, it is because I have worked hard on the assignment	
When I do very well on a writing assignment, it is because I write well.	
When I get a poor grade on a written assignment, it is because I am not good at writing.	

Perceptions of Gender Group Competence[2]

Response Option

Not well at all	←---------------------------------|---------------------------------→	Very well

Items

Boys' Gender Group Competence

I think that in **MATH** boys do this well:

I think that in **SCIENCE** boys do this well:

I think that in **READING** boys do this well:

I think that in **WRITING** boys do this well:

Girls' Gender Group Competence

I think that in **MATH** girls do this well:

I think that in **SCIENCE** girls do this well:

I think that in **READING** girls do this well:

I think that in **WRITING** girls do this well:

Classroom Engagement in Mathematics, English, and Science, as Reported by Students[3]

Items	Response Options
Mathematics	
I work hard when we start something new in math.	1 = Not at all true; 2 = Not very true; 3 = Sort of true; 4 = Very true
The first time my teacher talks about a new topic in math, I listen carefully.	
If a math problem is really hard, I keep working on it.	
When I do badly on a math test, I work harder next time.	
When I come to a math problem that I can't solve right away, I just give up.	
Science	
I work hard when we start something new in science.	
The first time my teacher talks about a new topic in science, I listen carefully.	
If a science assignment is really hard, I keep working on it.	
When I do badly on a science test, I work harder next time.	
When I come to an idea in science that I don't understand, I just give up.	
English	
I work hard when we start something new in English.	
The first time my teacher talks about a new topic in English, I listen carefully.	
If an English assignment is really hard, I keep working on it.	
When I do badly on an English test, I work harder next time.	
When I have an English assignment that's really hard, I just give up.	

Students' Classroom Engagement, as Reported by Mathematics, English, and Science Teachers[3]

Items	Response Options
This student participates when we discuss new material.	1 = Not at all true; 2 = Not very true; 3 = Sort of true; 4 = Very true
This student works hard when we start something new in class.	
The first time I talk about a new topic, this student listens very carefully.	
When we start something new, this student practically falls asleep.	
This student's mind wanders when I start a new topic.	
This student never seems to pay attention when we begin a new topic.	
If a problem is really hard, s/he keeps working on it.	
When this student runs into a difficult question, s/he tries even harder.	
If this student can't get a problem right the first time, s/he keeps trying.	
When this student does badly on a test, s/he works harder next time.	
When this student has a hard question or problem in class, s/he doesn't even try.	
When this student comes to a problem that s/he can't solve right away, s/he just gives up.	
If a problem is really hard, this student just quits working on it.	
If this student doesn't understand something right away, s/he stops trying.	
When this student has trouble understanding something, s/he gives up.	

REFERENCES

Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987). Child/adolescent behavioral and emotional problems: Implications of cross informant correlations for situational specificity. *Psychological Bulletin,101*, 213-232.

Anderson, C. A. (1983). Motivational and performance deficits in interpersonal settings: The effects of attributional style. *Journal of Personality and Social Psychology,* 45, 1136–1147.

Andre, T., Whigham, M., Hendrickson, A., & Chambers, S. (1999). Competency beliefs, positive affect, and gender stereotypes of elementary students and their parents about science versus other school subjects. *Journal of Research in Science Teaching, 36(6*), 719-747.

Barber, B. K., & Olsen, J. A. (2004). Assessing the transitions to middle and high school. *Journal of Adolescent Research, 19*(1), 3–30.

Bar-Tal, D. (1978). Attributional analysis of achievement-related behavior. *Review of Educational Research, 48(1),* 259-271.

Berkner, L. K., & Chavez, L. (1997). *Access to postsecondary education for the 1992 high school graduates.* Statistical Analysis Report, NCES 98-105. Washington, DC: U.S. Department of Education.

Bollen, K. A., & Curran, P. J. (2006). *Latent curve models: A structural equation perspective.* Wiley: Hoboken, NJ.

Brophy, J., & Good, T. L. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 328–375). New York: Simon & Schuster.

Chouinard, R., & Roy, N. (2008). Changes in high-school students' competence beliefs, utility value and achievement goals in mathematics.*British Journal of Educational Psychology,78(1),* 31-50.

Clark S. & Muthén B. (2009). *Relating latent class analysis results to variables not included in the analysis*. Manuscript submitted for publication.

Collins, L. M., Schafer, J. L., & Kam, C. (2001). A comparison of inclusive and restrictive strategies in modern missing data procedures. *Psychological Methods, 6*(4), 330-351.

Connell, J. P., Spencer, M. B., & Aber, J. L. (1994). Educational risk and resilience in African-American youth: Context, self, action, and outcomes in school. *Child Development, 65*(2),493-506.

Cook, P. J. & Ludwig, J. (1997). Weighing the "Burden of 'Acting White'": Are there race differences in attitudes toward education? *Journal of Policy Analysis and Management*, *16(2)*, 256-278.

Deaux, K., & Emswiller, T. (1974). Explanations for successful performance on sex-linked tasks: What is skill for the male is luck for the female. *Journal of Personality and Social Psychology*, *29,* 80-85.

Deaux, K., & Major,B. (1987). Putting gender into context: An interactive model of gender-related behavior. *Psychological Review, 94*, 369-389.

Dweck, C. S., & Leggett, E. L. (1988). A social cognitive approach to motivation and personality. *Psychological Review, 95,*256-273.

Eccles, J. S., & Jacobs, J. E. (1986). Social forces shape math attitudes and performance. In M. R. Walsh (Ed.), *The psychology of women: Ongoing debates* (pp. 341–354). New Haven, CT: Yale University Press.

Eccles, J. S., & Midgley, C. (1989). Stage-environment fit: Developmentally appropriate classrooms for young adolescents. In C. Ames & R. Ames (Eds.), *Research on motivation in education* (Vol. 3, pp. 139-186). San Diego, CA: Academic Press.

Eccles, J. E., Midgley, C. M., & Adler, T. F. (1984). Age-related changes in the school environment: Effects on achievement motivation. In J. P. Nicholls (Ed.), *The development of achievement motivation* (pp. 283-331). Greenwich, CT: JAI Press.

Elig, T.W., & Frieze, I.H. (1979). Measuring causal attributions for success and failure. *Journal of Personality and Social Psychology, 37*(4), 621-634.

Erikson, E. H. (1968). *Identity: Youth and crises*. New York: Norton.

Evans, A.B., Copping, K.E., Rowley, S.J., & Kurtz-Costes, B. (2011). Academic self-concept in Black adolescents: Do race and gender stereotypes matter? *Self and Identity, 10,* 263-277.

Fisher,C. B.,Wallace, S. A.,&Fenton, R. E. (2000). Discrimination distress during adolescence. *Journal of Youth and Adolescence, 29*(6), 679–695.

Forsyth, D. R., Story, P. A., Kelley, K. N. & McMillan, J. H. 2009.What causes failure and success? Students' perceptions of their academic outcomes. *Social Psychology of Education: An International Journal, 12*(2), 157-174.

Fredricks, J.A., Blumenfeld, P.C., & Paris, A.H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74,* 59–109.

Fredricks, J. A., & Eccles, J. S. (2002). Children's competence and value beliefs from childhood through adolescence: Growth trajectories in two male-sex-typed domains. *Developmental Psychology, 38,* 519–533.

Friedel, J. M., Cortina, K. S., Turner, J. C., & Midgley, C. (2010).Changes in efficacy beliefs in mathematics across the transition to middle school: Examining the effects of perceived teacher and parent goal emphases. *Journal of Educational Psychology, 102,* 102–114.

Garcia Coll C, Lamberty G, Jenkins R, McAdoo HP, Crnic K, et al. 1996. An integrative model for the study of developmental competencies in minority children. *Child Development, 67,* 1891–914

Georgiou, S. N. (1999). Achievement attributions of sixth-grade children and their parents. *Educational Psychology, 19(4),* 399-412

Glasgow, K. L., Dornbusch, S. M., Troyer, L., Steinberg, L., & Ritter, P. L. (1997). Parenting styles, adolescents' attributions, and educational outcomes in nine heterogeneous high schools. *Child Development, 68(3),* 507-529.

Graham, S. (1988). Can attribution theory tell us something about motivation in blacks? *Educational Psychologist, 23(1),* 3-23.

Graham, S. (1994). Motivation in African Americans. *Review of Educational Research, 64,* 55-117.

Graham, S., & Long, A. (1986). Race, class, and the attributional process. *Journal of Educational Psychology, 78(1*), 4-13.

Graham, S., Taylor, A., & Hudley, C. (1998). Exploring achievement values among ethnic minority early adolescents. *Journal of Educational Psychology, 90,* 606–620.

Harter, S. (1990). Self and identity development. In S. Feldman & G. Elliot (Eds.), *At the threshold: The developing adolescent* (pp. 352-387). Cambridge, MA: Harvard University Press.

Hewstone, M., Gale, L., & Purkhardt, N. (1990). Intergroup attributions for success and failure: Group-serving bias and group-serving causal schemata. *European Bulletin of Cognitive Psychology, 10,* 23- 44.

Hill, C., Corbett, C., St. Rose, A. (2010). *Why So Few? Women in Science, technology, Engineering and Mathematics.* AAUW, Washington.

Hill, J. P., & Lynch, M. E. (1983). The intensification of gender-related role expectations during early adolescence. In J. Brooks-Gunn & A. C. Peterson (Eds.), Girls at puberty (pp. 201-228). New York: Plenum Press.

Hudley, C., & Graham, S. (2001). Stereotypes of achievement striving among early adolescents. *Social Psychology of Education, 5*, 201– 224.

Jacobs, J. E., & Bleeker, M. M. (2004). Girls' and boys' developing interests in math and science: Do parents matter? *New Directions for Child and Adolescent Development, 106*, 5-21.

Jacobs, J. E., Lanza, S., Osgood, D. W., Eccles, J. S., & Wigfield, A. (2002). Changes in children's self-competence and values: Gender and domain differences across grade one to twelve. *Child Development, 73(2)*, 509-527.

Jackson, L.A., Sullivan, L.A., & Hodge, C.N. (1993). Stereotype effects on attributions, predictions, and evaluations: No two social judgments are quite alike. *Journal of Personality and Social Psychology*, *65*(1), 69-84.

Jost, J. T., & Burgess, D. (2000). Attitudinal ambivalence and the conflict between group and system justification motives in low status groups. *Personality and Social Psychology Bulletin*, *26(3)*, 293–305.

Joyce C.R., Zutshi D.W., Hrubes V., & Mason R.M. (1975). Comparison of fixed interval and visual analogue scales for rating chronic pain. *European Journal of Clinical Pharmacology, 8*, 415–420.

Keating, D. (1990). Adolescent thinking. In S. Feldman & G. Elliot (Eds.), *At the threshold: The developing adolescent*(pp. 54–89). Cambridge, MA: Harvard University Press.

Keifer, A., & Shih, M. (2006). Gender differences in persistence and attributions in stereotype relevant contexts. *Sex Roles, 54* (11-12), 859-868.

Kelly, G., & Chen, C. (1999). The sound of music: Constructing science as sociocultural practices through oral and written discourse. *Journal of Research in Science Teaching, 36*, 883–915.

Kurtz-Costes, B., Rowley, S. J., Harris-Britt, A., & Woods, T. A. (2008). Gender stereotypes about mathematics and science and self-perceptions of ability in late childhood and early adolescence. *Merrill Palmer Quarterly*, *54*, 386-410.

Lee, O., & Anderson, C. W. (1993). Task engagement and conceptual change in middle school science classrooms. *American Educational Research Journal, 30*, 585–610.

Lee, V. E., & Bryk, A. S. (1989). A multilevel model of the social distribution of high school achievement. *Sociology of Education*, *62(3)*, 172-192.

Liu, K., Ying-Yao C., Yi-Ling C., & Yuh-Yih, W. (2009). Longitudinal effects of educational expectations and achievement attributions on adolescents' academic achievements. *Adolescence, 44,(176)*, 911-24.

Lo, Y., Mendell, N. R., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika, 88,* 767–778.

Losen, D., & Orfield, G. (2002). *Racial inequality in special education*. Cambridge, MA: Harvard Civil Rights Project.

Lubke, G.H., & Muthén, B. (2005). Investigating population heterogeneity with factor mixture models. *Psychological Methods*, *10*(1), 21-39.

Lucas, S. R. (1999). *Tracking inequality*. *Stratification and mobility in American high schools*. New York: Teachers College Press.

Lytton, H. & Romney, D. M. (1991). Parents' differential socialization of boys and girls: A meta-analysis. *Psychological Bulletin*, *109*, 267–297.

Ma, X., & Cartwright, F. (2003). A longitudinal analysis of gender differences in affective outcomes in mathematics during middle and high school. *School Effectiveness and School Improvement*, *14(4),* 413–439.

Madon, S., Jussim, L., Keiper, S., Eccles, J., Smith, A., & Palumbo, P. (1952). The accuracy and power of sex, social class, and ethnic stereotypes: A naturalistic study in person perception. *Personality and Social Psychology Bulletin, 24*(12), 1304– 1318.

Major, B., & O'Brien, L.T. (2005). The social psychology of stigma. *Annual Review of Psychology, 56 (1*), 393-421.

Marks, H. (2000). Student engagement in instructional activity: patterns in the elementary, middle and high school years. *American Educational Research Journal, 37*(1), 153-184.

Marsh, H. W. (1986). Verbal and math self-concepts: An internal/external frame of reference model. *American Educational Research Journal, 23(1),* 129-149.

Marsh, H. W., & Ayotte, V. (2001.) Do multiple dimensions of self-concept become more differentiated with age? *Journal of Educational Psychology, 95*, 687-706.

Marsh, H. W., & Craven, R. (2002). The pivotal role of frames of reference in academic self-concept formation: The big fish little pond effect. In F. Pajares & T. Urdan (Eds.), *Adolescence and education* (Vol. II, pp. 83–123). Greenwich, CT: Information Age.

Marsh, H. W., & Hau, K. T. (2003). Big fish little pond effect on academic self-concept: A cross-cultural (26 country) test of the negative effects of academically selective schools. *American Psychologist, 58,* 364–376.

Marsh, H. W., & Parker, J. (1984). Determinants of student self-concept: Is it better to be a relatively large fish in a small pond even if you don't learn to swim as well? *Journal of Personality and Social Psychology, 47*, 213-231.

Maruyama, G. (1982). How should attributions be measured? A reanalysis of data from Elig and Frieze. *American Educational Research Journal, 19,* 552-558.

McDonald, R. P., & Ho, M. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods, 7*(1), 64–82.

McLoyd, V.C. (2006). The legacy of Child Development's 1990 Special Issue on Minority Children: An editorial retrospective. *Child Development, 77, 5*, 1142-1148.

McHale, S. M., Crouter, A. C., & Tucker, C. J. (1999). Family context and gender role socialization in middle childhood: Comparing girls to boys and sisters to brothers. *Child Development, 70,* 990–104.

Meece, J. L. (1987). The influence of school experiences on the development of gender schemata. In L. S. Liben & M. L. Signorella (Eds.), *Children's gender schemata* (New Directions for Child Development No. 38, pp. 89–105). San Francisco, CA: Jossey-Bass.

Meece, J. L., Glienke, B. B., & Burg, S. (2006). Gender and motivation. *Journal of School Psychology, 44*, 351-373.

Meece, J. L., Wigfield, A., & Eccles, J. S. (1990). Predictors of math anxiety and its influence on young adolescents' course enrollment intentions and performance in mathematics. *Journal of Educational Psychology, 82(1),* 60-70.

Mickelson, R.A. (1990). The Attitude-Achievement paradox among Black adolescents. *Sociology of Education*, 63(1), 44-61*82(1),* 60–70.

Mullen, B., Brown, R., & Smith, C. (1992). Ingroup bias as a function of salience, relevance, and status: An integration. *European Journal of Social Psychology, 22(2),* 104–122.

Muthén, B. (2001). Latent variable mixture modeling. In G. A. Marcoulides & R. E. Schumacker (eds.), *New developments and techniques in structural equation modeling* (pp. 1-33). Lawrence Erlbaum Associates.

Muthén, L.K., & Muthén, B.O. (1998-2007). *Mplus user's guide. Fifth edition.* Los Angeles, CA: Muthén & Muthén.

National Center for Education Statistics [NCES]. (2009). *The Nation's Report Card: Reading 2009,* U.S. Department of Education.

Nicholls, J. G. (1978). The development of the concepts of effort and ability, perception of academic attainment, and the understanding that difficult tasks require more ability. *Child Development*, *49,* 800-814.

Nicholls, J. G. (1979). Development of perception of own attainment and causal attributions for success and failure in reading. *Journal of Educational Psychology*, *71*, 94–99.

Nicholls, J. G. (1990). What is ability and why are we mindful of it? A developmental perspective. In R. Sternberg & J. Kolligan (Eds.), *Competence considered* (pp.11-40). New Haven, CT: Yale University Press.

Norris, S. P., & Phillips, L. M. (2003). How literacy in its fundamental sense is central to scientific literacy. *Science Education*, *87*, 224–240.

O'Sullivan, J.T., & Howe, M.L. (1996). Causal attributions and reading Achievement: individual differences in low-income Families. *Contemporary Educational Psychology*, *21(4),* 363-387.

Oakes, J. (1985). *Keeping track: How schools structure inequality*. New Haven, CT: Yale University Press.

Osborne, J., Simon, S., & Collins, S. (2003). Attitudes towards science: A review of the literature and its implications. *International Journal of Science Education, 25(9),* 1049–1079.

Parsons, J. E. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), Achievement and achievement motives: Psychological and sociological approaches (pp. 75–146). San Francisco: Freeman.

Piaget, J. S. (1952). *The child's conception of the world.* London: Reutledge & Kegan Paul.

Pintrich, P. R., & Blumenfeld, P. (1985). Classroom experience and children's self-perceptions of ability, effort, and conduct. *Journal of Educational Psychology, 77*, 646-657.

Reyes, O., Gillock, K. L., & Kobus, K. (1994). A longitudinal study of school adjustment in urban, minority adolescents: Effects of a high school transition program. *American Journal of Community Psychology*, *22(3)*, 341–369.

Roeser, R. W., Eccles, J. S., & Freedman-Doan, C. (1999). Academic functioning and mental health in adolescence: Patterns, progressions, and routes from childhood. *Journal of Adolescent Research, 14(2),* 135-174.

Rouland, K.K., Rowley, S.J., Kurtz-Costes, B, DeSousa, V.L., & Wachtel, S (2011). *Self views of African American youth are related to the gender stereotypes and academic attributions of their parents.* Manuscript submitted for publication.

Rowley, S. R., Kurtz-Costes, B., Mistry, R., & Feagans, L. (2007). Social status as a predictor of race and gender stereotypes in late childhood and early adolescence. *Social Development*, *16*, 150-168.

Ruble, D. N., Martin, C. L., & Berenbaum, S. A. (2006). Gender development. In W. Damon & R. M. Lerner (Series Eds.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3, Social, emotional, and personality development* (6th ed., pp. 858-932). Hoboken, NJ: Wiley.

Ruck, M. D., & Wortley, S. (2002). Racial and ethnic minority high school students' perceptions of school disciplinary practices: A look at some Canadian findings. *Journal of Youth and Adolescence, 31*(3), 185-195.

Russell, D. (1982). The Causal Dimension Scale: A measure of how individuals perceive causes. *Journal of Personality and Social Psychology, 42,* 1137–1145.

Saunders, J., & Davis, L., Williams, T., & Williams, J. H. (2004). Gender differences in self-perceptions and academic outcomes: a study of African American high school students. *Journal of Youth and Adolescence, 33*(10), 81-90.

Schmader, T., Johns, M., & Barquissau, M. (2004). The costs of accepting gender differences: The role of stereotype endorsement in women's experience in the math domain. *Sex Roles*, *50(11/12),* 835-850.

Schmeelk-Cone, K.H., & Zimmerman, M.A. (2003). A longitudinal analysis of stress in African American youth: Predictors and outcomes of stress trajectories. *Journal of Youth and Adolescence*, *32(6),* 419-430.

Schunk, D. H. (1982). Effects of effort attributional feedback on children's perceived self-efficacy and achievement. *Journal of Educational Psychology*, *74*(4),548-556.

Schunk, D.H., Pintrich, P.R., & Meece, J.L. (2002). *Motivation in education: theory, research, and applications.* Upper Saddle River, NJ: Pearson/Merrill Prentice Hall.

Schwartz, G. (1978). Estimating the dimension of a model. The Annals of Statistics, 6, 461–464.

Simmons, R.G., Carlton-Ford, S.L., & Blyth D.A. (1987). Predicting how a child will cope with the transition to junior high school. In R.M. Lerner & T.T. Foch (Eds.). *Biological psychosocial interactions in early adolescence.* Hillsdale, NJ: Erlbaum.

Simons, R. L., Murry, V., McLoyd, V., Hsiu, L. K., Cutrona, C., & Conger, R. D. (2002). Discrimination, crime, ethnic identity, and parenting as correlates of depressive symptoms among African American children: A multilevel analysis. *Development and Psychopathology, 14,* 371–393.

Skinner, E., & Belmont, M. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85(4)*, 571-581.

Steele, C. (1992). Race and the schooling of Black Americans. *Atlantic Monthly,* 68-78.

Steele, C. & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology, 69(5),* 797-811.

Stevenson, H.W. (2001). Schools, teachers, and parents. In A. Thorton (Ed.), *The well-being of children and families: Research and data needs* (pp. 341-355). Ann Arbor, MI: The University of Michigan Press.

Stipek, D. (2002). Good instruction is motivating. In A. Wigfield & J. Eccles (Eds.), *Development of achievement motivation.* San Diego, CA: Academic Press.

Stipek, D., & Gralinski, J. H. (1996). Children's beliefs about intelligence and school performance. *Journal of Educational Psychology, 88,* 397--408.

Swinton, A.D., Kurtz-Costes, B., Okeke, N., & Rowley, S.R. (in press). A longitudinal examination of African American adolescents' attributions about Achievement outcomes. *Child Development.*

Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S.Worchel & W. G.Austin (Eds.), *Psychology of intergroup relations* (2nd ed., (pp. 7–24). Chicago: Nelson-Hall.

Utley, C. A., Kozleski, E., Smith, A. & Draper, I. L. (2002). Positive behavior support: A proactive strategy for minimizing behavior problems in urban multicultural youth. *Journal of Positive Behavior Interventions, 4*(4), 196-207.

van Laar, C. (2000). The paradox of low academic achievement but high self-esteem in African American students: An attributional account. *Educational Psychology Review, 12(1),* 33-61.

Vispoel, W. P., & Austin, J. R. (1995). Success and failure in junior high school: A critical incident approach to understanding students' attributional beliefs. *American Educational Research Journal, 32,* 377-412.

Watt, H. M. G. (2008). A latent growth curve modeling approach using an accelerated longitudinal design: The ontogeny of boys' and girls' talent perceptions and intrinsic values through adolescence. *Educational Research and Evaluation, 14*(4), 287-304.

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92(4)*, 548-573.

Weiner, B. (1992). *Human motivation: Metaphors, theories, and research.* Newbury Park, CA: Sage. Weiner, B., & Kukla,

Weiss, I., Banilower, E., McMahon, K., & Smith, P. (2001). Report of the 2000 national survey of science and mathematics education. Chapel Hill, NC: Horizon Research, Inc.

Wigfield, A., Eccles, J. S., MacIver., Reuman, D. A., & Midgley, C. (1991). Transitions during early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology, 27,* 552-565.

Winsler, A., & Wallace, G.L. (2002). Behavior problems and social skills in preschool children: Parent-teacher agreement and relations with classroom observations. *Early Education and Development*, *13*(1), 41-58.

Wong, C., Eccles, J. S., & Sameroff, A. (2003). The influence of ethnic discrimination and ethnic identification on African American adolescents' school and socioemotional adjustment. *Journal of Personality, 71,* 1197 – 1232.

Wood, D. A., Kurtz-Costes, B., & Copping, K. E. (in press). Motivational pathways to college for African American youth: A test of expectancy-value theory. *Developmental Psychology.*

Wood, D., Kurtz-Costes, B., Rowley, S.J., & Okeky-Adeyanju, N. (2010). Mother's academic gender stereotypes and educational-related beliefs about sons and daughters in African American families. *Journal of Educational Psychology*, *102*(2), 521-530.