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Middle School Noncognitive Development in a Sample of Hispanic/Latino Youth

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Abstract

This study examined the development of noncognitive skills in a sample of 4,769 Hispanic/Latino students as they went through middle school and the first year of high school using ACT Engage 6-9, an assessment designed to predict student outcomes by measuring students' behaviors and psychosocial attributes. The scales of Academic Discipline, Relationships with School Personnel, and Thinking before Acting were examined longitudinally through HLM analysis. The factors of gender and several indices of academic achievement were used to predict differences in students' starting scores and growth over time.

All factors related to academic achievement were significantly related to differences in students' starting scores in 7^{th} grade on all three scales. Mean scores in Academic Discipline and Relationships with School Personnel declined between 7^{th} and 9^{th} grades, but increased in Thinking before Acting. Some indices of academic achievement were also significantly related growth in all three models; as was gender in the scales of Relationships with School Personnel and Thinking before Acting.

The results of this study are consistent with prior research and indicate that there is a significant relationship between academic indicators and noncognitive skills, and that this relationship influences how these skills develop over time. These findings underscore the importance of these skills and suggest that measuring noncognitive skills would provide insight into differences in individual academic achievement.

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ABSTRACT

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

The Importance of Noncognitive Factors

Carla and Sam are both 10th graders at the same high school.[1] In fact, they are next-door neighbors and have known each other since they were young. Both students come from similar socioeconomic backgrounds and have been described by their teachers as being very quick learners. Additionally, both students have always attended the same schools and many times, have even been in the same class, receiving exactly the same curriculum. However, while Carla has been on the honor roll nearly every semester, Sam earns mostly C's with a few B's since he started high school. What accounts for this difference?

Academic achievement is one measure used to determine how academically prepared children are as they progress from year to year. Many measures of academic achievement focus upon how well students can demonstrate their proficiency of content knowledge, which is inarguably important. In most academic settings, this is done through a combination of coursework and exams. However, there are a number of factors that influence how well students perform on both everyday classroom tasks and tests. Noncognitive skills are factors related to academic success and yet are often overlooked in many school curricula (Rothstein, 2004; U.S. Department of Education, 2013).

[1] These are not real students. This is a hypothetical example to illustrate the impact that differences in noncognitive skill can have on student achievement.

The label "noncognitive" is a kind of catchall for factors and behaviors related to academic performance that are differentiated from intelligence or cognitive ability (Lipnevich & Roberts, 2011). Examples of noncognitive factors include social and/or emotional skills, self-efficacy, engagement, motivation, and academic behaviors, such as good time management skills. As Tooley and Bornfreund (2014) write:

> These kinds of habits, mindsets, and non-technical skills are integral to academic, professional, and personal success. Recently, they have begun to enter public discourse as research demonstrating their importance has been made more accessible through the use of terms such as "growth mindsets," "grit," and "character." The various terms used to describe such skills, habits, and mindsets are…numerous. (p. 2)

In addition to the relevance these factors have in and outside of the classroom, there have been a number of studies that have demonstrated a relationship between certain noncognitive factors and student success (Brown et al., 2008; Duckworth, Quinn, and Tsukayama, 2012; Lleras, 2008). For example, increased levels of student engagement have been shown to relate positively to academic outcomes (McClenney, Marti, & Adkins, 2012). One important difference between our 10th grade students Carla and Sam is the way they engage during class. While Carla usually focuses on the teacher during instructional time, takes relevant notes, and asks questions when she needs to clarify an idea, Sam shows fewer signs of engagement. He usually copies down notes if they are first written on the board or presented on slides, but rarely follows up with a question. Though Sam has been reminded often from his teachers that he needs to pay more attention during class, he has received little direct instruction on ways that he can do so. Indeed, in many schools across the country, there is little emphasis on directly

teaching noncognitive skills (Jairam & Kiewra, 2009; U.S. Department of Education, 2013).

Since a number of important noncognitive skills are not consistently taught in many school curricula, competence in these areas is not usually directly measured (Burger, Nadirova & Keefer, 2012; Rothstein, 2004). Rather, these skills are indirectly measured in that they influence performance indicators like student grade point average (Farrington, et al., 2012). For example, a student who is motivated to do well in school may exert more effort on homework in order to create higher quality assignments than a student who is not motivated to do well, and will probably earn a higher grade as a result. Or students who have effective social skills, for example active listening and peer negotiation skills, may be more likely to facilitate cooperation with other students when working in groups and therefore have more time to spend focused on the group task.

Behaviors like increased effort and effective social skills may not be directly factored into a student's grade, but they certainly play a part in academic achievement. As Jacob (2002) explained, "The effect of non-cognitive skill is comparable in magnitude to socio-economic status and cognitive ability" (p. 597). However, unlike student socioeconomic status or cognitive ability, noncognitive skills are malleable (Anger, 2012; Kautz, Heckman, Diris, Weel & Borghans, 2014; Kautz & Zanoni, 2014). Numerous studies have demonstrated success in teaching various noncognitive skills to students through a specialized curriculum and seeing subsequent increases in academic achievement (Brackett, Rivers, Reyes, & Salovey, 2012; CASEL, 2007), increased rates

of college enrollment (Kautz & Zanoni), and improved social skills (Durlak, Weissberg, & Pachan, 2010).

Noncognitive skills may also help limit or reverse cognitive delays in addition to helping improve academic outcomes (Rosen, Glennie, Dalton, Lennon, & Bozick, 2010). For example, researchers studied long-term outcomes from one noncognitive intervention designed for children in grades 1-6 and found significant effects on participants throughout school, as well as at ages 18 and 21 (Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999; Hawkins, Kosterman, Catalano, Hill, & Abbott, 2005). This intervention, which was followed up with further research to study more long-term outcomes, used a combination of teacher, parental, and child education, and taught social emotional skills to students and ways to engage and support children to teachers and parents. Years later, the intervention group still showed higher levels of academic engagement and achievement and reduced levels of criminal activity and drug use than students who did not receive any intervention.

Like the examples highlighted above, numerous research studies support the idea that noncognitive factors play a role in student success (Bratko, Chamorro-Premuzic, & Saks, 2006; Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011; Davis, Solberg, de Baca, & Gore, 2014; Finkelstein, & Thom, 2014; Jones, Greenberg, & Crowley, 2015; Poropat, 2009; Zimmerman & Kitsantas, 2014). Turning back to Carla and Sam again, differences in noncognitive factors could help explain some of the differences between these two students' various grade point averages. Whereas Carla has developed good studying habits that include regularly completing work and organizing

her materials, Sam has not. As these friends progressed through school, the difference between their grades has magnified, particularly when they got to high school.

Carla tends to participate in her classes to a greater degree than Sam and always comes to class on time, which also influences her grades. Her teachers see her as a responsible, hard-working student. Though Sam likes school and does not have difficulty learning the material, he frequently misplaces assignments and forgets about due dates, so he is often behind in coursework. His teachers, frustrated by his lack of consistency, believe that Sam is not truly applying himself to his work, despite the fact that when he does turn in his work, it is usually done well.

While these factors may seem like obvious ways in which two students could vary so widely in terms of their academic achievement, the skills that make Carla a more successful student than Sam are often overlooked in many schools, when in fact these differences could account for the reason that Carla consistently makes the honor roll and Sam's grades have declined throughout middle and high school. The importance of these skills also extends beyond the classroom. Studies in economics have found that differences in noncognitive skills account for a significant part of the variance between individuals in terms of educational attainment, occupation, and wages in adults (Blanden, Gregg, & MacMillan, 2007; Toomela, 2008).

Important Noncognitive Skills

A number of noncognitive skills have been demonstrated to positively relate to academic outcomes (Farrington et al., 2012). These noncognitive skills are explained in more detail in the review of literature in Chapter 2, but include a) academic behaviors, b)

personality, c) self-regulation, d) self-efficacy, e) engagement, f) motivation, and g) social skills. Academic behaviors are observable actions that students, like regularly attending class or completing homework (Farrington et al.). Personality is comprised of traits and tendencies can influence the choices and behaviors that students make in school (Corker, Oswald, & Donnellan, 2012). Self-regulation refers the ability to independently monitor and regulate thoughts, behavior, and emotions (Rosen, et al., 2010). Self-efficacy refers to a person's belief that they can accomplish what they set out to do (Bandura, 1997), and motivation is simply the desire to do something (Covington & Müeller, 2001). Finally, social skills are the skills used to communicate and interact with others (Gresham, Sugai, & Horner, 2001).

Research Questions

This study examined noncognitive assessment data from a group of students using ACT Engage Grades 6-9, an assessment designed to predict student outcomes (such as high school graduation) by measuring student behaviors and psychosocial attributes (ACT, 2012). This assessment is designed to predict student success by measuring three broad domains of student functioning: 1) Motivation, 2) Social Engagement, and 3) Self-Regulation (ACT, 2013). ACT Engage 6-9 contains 106 items that are scored using a 6-point Likert-type scale ranging from strongly disagree to strongly agree (Casillas, et al., 2012). There are ten scales, and each is relatively short at 9 to 12 items. All scales have high internal consistency reliabilities: $\alpha = .81$ to .90, with a median of .87 (Casillas et al., 2011).

This study used ACT Engage scores to measure the development of students' noncognitive skills over the span of middle school and the first year of high school. The longitudinal data came from a cohort of 4,769 Hispanic/Latino students from the Southwestern region who had completed ACT Engage Grades 6-9 on a yearly basis from grades 7 through 9. I examined how these skills developed over time while controlling for other student variables, such as prior academic performance, through HLM analysis. The scales examined in this study are related to academic behaviors (Academic Discipline), social skills (Relationships with School Personnel), and self-regulation (Thinking before Acting).

The dataset was also examined to look for developmental trends in order to determine at what points in time a targeted intervention designed to promote these noncognitive skills may be most appropriate. Finally, the data was examined to determine whether or not student achievement and demographics had any relationship with the way that scores varied over time. For example, did scores vary across time differently for boys and girls? This study addressed the following research questions:

1. How do students' Motivation, Social Engagement, and Self-Regulation scores develop as they progress from grades 7 to 9 as measured by the domains of ACT Engage? More specifically, I will examine the following:
    a. How does the scale of Academic Discipline (within the domain Motivation) develop from grades 7 to 9?
    b. How does the scale of Relationships with School Personnel (within the domain of Social Engagement) develop from grades 7 to 9?

c. How does the scale of Thinking before Acting (within the domain of Self-Regulation) develop from grades 7 to 9?

2. Do students' ACT Engage scores vary across time by students' academic achievement or gender?

Study Rationale

There is an abundance of evidence to support the idea that noncognitive factors play an important role in academic success (Amrai, Motlagh, Zalani, & Parhon, 2011; Bratko, Chamorro-Premuzic, & Saks, 2006; Conard, 2006; Finkelstein, & Thom, 2014; Jones, Greenberg, & Crowley, 2015; Noftle & Robbins, 2007; Wagerman & Funder, 2006). Research has highlighted the ways in which certain noncognitive skills, such as self-efficacy, engagement, and social skills, help predict academic performance beyond traditional measures such as prior GPA or cognitive ability (Poropat, 2009; Robbins, Allen, Casillas, Peterson, & Le, 2006; Schmitt et al., 2009; Shivpuri, Schmitt, Oswald, & Kim, 2006). Additionally, many noncognitive skills are malleable (Farrington et al., 2012; Robbins, Lauver, Le. Davis, & Langley, 2004), which means that interventions designed to improve these skills can help students become better learners. In its report on noncognitive factors and education, the U.S. Department of Education (2013) unequivocally stated that noncognitive skills should play an important role in educational priorities.

However, despite the growing recognition that noncognitive skills should be more highly prioritized in the classroom, this is seldom reflected in many schools (U.S. Department of Education, 2013). This may be due to the fact that many academic content

standards rarely include information beyond what content students should know. While modern educational standards have been in use for over two decades (Marzano & Kendall, 1996), they have taken on new importance under the No Child Left Behind Act (NCLB), which was signed into law in 2002. Under NCLB, also known as the Elementary and Secondary Education Act, content standards have been used to form the basis of what knowledge and skills students need to have in order to be considered proficient in various subject areas (U.S. Department of Education, 2009). Schools that fail to meet "adequate yearly progress" of these standards, as assessed through yearly testing, are subject to increasingly harsh sanctions, such as eventually replacing school staff (New Hampshire Department of Education, 2012).

The increased focus on school and teacher accountability due to NCLB has led to reduced instructional time in subjects that do not require testing, such as music or social studies (Dee & Jacob, 2010; McMurrer, 2007). In fact, researchers at the Center on Education Policy examined this issue by conducting research to determine the amount of instructional time spent on various subjects in 349 school districts (McMurrer). They found that a majority of the sampled schools increased instructional time in English language arts and mathematics because of the requirements of NCLB. In fact, 62% of the schools surveyed reported increasing instructional time spent on these subjects. Since there are limited hours in the school day, inevitably time must be taken from other content areas (McMurrer).

It is not surprising that noncognitive factors receive little attention in the classroom when there are increased demands on the use of instructional time as well as

an emphasis on demonstrating knowledge of content standards through standardized test performance, which heavily emphasizes cognitive skills (Finn, et al., 2014). Though teaching noncognitive skills has been shown to be advantageous in terms of improving grades and test scores (Cunha & Heckman, 2006), as well as improving other educational outcomes, such as college enrollment and persistence (Kautz & Zanoni, 2014), given the current climate of accountability in certain subject areas, it is important for educators to have a firm understanding of why these skills are so important. This includes not only knowing how noncognitive skills lead to improved outcomes, but also how and when these skills show growth, and whether or not certain students may be most likely to benefit from intervention. As Coates (2014) noted following an examination of data from a school that measured character performance, the study "provided evidence that a systematic approach [to tracking and analyzing noncognitive skills] could be an untapped resource for teachers, schools and districts to apply preventive interventions in their efforts to improve student persistence and academic outcomes" (p. 102).

Significance of the Study

The purpose of this study was to examine the progression of noncognitive factors and skills over the span of middle school and the first year of high school for developmental trends using longitudinal data from the ACT Engage 6-9 assessment. Researchers have concluded that noncognitive skills formed during childhood have an important and long-lasting impact on school and professional performance (Rauber, 2007). In addition to the important role that noncognitive factors play regarding future success, understanding how they can change over the course of early adolescence could

shed light on when and what kinds of skills should be taught during middle school and early high school.

Early adolescence is a time of change and transition. Between grades 6 and 9, many students will first transition to middle school and again to high school within the span of a few years. School transitions are related to decreased self-esteem and decreased feelings of wellbeing, motivation, and perceptions of school competence (Barber & Olsen, 2004; Cantin & Boivin, 2004). In addition to the adjustments that students must make as they begin middle and high schools, this is also a time in which many physical and cognitive changes take place as children enter and go through puberty (Silberseisen & Weichold, 2005).

In fact, this time period may also be particularly important for the development of certain noncognitive skills. In their study examining critical time periods in childhood for developing both cognitive and noncognitive skills by analyzing longitudinal data from children at ages 6 through 13, Cunha and Heckman (2007) found that, while early childhood is the best time to influence cognitive development, noncognitive skills are best effected at later time points. In this study, the most effective time to influence noncognitive skills was at ages 12 to 13. The authors concluded that adolescence was a sensitive period for developing noncognitive skills. Better understanding the progression of noncognitive skills over the course of early adolescence will offer educators information about student development during this time of change.

CHAPTER 2

Review of Literature

There is growing recognition within the field of education that various noncognitive factors play a role in student success. The following review of literature will discuss the attributes of important noncognitive factors and highlight some of the ways in which these factors and skills are related to outcomes in education. While there are a number of outcomes that relate to educational success, in this review of literature, I will focus upon the following, which relate to my research questions: 1) student academic achievement, and 2) successfully transitioning to high school. Finally, I will provide an overview of the available research on differences in noncognitive skills between groups of individuals as well as research related to early and middle adolescent noncognitive skill development.

Noncognitive Factors: What are they?

Noncognitive skills, or more broadly, noncognitive factors, are composed of behaviors, attitudes, and strategies that influence academic performance but are often not directly measured in school (U.S. Department of Education, 2013). Noncognitive factors have been characterized across multiple domains: social skills, attitudes, personality, self-efficacy, and motivation are all factors that could be considered noncognitive (Toomela, 2008; U.S. Department of Education).

Lleras (2008), who examined longitudinal data in order to compare the importance of noncognitive and cognitive factors in high school to educational attainment and earnings ten years later, stated that "noncognitive behaviors are as important and perhaps more important than cognitive abilities … in predicting individual educational and occupational success" (p. 898). Farrington et al. (2012) describe these factors and their relation to academic performance as such:

> School performance is a complex phenomenon, shaped by a wide variety of factors intrinsic to students and in their external environment. In addition to content knowledge and academic skills, students must develop sets of behaviors, skills, attitudes, and strategies that are crucial to academic performance in their classes, but that may not be reflected in their scores on cognitive tests. (p. 2)

Academic Behaviors

Academic behaviors are observable actions that students take related to schoolwork. These include behaviors like regularly attending class, consistently completing homework, spending time studying, and so on (Farrington et al., 2012). Academic behaviors are clearly related to academic achievement, and it is not hard to understand why. A student who spends plenty of time studying, regularly comes to class on time, and completes all of his or her assignments is much more likely to be successful than a student who does not engage in those behaviors.

However, while academic behaviors are important, other noncognitive factors are likely influencing these behaviors (Farrington et al., 2012). For example, a student who believes that she is good at math might be more likely to persevere through a difficult assignment while another student who believes that she is not good at math might simply give up. Or, a student who sets high goals for his final exam scores would likely spend

more time studying than a student who does not have any score expectations. In other words, while both of the above examples illustrate various academic behaviors, the reasons for engaging in these behaviors depend on other factors.

Therefore, academic behaviors may be the behavioral manifestation of other noncognitive factors at work. While it's important not to understate the importance of academic behaviors in terms of academic success, it's also important to understand that "virtually all other factors that affect school performance – including content knowledge, academic skills, student background characteristics, and the full range of noncognitive factors – exercise their effect through students' academic behaviors" (Farrington et al., 2012, p. 19). In this review of literature, I will focus on some of the constructs that influence academic behaviors: personality, self-regulation, self-efficacy, student engagement, motivation, and social skills.

Personality

Though personality may not be a factor that is frequently considered in school settings, personality traits and tendencies can influence the choices and behaviors that students make in school (Corker, Oswald, & Donnellan, 2012). Contrary to popular opinion, personality is not "fixed" for life, and there is ample evidence to suggest that traits change over one's lifetime and can also be influenced through teaching (Rothbart, 2007; Soto, John, Gosling, & Potter, 2011), meaning that it is possible for individuals to strengthen their adaptive traits. In fact, personality is far more malleable than cognitive ability, which generally has stabilized by around age 10 (Almlund, Duckworth, Heckman, & Kautz, 2011). One of the most widely used frameworks for describing

personality is the Five Factor Model (FFM), which describes five domains of personality that can be measured through individuals' thoughts, feelings, and actions, which remain relatively consistent over time and across situations (McCrae & Costa, 2008).

The five domains that comprise the FFM are as follows: 1) Neuroticism, 2) Extraversion, 3) Openness, 4) Agreeableness, and 5) Conscientiousness. Neuroticism has to do with emotional stability and how individuals react to things like stress. Those high in this trait are more likely to experience distress than average (Grice, 2006; McCrae & John, 1992). Extraversion is shown by assertive, energetic, and outgoing behaviors (Grice). Openness to experience describes an individual's levels of curiosity and desire for a wide variety of interests and experiences (McCrae & John). Agreeableness refers to a tendency for kind, caring, and altruistic behavior (Grice; McCrae & John). Finally, Conscientiousness refers to an individual's sense of diligence, responsibility, as well as the ability for organization and planning (Grice; McCrae & Costa, 2008).

The domain of Conscientiousness is particularly important in terms of noncognitive factors given its significant relationship with academic achievement (Bratko, Chamorro-Premuzic, & Saks, 2006; McAbee & Oswald, 2013; Poropat, 2009; Trautwein, Lüdtke, Roberts, Schnyder, & Niggli, 2009). Research has shown that Conscientiousness has a positive relationship with academic effort (Trautwein, et al.) and academic motivation (Hazrati-Viari, Rad, & Torabi, 2012; Komarraju & Karau, 2005), and has incremental validity in predicting student grade point average even when controlling for ability (Conard, 2006; Poropat; Wagerman & Funder, 2006). Conscientiousness is thought to influence behavior and certain noncognitive skills

(Corker, Oswald, & Donnellan, 2012; Noftle & Robins, 2007); specifically academic behaviors such as coming to class on time, regularly committing time to study, or showing perseverance during difficult academic tasks. One particular facet of Conscientiousness is self-control or self-regulation, which is frequently studied in relation to academic achievement and is also positively associated with success in school (Duckworth, Quinn, & Tsukayama, 2012).

Self-regulation

Self-regulation refers to a variety of related concepts, including the ability to independently monitor and regulate cognition, behavior, and emotions (Rosen, et al., 2010). This concept is sometimes referred to as self-control. Though self-control and self-regulation are arguably different but highly related constructs (Zimmerman & Kitsantas, 2014), they are often used somewhat interchangeably in the literature. There are a number of different ways that various forms of self-regulation relate to academic outcomes. For example, behavioral regulation may play a role in sustaining attention and inhibiting problem behavior (Harris, Friedlander, Saddler, Frizzelle, & Graham, 2005; Ponitz, McClelland, Matthews, & Morrison, 2009). A meta-analysis on the effectiveness of self-regulatory interventions revealed that these interventions are often effective in improving both motivation and academic achievement (Dignath, Buttner, & Langfeldt, 2008).

Self-regulation is positively associated with achievement (Pintrich & De Groot, 1990; Zimmerman & Kitsantas, 2014) and as a result, educators and researchers have developed self-regulatory learning strategies that can be taught in order to improve

academic performance. One often-used model of self-regulated learning developed by Zimmerman (2002), called the cyclical model, includes three phases: 1) forethought and planning, 2) performance monitoring, and 3) reflections on performance. During the first phase, students analyze the task and set goals related to completion (Zumbrunn, Tadlock, & Roberts, 2011). For example, this could entail making a plan for how many pages the student needs to read and take notes on each night in order to complete an assigned text by the due date.

Progress and performance monitoring characterize the second phase, which demands using elements of self-control as well as self-observation (Zimmerman, 2002). To use the example above, this student might check to see how many pages she has read so far, and whether or not this meets her goal. Additionally, she might think about whether or not she found ways to make progress on the task more efficiently or experiment with ways to do so (for example, listening to classical music while taking notes). Finally, in the third phase, students will need to make an assessment about how effective their strategies have been in accomplishing the task and reflect on the learning process. Did reading and taking notes help our student learn the material? Zimmerman also notes that there is an affective component to this phase as well. For example, a student who successfully reaches her goal may feel satisfied and develop additional motivation for self-regulated learning strategies.

Self-efficacy

Self-efficacy is another noncognitive factor that is related to academic achievement. Broadly, self-efficacy refers to a person's belief that they can accomplish

what they set out to do (Bandura, 1997; Carey & Forsyth, 2014), though self-efficacy in the realm of education is sometimes referred to as academic self-efficacy. At a basic level, academic self-efficacy is the belief that one can successfully learn and complete educational tasks. Another related idea is academic self-concept, which is a person's own assessment and feelings related their feelings of competence in education (McGrew, 2008). Though a person can have a global academic self-concept, this can also vary by subject or curricular domain (Arens, Yeung, Craven, & Hasselhorn, 2011).

"Self-efficacy is a strong and consistent predictor of grade point average and expectations of academic success" (Weiser & Riggio, 2010, p. 367). Academic self-efficacy has a positive relationship with academic achievement (Brown, et al., 2008; Robbins et al., 2004), school satisfaction, (Huebner & McCullough, 2000), and is also an important component of academic motivation (Howard & McCabe, 2006; Linnenbrink & Pintrich, 2002 & 2003). Komarraju and Nadler (2013) found that in addition to its positive relationship with GPA, self-efficacy was also highly related to student self-regulation, motivation, and effort. They found that students with high levels of academic self-efficacy were more likely to pursue challenging goals, persist through boring or difficult tasks, and have higher levels of motivation. In other words, a student who believes that he is good at writing is more likely to be motivated to complete writing assignments and keep going when it is hard, which influences his grade(s). This in turn increases his motivation and feelings of self-efficacy.

Student engagement

Student engagement is "the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education" (Great Schools Partnership, 2014, para. 1). There are a number of ways that student engagement can be broken down into more precise categories; behavioral engagement, emotional engagement, and cognitive engagement are all part of this domain (Wang & Eccles, 2012). Behavioral engagement generally involves demonstrating behaviors that comply with the expectations of your role (Trowler, 2010). For example, a student who comes to class, pays attention, and does not behave disruptively is showing some level of behavioral engagement.

Emotional engagement is an affective form of engagement; for example, feeling a sense of belonging or attachment to school (Wang & Eccles, 2012). Cognitive engagement is related to taking an interest in learning, enjoying challenging schoolwork, and using self-regulation strategies for learning (Trowler, 2010; Wang & Eccles). Taken together, student engagement has been shown to yield a positive relationship with academic achievement (McClenney, Marti, & Adkins, 2012). However, the relationship between behavioral engagement and academic performance is particularly robust (Fredricks, Blumenfeld, & Paris, 2004).

Motivation

Motivation is a construct that is relevant in a number of settings, but one facet of this construct that is particularly salient to educational contexts is academic motivation,

which is the desire to complete academic activities successfully (Rosen, et al., 2010). Though motivation is also related to student engagement, there are a number of research studies that have highlighted several different types of motivation in academic settings, and the importance motivation can have on certain academic outcomes. One important distinction in motivation is intrinsic versus extrinsic motivation; the prior refers to a desire to achieve because the individual is interested in the task, and the former indicates a desire to achieve because of the presence of outside goals or rewards (Covington & Müeller, 2001). Of the two, intrinsic motivation is generally viewed as a better predictor of academic outcomes (Rosen, et al., 2010).

Some research studies have shown that motivation alone is positively associated with academic achievement (Amrai, et al., 2011; Hodis, Meyer, McClure, Weir, & Walkey, 2011). For example, one study used a simple measure of motivation to predict later academic achievement. Using student motivation and prior grades, researchers were able to predict patterns of achievement and underachievement in high school students (Hodis, et al.). However, other researchers have found evidence that motivation acts as more of a mediator between academic self-efficacy and achievement (Guay, Ratelle, Roy, & Litalien, 2010). In other words, students who believe they are capable of doing well are more motivated and as a result, often perform better in school.

Another way in which motivation plays a part in academic achievement is its relation to achievement goals. In education, two main types of achievement goals have been identified: a) performance goals, which relate to striving to do better than others academically and being judged favorably by teachers, and b) mastery goals, which relate

more to a desire to learn new skills and trying to do something challenging (Meece, Anderman, & Anderman, 2006). Mastery goals are related to a number of positive academic outcomes, such as increased effort, persistence, and engagement (Meece et al.). In addition, interventions designed to increase the use of mastery goals in students have promising results, indicating that it is possible to help students increase motivation and the use of these goals in the classroom (Lüftenegger, van de Schoot, Schober, Finsterwald & Spiel, 2014; Miles, 2010).

Social skills

Social and emotional skills also fall under the umbrella of noncognitive factors. Some researchers have categorized types of social skills found in the educational literature into five social dimensions: a) peer relational skills, b) self-management skills, c) academic skills, d) compliance skills, and e) assertion skills (Gresham, Sugai, & Horner, 2001). Social skills have been shown to influence student success, particularly when examining outcomes that extend beyond academic achievement. Though some studies have shown a relationship between social skills and achievement, this may be due in part to other mediating factors, such as increased motivation or engagement in learning (DiPerna, Volpe, & Elliot, 2001; Murdock, Anderman, & Hodge, 2000). For example, researchers have found that adolescents' emotional health and social skills relate to their conduct in school and the quality of their friendships with peers (Roeser, Eccles, & Sameroff, 2000).

Additionally, social skills may play a role in other educational factors, like school discipline practices. Duran, Zhou, Frew, Kwok, and Benz (2011) found that "students

rated by parents and teachers as having low social skills were 12.5 times more likely to be excluded from school than were students with high social skills" (p. 21). Disciplinary exclusion, such as school suspension, is related to lowered academic performance and increased rates of school dropout. This finding may have especially important implications for groups of students who are at-risk for these kinds of practices, like students with disabilities, such as Attention Deficit/ Hyperactivity Disorder, Emotional and Behavioral Disorders, and Learning Disabilities (Duran, et al., 2001; Gresham et al., 2001).

Differences in Noncognitive Skill Level

Differences between noncognitive skill levels have been well demonstrated between males and females in various research studies (Bertrand & Pan, 2013; Cornwall, Mustard, & Van Parys, 2013; Jacob, 2002). Even when girls and boys perform equally well on achievement tests, therefore demonstrating similar levels of content knowledge, girls tend to outperform boys in terms of grade point averages (Duckworth & Seligman, 2006). This is likely due to the fact that grades often include attributes that are not directly measured by using achievement tests, such as study skills, time management, attendance, and work habits (Farrington, et al., 2012).

Using longitudinal data to examine the differences in college enrollment rates between men and women, Cornwall, Mustard, & Van Parys (2013) concluded that "boys who perform equally as well as girls on subject-area tests are graded less favorably by their teachers, but this less favorable treatment essentially vanishes when noncognitive skills are taken into account" (p. 263). In other words, girls are achieving higher GPAs

and attending college at higher rates than boys due to differences in noncognitive skill levels (Jacob, 2002). While there is a clear disparity in noncognitive skill levels between males and females, it is not entirely understood why, though theories about differences in biology and/or child rearing practices have been put forth as reasons for this phenomenon (Bertrand & Pan, 2013).

However, less established than the difference between males and females is how other factors, such as student race/ethnicity or socioeconomic status, relate to noncognitive skills. Some studies have shown that socioeconomic status (SES) is associated with noncognitive skill levels (Blanden, Gregg, & MacMillan, 2007; Garcia Garcia, 2013), just as it is correlated to other academic variables such as GPA (Sirin, 2005). Some of these studies use the framework of Lareau's cultural capital and concerted cultivation when attempting to explain reasons that noncognitive factors could vary between students at different SES levels (Farkas, 2003; Lee, 2008). In this framework, Lareau (2003) argues that higher SES families intentionally try to cultivate skills in their children by sending them to extracurricular activities and special lessons, which then leads to unequal skill development between high and low SES children. Covay and Carbonaro (2010) found evidence that supports the idea that certain extracurricular activities play a role in explaining some of the advantages that higher SES students have both noncognitively and academically.

Additionally, differences in student engagement between SES levels are often highly related to school factors. Lower SES students often do not have access to the same

educational opportunities as higher SES peers, such as advanced coursework. Lleras (2003, p. 19-20) wrote that:

> Student engagement could also contribute to differences in achievement through its effect on student's learning opportunities. Since curriculum differentiation and tracking create vastly different educational experiences, students enrolled in less challenging coursework may respond to the less demanding classroom environment by decreasing their level of participation and reducing their efforts to learn. Conversely, students who take more academic classes may participate in more rewarding coursework and be expected to put forth more effort in their studies, thereby increasing their engagement and raising their achievement.

Despite the link between SES and noncognitive skills, many studies have reliably demonstrated that noncognitive skills are important predictors of student academic performance even when including student factors such as SES levels (Coates, 2014; Jacob, 2002). Coates examined the relationship between character performance in school (or participation, team work, remaining on task, going above and beyond, and being thoughtful) and academic performance. The results "indicated that character performance had a stronger relationship with achievement measured by all academic indicators than any student background characteristic including race, SES, gender and grade level" (p. 100).

Research results related to differences in noncognitive skill levels based on race or ethnicity are even less clear. Some research studies have revealed lower levels of academic self-efficacy in Black and Latino students than in White students, while others have found no meaningful differences between groups in terms of academic self-efficacy levels that could not be explained by differences in SES (Schunk & Meece, 2006). Overall self-esteem levels (and not just academic self-efficacy) reveal different trends, however. A meta-analysis done by Twenge and Crocker (2002) found that on average,

Black individuals had the highest levels of self-esteem, followed by Whites and Latinos. However, differences between levels of self-esteem and/or self-efficacy, when they exist, could be partially explained by other factors. For example, adolescents who attend schools in which they are in the religious, racial, or socioeconomic minority are more likely to experience lower self-esteem (Rhodes, Roffman, Reddy, & Fredricksen, 2004).

Cultural context is another important consideration when thinking about noncognitive skills, particularly in students who are racially or ethnically a minority. Several studies have illustrated that how students perceive the school climate and school norms to be important indicators for their behavior, and that minority students may be particularly sensitive to these norms (Crisp & Nora, 2010; Espinoza & Juvonen, 2011). In a study done by Espinoza and Juvonen, the researchers examined student perceptions of school social climate and behavior norms during the middle to high school transition, and found that Latino students were much more sensitive to school climate than White students, and that these perceptions were related to student school conduct. The authors state that (p. 755):

> The more normative students perceived academic compliance among their grade mates, the more likely [Latino students] were to participate in class, listen to their teachers, and do what they say. The more normative students perceived rule breaking, the more likely they were, in turn, to engage in behaviors such as damaging school property or making fun of other kids… Unlike those of their White classmates, Latino students' views of school social climate predicted both self-reported academic compliance and rule breaking, suggesting greater sensitivity.

Additionally, minority students may be particularly vulnerable to stereotype threat, which is a fear of confirming negative stereotypes about one's racial or ethnic group (Walton & Cohen, 2007). Stereotype threat, and a related concept, collective threat

– that is, fearing that others in your self-identified group will also be stereotyped - can be a powerful influence, as shown by a series of experiments done by Cohen and Garcia (2005). In these experiments, college students were placed into a "threat" group or a control group before taking measures of racial stereotype activation, self-esteem, and verbal ability. Black students in the threat group, who witnessed some form of stereotype or collective threat (for example, hearing a Black student say that he was bad at certain types of tests), scored significantly lower on both measures of self-esteem and verbal ability than Black students in the control.

Walton and Spencer (2009) had similar findings after conducting two meta-analyses using a total sample of nearly 20,000 students. These researchers found that when stereotype threat was reduced, stereotyped students performed better than non-stereotyped students who had similar levels of past performance. In fact, interventions specifically designed to combat stereotype threat have led to significant increases in grades for minority students compared to a control group, the effects of which continued over the course of several years (Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009). These studies reveal that stereotype threat can negatively influence the expression of minority students' cognitive and noncognitive skills. This means that it is difficult to draw conclusions about any differences in noncognitive skills between students in different racial or ethnic groups, since this construct is often highly correlated with SES (American Psychological Association, 2007), and many studies that have specifically examined differences in noncognitive factors like self-esteem did not control for variables like stereotype threat.

How Noncognitive Factors and Skills relate to Measures of Success

Academic performance

Academic performance, one of the primary drivers of school success, is often measured using grade point average (GPA), which is traditionally made up of graded course work combined with course exam scores. While both GPA and test scores are related to general intelligence, there is a great deal of evidence to suggest that noncognitive factors are also highly related to GPA (Coates, 2014; Cunha & Heckman, 2006; Poropat, 2009). The noncognitive constructs described in this review (personality, self-regulation, self-efficacy, engagement, motivation, and social skills) have all been shown to have a significant relationship with GPA. Many studies have shown that these noncognitive factors help predict GPA beyond cognitive ability, standardized achievement test scores, and/or prior academic performance.

Personality. Conscientiousness is a domain within personality that captures an individual's tendency to think before acting, which facilitates thoughts and behaviors such as prioritizing, planning, organizing, and goal-oriented behavior (Corker et al., 2012). This is also one domain within personality that has consistently demonstrated a positive relationship with academic achievement (Bratko et al., 2006; McAbee & Oswald, 2013; Poropat, 2009). Noftle and Robbins (2007) examined the link between Big Five personality traits, college and high school GPA, and SAT scores. Using information gathered from four independent samples, the authors found that Conscientiousness was the strongest personality predictor of both high school and college GPA, and was

significantly, positively related to these variables, even when controlling for gender and SAT scores.

One theory as to why this personality trait is so highly related to GPA, even though it is relatively independent of intelligence, is that it is mediated by academic effort (Corker, et al., 2012; Noftle & Robbins, 2007). Trautwein et al. (2009) conducted 3 related studies with middle school students to find out to what extent Conscientiousness and competence beliefs, or academic self-efficacy, influenced academic effort. The results of the research indicated that both of these variables independently predicted academic effort. However, whereas Conscientiousness was predictive of effort across academic domains, competence beliefs were domain-specific. So while higher levels of academic self-efficacy were related to students increasing effort in subjects in which they felt competent, Conscientiousness was related to students working hard in all subject areas.

Corker et al. (2012) conducted a study examining the link between Conscientiousness and academic effort that showed similar results. Using a sample of college students, these researchers used personality and achievement goal measures to create a baseline at the beginning of the semester. As the semester progressed, students were asked to complete study strategy and effort questionnaires. The results of these measures, along with standardized test scores (as a measure of cognitive ability), were used to predict final course grades. The authors found that Conscientiousness was correlated with both academic effort and persistence. As the authors write in their discussion “Conscientiousness predicts performance because Conscientiousness

contributes to setting achievement-related goals and to engaging in effortful strategies" (p. 1021).

Self-regulation, self-efficacy, and motivation. Duckworth, Quinn, and Tsukayama (2012) examined a middle school population using longitudinal data in order to explore the relationships between student self-control, IQ, report card grades, and standardized test scores. Though the authors identify self-control as a personality trait, and they define it as "the voluntary regulation of attention, emotion and behavior" (p. 440). By examining the data, the authors found that student self-control actually predicted changes in GPA over time better than IQ.

IQ, however, was a better predictor of standardized test scores than self-control. One possible explanation is that when middle school teachers determined grades, they factored in completion of homework assignments, class participation, effort, and attendance; skills that are not dependent on intelligence. Likewise, a study examining the role of behavioral regulation in kindergarten students found that higher levels of behavioral regulation were significantly correlated to gains in academic achievement, even when controlling for important student background characteristics (Ponitz, et al., 2009).

Grigorenko, et al. (2009) also found support for the relationship between various noncognitive skills and academic performance. These researchers used a number of middle school student characteristics, including standardized test scores, middle school GPA, and several noncognitive factors in order to predict the high school GPA earned while attending a competitive high school. Though middle school grades were the best

predictor of high school grades, the noncognitive factors of self-efficacy, locus of control, and motivation explained an additional ten percent of the variance of high school GPA beyond both middle school GPA and standardized test results.

The importance of noncognitive skills also extends beyond high school. In one study, Kitsantas, Winslor, and Huie, (2008) studied the relationship between prior academic performance, self-regulation, motivation, and college GPA. First-year college students were asked to take questionnaires that measured characteristics and skills such as self-efficacy, motivation, and self-regulation. The researchers then collected their grades for the next four semesters, or the first two years of their college education. They discovered that while prior achievement – high school GPA and SAT scores – accounted for the most variance in predicting college performance, both self-efficacy and time management skills accounted for additional variance.

Brown, et al. (2008) also studied how noncognitive factors influenced student achievement and persistence in college, and found that student self-efficacy and goals were highly related to persistence in college. The authors of this study used meta-analytic data of the following student characteristics as a way to predict performance and persistence in college: a) cognitive ability, b) self-efficacy, c) goals, and d) prior academic performance. The authors found that self-efficacy was related to both high school and college performance. In fact, self-efficacy was more strongly related to high school performance than cognitive ability. In terms of student persistence, student goals were also more important than cognitive ability.

Student Engagement. Ladd and Dinella (2009) evaluated the behavioral and emotional engagement in students longitudinally to examine the relationship between earlier levels of engagement in students to later academic achievement. The authors followed a group of children from the time they began kindergarten to the time they finished the 8th grade by measuring students' engagement and achievement each year. Results indicated that student's levels of engagement were both related to current achievement and predictive of later achievement. Students with higher levels of early engagement had greater levels of later achievement, while students with continued low levels of engagement across the primary grades had less academic growth and achievement.

Researchers in another study also found student engagement to be of particular importance. Willingham, Pollack, and Lewis (2002) examined the factors that accounted for differences between students' grades and test scores, which are sometimes incongruent, with grades often being higher than test scores alone would suggest. Grades and test scores were correlated in the sample at .62. Though the correlation is a strong one, it is far from perfect, even when correcting for unreliability in the predictors, suggesting that other factors accounted for some of this variability.

The authors looked at a variety of student characteristics, including 26 variables in the areas of school skills, initiative, competing activities, family background, and attitudes. School factors, such as teacher ratings and grading variability were also studied. Aside from the school factors of grading patterns and teacher judgments about student performance, the biggest predictor of the difference between grades and test scores was

student engagement. Engagement included characteristics of employing appropriate school skills, showing initiative in school, and avoiding competing activities that interfered with school. Due to the importance of student engagement for both grades and test scores (though particularly student GPA), the authors noted that increasing student engagement would be a good way to improve student achievement.

Social Skills. Several studies have demonstrated that social skills are related to academic achievement. DiPerna and Elliot (1999) designed an instrument called the Academic Competence Evaluation Scales (ACES), which allowed elementary teachers to rate students on the dimensions of academic competence. The results of this assessment were then compared to students' Iowa Test of Basic Skills scores. The ACES was composed of five factors: Academic Skills, Interpersonal Skills, Academic Motivation, Participation, and Study Skills. Though Academic Skills was the scale most highly related to academic performance, social skills were also significantly related to test scores. In a later study using this assessment, DiPerna, Volpe, and Elliot (2001) found that social skills were related to academic achievement, though this relationship was mediated by motivation to engage in the classroom and to spend time studying.

Durlak and Weissberg (2007) examined the effectiveness of after-school interventions designed to promote personal and social skills through a meta-analysis. After school programs that used evidence-based skills training successfully promoted students' positive feelings and attitudes, indicators of behavioral adjustment, and school performance. These programs also significantly increased students' self-perceptions, bonding to school, positive social behaviors, school grades, and performance on

achievement tests. Additionally, they were also associated with reduced problem behaviors and drug use.

While social skills are associated with school performance, there may not always be a direct relationship between these skills and academic performance (Farrington, et al., 2012). This may be due to the general nature of social skills, which encompass a wide array of skills and behaviors and could have significant overlap with other noncognitive skills. However, good social skills, such as interpersonal skills, empathy, and cooperation, may have a role in influencing self-efficacy, motivation, and academic behaviors, which in turn influences grades, as was evident in the DiPerna, Volpe, and Elliot (2001) study.

High school transitions

Adjustment to the 9th grade is an important factor for whether or not students ultimately graduate from high school. Traditional measures of student success, such as middle school grade point average, are related to high school adjustment. Though important, success in middle school alone is not enough to predict whether or not a student will finish high school. However, a student's first year performance in high school is highly related to his or her chances of graduating on time independent of prior achievement (Allensworth & Easton, 2007).

In their study examining high school graduation rates of students in the Chicago Public School system, Allensworth and Easton (2007) found that freshman year course grades were "the best indicator of predicting non-graduates" (p. 6). Eighty-six percent of students who earned at least a 2.5 GPA (C+ average) during their first year of high school

went on to graduate within 4 years. Another important indicator of graduation was freshman year attendance rates. As absences increased, the probability that students would graduate within 4 years fell dramatically. For example, students who missed more than a week of class per semester (5 to 9 days) had a 63% probability of graduating on time, compared to 87% students who missed less than a week of class (0 to 4 days).

As students advance through the educational pipeline, expectations continue to increase regarding what students should be able to do independently, such as having good organization and study skills - both examples of academic behaviors. However, many teachers overestimate students' skills in these areas even as they become more important (Lambert & Nowacek, 2006; Thomas, Iventosch, & Rohwer, 1987). School transitions, such as leaving middle school and beginning high school, are correlated with student decreases in self-esteem, feelings of well-being, and academic self-efficacy (Barber & Olsen, 2004; Cantin & Boivin, 2004), increased disengagement and declines in motivation (National Research Council, 2004), as well as decreases in academic achievement (Alspaugh, 1998; McCallumore & Sparapani, 2010). Though middle school is years away from high school graduation, researchers have discovered that some events in middle school, such as middle school course failures or grade retentions, are significant predictors of high school graduation (Kurlaender & Jackson, 2012; Rumberger & Lim, 2008). Trusty and Niles (2004) even found that the path to higher odds of completing a bachelor's degree diverges as early as 8th grade.

Although all school transitions can be challenging, the transition from 8th to 9th grade appears to be particularly problematic, and is shown to negatively impact both

behavior (Graber & Brooks-Gunn, 1996) and achievement (Alspaugh, 1998; Isakson & Jarvis, 1999). McCallumore and Sparapani (2010) called it the "make or break year for completing high school," (p. 60) because students face difficulties due to factors such as increased academic expectations and changing social climates. The ninth grade typically has the largest enrollment of students in the high school grades due to the fact that approximately 22% of students repeat ninth grade classes (McCallumore & Sparapani, 2010). This estimate may be higher at some schools, and as a result, has created what is called the "ninth grade bulge." This "bulge" is reduced throughout the high school grades as many students begin to drop out of school altogether (Kennelly & Monrad, 2007). There are a variety of negative academic consequences associated with repeating the ninth grade, such as losing interest in school and eventually dropping out (Fulk, 2003; Kennelly & Monrad).

In fact, approximately one-third of students who have dropped out of high school in recent years were not promoted beyond the ninth grade, and in cities such as Chicago and Philadelphia, the high school graduation rate of students who got off track in the ninth grade was only 20-22% (Neild, 2009). Though the difficulty many students face when transitioning to high school is clearly a documented phenomenon, there is no clear consensus about which factors are most important in determining a smooth transition. However, several studies suggest that certain noncognitive skills could play a role in the relative success of these transitions.

Moving from middle to high school may highlight some of the differences found between students' levels of certain noncognitive skills. Researchers at the University of Chicago (Farrington et al., 2012, p. 60) noted that:

> …what is particularly important about the high school transition is that students' grades drop in ninth grade because of dramatic changes in their *academic behaviors*, and this decline occurs among students with strong academic skills as well as among students with weak skills.

For students who have effective academic behaviors, like organizing school work and studying regularly, this drop in grades will not be as drastic as those students who have less effective academic behaviors. As Lleras (2003) wrote, "less desirable skills and habits in middle school translate into even greater gaps in skills, habits, and performance in high school and these in turn influence both achievement and grades" (p. 101).

Though research specifically related to the impact of noncognitive skills on successfully transitioning to high school is sparse, some studies have identified skills in middle school that are related to more successful outcomes in high school. For example, students' academic self-efficacy beliefs at age 13 contribute not only to middle school grade point average, but to high school GPA as well (Caprara, et al., 2011; Moore et al., 2015). Additionally, one study found that students with higher levels of social-emotional skills in the 8th grade were significantly more likely to make good academic progress towards high school graduation than students with lower levels of these skills (Davis, et al., 2014).

Murdock, Anderman, and Hodge (2000) identified several middle school variables that were shown to help predict 9th GPA in their longitudinal study of 405 students. Behavior problems in school during the 7th grade (measured by the frequency of

various discipline referrals, such as detention, etc.) were significantly associated with both behavior problems in the 9th grade and lower 9th grade GPA levels. Also, students' perceived academic aspirations of their peers in 7th grade were significantly correlated with 9th grade GPA in the lowest performing students. Students who felt that their peers did not value education or had few educational aspirations in the 7th grade were more likely to earn a low GPA in the 9th grade.

Noncognitive skills may have particular importance during times of difficult transitions for students, such as starting high school or beginning college (Neild, 2009; Finkelstein & Thom, 2014). There are a number of student-level factors that influence the transition to high school. Some of the factors that have been proposed as influences on the transition to high school include: a) prior academic performance (Allensworth & Easton, 2005), b) social skills and/or emotional readiness (Davis, et al., 2014; McCallumore & Sparapani, 2010; Neild, Stoner-Eby & Furstenburg, 2008), c) life-course or developmental changes (Cohen & Smerdon, 2009; Neild, 2009), and d) student behavior (McIntosh et al., 2008).

Adolescent Noncognitive Development

Adolescence is a time of physical, intellectual, emotional, and social development. The American Academy of Pediatrics (2015) divides this time period into three stages: 1) early adolescence (ages 11 to 14), 2) middle adolescence (ages 15 to 17), and 3) late adolescence (ages 18 to 21). Early adolescence is particularly replete with changes; a time when many children are undergoing the physical and emotional changes that puberty brings as well as environmental changes as they move from elementary to

middle school and again to high school. Though many individuals pass through adolescence without too much difficulty, "the combination of so many changes occurring simultaneously … makes early adolescence problematic for many young people" (Eccles, 1999, p. 37). The rapid changes that children undergo during early adolescence, during which most children are in middle school and early high school, have also been shown to extend to some noncognitive skills (Anger, 2012; Wang and Eccles, 2012).

Several research studies have highlighted the changes that occur to personality during the teenage years. Using a combination of parental and self-reported data, Van den Akker, Dekovic, Asscher, and Prinzie (2014) examined mean-level changes to personality using the Big Five traits between the ages of 6 and 20 in a longitudinal sample of nearly 600 children. The results of the study indicated that mean-level personality change occurred to all five dimensions during childhood and adolescence in a non-linear fashion. Many traits began changing in late childhood to early adolescence (roughly ages 9 to 13); during this time, both children and mothers reported decreases in children's levels of Extraversion, Agreeableness, Openness, and Conscientiousness and increases in Neuroticism. Soto, John, Gosling, and Potter (2011) found similar patterns of change during this time by using cross-sectional data from individuals between the ages of 10 and 65. In both studies, as children approached early adulthood, many of these traits reversed their course, suggesting that these changes may be a temporary part of adolescence.

However, other researchers have discovered different patterns of personality change during adolescence. Klimstra et al. (2009) studied adolescent personality

development between the ages of 12 and 20. These researchers found that only some of these traits decreased, including Conscientiousness and Extraversion, and only in early to middle adolescence, before they tended to increase. These researchers also found that Neuroticism tended to increase for some participants (primarily girls) during this time as well.

Though these results do not show exactly the same changes to the previously described studies, there are some similarities between all three. Perhaps most importantly, given its relationship to academic achievement, was the finding that Conscientiousness tended to decrease during early and middle adolescence. One take-away from these studies was that personality tended to become more stable and the trends followed the same patterns as these children aged, suggesting that as adolescents mature into early adulthood, personality becomes more constant.

While personality is one noncognitive factor that tends to change during adolescence, other noncognitive factors and skills undergo adjustment as well. Student academic engagement is one such factor, as middle school is a time when many students show declines in academic engagement. Middle school students "may withdraw participation, show more negative attitudes, and decrease effort" (Turner, Christensen, Kackar-Cam, Truncano & Fulmer, 2014, p. 1196).

Using longitudinal data, Wang and Eccles (2012) examined middle and high school students' engagement trajectories from grades 7 to 11. They found that students' levels of school participation (a measure of behavioral engagement), sense of belonging to school (emotional engagement), and self-regulated learning (cognitive engagement) all

steadily declined as students progressed through school. Li and Lerner (2011) found a similar pattern of engagement using longitudinal data. These researchers found that all students in the sample experienced decreasing levels of emotional engagement as they progressed from the 5th to the 8th grades. Behavioral engagement remained stable for a small group of students and declined in all others. Students who had a relatively stable engagement trajectory, or engagement levels that did not change much, fared better academically and socially than students whose engagement levels continued to fall throughout middle school.

Like student engagement, self-efficacy may show declines throughout adolescence. Jacobs, Lanza, Osgood, Eccles, and Wigfield (2002) analyzed longitudinal data for children across grades 1 through 12 to study changes to self-efficacy over time. These researchers found that on average, academic self-efficacy declined from early middle school to late high school before leveling off in some cases. Researchers hypothesize this may be due to several factors. As adolescents develop additional cognitive skills, they become better able to make social comparisons and reflect on their own abilities than younger children (Schunk & Meece, 2006). Additionally, as student progress through middle and high school, they have more opportunities to compare their own abilities with those of their peers (Jacobs et al., 2002).

Despite (or perhaps because of) the noncognitive changes that occur during this time, there is evidence that adolescence may actually be an ideal time to teach students these skills (Anger, 2012; Hsin & Xie, 2012; Kautz et al., 2014). In one study from Germany, Anger (2012) researched the heritability of both cognitive and noncognitive

skills using representative data from the German Socio-Economic Panel Study and found that adolescence was a unique time period. Interestingly, the strength of the correlation between children and parents' noncognitive skills was lower in adolescence (between 0.12 and 0.22) than in adulthood (between 0.19 and 0.27). The researcher hypothesized that this may be due to personality development during adolescence, and may be when these traits are more malleable. As Anger stated:

> Overall, this study suggests that non-cognitive skills are not as strongly transmitted as cognitive skills, but are at least as important for economic success, as past empirical evidence has shown. Thus, there seems to be more room for external (non-parental) influences in the formation of [noncognitive skills]. Therefore, it should be more promising for policy makers to focus on shaping children's noncognitive skills to promote intergenerational mobility. (p. 22)

Anger's (2012) suggestion that adolescence is a time when noncognitive skills may be particularly malleable relates to the conclusions of other research studies. Kautz et al. (2014) examined the effectiveness of noncognitive interventions given at different ages, and found that when targeting adolescents, "the available evidence suggests a much greater benefit from programs that target non-cognitive skills compared to the benefits of programs that mainly target cognition and academic learning" (p. 82). This finding was corroborated by other researchers who noted that the sensitive period regarding noncognitive skill formation occurred later than the period best for developing cognitive skills (Hsin & Xie, 2012).

Medical research has also revealed that adolescence may be a critical period for brain development, specifically the prefrontal cortex, which is related to executive functioning skills, such as planning and inhibiting impulsive behavior (Selemon, 2013). However, while increasing executive functioning ability could be beneficial in terms of

the development of noncognitive skills, the plasticity of this region in the brain could also be related to an increased vulnerability to environmental factors such as stress or substance abuse. Additionally, the relative slow development of this region of the brain is associated with decreased impulse control and lower levels of self-regulation, which may partially explain lower levels of Conscientiousness and increased risk-taking behavior during adolescence (Braver et al., 2014).

The evidence that many noncognitive factors and skills, as well as the brain, are undergoing change during adolescence underscores the fact that this is a period of rapid development and change. The natural development that individuals experience during these years, combined with the evidence that adolescence may be a critical period to provide noncognitive intervention (Cunha & Heckman, 2007; Kautz, et al., 2014) provides support to the idea of further studying the development of noncognitive skills during this critical period.

CHAPTER 3

Method

The following section presents the methods that were used to perform the research in this study and describe the sample of students who participated. The purpose of this study was to examine the progression of noncognitive factors and skills over the span of middle school and the first year of high school for developmental trends using longitudinal data from a cohort of 4,769 Hispanic/Latino students from the Southwest region who have completed ACT Engage Grades 6-9 on a yearly basis from grades 7 through 9. The following research questions were used to guide the study:

1. How do students' Motivation, Social Engagement, and Self-Regulation scores develop as they progress from grades 7 to 9 as measured by the domains of ACT Engage? More specifically:
    a. How does the scale of Academic Discipline (within the domain Motivation) develop from grades 7 to 9?
    b. How does the scale of Relationships with School Personnel (within the domain of Social Engagement) develop from grades 7 to 9?
    c. How does the scale of Thinking before Acting (within the domain of Self-Regulation) develop from grades 7 to 9?

2. Do students' ACT Engage scores vary across time by indices of academic achievement or gender?

Research Design

This study was a correlational design using longitudinal data. I examined the development of students' ACT Engage 6 – 9 scores over the course of three years using a sample of students who took the measure during multiple years by using Hierarchical Linear Modeling (HLM). HLM is particularly well suited to correlated observations, as when identical measures are repeated over time (Garson, 2013). The scores obtained by the same individual taking an identical measure several different times are assumed to correlate with one another rather than vary randomly (Singer & Willett, 2003). In this sample of students, for example, student scores across all three time points had correlations of .561 to .680 in the scale of Academic Discipline, .494 to .646 in the scale of Relationships with School Personnel, and .537 to .690 in the scale of Thinking before Acting. HLM also allows for variations in individual growth curves (Burchinal, 2007), which is important because participants do not grow at the same rate, and flexibility in including study participants who are included for varying lengths of time or at varying intervals (Schonfeld & Rindskopf, 2007).

Additionally, by using a hierarchical data structure, or data broken into levels, researchers can assess the effects of level-2 or level-3 variables on those in level-1 (Garson, 2013). For example, student test scores come from students, who come from classrooms. The first level of the data in this example would be test scores. The next level would be students, who can vary on any number of characteristics (gender, race, IQ, SES,

etc.). The highest level would be the classrooms that students attended. In this example, it's possible that students who have the same teacher may be more similar to one another than to students in other classrooms, which could mean their test scores are related to which classroom they attended. This type of data is frequently referred to as "nested data" (Justice, 2009). HLM accounts for the statistical dependency found in these levels of data (O'Dwyer & Parker, 2014).

The level-1 variables used in this study included ACT Engage scores at each wave of data collection for each student. Level-2 variables included the student-level variables of gender and indices of student achievement, including self-reported grades, the number of hours spent on daily homework and whether or not students have failed a course in the last school year, as well as how often students skip class. Because repeated measures are nested within individuals (or in other words, scores over time are assumed to correlate to the individual test-taker), it makes sense to employ a design that accounts for the hierarchical structure of the data. HLM takes into account the fact that there are correlated error terms between repeated observations within the same individuals and within students who attend the same schools (Hox, 2010), which means that because nested data is correlated, so too is its predicted error.

Data

This study was done using data that was already collected by ACT, Inc., and rendered anonymous. This data consisted of the ACT Engage Grades 6-9 student assessment results collected once per year, in three waves between the years 2012, when students began 7th grade, and 2014, when students were in the 9th grade. Student-level

information, such as age, gender, race/ethnicity, and course grades accompanied the assessment results. Additionally, some school-level data was included in the dataset; specifically the percentage of students identified as English Language Learners and the percentage of students who received free and reduced lunch at each school. However, no personally identifying information was used in this study, and in fact, all data was rendered anonymous before running any analyses. Students and schools were given idiosyncratic identification numbers by the research staff at ACT that are not linked or related to any identifiable information.

Participants

Participants in this study included 4,769 students who were located in the Southwestern United States. The original sample in this data set included 5,369 students. However, students who did not have completed ACT Engage scores for each time point (in 7th, 8th, and 9th grades) were excluded from the study. Additionally, because the sample was almost entirely composed of students who identified as Hispanic/Latino (approximately 93% of students who had scores from each of the three time points self-identified as Hispanic/Latino), only these students were included. Approximately 51% of the participants were girls, and 49% were boys.

Measures

Noncognitive factors. Noncognitive factors were measured using ACT Engage Grades 6-9. This assessment is designed to predict student success by measuring three broad domains of student functioning: 1) Motivation, 2) Social Engagement, and 3) Self-Regulation (ACT, 2013). Engage 6-9 contains 106 items that are scored using a 6-point

Likert-type scale ranging from strongly disagree to strongly agree (Casillas, et al., 2012). There are ten scales, and each is relatively short at 9 to 12 items. Additionally, all scales have high internal consistency reliabilities: $\alpha = .81$ to $.90$, with a median of .87 (Casillas et al., 2011).

The scales within the three larger domains of Engage demonstrate convergent/ discriminant validity, as they are more strongly correlated with one another than to scales in other domains (Casillas et al., 2011). Additionally, Engage 6-9 shows content validity, as it is shows significant associations with related constructs, such as relevant student behavioral indicators like time spent studying, failing to complete homework, and number of absences. Finally, Engage 6-9 has also demonstrated predictive validity in predicting high school grade point average and in identifying students potentially at-risk of dropping out, including those with a grade point average less than 2.0 (Casillas et al., 2011; Casillas et al., 2012; Moore et al., in press).

Each domain contains scales that provide educators with information about what kinds of skills and psychosocial attributes that students have compared to others in their grade level (see appendix A for more information on Engage 6-9 scales). ACT reports that Engage Grades 6-9 alone accounts for approximately 31% of the variance in predicting 9th grade GPA (ACT, 2014). The percentage of the variance explaining 9th grade GPA by Engage was roughly equal to that of the variance explained by students' middle school GPA, highlighting the importance these skills play in academic achievement. Additionally, some scales within Engage were also significant predictors of both high school GPA and high school graduation (Moore et al., 2015).

Motivation domain. The Motivation domain of Engage includes the scales of Academic Discipline, Commitment to School, and Optimism (ACT, 2014). Academic Discipline measures a student's level of effort and diligence in schoolwork, such as working hard and coming to class prepared and on-time. This scale is related to the personality trait of Conscientiousness and includes various academic behaviors. The Commitment to School scale measures a student's level of commitment to school as well as their feelings about future academic plans, such as graduating from high school and attending college. Finally, Optimism measures a student's tendency to maintain a positive outlook, which is related to both school satisfaction and retention (Loundsbury, Saudargas & Gibson, 2004; Lounsbury, Saudargas, Gibson, & Leong, 2005).

Social engagement domain. The Social Engagement domain includes the scales of Family Involvement, Family Attitude toward Education, Relationships with School Personnel, and School Safety Climate (ACT, 2014). These interpersonal factors often play a role in student success; for example, family support and facilitation are related to increased academic effort and subsequently increases in grade point average (Meeuwisse, Born & Severiens, 2011). The Family Involvement and Attitude scales measure a student's level of perceived familial support and attitudes towards the importance of education.

Relationships with School Personnel and School Climate measure the students' levels of connectedness to adults at the school as well as how safe and welcomed they feel while they are there. School connectedness and belonging are significantly related to student outcomes. Students who feel a sense of belonging to their schools are less likely

to engage in substance use, report higher levels of wellbeing, and have more positive academic outcomes than students with low attachments to their schools (Bond, et al., 2007; Klem & Conell, 2004; McNeely, Nonnemaker, & Blum, 2002).

Self-regulation domain. The Self-Regulation domain includes the scales of Managing Feelings, Thinking before Acting, and Orderly Conduct (ACT, 2014). Self-regulation is clearly related to academic performance; numerous studies have shown there is a relationship between self-regulation skills and academic performance that predicts significant variance beyond other traditional variables such as prior academic performance (Dignath et al., 2008; Kitsantas et al., 2008; Pintrich, & DeGroot, 1990). The Managing Feelings scale measures students' ability to control their own emotions, which is an important part of developing interpersonal skills, which may in turn influence academic behaviors (Farrington, et. al, 2012). Thinking before Acting is another component of self-regulation, and orderly conduct measures student's behavior and conduct while at school.

Data Analysis

In this initial analysis, the Engage scaled scores of Academic Discipline, Thinking Before Acting, and Relationships with School Personnel were examined by the following student attributes. A two-level hierarchical linear model (HLM) was used to describe the growth of ACT Engage scores of students. This analysis models students' scores from three time points: 7^{th} grade, 8^{th} grade, and 9^{th} grade. Student characteristics were included as predictors in the second level equations for the intercept as a mean to describe how they are related to students' scaled scores in 7^{th} grade. Student attributes were also

included in order to describe the relationship of individual background characteristics to the growth rate of scores.

Student-level controls. Individual-level characteristics included students' gender, and several measures of academic achievement, all of which were based on student self-reports. One element of academic achievement was measured using self- reported student grades during each wave of data collection. This scale ranged from 0 to 4, where these numbers corresponded to the letter grades of mostly Fs (0), Ds (1), Cs (2), Bs (3), and As (4). The question asked students to rate their grades over the last two-year period. Research studies generally show that student self-reported grades have a fairly high level of accuracy (Kuncel, Credé, & Thomas, 2005). A meta-analysis examining the validity of self-reported grades revealed the overall accuracy rate of over 60,000 students to be 84% (Kuncel, Credé, & Thomas).

Procedure

I began this study by first cleaning the data to ensure that only students with one set of Engage scores at each time point were included in the sample. Students who had multiple scores in the same grade level were excluded from the sample (for example, 1 score in 7^{th} grade and twice in 8^{th} grade, but none in 9^{th} grade). Additionally, students without a score at each time point were also excluded. There was no missing data in any of the independent or dependent variables examined. The descriptive and inferential statistics were calculated with SPSS. The HLM analysis was done using the HLM7 software. The research questions were answered through HLM analysis.

The level-1 variable, or the outcome variable, included mean Engage scores at each wave of data collection for each student by domain. Because there are three domains in Engage, this necessitated running three HLM models: one for each of the scales of Academic Discipline, Relationships with School Personnel, and Thinking before Acting. Level-2 variables, which were the same for all three models, included the student-level factors of gender and several indices of academic achievement, including course failure (yes or no), average number of hours spent each night on homework, how often students came to class without work done, how often they skipped class, and self-reported grades. Gender was a categorical, fixed-effects predictor variable. Each of the indices of student academic achievement were random-effects, categorical-level predictor variables.

CHAPTER 4

Results

This chapter discusses the results of the research questions and some of the analyses done to ensure the data met the assumptions of hierarchical linear modeling. The results of the HLM procedures for each of the dependent variables are reported: a) Academic Discipline, b) Relationships with School Personnel, and c) Thinking before Acting.

Dependent Variables

Each of the dependent variables is a scale from ACT Engage Grades 6-9. These scales are related to important noncognitive constructs discussed in the review of literature. The range of possible scores that students could receive ranged from 10 to 60 on each scale. For ease of interpretation, variations in these scaled scores will be referred to as "points." For example, an average increase of 3 points on a scale would mean that the average scaled score increased from 40 to 43.

Motivation. Within the domain of Motivation, the scale of Academic Discipline was used to help understand how this skill develops in students. The scale of Academic Discipline most closely relates to the Academic Behaviors described on pages 12 and 13. The average scores in the Motivation domain overall and Academic Discipline scale more specifically can be found in Table 1 below. Average scores in the Motivation domain remain stable in 7th and 8th grades before significantly decreasing in the 9th grade.

This same pattern can be observed in the Academic Discipline scale, which remains statistically unchanged in 7th and 8th grades before significantly decreasing in the 9th grade.

Social Engagement. As shown in Table 1, average scores in the Social Engagement domain remain stable in 7th and 8th grades before significantly decreasing in the 9th grade. This same pattern can be observed in the Relationships with School Personnel scale, which remains steady in 7th and 8th grades before significantly decreasing in the 9th grade. Relationships with School Personnel is related to both social skills, described on pages 19 and 20, as well as certain elements of engagement (see pages 17-18).

Self-Regulation. This scale is most closely related to the constructs of Conscientiousness and self-regulation, which are described on pages 14-17. In this sample, the Self-Regulation domain differs significantly across all grade levels. As shown in Table 1, average scores in this domain increase across each of the three years studied. In the following HLM analyses, Thinking before Acting will be used to measure any student differences in this domain. The scale of Thinking before Acting has a similar pattern of change. Each grade level has a significantly higher mean score than the preceding year. This differs from each of the other domains, which do not show consistent growth from 7th to 9th grades.

Table 1

Mean Engage Domain Scores and Selected Scale Scores by Grade Level

	Grade 7		Grade 8		Grade 9	
	Mean	SD	Mean	SD	Mean	SD
Motivation	50.85	6.03	50.73	5.88	50.06*	6.09
Academic Discipline	46.57	8.88	46.61	8.44	45.91*	8.45
Social Engagement	46.23	6.00	45.97	6.07	45.18*	6.12
Relationships to School Personnel	41.12	9.11	40.87	9.31	39.99*	9.29
Self-Regulation	41.91*	9.67	42.40*	9.75	43.67*	9.29
Thinking before Acting	40.54*	7.86	40.92*	8.16	41.34*	8.05

*$p < .01$

Independent Variables

Gender and Engage Scores. As mentioned in the review of literature, noncognitive skill levels appear to be related to gender. As such, each of the variables of interest have been examined for differences in average scores between boys and girls. Tables 2 and 3 below show the average score for each gender, and whether or not it varies across time. While there is a similar pattern for both boys and girls, there are a few differences. In the Motivation domain, girls' average scores are highest in the 7th grade, before they significantly drop in the 8th grade and remain stable in 9th. However, the average boys' scores do not differ in 7th and 8th grades, but do drop significantly in the 9th grade. In the Social Engagement domain, girls' average scores drop each year studied, but boys' average scores drop once between 7th and 8th grades before remaining stable. The pattern in the Self-Regulation domain remains the same for both boys and girls. This domain increases year-by-year, and both genders see a significant increase in the 9th

grade. However, in the Thinking before Acting scale, boys see significant increases year over year, whereas girls' scores do not vary by grade level.

Table 2

Mean Engage Domain Scores and Selected Scale Scores for Girls by Grade Level

	Grade 7		**Grade 8**		**Grade 9**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Motivation	51.19*	6.02	50.99	5.79	50.31	5.91
Academic Discipline	47.09	9.01	47.12	8.42	46.44*	8.38
Social Engagement	46.47*	6.02	46.07*	6.05	45.18*	6.19
Relationships with School Personnel	41.31	9.06	40.84	9.41	39.79*	9.57
Self-Regulation	42.93	9.89	43.33	9.80	44.42*	9.31
Thinking before Acting	40.84	8.17	41.06	8.39	41.20	8.41

*p < .01

Table 3

Mean Engage Domain Scores and Selected Scale Scores for Boys by Grade Level

	Grade 7		**Grade 8**		**Grade 9**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Motivation	50.48	6.02	50.45	5.95	49.79*	6.26
Academic Discipline	46.03	8.70	46.07	8.43	45.34*	8.50
Social Engagement	45.97*	6.02	45.86	6.08	45.18	6.04
Relationships with School Personnel	40.92	9.15	40.86	9.21	40.22**	8.97
Self-Regulation	40.83	9.31	41.42	9.59	42.89*	9.21
Thinking before Acting	40.23*	7.51	40.77*	7.90	41.49*	7.66

*p < .01; **p < .05

The following table examines significant differences between each domain and scale of interest by gender and grade level. Though many average scores are significantly different between boys and girls, the effect sizes are small. The Academic Discipline

scale within Motivation shows a consistent difference across grade levels (δ = .12 - .13), as well as the domain of Self-Regulation (δ =.17 - .22).

Table 4

Mean Engage Domain Scores and Selected Scale Scores by Gender and Grade Level

		Grade 7			**Grade 8**			**Grade 9**		
	Gender	**Mean**	**SD**	**ES**	**Mean**	**SD**	**ES**	**Mean**	**SD**	**ES**
Motivation	F	51.19*	6.02	*.08*	50.99*	5.79	*.09*	50.31*	5.91	*.09*
	M	50.48*	6.02		50.45*	5.95		49.79*	6.26	
Academic Discipline	F	47.09*	9.01	*.12*	47.12*	8.42	*.12*	46.44*	8.38	*.13*
	M	46.03*	8.70		46.07*	8.43		45.34*	8.50	
Social Engagement	F	46.47*	6.02	*.12*	46.07	6.05	*.03*	45.18	6.19	*.00*
	M	45.97*	6.02		45.86	6.08		45.18	6.04	
Relationships with School Personnel	F	41.31	9.06	*.00*	40.84	9.41	*.00*	39.79	9.57	*.00*
	M	40.92	9.15		40.86	9.21		40.22	8.97	
Self-Regulation	F	42.93*	9.89	*.22*	43.33*	9.80	*.20*	44.42*	9.31	*.17*
	M	40.83*	9.31		41.42*	9.59		42.89*	9.21	
Thinking before Acting	F	40.84*	8.17	*.08*	41.06	8.39	*.00*	41.20	8.41	*.00*
	M	40.23*	7.51		40.77	7.90		41.49	7.66	

*p < .01

Grades. The overall percent of students who selected each type of grade at each time point can be found below in Table 5. The percentages of students in each category of the self-selected grades did not significantly differ across grade levels.

Table 5

Percent of Students' Self-reported Grades in each Category for the Last 2 Years by Grade Level

	Grade 7	Grade 8	Grade 9
Mostly As	24	24.1	22.9
Mostly Bs	58.6	58.3	58.7
Mostly Cs	15.6	16.1	16.9
Mostly Ds	1.3	1.2	1.2
Below D	0.4	0.4	0.3

χ^2 = *N.S.*

Homework. Another measure that was used as a student-level control was the number of hours students reported doing homework each night. The options students could select from ranged from 0 hours to 7 or more hours per night. This variable varied significantly by grade level ($\chi^2 = 53.45$), with students generally reporting spending more time on homework in 8th and 9th grades. Additionally, students were asked how often they came to class without homework completed. This variable also varied significantly by grade level ($\chi^2 = 53.33$), with more students than expected coming to class without homework done, especially in 9th grade.

Table 6

Percent of Students' Time Spent in Hours doing Homework on a School Day by Grade Level

	Grade 7	Grade 8	Grade 9
None	17.4	15.9	16.4
1-2 hours	74.2	76.0	72.0
3-4 hours	7.2	7.0	10.4
5-6 hours	.6	.7	.6
7 or more hours	.6	.4	.5

$\chi^2 = 53.45$, $p < .001$

Table 7

Percent of Students who came to School without Homework done by Grade Level

	Grade 7	Grade 8	Grade 9
Never	16.7	14.8	13.5
Rarely	36.5	40.2	38.8
Sometimes	34.2	31.1	32.7
Frequently	7	8.1	9.6
Daily	5.6	5.8	5.3

$\chi^2 = 53.33$, $p < .001$

Class Failure. Whether or not students had failed a class within the last year was included as a dichotomous variable (yes or no during each grade level). The rates of course failure did not vary significantly by grade level, with approximately 30% of students experiencing a course failure in each school year.

Table 8

Percent of Students that have failed a Class within the Last Year by Grade Level

	Grade 7	**Grade 8**	**Grade 9**
Yes	31	31	31.5
No	69	69	68.5

χ^2 = *N.S.*

Skipping School. Finally, the frequency of students skipping school was also included as a student-level control. Skipping school varied significantly by grade level (χ^2 = 284.98), with more students than expected skipping class, especially in 9th grade.

Table 9

Percent of Students who reported Skipping Class at each Grade Level

	Grade 7	Grade 8	Grade 9
Never	87.1	84	74.6
Rarely	8	10	14.8
Sometimes	4.2	5.1	9.1
Frequently	0.4	0.4	0.8
Daily	0.2	0.4	0.7

$\chi^2 = 284.98$, $p < .001$

Missing Data and Multicollinearity

While missing data is common in the social sciences, this sample does not include missing data in any of the key variables examined after removing observations that did not have data at each of the three time points collected. In addition to checking for

missing data, the independent variables were correlated with one another to check for potential multicollinearity. Because each of the independent variables are made up of ordinal level data, a non-parametric test was needed, and therefore Spearman's rho was used in place of Pearson's r. The data meets the assumptions of Spearman's correlation: the variables are made up of ordinal-level data and are monotonically related (Kornbrot, 2014). The correlation matrices for the independent variables in this model can be found in Table 10 below. While each of the correlations is statistically significant, they all fall below a suggested threshold of .60 (Multicollinearity, 2014). The largest correlation is between grades and course failure (r = .40).

Table 10

Spearman's Rho Correlation Coefficients among Independent Variables

	1	2	3	4	5
1. Without Homework	1	.218	.241	-.265	-.161
2. Skipped Class		1	.234	-.186	-.195
3. Failed Class			1	-.400	-.146
4. Grades				1	.157
5. Hours of Homework					1

*All correlations significant; $p < .01$

HLM Analyses

Each of these models was run with a different scale as the outcome variable and the same set of predictor variables. Table 11 shows the relationship between each of the independent variables and the dependent variables using Spearman's Rho for the categorical variables and point-biserial correlation for the dichotomous variables. The variables of a) gender, b) coming to class without completed homework, c) skipping class, and d) failing class were all considered risk factors in these models, as increases in

these variables were negatively associated with our outcome variables. Though gender was a dichotomous variable coded 0 and 1, boys, who were coded as 1, showed significantly lower scaled scores at Time 1 (7th grade) in both Academic Discipline and Thinking before Acting. Additionally, failing a course was also a dichotomous variable coded as 0 if students did not fail any courses and 1 for failing at least one course. The variables of grades and hours of homework were considered protective factors, since increases in these variables were positively associated with the outcome variables.

Table 11

Correlations between Independent and Dependent Variables

	Academic Discipline			Relationships with School Personnel			Thinking before Acting		
	Grade			Grade			Grade		
	7	8	9	7	8	9	7	8	9
Gender	-.06*	-.06*	-.06*	-.02	0	.02	-.04*	.02	.02
Coming to class without homework	-.50*	-.45*	-.46*	-.24*	-.21*	-.25*	-.31*	-.29*	-.27*
Skipping class	-.34*	-.35*	-.42*	-.19*	-.19*	-.24*	-.29*	-.32*	-.36*
Failing class	-.41*	-.41*	-.41*	-.21*	-.20*	-.21*	-.28*	-.28*	-.27*
Grades	.45*	.46*	.44*	.20*	.22*	.22*	.28*	.29*	.27*
Hours of homework	.27*	.31*	.38*	.19*	.19*	.24*	.19*	.22*	.26*

* $p < .01$

Evaluation of unconditional model

The first step in evaluating this hierarchical linear model was to run the unconditional model, which only included the level 1 factors as well as the variable of time, which includes Time Zero (7th grade), Time 1 (8th grade), and Time 2 (9th grade). The model was run three times with different variables in the place of Y; the scale of Academic Discipline in the domain of Motivation, the scale of Relationships with School

Personnel in the domain Social Engagement, and the scale of Thinking before Acting in the domain of Self-Regulation. The unconditional model equation is:

Level-1: $Y_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + e_{ti}$

Level-2: $\pi_{0i} = \beta_{00} + r_{0i}$
$\pi_{1i} = \beta_{10} + r_{1i}$

Y is the student's Engage score at a given time point for student i. The intercept, Π_0, is the students' initial Engage score in grade 7. Π_1 is the growth rate over each of the time points. TIME is the elapsed time since the initial assessment. This model assumes that errors are independent and normally distributed, with a common variance (Hox, 2010).

Academic Discipline

Academic Discipline is a scaled variable within the Motivation domain of Engage Grades 6-9. The possible scaled scores range from 10 to 60. This scale "measures the degree to which a student is hardworking and conscientious as evidenced by the amount of effort invested into completing schoolwork" (Moore, et al., 2015). An example item is "I turn in my assignments on time" (Moore et al.). In this model, students' scaled Academic Discipline scores at each time point were the outcome variables in the model. The initial intra class correlation was 0.692, meaning that 69.2% of the variance occurred between students. The null Academic Discipline HLM equation was a follows:

Level-1: $SCL\_ACAD_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + e_{ti}$

Level-2: $\pi_{0i} = \beta_{00} + r_{0i}$
$\pi_{1i} = \beta_{10} + r_{1i}$

The level 2 variables were added to both the intercept and the slope by risk factors first, which were: a) gender, b) coming to school without homework, c) skipping class,

and d) failing a class. In the model with only risk factors, all of the risk factors significantly predicted the intercept but not the slope. Gender was a significant predictor of the intercept, but not the slope in this model. As shown in Table 12, the model with only risk factors predicted approximately 35.7% of the variance in the students' starting scores, and approximately 17.7% of the slope.

Next, factors that would likely be associated with increases in the Academic Discipline scores, or protective factors, were added. These included grades and hours of homework. The results of the model can be found in Table 13. In this model, gender becomes a non-significant predictor of both the intercept and slope. Overall, the final model including both risk and protective explained approximately 44.2% of the variance of the intercept, and 21.8% of the intercept. The final Academic Discipline HLM equation, which included both risk and protective factors, was as follows:

Level-1: $SCL\_ACAD_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + e_{ti}$

Level-2: $\pi_{0i} = \beta_{00} + \beta_{01}*(GENDER_i) + \beta_{02}*(GRADES_i) + \beta_{03}*(WOUT\_HMW_i) + \beta_{04}*(SKIPPED_i) + \beta_{05}*(HRS\_HMWR_i) + \beta_{06}*(FAILED\_C_i) + r_{0i}$

$\pi_{1i} = \beta_{10} + \beta_{11}*(GENDER_i) + \beta_{12}*(GRADES_i) + \beta_{13}*(WOUT\_HMW_i) + \beta_{14}*(SKIPPED_i) + \beta_{15}*(HRS\_HMWR_i) + \beta_{16}*(FAILED\_C_i) + r_{1i}$

Mixed Model: $SCL\_ACAD_{ti} = \beta_{00} + \beta_{01}*GENDER_i + \beta_{02}*GRADES_i + \beta_{03}*WOUT\_HMW_i + \beta_{04}*SKIPPED_i + \beta_{05}*HRS\_HMWR_i + \beta_{06}*FAILED\_C_i + \beta_{10}*TIME_{ti} + \beta_{11}*GENDER_i*TIME_{ti} + \beta_{12}*GRADES_i*TIME_{ti} + \beta_{13}*WOUT\_HMW_i*TIME_{ti} + \beta_{14}*SKIPPED_i*TIME_{ti} + \beta_{15}*HRS\_HMWR_i*TIME_{ti} + \beta_{16}*FAILED\_C_i*TIME_{ti} + r_{0i} + r_{1i}*TIME_{ti} + e_{ti}$

Table 12

Proportion of Variance Explained: Academic Discipline

	Original variance	Residual variance	Proportion of variance explained
Intercept			
Risk factors only	48.46	31.16	35.7%
Full model (Risk and protective factors)	48.46	27.03	44.2%
Incremental variance			8.5%
Slope			
Risk Factors Only	5.70	4.69	17.7%
Full model (Risk and protective factors)	5.70	4.46	21.8%
Incremental variance			4.1%

Academic Discipline Analysis

Table 13 below reports the fixed effects for the final model for the Academic Discipline scale within the domain of Motivation. The average estimated scaled score in 7th grade (coded as Time Zero), or the intercept, was 46.36. All of the student-level variables had a significant effect on the intercept with the exception of gender. Though the starting Academic Discipline means between girls and boys were statistically different in grade 7 ($t = 4.14$, $p < 0.01$), these differences were explained by the other academic factors in this model. Both the grades and hours of homework variables were correlated with an increase in the intercept; for each gain in the grades category, students saw an average increase in their Academic Discipline scores of 2.79 points. Likewise, for each increase in hours spent on homework category, students saw an average increase of 1.69 points in their starting score. However, the risk factors were associated with lower starting Academic Discipline scores. In order from the greatest to least impactful risk

factors were failing a class (-3.24), skipping class (-2.59), and coming to school without completed homework (-1.71).

Similar to the intercept, all of the cross-level interactions were also statistically significant with the exception of gender. The variables here had a reversed relationship with the intercept; the variables of grades and hours of homework were negatively correlated with the slope, while the variables of coming to class without homework, skipping class, and failing class were positively associated with the slope. This follows the same pattern, however, as the growth rate in this model is negative at -0.33. This means that the protective factors of grades and hours of homework made it less likely that students would experience a negative growth rate, while the risk factors increased the likelihood of negative growth.

Table 13

Fixed Effects of Academic Discipline

Fixed Effect	Coefficient	Standard Error	t-ratio	*df*	p-value
Intercept					
Intercept	46.36	.08	547.01	4762	<0.001
*Gender**	-0.32	.17	-1.87	4762	0.062
Without Homework	-1.71	.09	-19.49	4762	<0.001
Skipped Class	-2.59	.17	-15.60	4762	<0.001
Failed Class	-3.24	.20	-16.07	4762	<0.001
Grades	2.79	.13	20.79	4762	<0.001
Hours of Homework	1.69	.15	11.13	4762	<0.001
Time Slope					
Intercept	-0.33	.06	-5.88	4762	<0.001
*Gender**	-0.18	.11	-1.54	4762	0.123
Without Homework	0.44	.06	7.56	4762	<0.001
Skipped Class	1.05	.11	9.46	4762	<0.001
Failed Class	0.32	.13	2.37	4762	0.018
Grades	-0.43	.09	-4.81	4762	<0.001
Hours of Homework	-0.71	.10	-7.05	4762	0.010

* Not statistically significant at $p < .05$

Table 14

Random Effects of Academic Discipline

Random Effect	Standard Deviation	Variance Component	*df*	χ^2	p-value
Intercept, r_0	5.20	27.03	4762	22638.55	<0.001
Time Slope, r_1	2.11	4.46	4762	6728.91	<0.001
Level-1, e	4.65	21.60			

Relationships with School Personnel

Relationships with School Personnel is a scaled variable within the Social Engagement domain of Engage Grades 6-9. The possible scaled scores range from 10 to 60. This scale measures "the extent to which students relate to school personnel as part of

their connection to school" (Moore, et al., 2015). An example item is "Adults at my school understand my point of view" (Moore et al.). In this model, students' scaled Relationships with School Personnel scores at each time point were the outcome variables in the model. The initial intraclass correlation was 0.624, meaning that 62.4% of the variance occurred between students. The null HLM equation was a follows:

Level-1: $SCL\_REL_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + e_{ti}$

Level-2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10} + r_{1i}$

As in the Academic Discipline model, the level 2 variables were added to both the intercept and the slope by risk factors first, which were: a) gender, b) coming to school without homework, c) skipping class, and d) failing a class. In the model with only risk factors, all of the risk factors significantly predicted the intercept with the exception of gender. However, gender was a significant predictor of the slope. In addition, skipping class also significantly predicted the slope, but coming to class without homework and failing a class did not. As shown in Table 15, the model with only risk factors predicted approximately 10.7% of the variance in the intercept, and approximately 2.6% of the slope.

Next, factors that would likely be associated with increases in the Relationships with School Personnel scores, or protective factors, were added. These included grades and hours of homework. The results of the model can be found in Table 16. In this model, each of the non-significant predictors of the slope remained non-significant. The only non-significant predictor of the intercept was gender. However, several variables did not significantly predict the slope, including a) grades, b) coming to class without homework,

and c) failing a class. Overall, the final model including both risk and protective factors explained approximately 13.1% of the variance of the intercept, and 4.2% of the slope. The final Relationships with School Personnel HLM equation, which included both risk and protective factors, was a follows:

Level-1: $SCL\_REL_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + e_{ti}$

Level-2: $\pi_{0i} = \beta_{00} + \beta_{01}*(GENDER_i) + \beta_{02}*(GRADES_i) + \beta_{03}*(WOUT\_HMW_i) + \beta_{04}*(SKIPPED_i) + \beta_{05}*(HRS\_HMWR_i) + \beta_{06}*(FAILED\_C_i) + r_{0i}$

$\pi_{1i} = \beta_{10} + \beta_{11}*(GENDER_i) + \beta_{12}*(GRADES_i) + \beta_{13}*(WOUT\_HMW_i) + \beta_{14}*(SKIPPED_i) + \beta_{15}*(HRS\_HMWR_i) + \beta_{16}*(FAILED\_C_i) + r_{1i}$

Mixed Model: $SCL\_REL_{ti} = \beta_{00} + \beta_{01}*GENDER_i + \beta_{02}*GRADES_i + \beta_{03}*WOUT\_HMW_i + \beta_{04}*SKIPPED_i + \beta_{05}*HRS\_HMWR_i + \beta_{06}*FAILED\_C_i + \beta_{10}*TIME_{ti} + \beta_{11}*GENDER_i*TIME_{ti} + \beta_{12}*GRADES_i*TIME_{ti} + \beta_{13}*WOUT\_HMW_i*TIME_{ti} + \beta_{14}*SKIPPED_i*TIME_{ti} + \beta_{15}*HRS\_HMWR_i*TIME_{ti} + \beta_{16}*FAILED\_C_i*TIME_{ti} + r_{0i} + r_{1i}*TIME_{ti} + e_{ti}$

Table 15

Proportion of Variance Explained: Relationships with School Personnel

	Original variance	Residual variance	Proportion of variance explained
Intercept			
Risk factors only	50.67	45.26	10.7%
Full model (Risk and protective factors)	50.67	44.04	13.1%
Incremental variance			2.4%
Slope			
Risk Factors Only	6.13	5.97	2.6%
Full model (Risk and protective factors)	6.13	5.87	4.2%
Incremental variance			1.6%

Relationships with School Personnel Analysis

The average estimated scaled score at 7th grade was 40.66. All of the student-level variables had a significant effect on the intercept with the exception of gender, which was not unexpected as girls' and boys' scores did not significantly differ in any grade level. Both the grades and hours of homework variables are correlated with an increase in the intercept; for each gain in the grades category, students saw an average increase in their Relationship with School Personnel scores of 1.23 points. Likewise, for each increase in the hours spent on homework category, students saw an average increase of 1.38 points in their starting score. The risk factors were again associated with lower starting scores. In order from the greatest to least impactful variables were failing a class (-1.93), skipping class (-1.34), and coming to school without completed homework (-1.05).

Gender, skipping class, and hours of homework were the only significant variables on the slope. Because the slope was negative, (-0.56), being a boy was associated with greater decreases in Relationship with School Personnel scores (0.38), as

was skipping class (.49). Hours of homework were associated with a lower likelihood of experiencing negative growth (-0.59).

Table 16

Fixed Effects of Relationships with School Personnel

Fixed Effect	Coefficient	Standard Error	t-ratio	*Df*	p-value
Intercept					
Intercept	46.66	.11	381.33	4762	<0.001
*Gender**	0.42	.24	1.96	4762	0.050
Without Homework	-1.05	0.11	-9.53	4762	<0.001
Skipped Class	-1.34	.21	-6.40	4762	<0.001
Failed Class	-1.93	.25	-7.63	4762	<0.001
Grades	1.23	.17	7.30	4762	<0.001
Hours of Homework	1.38	.19	7.21	4762	<0.001
Time Slope					
Intercept	-0.56	.07	-8.42	4762	<0.001
Gender	0.38	.13	2.84	4762	0.005
*Without Homework**	0.10	.07	1.39	4762	0.165
Skipped Class	0.49	.13	3.75	4762	<0.001
*Failed Class**	0.18	.16	1.11	4762	0.269
*Grades**	0.04	.11	.37	4762	0.709
Hours of Homework	-0.59	.12	-4.96	4762	<0.001

* Not statistically significant at $p < .05$

Table 17

Random Effects of Relationships with School Personnel

Random Effect	Standard Deviation	Variance Component	*df*	χ^2	p-value
Intercept, r_0	6.64	44.04	4762	25344.05	<0.001
Time Slope, r_1	2.42	5.87	4762	6592.43	<0.001
Level-1, e	5.53	30.57			

Thinking before Acting

Thinking before Acting is a scaled variable within the Self-Regulation domain of Engage Grades 6-9. The possible scaled scores ranged from 10 to 60. This scale measures the "tendency to think about the consequences of one's actions before acting" (Moore, et al., 2015). An example item is "I think about what might happen before I act" (Moore et al.). Like the previous two model examining other scaled scores, students' scaled Thinking before Acting scores at each time point were the outcome variables in the model. The initial intraclass correlation was 0.674, meaning that 67.4% of the variance occurred between students. The null HLM equation was a follows:

Level-1: $SCL\_THIN_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + e_{ti}$

Level-2: $\pi_{0i} = \beta_{00} + r_{0i}$

$\pi_{1i} = \beta_{10} + r_{1i}$

As in the previous models examining scaled scores, the level 2 variables were added to both the intercept and the slope by risk factors first, which were: a) gender, b) coming to school without homework, c) skipping class, and d) failing a class. In the model with only risk factors, all of the risk factors significantly predicted the intercept with the exception of gender. However, gender was a significant predictor of the slope. In addition, skipping class also significantly predicted the slope, as did coming to class without homework, but failing a class did not. As shown in Table 18, the model with only risk factors predicted approximately 19.2% of the variance in the intercept, and approximately 4.7% of the slope.

Next, factors that would likely be associated with increases in scaled scores, or protective factors, were added. These included grades and hours of homework. The

results of the model can be found in Table 19. As in the previous model, gender remained a non-significant predictor of the intercept. The only non-significant variable in predicting the intercept was failing a class. Overall, the final model including both risk and protective factors explained approximately 22.3% of the variance of the intercept, and 5.3% of the slope. The final Thinking before Acting HLM equation, which included both risk and protective factors, was a follows:

Level-1: $SCL\_THIN_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + e_{ti}$

Level-2: $\pi_{0i} = \beta_{00} + \beta_{01}*(GENDER_i) + \beta_{02}*(GRADES_i) + \beta_{03}*(WOUT\_HMW_i) + \beta_{04}*(SKIPPED_i) + \beta_{05}*(HRS\_HMWR_i) + \beta_{06}*(FAILED\_C_i) + r_{0i}$

$\pi_{1i} = \beta_{10} + \beta_{11}*(GENDER_i) + \beta_{12}*(GRADES_i) + \beta_{13}*(WOUT\_HMW_i) + \beta_{14}*(SKIPPED_i) + \beta_{15}*(HRS\_HMWR_i) + \beta_{16}*(FAILED\_C_i) + r_{1i}$

Mixed Model: $SCL\_THIN_{ti} = \beta_{00} + \beta_{01}*GENDER_i + \beta_{02}*GRADES_i + \beta_{03}*WOUT\_HMW_i + \beta_{04}*SKIPPED_i + \beta_{05}*HRS\_HMWR_i + \beta_{06}*FAILED\_C_i + \beta_{10}*TIME_{ti} + \beta_{11}*GENDER_i*TIME_{ti} + \beta_{12}*GRADES_i*TIME_{ti} + \beta_{13}*WOUT\_HMW_i*TIME_{ti} + \beta_{14}*SKIPPED_i*TIME_{ti} + \beta_{15}*HRS\_HMWR_i*TIME_{ti} + \beta_{16}*FAILED\_C_i*TIME_{ti} + r_{0i} + r_{1i}*TIME_{ti} + e_{ti}$

Table 18

Proportion of Variance Explained: Thinking before Acting

	Original variance	Residual variance	Proportion of variance explained
Intercept			
Risk factors only	41.30	33.38	19.2%
Full model (Risk and protective factors)	41.30	32.10	22.3%
Incremental variance			3.1%
Slope			
Risk Factors Only	4.68	4.46	4.7%
Full model (Risk and protective factors)	4.68	4.43	5.3%
Incremental variance			0.6%

Thinking before Acting Analysis

The average estimated scaled score in 7th grade was 40.94. All of the student-level variables had a significant effect on the intercept with the exception of gender. Though the starting Thinking before Acting mean between girls and boys was statistically different in grade 7 ($t = 2.66$, $p < 0.01$), these differences were explained by the other academic factors in this model. Both the grades and hours of homework variables were correlated with an increase in the intercept; for each gain in the grades category, students saw an average increase in their Thinking before Acting scores of 1.52 points. Likewise, for each increase in the hours spent on homework category, students saw an average increase of 1.03 points in their starting score. The risk factors were again associated with lower starting scores. Failing a class and skipping class were associated with similar decreases in the starting score (-2.35 and -2.32 respectively) and coming to school

without completed homework was correlated with a smaller, but also significant decrease in the intercept (-1.00).

Unlike the other models explaining the growth of Academic Discipline and Relationships with School Personnel, Thinking before Acting had an overall positive slope (0.40). All of the variables with the exception of failing a class were significantly associated with the slope. The risk factors were all associated with increased slopes, while the protective factors were associated a reduction of the slope, suggesting that as the slope was not as steep for students as grades and hours of homework increased.

Table 19

Fixed Effects of Thinking before Acting

	Coefficient	Standard Error	t-ratio	*df*	p-value
Intercept					
Intercept	40.94	.09	454.09	4762	<0.001
*Gender**	.25	.18	1.39	4762	0.166
Without Homework	-1.00	.09	-10.73	4762	<0.001
Skipped Class	-2.32	.18	-13.15	4762	<0.001
Failed Class	-2.35	.21	-10.94	4762	<0.001
Grades	1.52	.14	10.63	4762	<0.001
Hours of Homework	1.03	.16	6.36	4762	<0.001
Time Slope					
Intercept	0.40	.05	7.27	4762	<0.001
Gender	0.39	.11	3.49	4762	<0.001
Without Homework	0.15	.06	2.64	4762	0.008
Skipped Class	0.53	.11	4.90	4762	<0.001
*Failed Class**	0.08	.13	.65	4762	0.519
Grades	-0.20	.09	-2.28	4762	0.022
Hours of Homework	-0.25	.10	-2.50	4762	0.013

* Not statistically significant at $p < .05$

Table 20

Random Effects of Thinking before Acting

Random Effect	Standard Deviation	Variance Component	*df*	χ^2	p-value
Intercept, r_0	5.67	32.10	4762	27723.20	<0.001
Time Slope, r_1	2.10	4.43	4762	6875.15	<0.001
Level-1, e	4.47	19.97			

Summary

Overall, the HLM models employed explained between 13.1 and 44.2% of the variance in the students' starting scaled scores for the three scales examined, which included Academic Discipline, Relationships with School Personnel, and Thinking before

Acting. The proportion of variance explained in HLM is similar to the r^2 statistic found in regression (Singer & Willett, 2003). Academic Discipline had the largest proportion of the variance explained; 44.2% for the intercept. Put simply, this means that 44.2% of the variation in students' starting scores were explained by this model. In the Thinking before Acting model, 22.3% of the variance was explained for the intercept, or students' scores in grade 7. Finally, the model run with Relationships with School Personnel as an outcome variable explained the least amount of variance. This model accounted for only 13.1% of the variation in students' starting scores.

Student grades and hours of homework were both significantly and positively associated with higher starting scores in all three models, as shown in Table 21 below. This means that on average, students with higher grades and students who spent more time on homework had higher scaled scores in the 7^{th} grade for all three scales examined. This effect was strongest for both variables in the Academic Discipline scale; on average, for each increase in the either the grades category or hours of homework category, students' starting scores increased by 2.79 points and 1.69 points respectively. In the Relationships with School Personnel scale, scores increased an average of 1.23 points for each increase in the grades category, and 1.38 points for each increase in the hours of homework category. In the Thinking before Acting scale, the average increase was 1.52 points for grades and 1.03 points for hours of homework.

Coming to class without homework, skipping class, and failing a class were all significantly associated with lower starting scores in all three models, seen in Table 21 below. This means that on average, for each increase in each of these categories, students

saw a decrease in their starting scores in each scale. Gender did not significantly predict differences in starting scores in any of the three models. On the Academic Discipline scale, students saw an average decrease in their 7th grade scores by 3.24 points for failing a class, 2.59 points for each categorical increase in skipping a class, and 1.71 points for each categorical increase in coming to school without completed homework. In Relationships with School Personnel, students' starting scores decreased an average of 1.93 points for class failure, 1.34 points for each increase in skipping class, and 1.05 for each increase in coming to school without homework. Finally, students saw a decrease in their 7th grade Thinking before Acting scale by an average of 2.35 points for failing a class, 2.32 points for each increase in skipping class, and 1.00 point for each increase in coming to school without homework done.

Table 21

Average Change in Intercept by Risk and Protective Factors for each HLM Model

	Academic Discipline	Relationships with School Personnel	Thinking before Acting
Estimated average starting score (Intercept)	46.36	46.66	40.94
Grades	2.79	1.23	1.52
Hours of Homework	1.69	1.38	1.03
Failing a class	-3.24	-1.93	-2.35
Skipping class	-2.59	-1.34	-2.32
Coming to school without homework	-1.71	--1.05	-1.00

Between 4.2 and 21.8% of the variance was explained for the slope, or students' growth rates between grades 7 and 9. Academic Discipline had the largest proportion of the variance explained; 21.8% of the variation in students' growth in Academic Discipline between grades 7 and 9 was explained. The Thinking before Acting model

explained 5.3% of the variation in students' growth. Finally, the variables in the Relationships with School Personnel model explained 4.2% of the variation in growth rates.

While each of the slopes were significantly different from zero, the rate of change and the variables that predicted the slope were different in each model, which can be seen in Table 22 below. The growth rate was negative for both Academic Discipline and Relationships with School Personnel. Thinking before Acting was the only variable with a positive growth rate. One important note is that due to the negative slopes of both Academic Discipline and Relationships with School Personnel, which indicate that on average, students' scores decrease in these scales between grades 7 and 9, the relationship that each of the predictors has to the slope, or growth rate, needs to be interpreted with caution. For example, in Academic Discipline, for each increase in the grades category, scores are associated with a decrease of 0.43 points. However, this means that for each increase in the grades category there is a decrease of 0.43 points in *the slope*, which is negative. This means that an increase in grades is associated with a reduction in the likelihood that students will experience negative growth.

Table 22

Average Change in Growth by Risk and Protective Factors for each HLM Model

	Academic Discipline	Relationships with School Personnel	Thinking before Acting
Estimated average growth (Slope)	-0.33	-0.56	0.40
Grades	-0.43	*ns*	-0.20
Hours of Homework	-0.71	-0.59	-0.25
Failing a class	0.32	*ns*	*ns*
Skipping class	1.05	0.49	0.53
Coming to school without homework	0.44	*ns*	0.15
Gender	*ns*	0.38	0.39

In Academic Discipline, all of the variables in the model significantly accounted for differences in students' growth rates with the exception of gender. Both of the protective factors of grades and hours of homework were associated with a decrease in the negative slope, meaning that on average, for each increase in the grades and hours of homework categories, students saw positive changes in their growth. In other words, students who had higher grades or who spent more time on homework were less likely to see negative growth between 7th and 9th grades, or may have had positive growth. On average, class failure, and categorical increases in skipping class and coming to school without homework all increased the magnitude of negative growth. In other words, students who had failed a class, or had higher levels of skipping class or coming to school without completed homework experienced greater negative growth.

In Relationships with School Personnel, only gender, skipping class, and hours of homework significantly accounted for differences in students' growth rates. Hours spent on homework was the only variable that was significantly associated with positive

changes in growth. Failing a class and being a boy were both significantly associated with experiencing more negative growth.

Finally, in Thinking before Acting, all of the variables except for failing a class significantly predicted differences in students' growth rates. This was the only scale examined with a positive growth rate, which makes interpretation more straightforward. Increases in both grades and hours of homework categories were negatively associated with growth, meaning that for each increase in the grades category or hours of homework category, students experienced less growth. Skipping class, coming to school without homework, and being a boy were all associated with experiencing greater growth in the scale of Thinking before Acting.

CHAPTER 5

Discussion and Summary

The purpose of this study was to explore how various noncognitive skills developed over time. This was done by examining a longitudinal sample of 4,769 students and their scores on a measure of noncognitive skills, ACT Engage Grades 6-9, through hierarchical linear modeling. Students' scaled scores of Academic Discipline, Relationships with School Personnel, and Thinking before Acting in the grade levels of 7, 8, and 9 were outcome variables in three different HLM models. The risk factors of gender, coming to class without homework, skipping class, and failing class, and the protective factors of grades and hours of homework were used to predict differences in both students' starting scores and their rate of growth in each model. The following research questions guided this study:

1. How do students' Motivation, Social Engagement, and Self-Regulation scores develop as they progress from grades 7 to 9 as measured by the domains of ACT Engage? More specifically:
    a. How does the scale of Academic Discipline (within the domain Motivation) develop from grades 7 to 9?
    b. How does the scale of Relationships with School Personnel (within the domain of Social Engagement) develop from grades 7 to 9?

2. How does the scale of Thinking before Acting (within the domain of Self-Regulation) develop from grades 7 to 9? Do students' ACT Engage scores vary across time by indices of academic achievement or gender?

This chapter is first organized by discussing the results of each research question as it applies to each scale studied in ACT Engage Grades 6-9. A more general discussion of how this study fits into previous literature follows. Finally, there are sections on the limitations of the study and final conclusions.

Research Questions: Results and Interpretations

Academic Discipline

How does Academic Discipline develop from grades 7 to 9? Do students' Academic Discipline scores vary over time by students' academic achievement or gender?

When comparing overall scaled scores across grades 7, 8, and 9, Academic Discipline appears to remain stable until 9th grade, when it drops significantly (see Table 1 on page 54). In addition, though this pattern was the same for both boys and girls, girls had significantly higher Academic Discipline scores in each grade (see Table 4 on page 56). However, when accounting for all of the variables in the model, which included both risk factors (gender, coming to class without homework, skipping class, and failing class) and protective factors (grades and hours of homework), gender was the only factor that did not significantly explain the differences in scores at either the starting point or when describing growth over grade levels. As a result, chi-square tests were run to see if differences were apparent between boys and girls in each of the variables used in the

model. As shown in Table 23 below, there were significant differences between boys and girls in each grade level.

In 7th grade, girls were significantly more likely than boys to earn As and Bs, while boys were significantly more likely than girls to fail a class or come to school without homework. In 8th and 9th grades, girls were again more likely to report earning As or Bs. Boys were more likely to fail a class, come to class without homework, and report spending no time on homework. The only variable that did not significantly differ by gender was skipping class. The associations between gender and the other variables in the model may help explain the non-significant results of this variable on either the intercept or the slope.

Table 23

Differences in Independent Variables by Gender

	Grade 7		Grade 8		Grade 9	
	χ^2	*df*	χ^2	*df*	χ^2	*Df*
Grades	28.49**	4	38.25**	4	50.69**	4
Hours of homework	3.50	4	15.84**	4	26.12**	4
Skipped class	4.75	4	9.19	4	6.74	4
Failed class	6.43*	1	14.36**	1	18.16**	1
Came to class without homework	47.55**	4	37.03**	4	35.26**	4

* $p < .05$, ** $p < .01$

Overall, the HLM model performed explained 44.2% of the variance between students' 7th grade Academic Discipline scores. Differences in students' 7th grade starting scores by varied by the frequency of coming to class without completed homework, skipping class, whether or not students had failed a class, as well as grades and hours of nightly homework. On average, students who had higher grades and did more nightly homework had higher starting scores in Academic Discipline. Students who skipped class

more often, came to class more often without homework, and had failed a course in the 7th grade were more likely to have lower starting scores. Failing a course had a strongest impact on reducing students' starting scores, followed by skipping class and coming to class without homework. The protective factors of grades and hours of homework were associated with gains in the students' starting scores, with grades being the best predictor of an increased intercept.

Because the scale of Academic Discipline is related to the amount of effort a student puts into his or her classwork, these results are consistent with other research that shows a significant, positive relationship between academic effort and academic behaviors (Corker, Oswald, & Donnellan, 2012; Noftle & Robins, 2007). Several of the predictor variables in the model were examples of academic behaviors (regularly studying, coming to class, and completing homework), and increases in these behaviors were therefore associated with higher 7th grade Academic Discipline scores. Academic effort is also positively correlated with grades (Meeuwisse, Born & Severiens, 2011; Trautwein et al., 2009), which was also the case here.

Failing at least one class had the strongest influence on students' 7th grade scores, and was associated with an average decrease of 3.24 points. However, while there is a negative relationship between these two variables, it is important to note that we do not know the cause: did low levels of Academic Discipline lead to course failures, course failures lead to low levels of Academic Discipline, or is there perhaps another unexplained reason for the negative relationship between them? However, in addition to the negative relationship seen between failing a class and Academic Discipline scores,

course failures in middle school are also associated with more extreme negative consequences, such as a reduced likelihood of graduating from high school (Kurlaender & Jackson, 2012; Rumberger & Lim, 2008).

This HLM model explained 21.8% of the variance between students' Academic Discipline growth rates between the 7th and 9th grades. Differences in the overall growth rate of Academic Discipline varied by the same factors as the intercept: the frequency of coming to class without completed homework, skipping class, and whether or not students had failed a class, as well as grades and hours of nightly homework. The average growth rate was negative, meaning that on average, students experienced a decrease in their Academic Discipline scores between 7th and 9th grades. However, this result is consistent with other literature on noncognitive development throughout adolescence. Several studies have illustrated that behavioral, cognitive, and emotional engagement show declines throughout middle school (Turner, et al., 2014; Wang & Eccles, 2012), and that academic effort is positively associated with engagement and motivation (Hazrati-Viari, Rad, & Torabi, 2012; Komarraju & Karau, 2005).

Students who skipped class more often, came to class more often without homework, and had failed a course in the 7th grade were more likely to have greater decreases in growth. Skipping class had the strongest relationship to a negative growth rate, followed by coming to class without homework and failing a class. The frequency of students skipping class also increased in the 8th and 9th grades (see Table 9 on page 58), with greater percentages of students reporting skipping class "rarely, sometimes, frequently, and daily" in the 9th grade in particular. The protective factors reduced the

likelihood of students experiencing a negative growth rate. Of these factors, hours of homework had the strongest relationship with growth, followed by grades.

While it is not particularly surprising, many of the variables in this analysis that were considered risk factors were associated with significantly lower starting Academic Discipline scores and decreased growth. Teachers could easily measure many of these variables and likely already do. For example, homework completion, attendance, and grades are usually recorded for each student, and students who frequently come to class without completed homework, skip class, or have any failing grades may be more at risk in 7th grade. The risk factors are particularly important in considering Academic Discipline, as several of these factors has a stronger relationship to students' initial scores than the protective factors of higher grades or more time spent on homework.

These factors are also related to student growth, which on average, decreased by approximately .33 points in each grade level. The strongest predictor of a decreased growth rate was skipping class, followed by coming to class without completed homework, and failing a class. This means that each of these factors contributed to students' negative growth in Academic Discipline, and as such, should be considered continuing risk factors in 8th and 9th grades.

One interesting result from this analysis is that gender alone does not significantly predict either students' starting Academic Discipline scores or their growth rates when accounting for other variables. This was not completely expected, as previous studies have revealed differences in girls' and boys' levels of noncognitive skill, with differences usually favoring girls (Cornwall, Mustard & Van Parys, 2013; Duckworth & Seligman,

2006). Researchers have hypothesized that differences in noncognitive skills can help explain the differences in girls' and boys' grades (Jacob, 2002). One possible explanation for this result is that differences between girls' and boys' Academic Discipline scores vary only because of differences accounted for in the model (grades, class failure, and homework completion), and not because of other differences in noncognitive skill that may exist but do not predict Academic Discipline (for example, social-emotional skills).

In this sample, significant differences emerged in the first time measured, or 7th grade. However, significant differences in noncognitive skill levels likely emerge far before the 7th grade. In a recent study, researchers found that levels of social-emotional skills measured in kindergarten could predict much later outcomes such as graduating from high school and college, and obtaining stable employment in early adulthood (Jones, Greenberg, & Crowley, 2015). On average, students who came to class without homework more often, skipped class more frequently, or experienced a class failure had significantly lower Academic Discipline scores in the 7th grade. Students with higher grades and those who spent more time on homework were more likely to have significantly higher starting Academic Discipline scores. Additionally, these differences also account for differences in growth, which suggest that they persist over time, magnifying the differences between students.

Relationships with School Personnel

How does the scale of Relationships with School Personnel (within the domain Social Engagement) develop from grades 7 to 9? Do students' Relationships with School Personnel scores vary across time by students' academic achievement or gender?

When comparing overall average scaled scores across grades 7, 8, and 9, Relationships with School Personnel scores appear to remain stable until 9th grade, when they drop significantly (see Table 1 on page 54). This pattern was the same for both boys and girls, and girls and boys did not have significantly different scores at any time point (see Table 4 on page 56). While the mean starting score and slope were both significantly different from zero, overall, this model did not explain a large percentage of the variance in scores at either the starting point or in growth rates. The model explained 13.1% of the variance between students' starting scores and 4.2% of the variance in their growth rates.

Students' scores in 7th grade were explained by the same variables as Academic Discipline, though much less variance was explained. Like Academic Discipline, differences in students' 7th grade starting scores by varied by the frequency of coming to class without completed homework, skipping class, whether or not students had failed a class, as well as grades and hours of nightly homework. On average, students who had higher grades and did more nightly homework had higher starting scores in Relationships to School Personnel. Students who skipped class more often, came to class more often without homework, and had failed a course in the 7th grade were more likely to have lower starting scores.

Differences in the overall growth rate of this factor varied by gender, the frequency of skipping class, and hours of nightly homework. The average growth rate was negative, meaning that on average, students experienced a decrease of 0.56 points in their Relationship with School Personnel scores at each time point. This result is consistent with previous research, which has found that students tend to show increasing levels of disengagement from their teachers as they enter and go through middle school (Lynch & Cicchetti, 1997).

Boys and students who skipped class more often were more likely to have greater decreases in growth. When examining differences in Relationship with School Personnel scores by gender without accounting for any other variables, there were no differences between girls' and boys' scores at any grade level (see Table 4 on page 56). However, prior research has shown that girls tend to feel more supported by their teachers than boys (Murray-Harvey & Slee, 2007), which could help explain why males tended to experience greater decreases in this scale over time. Students who spent more time on homework were less likely to experience negative growth.

Overall, these findings are consistent with related research. One study examining the impact of relationships with teachers, friends, and family on academic outcomes in Hispanic/Latino middle school students found that relationships with teachers were particularly salient to academic outcomes, and were mediated by student behavior at school (Woolley, Kol, & Bowen, 2009). The authors found that teacher relationships were important for both how students felt about school as well as how students behaved in school. The authors wrote that:

> Higher levels of satisfaction with school and more positive school behavior were predictive of better grades and more time spent on homework. In turn, higher teacher support was predictive of both more satisfaction with school and better behavior, with the standardized coefficients indicating teacher support to be the strongest social-environment factor associated with school satisfaction. (p. 60)

Teacher support of students has been shown to increase both school engagement and trouble avoidance in middle school Latino students (Garcia-Reid, Peterson, & Reid, 2015). Additionally, affirming students' cultural identities, for example, allowing students to speak their native language at school, is related to increased academic resilience (Sosa & Gomez, 2012). However, researchers have found that teachers may have differing expectations for different students. The results of a meta-analysis found that teachers held fewer positive expectations for Latino students than for White students (Tenenbaum & Ruck, 2007), which could have implications for how supported students feel at school, and the quality of relationships they have with their teachers.

Espinoza and Juvonen (2011) found that school climate is another important predictor of student behavior, and that Hispanic/Latino students may be particularly sensitive to this. These researchers found that Hispanic/Latino students' perceptions of school climate predicted both rule-following and rule breaking in students. Given that student behavior is related to teacher support (Woolley, Kol, & Bowen, 2009), school climate may also be a factor to consider when understanding teacher/student relationships.

This model helps explain some of the differences between students' Relationship with School Personnel scores, but there is quite a bit of variance left unexplained (86.9% unexplained variance in the intercept, and 95.8% unexplained variance in the slope). This means that although we can use the significant variables to help look for potential risk

factors in students, it is likely there are other variables not included in this model that do a better job of predicting potential difficulties in this area.

With that being said, the same variables that predicted starting Academic Discipline scores also predicted starting Relationships with School Personnel, and could be used to help monitor relationships with teachers. Students who skip class or come to class without homework more frequently, and students who have failed a course, are more likely to have lower Relationships with School Personnel scores. Additionally, students with higher grades and students who spend more time on homework have higher scores. A meta-analysis exploring the relationship between student characteristics and teacher-child relationships revealed that teachers reported less conflict and more closeness to students who showed higher levels of motivation and academic performance (Nurmi, 2012). The results of this study mirror those findings.

The growth rate for Relationship with School Personnel was negative. On average, students experience a decrease in scores of 0.56 points in each grade level. This decrease is magnified if students are male, or have an increased frequency of skipping class. Students who spent more time on homework were less likely to experience negative growth. In the previously mentioned study related to teacher relationships by Woolley, Kol, and Bowen (2009), the authors found that teacher support was positively associated with students' behavior and grades. In their study, girls had both better grades and behavior at school, similar to the results in this sample. Since both school behavior and grades were related to improved teacher support, it is possible that boys' school

behavior not addressed in this model was partly influencing the growth of this variable over time.

Thinking before Acting

How does the scale of Thinking before Acting (within the domain Self-Regulation) develop from grades 7 to 9? Do students' Thinking before Acting scores vary across time by students' academic achievement or gender?

When comparing overall average scaled scores across grades 7, 8, and 9, Thinking before Acting scores appear to significantly increase in each grade level (see Table 1 on page 54). When broken down by gender, this pattern was the same for boys, who saw a significant increase in Thinking before Acting scores in each grade level, but not for girls, who did not have significantly different scores at any time point (see Tables 2 and 3 on page 55). Overall, this model explained 22.3% of the variance between students' starting scores and 5.3% of the variance in their growth rates.

Like both models explaining differences in Academic Discipline and Relationships with School Personnel scores, gender was the only factor that did not significantly account for differences in Thinking before Acting scores at the starting point. Without accounting for any other variables, girls' had significantly higher starting scores in 7th grade (see Table 4 on page 56) but these differences were accounted for by other factors in the HLM model. As was the case in both of the previous models explaining differences in Academic Discipline and Relationships with School Personnel scores, with the exception of gender, the risk factors were all associated with lower 7th grade scores, and protective factors were associated with higher scores. Failing a class

and skipping class were the strongest predictors of lower starting scores, followed by coming to school without homework. Grades were the strongest predictor for increased starting scores, then hours of homework.

Unlike both Academic Discipline and Relationships with School Personnel, the overall growth rate for Thinking before Acting was positive, with an average increase of 0.40 points across each time point. This is consistent with prior research, which shows that self-regulation tends to increase throughout childhood and adolescence (King, Lengua, & Monahan, 2013). The risk factors of gender, coming to class without homework, and skipping class were significantly and positively associated with the growth rate. This means that on average, boys experienced greater growth in Thinking before Acting than girls. In addition, for each categorical increase in skipping class and coming to school without homework, students also saw small but significant positive growth. The protective factors also showed a significant cross-level interaction with growth, though they were negatively related to the slope.

So while students' with higher grades who spent more time on homework were more likely to have higher starting scores, they were less likely to experience as much growth between 7th and 9th grades. Additionally, while students who came to school without homework or skipped class more frequently had lower average 7th grade Thinking before Acting scores, they experienced more growth across the time studied. These results were unexpected, and I was unable to locate any research that corroborated these results.

However, while the negative associations between the growth rate and increased grades and time on homework were unexpected, it may mean that because these students had higher scores on average to begin with, they simply did not grow as quickly. Similar information was found when examining differences in scores between time points and genders. As shown in Table 1 (p. 54), when examined collectively, all students showed growth between 7th and 9th grades. When broken down by gender (see Tables 2 and 3 on page 55), the data showed boys making significant average gains each year and girls remaining on average, higher, but not making any significant gains.

When examining scores between girls and boys there are differences in 7th grade that disappear by the 8th grade (see Table 4 on page 56). Additionally, when examining differences in scores at each grade level by gender, girls' scores start relatively high and stay that way, while boys scores start lower but increase year-by-year (see Tables 2 and 3 on page 55). It may be that boys "catch up" to girls in this scale by growing at a faster rate during these years. The small but significant positive associations between the growth rate and coming to school without homework and skipping class are harder to understand. More research will need to be done to try to tease out the effects of coming to school unprepared and skipping class on this scale.

Discussion

The results of this study were consistent with other literature on noncognitive skills. Numerous other studies have found significant relationships between levels of noncognitive skill and academic achievement (Coates, 2014; Cunha & Heckman, 2006; Poropat, 2009). In this study, academic indicators, which were comprised of both

academic behaviors and indices of achievement, were used to help explain differences in noncognitive skill level, but differences in noncognitive skill level can also help explain differences in achievement.

While differences in variables other than gender accounted for all of the explained variance in students' starting scores in each model, it is important to note that these same variables varied significantly by gender in this sample. As shown in Table 23 on page 82, all of the variables in the model except for the frequency of skipping class varied by gender, with girls having more desirable responses in each category. It is interesting to see that the differences appear to magnify across each grade level. For example, in 7th grade, girls and boys do not differ in terms of how much time they spend on homework each night. However, chi-squared tests revealed that in both 8th and 9th grades, girls completed more homework and boys were more likely than expected to report spending no time doing homework (see Table 23 on page 82). These differences are worth noting and suggest that some of the differences in GPA that researchers have noted between boys and girls (Bertrand & Pan, 2013; Cornwall, Mustard, & Van Parys, 2013; Duckworth, & Seligman, 2006; Jacob, 2002) could be partly accounted for by differences in academic behaviors such as completing homework on time, or spending more time on homework each night.

In two of the three scales studied, the average growth between 7th and 9th grades was negative. While this result is consistent with other research (Lynch & Cicchetti, 1997; Turner, et al., 2014; Wang & Eccles, 2012), understanding some of the influences on these skills is important given that some researchers have hypothesized that this time

period may be particularly important for the development of certain noncognitive skills (Cunha & Heckman, 2007). Given the importance of 9th grade success on later outcomes, such as graduating from high school (Allensworth & Easton, 2007), understanding how noncognitive skills show growth during this time can help researchers look for patterns in the data to try to get at why this is happening.

Unfortunately, the "why" is a much more complicated question to answer. There are a number of theories as to why noncognitive skills may show decreases in middle school, such as prefrontal cortex development associated with increased impulsivity (Braver et al., 2014), but there are no definitive answers. The physical, cognitive, social, and life changes that occur during adolescence undoubtedly influence this development, but more research is needed to understand the relationships between the changes that middle and high schools students undergo and noncognitive development.

Noncognitive skills are associated with far-reaching outcomes. Differences in these skills as far back as kindergarten can help explain differences in educational attainment and employment in adulthood (Jones, Greenberg, & Crowley, 2015). Therefore, understanding students' levels of noncognitive skills, as well as some of the indices that help explain the differences in skills between students, could benefit educators with access to this kind of information. Measuring noncognitive skills and associated student behaviors would provide educators with a wealth of information in order to provide a more comprehensive picture of student performance.

Teachers can easily observe nearly all of the independent variables included in these HLM models, as they are usually already being recorded. Most teachers have

access to information related to all of the risk factors in the model, including student gender, skipping class (through attendance records), course failure, and coming to school unprepared. Some risk factors, such as failing a course and skipping class, are associated with other negative outcomes, like failing to graduation from high school (Allensworth & Easton, 2007; Kurlaender & Jackson, 2012; Rumberger & Lim, 2008), so these variables in particular should serve as important indicators to educators to monitor and help any student who has failed even one course or has skipped class. The protective factor of grades and GPA are usually available to teachers. The only variable that is not readily observable is time spent on homework. However, asking students to record the number of hours spent on homework each night as an assignment could be an easily solution to this lack of data.

In cases where access to these data points is not readily available (for example, teachers of different subjects do not share student grades with one another), it may be salient to remove obstacles to gathering this information. With the exception of student gender, each of the risk factors and protective factors significantly helped explain differences in noncognitive skills levels between students. Additionally, many variables helped explain the development of these skills over time. Gathering and systematically using this information as a way to help provide a more comprehensive picture of student performance would likely benefit students.

Limitations

There were several limitations to this study. One limitation is that this sample of students, while fairly large, came from one geographic region and is not nationally

representative. All of the students in the sample reported their race/ethnicity as Hispanic/Latino. Additionally, many of the students in this sample were all part of a program designed to improve college readiness in traditionally underserved communities. Each of these factors reduces the generalizability of the results. Another limitation is that all of the predictor variables used in the HLM models were both categorical in nature and self-reported. The scales of Engage 6-9 also rely on student self-reported data. For example, in the orderly conduct scale (a component of the Self-Regulation domain), one of the items reads, "I have been sent to the principal's office for misbehaving" (Casillas et al., 2012). While research has demonstrated that student self-reported assessments have a good degree of accuracy (Kuncel, Credé, & Thomas, 2005), students may choose not to answer honestly.

Recommendations for Further Study

This study was an initial examination of how certain noncognitive skills develop in students over the course of middle and early high school. However, in order to better illustrate how student noncognitive skills develop over middle and high school, additional research that includes a broader range of time points should be conducted. In this sample, only 7th, 8th, and 9th grade scores were available. Having additional time points, especially for 6th and 10th grades, would provide a better picture of what noncognitive development looks like during adolescence.

Additionally, in future research, the independent variables should be more comprehensive in scope. In the current study, each of the predictor variables were either dichotomous or categorical. If collected differently, many of these variables could

become continuous, which would increase the predictive capability of these models. For example, instead of a dichotomous variable for course failure, recording the number of classes that students have failed in a given year would provide more information about the associated risk with failing multiple classes as opposed to just one.

Finally, adding a third level to this type of multilevel research could help reveal what differences in noncognitive skill, if any, are associated with the effects of school or classroom environments. This could be particularly important to try to tease out differences in environment that may impact students' noncognitive skills. For example, a variable such as relationships with teachers could be heavily influenced by individual teacher factors.

Conclusion

The importance of various noncognitive skills on important life outcomes, such as academic attainment levels, cannot be overstated. The magnitude of influence these skills have on academic outcomes has been compared to IQ (Jacob, 2002), and there are numerous studies demonstrating its malleability (Anger, 2012; Kautz, Heckman, Diris, Weel & Borghans, 2014; Kautz & Zanoni, 2014), meaning that these skills can be influenced and improved. Additionally, there is evidence to show that interventions targeting specific noncognitive skills have had success in improving student outcomes such as improved engagement, achievement, and reduced likelihood of engaging in risky behaviors such as drug use and criminal activity (Hawkins et al., 2005).

The results of this study correspond with previous research that shows there is a significant relationship between academic indicators and noncognitive skills. The

academic indicators of homework completion, time spent on homework, skipping class, class failure, and grades are all related to differences in noncognitive skill level, as well as differences in the way these skills grow between middle school and the first year of high school. Though in this study, academic indicators were used to predict noncognitive skills over time, the association runs both ways. In other words, educators can, and should, use noncognitive skills to help understand differences in students' levels of academic achievement. Assessments that measure student levels of noncognitive skills, such as ACT Engage, could be used to help educators find ways to help their students succeed by identifying noncognitive areas of need.

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APPENDIX A

ACT Engage Grades 6-9 Domains and Scales Overview

Domain	Scale Name	Definition	Sample Item
Motivation	Academic Discipline	Degree to which a student is hardworking and conscientious as evidenced by the amount of effort invested into completing schoolwork.	I turn in my assignments on time.
	Commitment to School	Commitment to stay in school and obtain a high school diploma.	I am committed to graduating from high school.
	Optimism	A hopeful outlook about the future in spite of difficulties or challenges.	I am confident that everything will turn out all right.
Social Engagement	Family Attitude toward Education	Positive family attitude regarding the value of education.	My family supports my efforts in school.
	Family Involvement	Family involvement in a student's school life and activities.	I talk to my family about schoolwork.
	Relationships with School Personnel	The extent to which students relate to school personnel as part of their connection to school.	Adults at my school understand my point of view.
	School Safety Climate	School qualities related to students' perception of security at school.	I feel safe at school.
Self-Regulation	Managing Feelings	Tendency to manage duration and intensity of negative feelings (e.g., anger, sadness, embarrassment) and to find appropriate ways to express feelings.	I would walk away if someone wanted to fight me.
	Orderly Conduct	Tendency to behave appropriately in class and avoid disciplinary action.	I have been sent to the principal's office for misbehaving.
	Thinking before Acting	Tendency to think about the consequences of one's actions before acting.	I think about what might happen before I act.

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