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Abstract


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Dropping out of school has been viewed as a final stage in a cumulative process of disengagement. In recent years, the construct of engagement has received increased attention leading policymakers and scholars to suggest that efforts to increase engagement in school could reduce high school dropout rates. Using data from the Educational Longitudinal Study of 2002 (ELS:2002), this study examined the predictive relationship between tenth-grade students’ engagement and dropping out of high school. Engagement was viewed as a meta-construct comprised of multiple dimensions within three domains: behavioral, emotional, and cognitive. Additionally, this study examined how school processes, specifically administrator control and school morale, influenced students’ engagement on dropping out of high school. Hierarchical generalized linear modeling (HGLM) indicated that emotional engagement was a statistically significant predictor of dropping out of school, whereas, behavioral and cognitive engagement were not significant predictors. An analysis of the dimensions of engagement (i.e., conduct, class participation, class preparedness, attitudes about teachers, attitudes about the school social environment, attitudes about the school academic environment, persistence, and effort) revealed that students’ conduct in tenth-grade (i.e., lateness, cutting class, absent from school, not
following school rules, and suspensions), a component of behavioral engagement, is a statistically significant predictor of dropping out. Students’ ninth-grade grade point average (GPA), age in tenth grade, and family characteristics (i.e., socioeconomic status, lives with both birth parents, and parental involvement) were also important predictors of dropping out. Furthermore, dropping out of high school did not depend on both students’ engagement and school processes (i.e., administrator control and school morale). Overall, the study findings support the need for high schools and districts to put systems in place that would track student engagement at the beginning of high school to identify at-risk students and provide them with additional supports. These findings also emphasize the need for further research to identify what school factors influence student engagement and when low levels of engagement begin to develop.
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Introduction

From the time children enter elementary school in the United States, there is an expectation that the education they receive will provide them with the necessary knowledge and skills needed to become self-reliant within society. A high school diploma symbolizes the attainment of these knowledge and skills, opening up the doors to both postsecondary education and the world of work. High school students who drop out of school often experience difficulties transitioning to adulthood. High school dropouts have limited access to the same opportunities as graduates and are at risk for unemployment, welfare dependency, and imprisonment (Belfield & Levin, 2007; Levin, Belfield, Muennig, & Rouse, 2007). Given the importance of educational attainment to the future success of children’s transition to adulthood understanding why children drop out of school is imperative to ensure that all children are prepared to enter the adult world.

Theories on why students drop out of school have described dropping out as the final stage of a process of disengagement from school (Finn, 1989; Newmann, Wehlage, & Lamborn, 1992; Rumberger & Larson, 1998; Wehlage, Rutter, Smith, Lesko, & Fernandez, 1989). In recent years, the construct of engagement has received increased attention, leading policymakers and scholars to suggest that efforts to increase engagement in school could reduce high school dropout rates (National Research Council & Institute of Medicine [National Research Council], 2004). There is also evidence to support that school processes, such as how schools are managed (i.e., administrator control) and their academic and social climates (i.e., school morale) influence dropping out (Rumberger, 2004; Rumberger & Palardy, 2005). Yet little is known about how administrator control and school morale interact with student engagement to mediate dropping out. Using data from the Educational Longitudinal Study of 2002 (ELS:2002), this study seeks to
address the gaps in the literature and examine how engagement and school processes (i.e., administrator control and school morale) influence dropping out of high school.

**Statement of the Problem**

Over the past 40 years, dropping out of high school has been viewed as a serious educational and social problem. Research has documented that compared to individuals who graduate from high school those who drop out severely limit their economic and personal well-being (e.g., health) (Belfield & Levin, 2007; Levin et al., 2007). In 2008, eight percent of 16- to 24-year-olds dropped out of high school, as compared to 16 percent in 1968 (Snyder & Dillow, 2010). Despite this decline, dropping out of school remains an area of concern for a number of reasons. First, the individual consequences of dropping out still exist (e.g., lower earnings, increased involvement in criminal activity, inferior health status, and increased need for public assistance). Research has documented that high school dropouts earn significantly less than high school graduates (Belfield & Levin, 2007; Levin et al., 2007). The disparity in earnings for high school drop outs has escalated, as the rate of college enrollment has increased and a college degree has become a requirement for employment in the modern labor market (Murphy & Welch, 1989; Snyder & Dillow, 2010). In 1975, individuals 18-years-old and older with a bachelor’s degree earned an average of approximately $4,500 more a year than high school graduates and about $6,100 more than high school dropouts (United States Census Bureau Current Population Survey, 2010). Today, the difference in mean earnings between college and high school graduates is approximately $27,000 and about $37,000 between college graduates and high school dropouts. Given the economic returns of higher levels of educational attainment, a high school diploma is a critical first step to obtaining a college education and further enhances one’s opportunities later in life.
In addition to earning less than peers who graduate, high school dropouts are more likely to be involved in criminal activity, have a higher incidence of health problems, and have a higher likelihood of needing public assistance at some point in their adult lives (Belfield & Levin, 2007). Research has documented that high school dropouts are twice as likely to commit crimes compared to high school graduates (Harlow, 2003). Dropouts are also more likely to suffer from poor health due to poor eating habits and limited access to health insurance compared to high school graduates (Muennig, 2007). Muennig (2007) estimated that compared to high school dropouts, high school graduates gain 1.7 years of good health over their lifetime after controlling for demographic and health characteristics. Furthermore, high school dropouts are more likely to need public assistance as a result of low levels of employment and low earnings (Waldfogel, Garfinkel, & Kelly, 2007).

A second reason for concern is that the individual consequences of dropping out lead to economic harms that affect society as a whole. Rouse (2007) reported that over a lifetime an 18-year-old who does not complete high school earns approximately $260,000 and contributes on average $60,000 less in lifetime federal and state income taxes than a peer with a diploma. The combined income and tax losses for a cohort of 18-year-olds who do not complete high school aggregate to more than $156 billion over their lifetime. Rouse also estimated that a one percent increase in the male high school completion rate would save the United States approximately $1.6 billion a year in reduced costs from crime. Crime costs include incarceration costs and victim costs (e.g., loss of wages, medical costs, etc.). Waldfogel et al. (2007) estimated Temporary Assistance to Needy Families (TANF) savings of nearly $3.5 billion per year, if the number of single-mother dropouts enrolled in TANF reduced by 15 percent.
A third reason for concern is that the disadvantages faced by high school dropouts are exacerbated for individuals from minority populations. In 2008, four percent of White females dropped out of school, compared to 11 percent of Black females and 17 percent of Hispanic females (Snyder & Dillow, 2010). About five percent of White males dropped out of school in 2008, compared to nine percent of Black males and 20 percent of Hispanic males. As the minority public school population continues to grow in the United States, particularly among Hispanics, the racial/ethnic gap in dropout rates will continue to exist (Aud, Hassar, Planty, Snyder, Bianco, Fox, Frohlich, & Drake, 2010; Rumberger, 1987).

A fourth reason for concern is the potential inaccuracy and poor reliability of the nationally reported dropout rates. The status dropout rate is the most widely reported dropout statistic, which is calculated from data collected through the United States Census Bureau’s Current Population Survey (CPS). Researchers (Barton, 2005; Swanson & Chaplin, 2003; Greene & Winters, 2006; Miao & Haney, 2004) have recently suggested that the dropout rate is much higher than reported, particularly for Blacks and Hispanics. These researchers have argued that the CPS data have a number of potential biases that tend to deflate the dropout rates. The sources of bias include: the inclusion of General Educational Development (GED) degrees along with regular high school diploma recipients as high school graduates¹, the exclusion of certain individuals (i.e., individuals who are younger than age 16, incarcerated, or in the Armed Forces), and self-reporting bias regarding school enrollment and/or level of educational attainment.

¹ The inclusion of GED recipients as high school graduates has been an area of contention. Evidence suggests that the performance of GED recipients in the job market and postsecondary institutions is not equivalent to that of regular high school diploma recipients. GED recipients, however, have more years of schooling, have higher levels of cognitive skills, and are more likely to enroll in postsecondary education as compared to high school dropouts (Boesel, Alsalam, & Smith, 1998; Cameron & Heckman, 1993; Chaplin, 2002; Tyler, Murnane, & Willet, 2000). In addition, the number of individuals who have received a GED has increased in recent years (American Council on Education, 2010). Therefore, when examining dropout rates of traditional four-year high schools counting GED recipients as high school graduates will deflate dropout rates.
The poor reliability of dropout data prompted Swanson and Chaplin (2003) to develop an alternative measure, called the Cumulative Promotion Index (CPI). The CPI relies on enrollment information and high school diploma counts from the Common Core of Data (CCD). This United States Department of Education (USDOE) database contains a wide array of administrative data on public schools and local education agencies. The use of the CCD, therefore, provides a direct measure of public school performance throughout the country as opposed to the CPS, which relies on a sample of individuals from public and private schools. Swanson and Chaplin reported that in 2001 as few as two-thirds of ninth graders completed public high school with a regular diploma four years later. This statistic was even lower for large districts with high enrollment of minorities.

A fifth reason for concern is due to the differences among schools in their ability to graduate students. Balfanz and Legters (2004) found that one in five high schools in the United States have weak “promoting power”, indicating low graduation rates and high dropout rates. Balfanz and Legters labeled these schools “dropout factories.” Promoting power refers to the number of freshman within a high school in comparison to the number of seniors four years later. High schools with the weakest promoting power are those that have 50 percent or fewer seniors than there were freshmen four years earlier, meaning students in these schools have a 50/50 chance of graduating on time, if at all. High schools with weak promoting power are concentrated in cities, such as New York, Chicago, and Los Angeles, and are primarily attended by minority students. Although promoting power is only a proxy for schools’ graduation and dropout rates, it implies that some schools, more than others, are successful in preventing their students from dropping out.
Lastly, with the passing of the No Child Left Behind (NCLB) Act in 2002, public high schools face potential consequences for not meeting specific graduation rate requirements (United States Department of Education, 2001). Based on the terms of NCLB, state education agencies hold schools accountable to a set of performance standards. Each year, schools submit their progress on meeting these performance standards through an adequate yearly progress (AYP) report. If the standards are not met for two consecutive years, then the school is identified as “in need of improvement.” Continued failure can lead to withholding of federal funds, loss of students and staff to other schools, or, ultimately, school closure.

Based on the concerns outlined above, dropping out of high school remains a current problem within schools and throughout society. NCLB took one of the first steps to ensure that all students receive a high school diploma by holding schools accountable for graduation rates. Yet in order to assist schools in the effort to increase graduation rates and educators and policymakers must better understand why students make the decision to leave school prior to completion.

**Rationale for Study**

To date, there is a vast body of literature that focuses on understanding why students drop out of school. Empirical research has identified numerous factors that contribute to a student’s decision to drop out, including both individual student attributes (e.g., demographic characteristics, educational background, attitudes, and behaviors) as well as students’ family, school and community (Rumberger, 2004). Several theories have been developed that suggest that dropping out does not occur as an isolated event in time, but rather is the final stage of a dynamic and cumulative process of disengagement from school (Finn, 1989; Newmann et al., 1992; Rumberger & Larson, 1998; Wehlage et al., 1989). The decision to drop out is not the
result of one incident, but rather is based on students’ engagement or active involvement in learning and school activities over the course of their school career. As students make the transition from elementary school to high school their level of engagement may change as individual or school factors change (e.g., changes in family structure, ease of academic material, relationship with teachers or school environment).

In recent years, the construct of engagement has received increased attention for its ability to explain and predict educational attainment (National Research Council, 2004). Despite this attention, researchers have argued that engagement lacks a standard and comprehensive definition and measure (Appleton, Christenson, & Furlong, 2008; Fredricks, Blumenfeld, & Paris, 2004; Glanville & Wildhagen, 2007). These limitations have led to variations in how researchers conceptualize and operationalize engagement, which has resulted in an incomplete understanding of the relationship between engagement and dropping out.

Broadly defined, engagement is students’ active commitment and involvement in learning and school activities (Fredricks et al., 2004; Newmann et al., 1992). In a review of literature on engagement, Fredricks et al. (2004) defined engagement as a meta-construct comprising behavioral, emotional, and cognitive domains. The authors argue that these domains are interrelated; therefore, focusing on only one domain separates students’ behavior, emotion, and cognition and does not provide a comprehensive understanding of students’ engagement in school. Much of the current literature, however, only examines the effects of one or two domains on dropping out, as opposed to considering all three.

Fredricks et al. (2004) describe behavioral, emotional, and cognitive engagement as dimensions as opposed to domains. As it is interpreted here, however, the constructs of behavioral, emotional, and cognitive engagement are viewed as domains which have multiple dimensions. For example, behavioral engagement comprises both participation in class and adherence to school rules, which are two different dimensions that fall under the behavioral domain.
Behavioral engagement represents behaviors that demonstrate students’ involvement in academic and/or social activities, as well as their adherence to school rules (e.g., attending school and/or class regularly, and not participating in disruptive behaviors). Emotional engagement refers to students’ affective reactions to their experiences in school, such as students’ feelings and attitudes towards teachers, peers, schoolwork, and school overall. Cognitive engagement refers to students’ psychological investment in learning or a willingness to go beyond the requirements and prefer challenge.

The conceptualization of engagement as students’ commitment or involvement implies that there are qualitative differences in the level or degree of engagement (Fredricks et al., 2004). The vast majority of studies have shown that prior to dropping out students exhibit low levels of behavioral engagement, such as not attending school or class regularly, not adhering to school rules, not attending class prepared to learn, and/or not participating in school activities (Ekstrom, Goertz, Pollack, & Rock, 1986; Finn & Rock, 1997; Mahoney & Cairnes, 1997; McNeal, 1995; Ream & Rumberger, 2008; Rumberger & Larson, 1998; Rumberger & Palardy, 2005). Behavioral engagement as measured by attendance and cutting classes has been shown to be one of the most proximal and strongest predictors of dropout risk (Rumberger, 1995; Rumberger & Larson, 1998).

Low levels of emotional engagement are reflected in students’ attitudes such as lack of interest, boredom, sadness, and anxiety (Fredricks et al., 2004). Students who dropped out of school have frequently reported that they “did not like school” or they “could not get along with teachers” as their reason for leaving (Ekstrom et al., 1986; Rotermund, 2007; Rumberger, 2004). Ethnographic studies indicate that students who drop out of school often feel disconnected from teachers, complain that their teachers do not care about them, are not interested in how well they
do in school, and are unwilling to help with problems (Fine, 1986, 1991; Wehlage et al., 1989). Croninger and Lee (2001) found that students who reported having supportive teachers that they could depend on were more likely to persist through graduation. This finding was particularly true for students who were most at risk (i.e., low family income, racial/ethnic minority, language-minority, a single-parent household, or parent who did not complete high school) for dropping out.

Fewer studies have examined the relationship between cognitive engagement and dropping out of school. Connell and Wellborn (1991) described low levels of cognitive engagement in terms of students who do not want to work hard, do not have independent work styles, and do not have positive coping strategies when faced with failure. Most of the dropout literature, however, has measured cognitive engagement through behavioral interpretations, such as time-on-task or enrollment in advanced or academic focused coursework (Finn & Rock, 1997; Rumberger & Thomas, 2000; Lee & Burkam, 2003). One study that defined cognitive engagement as students’ perceptions of their investment in learning found that cognitive engagement had an indirect effect on dropping out of school through students’ academic achievement (Rotermund, 2010).

In addition to understanding the relationship between engagement and dropping out, it is also important to understand if the effect of engagement on dropping out is different for different groups of students. The literature does not examine interactions of the domains with other student background characteristics (e.g., gender, race/ethnicity, educational background, etc.) on dropping out. The analysis of interaction effects could provide educators with useful information that would allow them to target a specific domain of engagement depending on the needs of the student (Lee & Burkam, 2003).
Researchers also believe that engagement results from an interaction between the individual and his/her environment, suggesting that schools can promote high levels of engagement (Finn & Rock, 1997; Fredricks et al., 2004; National Research Council, 2004; Newmann et al., 1992; Wehlage et al., 1989; Weiss, Carolan, & Baker-Smith, 2010). In a synthesis of almost a hundred case studies of secondary schools, Newmann et al. (1992) outlined characteristics of schools that influence student engagement. These include establishing clarity of purpose, fairness, personal support, authentic work, a caring environment, and provide opportunities for success.

Research on the relationship between student engagement and school characteristics provides evidence to support these characteristics. Natriello (1984) interviewed students about disciplinary practices in their schools and found that students who perceived their schools as lacking fairness in implementing rules were more likely to be behaviorally disengaged, that is, be absent from school, not participate in class, and disturb the teacher and the class. Finn and Voelkl (1993) found that there is a relationship between engagement and school size. More specifically, students with higher absenteeism, low levels of classroom participation, and poor perceptions of the school environment attended larger schools. Using data from the National Educational Longitudinal Study of 1988 (NELS:88), Lee and Smith (1993, 1995) found that students in schools characterized as communal organizations (i.e., a shared commitment to a common set of goals, communication in decision making, and expectations) showed higher engagement and greater gains in engagement over time. Engagement was measured as students’ behaviors and attitudes about their current high school and classes.

School effectiveness research supports the finding that the school context can influence students to leave school prior to graduation (Bryk & Thum, 1989; Fine, 1991; McNeal, 1997;
Rumberger, 1995). Dropout rates have been shown to vary substantially among schools, even after controlling for background characteristics of students (e.g., gender, race/ethnicity, socioeconomic status) (Rumberger, 1995, 2004; Rumberger & Palardy, 2005; Rumberger & Thomas, 2000). In a review of research on dropping out, Rumberger (2004) identified four factors of the school context that have accounted for the differences in dropout rates between schools: (1) student composition (e.g., school size, school economic status), (2) school resources (e.g., teacher salary), (3) school structural characteristics (i.e., location, size, control), and (4) school processes (i.e., school policies and practices). The first three factors are considered “inputs” and are generally “given” to the school (Hanushek, 1989), whereas, the school has more control over its own processes (Rumberger, 2004).

Of particular interest in this study is how school processes influence student engagement. School processes include school policies and practices about how schools are organized and managed, both academically and socially, the teacher practices used, and the climate created for student learning. A number of school processes have been shown to affect dropping out, such as students taking advance courses and students’ perceptions of a fair discipline policy and safe environment (Bryk & Thum, 1989; Rumberger, 1995; Rumberger & Palardy, 2005). Studies have also found that schools with high morale and academic press and where teachers reported greater control over curriculum and discipline policy also had lower dropout rates (Rumberger & Palardy, 2005; Werblow, Robinson, Duesbury, 2010). Another study revealed that high schools where teachers had high expectations for student learning and where principals had strong leadership had lower dropout rates (Rumberger & Palardy, 2005). What is missing from this research is how school processes interact with engagement to reduce dropping out. This
particular study will explore how administrator control and school morale interacts with student engagement to predict dropping out.

Together the student engagement and school effectiveness research support the idea that schools can promote high levels of engagement to prevent dropping out; yet, the research is limited by the lack of studies that test this hypothesis. The current research also does not consider how school processes interact with each of the domains of engagement to mediate dropping out. The benefit of engagement as a meta-construct is that there are multiple pathways that could lead to increasing engagement and decreasing the drop out risk. This study will provide information on how specific school processes (i.e., administrator control and school morale) influence student engagement. Furthermore, this study will explore whether or not the effects of these school processes on engagement are different for different types of schools, such as schools with varying sizes, or control (i.e., public or private).

The research presented above supports the theory that dropping out is the result of disengagement from school. Although this research is comprehensive the literature suffers from three limitations: (1) inconsistency in how studies define and operationalize engagement when examining its relationship with dropping out, (2) lack of an examination of interaction effects between engagement and students’ demographic and educational background, and (3) lack of a clear understanding of how specific school processes around administrator control and school morale affects student engagement to mediate dropping out. This study improves upon these limitations and provides a more comprehensive understanding of the relationship between engagement, school processes, and dropping out. Furthermore, it can help inform researchers, school staff, and policymakers on how schools can influence students’ engagement to prevent students from dropping out of school.
Theoretical Framework

The conceptual model, in Figure 1, illustrates the theoretical framework for this study. The model was based on prior theories and conceptual models of dropping out that suggest that students’ background prior to entering high school influences their engagement, which in turn influences their educational performance, more specifically students’ academic achievement and dropping out (Finn, 1989; Newmann et al., 1992; Rumberger & Larson, 1998; Wehlage et al., 1989). Engagement is characterized as a meta-construct consisting of behavioral, emotional, and cognitive domains that are interrelated. The model suggests that engagement is a mediator between students’ background and their educational performance. The double-headed arrow between engagement and academic achievement posits that there is reciprocal relationship between engagement and academic achievement. That is, changes in engagement may influence students’ academic achievement, which then influences students’ engagement. Both engagement and academic achievement have a direct influence on graduating or dropping out. The theoretical framework also suggests that the school context influence students’ educational background, engagement, and educational performance. Therefore, in theory, schools can modify their context to increase student engagement and prevent students from dropping out.
Purpose of Study

The purpose of this study was to examine the effects of student engagement on dropping out of high school. More specifically, the goal was to understand whether lower levels of student engagement predict dropping out, and, if so, for whom and under what conditions. To achieve this goal, this study improved upon the weaknesses of the existing literature. Data from the Educational Longitudinal Study of 2002 (ELS:2002) were analyzed to answer this study’s research questions. The ELS:2002 is a longitudinal panel study with a nationally representative sample of tenth-grade students from public, Catholic, and other private schools throughout the United States. Students were surveyed in 2002 when they were in tenth grade and then again two years later in 2004. The survey data contain information on students’ background characteristics, engagement indicators, school processes, and dropout status. In addition, students’ high school transcripts were collected in the winter of 2004, about six months after expected graduation. The
transcripts provided information on students’ course taking, grades received, and enrollment status. The enrollment status specified whether students transferred, graduated early, dropped out, or graduated in June 2004, which allows for this study to make a specific comparison of dropouts and graduates.

To gain a better understanding of the relationship between engagement, school processes, and dropping out of high school, this study addresses five specific research questions:

1. Does factor analysis support the hypothesis that engagement consists of multiple dimensions within three domains (behavioral, emotional, and cognitive)?

2. Within the students’ high schools, how do the domains of engagement influence dropping out of school in contrast to students who graduate, after controlling for other student characteristics (e.g., student demographics, family background, and educational background and values)?

3. Within the students’ high schools, how do the domains of engagement influence dropping out of school in contrast to students who graduate for students in various subgroups (i.e., gender, race/ethnicity, native language other than English, socioeconomic status, and, academic achievement), after controlling for other student characteristics?

4. How do school processes (i.e., administrator control and school morale) influence the effects of the domains of engagement on dropping out after controlling for other school contextual factors (i.e., student composition, school resources, and school structural characteristics)?

5. How do school processes (i.e., administrator control and school morale) influence the domains of engagement on dropping out for schools of varying structural
characteristics (i.e., enrollment and school control), after controlling for other school contextual factors?

The first research question was addressed using factor analysis. The remaining research questions were addressed by using hierarchical generalized linear modeling (HGLM). To answer Research Question 2, student background characteristics were entered into the student-level (Level 1) model, to capture important differences between students who graduate and those who drop out and then the engagement variables for each domain were entered into the model. The interactions effects of student engagement and student background characteristics were explored to answer Research Question 3. Research Question 4 was answered by entering the school-level control variables and school process variables to determine if there is an effect of school processes on engagement and dropping out. Lastly, the interactions effects were explored between school process variables on engagement and schools with differing structural characteristics, which addressed the fifth research question.

Importance of Study

The results of this study provide researchers, policymakers, and educators with a more comprehensive understanding of the dropout process and how schools or interventions can aim to increase the domains of student engagement and prevent students from dropping out. Although the study’s focus is on tenth-grade students, the results can inform policies and practices for all high school students. This research also contributes to the engagement and dropout literature, by adding nationally representative estimates of the relationship between the engagement, school processes, and dropping out.
Literature Review

A review of the literature on dropping out of school reveals numerous student and school related factors that influence dropout behavior. This review focuses on research that examines factors presented in this study’s theoretical framework (see Figure 1). The first section presents the prominent theories on why students drop out of school and provide a discussion on how engagement and school processes influence dropout behavior. The next section examines research findings on indicators of engagement and their relationship with dropping out. The remaining two sections describe student characteristics and school contextual factors, which are frequently referenced in the literature as predictors of dropping out.

Theories on Dropping Out

Over the past 30 years, researchers have agreed that dropping out of school is a dynamic and cumulative process, as opposed to an isolated event in time (Finn, 1989; Newmann et al., 1992; Rumberger & Larson, 1998; Wehlage et al., 1989). Although different theoretical models are used to describe the dropout process, common amongst them is the idea that the process is one of disengagement from school. In addition, many of the theories suggest that school contextual factors influence both student disengagement and dropping out. In describing the dropout process, researchers describe how students’ involvement, behaviorally, emotionally, and cognitive, in learning and other school activities decline as they transition from elementary school through high school. The section below describes and synthesizes each of the theoretical models, highlighting the theories’ similarities in relation to student engagement and how schools influence the dropout process.

Finn (1989) proposes two alternative models, the frustration-self-esteem model and the participation-identification model. The frustration-self-esteem model hypothesizes that students
who experience consistent school failure develop feelings of frustration and embarrassment, which ultimately leads to an impaired self-view or low self-esteem. Finn explains further that the more these feelings are experienced the more the students begin to exhibit inappropriate behaviors (e.g., continued failure, truancy, etc.), until they ultimately withdraw or are disengaged from school. The participation-identification model proposes that students, who actively participate in school (e.g., participate within the classroom and/or are involved with extracurricular activities), develop a sense of identification with school as a whole. Finn defines identification in terms of two internalized concepts, (a) a feeling of belonging within the school environment and (b) valuing success in school-related goals. Without developing this sense of identification, students do not participate and have less of an opportunity to perform well in school, ultimately withdraw both emotionally and physically from school.

Finn’s (1989) models suggest that there is an emotional and behavioral component to the disengagement process. The models differ, however, in how each of the components influences the final behavior of dropping out. In the frustration-self-esteem model, the emotional component (i.e., students’ feelings of frustration) leads to behavioral disengagement (e.g., truancy). On the other hand, in the participation-identification model the behavioral component (i.e., participation in school) precedes the emotional component (i.e., identification with school).

Similar to Finn’s (1989) models, Wehlage et al.’s (1989) view of the dropout process incorporates an emotional and behavioral component. These components are highlighted in their model through the idea that students’ school membership, or social bond, influences the dropout process. What differentiates Finn’s and Whelage et al.’s model is the belief that the dropout process is jointly influenced by students’ school membership and educational engagement (the psychological investment required to learn), which adds a cognitive component to the dropout
process. Wehlage et al.’s model also stresses the importance of how students’ experiences and interactions with specific features of the school can directly contribute to students’ decision to drop out.

Wehlage et al.’s (1989) model was developed through a detailed evaluation of 14 schools, with exemplary dropout prevention programs throughout the United States. Their model explains dropping out as jointly influenced by school membership and educational engagement. They define school membership in terms of the social bond as defined by Hirschi (2002). According to Hirschi, individuals form a social bond with social institutions, such as schools. The strength of a student’s social bond with school is dependent on the extent to which he or she is attached to adults and peers within the school, is committed to the norms of the school, is involved in school activities, and believes in the legitimacy of the institution. In Wehlage et al.’s application of the social bond, they incorporate aspects of Tinto’s (1987) theory on early college withdrawal to highlight the importance of a mutual exchange of support and commitment that is required between students and school staff. The social bond or school membership is reinforced through the commitment of the school staff to provide a positive school environment, which communicates student success, and the commitment of students to actively engage in learning.

Students’ educational engagement in school is the second component of Wehlage et al.’s (1989) model that influences student success in school. Students who are psychologically invested or engaged in school present signs of intention and commitment to their learning. The level or intensity of engagement is dependent on both the students themselves and on the school’s ability to influence students’ learning. Wehlage et al. explain that promoting educational engagement is a complex process, which requires consideration of students’ characteristics, the difficulty level of the work, the school environment in which learning occurs, and the external
environment that influences the students and the school itself. Yet without the development of
students’ sense of membership to school, the ability of schools to promote educational
engagement is limited. As a whole, Wehlage et al.’s theory places the responsibility of school
completion in both the hands of the student and the school.

Wehlage et al.’s (1989) model was further extended by Newmann et al. (1992) to focus
on academic engagement, which they define as students’ psychological investment and effort
toward learning and mastering skills. Newmann et al. suggest that students need a sense of
competence, membership in school, and need to believe that their school work is meaningful.
They explain that if these needs are met, students will experience high levels of engagement in
school.

Rumberger and Larson (1998) developed a conceptual framework for their work on
school mobility based on the work of Finn (1989), Tinto (1987), and Wehlage et al. (1989). They
define school mobility as one factor of educational stability, which influences educational
attainment. Students who are stable remain in enrolled in school until completion and tend to
attend one elementary school, one middle school, and one high school. Rumberger and Larson’s
framework emphasizes that educational stability includes both a behavioral and cognitive
component. More specifically, their framework posits that social engagement, engagement in
school activities, and academic engagement, engagement in learning, influence both stability
within school (i.e., mobility between schools or dropping out) and academic achievement.
Students’ characteristics, including educational background, experiences, and attitudes, as well
as the characteristics of their families, their schools and their communities influence all
components of the framework. The framework also suggests that reciprocal relationships exist
among each of the factors. Engagement affects stability, and academic achievement, which then
later affects students’ attitudes, involvement, and overall school experiences. Rumberger and Larson view students’ mobility and willingness to drop out as both a cause and a consequence of students’ engagement in school.

Each of the dropout theories described incorporate the construct of engagement as the link to understanding why students drop out of school. Finn’s (1989) models focus on individual factors, whereas, Wehlage et al.’s (1989) and Rumberger and Larson’s (1998) models suggest that dropping out is the result of an interaction between individual student and school factors. Each of the theories provide insight into the dropout process, yet, there is inconsistency in how the theories define engagement. Finn defines engagement using behavioral and emotional definitions; whereas, Wehlage et al. define engagement using behavioral, emotional, and cognitive definitions and Rumberger and Larson use behavioral and cognitive definitions. The inconsistency in how engagement is defined makes it difficult to empirically test the theoretical models.

**Engagement**

In a comprehensive review of the engagement literature, Fredricks et al. (2004) synthesize an array of definitions and measurements used to characterize the construct of engagement. The authors suggest that there is considerable overlap between definitions of engagement and other constructs discussed in the educational and psychological literature, such as student conduct, on-task behavior, attitudes, interests, values, motivational goals, and self-regulated learning. Despite this overlap, the authors argue that their review of literature reveals a pattern that provides a more complex understanding of engagement. They conclude that engagement is best viewed as a meta-construct with three interrelated, domains of behavioral, emotional, and cognitive engagement. Fredricks et al. also explain that considering engagement

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3 See footnote two.
as a construct with three domains provides multiple pathways to affect student outcomes, such as dropping out of school. They argue that engagement is malleable and results from an interaction between the individual and the environment. This suggests that certain school factors may influence engagement and possibly influence each of the domains differently.

In addition to the theoretical validation of engagement as a multifaceted construct, there is also empirical research to support this claim. Glanville and Wildhagen (2007) used data from the National Educational Longitudinal Study of 1988 (NELS:88), a national longitudinal panel study of a cohort of eighth graders, to test a proposed measurement model of engagement. The results of a confirmatory factor analysis (CFA) suggest that engagement is composed of two domains, behavioral (i.e., at-risk behavior, preparedness for class, and teachers’ perception of student effort) and psychological (i.e., value of school and extrinsic motivation) engagement. Archambault, Janosz, Fallu, and Pagani (2009) used data from a longitudinal study, which sampled seventh, eighth, and ninth grade students from 69 schools in Quebec, Canada. The results of both an exploratory factor analysis (EFA) and a CFA supported the multifaceted nature of engagement with three domains, behavioral (i.e., school attendance, and student discipline), emotional (i.e., liking school and interest in school work), and cognitive (i.e., willingness to learn French and willingness to learn mathematics). Furthermore, Rotermund (2010) used data from the Educational Longitudinal Study of 2002 (ELS:2002) and found that the results of an EFA and a CFA supported the theory that engagement was a meta-construct comprised of behavioral (i.e., school attendance and student discipline), emotional (i.e., liking school and interest in school work), cognitive (i.e., effort and persistence) domains.

**Behavioral engagement.** Behavioral engagement is broadly defined as students’ participation or involvement in school. Within the literature, behavioral engagement is typically
measured through attendance in class and school, student conduct, and involvement in academic work and school activities. In general, students are considered to have high levels of behavioral engagement when they attend school and class regularly, adhere to school rules, come to class prepared, complete assignments, and/or participate in extracurricular activities (Finn & Rock, 1997; Finn & Voelkl, 1993).

Research examining the impact of absenteeism indicates that students with higher absenteeism are more likely to drop out and less likely to graduate (Alexander, Entwisle, & Horsey, 1997; Barrington & Hendricks, 1989; Rumberger, 1995; Rumberger & Larson, 1998). Using the NELS:88, Rumberger and Larson (1998) found that high absenteeism in eighth and twelfth grade is predictive of dropping out. In a longitudinal study tracking students from first grade through high school graduation, Alexander et al. (1997) demonstrated that the number of students’ absences in first grade increased the odds of dropping out of high school. Each additional day absent was estimated to increase the likelihood of dropping out by about five percent. Research by Barrington and Hendricks (1989) revealed that dropouts compared to high school graduates showed a pattern of increasing absences throughout their school career. Dropouts were absent twice as often as graduates by grade five and three times as often by grade nine. Studies have also shown that students with a high frequency of cutting class are at risk of dropping out (Ekstrom et al., 1986; Rumberger, Ghatak, Poulos, Ritter, & Dornbusch, 1990).

Behavioral engagement in terms of student conduct is often measured by students’ misbehavior such as, not following school rules, was in a fight with other students, parents received a warning about their behavior, put on an in-school suspension, are suspended from school, or transferred to another school for disciplinary problems. The results of studies using the NELS:88 indicated that eighth-grade students who had high misbehavior in school were less
likely to complete high school and receive a high school diploma (Goldschmidt & Wang, 1999; Rumberger & Larson, 1998; Rumberger & Palardy, 2005). This was true even after controlling for student and family characteristics, as well as school contextual factors (Rumberger & Larson, 1998; Rumberger & Palardy, 2005). In a longitudinal study that followed seventh-grade students from middle school through high school, Cairns, Cairns, & Neckerman (1989) measured student conduct by asking teachers and administrators to identify students who they felt were extremely aggressive. Seventh-grade male students who had two or more teachers or administrators identify them as aggressive were more likely to drop out of high school than seventh-grade male students who were not seen as aggressive. Using the NELS:88, Rumberger (1995) and Goldschmidt and Wang (1999) found that eighth-grade students who had high levels of disciplinary problems in school were also more likely to drop out of middle school.

Another measure of behavioral engagement is students’ involvement or participation in classroom activities. Classroom involvement activities are observable behaviors that indicate a commitment or investment in learning. These behaviors include coming to class prepared, completing homework, paying attention in class, and participating in class discussions (Finn, 2006; Finn & Rock, 1997; Finn & Voelkl, 1993; Voelkl, 1997). Studies using the NELS:88, found that tenth-grade students who reported having low levels of attending class prepared, with a pencil and paper, books, and homework completed, significantly predicted dropping out (Croinger & Lee, 2001; Ream & Rumberger, 2008). Using the same dataset, grade 10 teachers reported that students who dropped out did not work hard to get good grades, complete homework, or pay attention in class, and were more disruptive than their peers who completed high school (Finn & Rock, 1997). Similar results were found in a study that examined these behaviors in first-grade students. Teachers who rated students in first grade as externalizing
behaviors (e.g., teases or fights) and were seen as having poor work habits and low adaptability, had a higher likelihood of dropping out of school (Alexander et al., 1997).

Participation and involvement in school activities is a widely used indicator of behavioral engagement. School activities or extracurricular activities include athletics (e.g., football, baseball/softball, cheerleading, etc.), fine arts (e.g., band, chorus, school plays, etc.), student government, academic clubs (e.g., math team), and services clubs (e.g., volunteer work) amongst others. Many studies have found that students who participate in sports or other extracurricular activities are less likely to drop out (Davalos, Chavez, Guardiola, 1999; Finn, 2006; Mahoney & Cairns, 1997; McNeal, 1995; Ream & Rumberger, 2008). After controlling for student demographics and ability level, McNeal (1995) found that tenth-grade students who participated in athletic teams were 1.7 times less likely to drop out than those who did not participate and 1.2 times less likely to drop out if they participated in fine-arts activities. The findings also indicated that students did not benefit from participating in both athletic and fine-arts activities. Mahoney and Cairns (1997) attempted to capture the magnitude of students’ participation by calculating the number of activities. The results revealed that dropouts participated in significantly fewer extracurricular activities in seventh through tenth grade.

**Emotional engagement.** Emotional engagement focuses on students’ affective reactions to their experiences in school. Researchers measure emotional engagement through a variety of students’ emotions, including interest, boredom, happiness, sadness, and anxiety (Connell & Wellborn, 1991; Skinner & Belmont, 1993). Students are considered having high levels of emotional engagement when they experience feelings of interest, happiness, or a sense of satisfaction or pride regarding their schoolwork, teachers, peers, or school overall (Fredricks et al., 2004).
Ethnographic studies have provided evidence linking students’ emotional engagement to dropping out. In the early 1980s, Fine (1986, 1991) observed a comprehensive high school in New York City over the course of a school year. She attended classes, sat in the deans’ and guidance counselors’ offices, observed the cafeteria, the library, and interviewed parents and students. Through this work Fine revealed that many students in this school were silenced; students were often discouraged from participating in class and in school. As a result, students felt disconnected to the teachers, to the schoolwork, and to school overall. Fine reported that 40 percent of the dropouts interviewed attributed their early leaving to “being bored,” “frustrated,” or “not getting it.” Smaller percentages mentioned being left back, having family problems, or being “pushed out” out by the school.

In an attempt to understand how schools can prevent students from dropping out, Wehlage et al. (1989) conducted case studies at 14 schools with exemplary dropout prevention programs throughout the United States. The case studies involved observations in classes, teachers’ meetings, teacher-student interactions, peer-group interactions, and formal and informal interviews with staff and students over the course of a school year. The synthesis of findings across sites led Wehlage et al. (1989) to believe that students, particularly those at-risk of dropping out, must develop a sense of school membership. Students interviewed expressed wanting to belong and be accepted by their peers, as well as receive support and approval from adults within schools. When students were asked about the strength of their alternative school, they described their alternative schools as friendlier and more caring places then their previous schools.

Findings from studies more quantitative in nature further support the link between students’ emotional engagement and dropping out. Croninger and Lee (2001) found that tenth-
grade students’ positive ratings of their teacher relations significantly reduced the likelihood of dropping out, even after controlling for student background characteristics. Teacher relations were measured based on students’ perceptions of whether teachers were interested in them; were good at teaching; cared about them and whether they succeed in school; recognized and praised them when they worked hard; and valued what they had to say. Eighth-grade students who felt they had high quality teachers were also less likely to drop out of middle school (Rumberger, 1995).

The Baltimore Beginning School Study (BSS) followed a cohort of first-grade students from first grade through high school graduation. Student attitudinal and behavioral information were collected in first, second, fourth, and sixth through ninth grades. The findings revealed that after controlling for the effects of school performance and family background students’ satisfaction with school did not predict dropping out until grade nine (Alexander, Entwisle, & Kabbani, 2001). These findings suggest that students’ emotional engagement at the beginning of high school is critical to the students’ path to graduation. Lan and Lanthier (2003) demonstrated that students, who eventually drop out, perceive their teachers and school less favorably over time, from eighth through twelfth grade.

Another measure of emotional engagement is how students perceive themselves in relation to their peers. Rumberger (1995) found that after controlling for demographic and family and educational background factors eight-grade students, who believed they were viewed positively by their peers (i.e., as popular, athletic, and important), were less likely to drop out of middle school. Students’ peers also influence students’ likelihood of dropping out. Tenth-grade students who reported having friends that value education reduced the likelihood of dropping out of school between tenth and twelfth grade (Ream & Rumberger, 2008).
Cognitive engagement. Cognitive engagement is defined as students’ investment in learning and incorporates students’ willingness to exert the effort needed to comprehend and master new skills. Students with high levels of cognitive engagement prefer hard work, have effective coping skills in the face of failure, use metacognitive strategies, and are able to self-regulate their learning (Connell & Wellborn, 1991; Fredricks et al., 2004). Most of the dropout literature, however, has measured cognitive engagement through behavioral interpretations, such as time-on-task or enrollment in advanced or academic focused coursework (Finn & Rock, 1997; Rumberger & Thomas, 2000; Lee & Burkam, 2003). Although these behavioral indicators provide some insight into a students’ investment in learning, they do not provide a reliable measure of a students’ effort to master new skills. For instance, students in remedial or non-academic track courses may prefer challenge and use metacognitive or self-regulatory skills, but yet need additional assistance in a particular subject area or perhaps they are interested in non-academic courses (e.g., career-technical education).

Few dropout studies have measured students’ perceptions of their investment in learning. Research examining the relationship between cognitive engagement and academic achievement shows that students who perceived themselves as having higher levels of cognitive engagement (i.e., a higher perception of self-efficacy and confidence in the use of cognitive strategies) exhibited greater investment in learning and higher levels of academic achievement (Green, Miller, Crowson, Duke, & Akey, 2004). One study that measured cognitive engagement through students’ perceptions of their investment in learning found that cognitive engagement had an indirect effect on dropping out of school through students’ academic achievement (Rotermund, 2010).
**Student Background Characteristics**

Dropout research has identified several student background characteristics that account for why students drop out of school. Student background characteristics include demographics, family background, and past performance in school. The section below identifies the major indicators identified in the literature within each of these categories.

**Student demographics.** The dropout literature has examined several demographic variables including: gender, race/ethnicity, language background, and learning disabilities. Dropout rates in the United States vary by both gender and race/ethnicity. For instance, in 2008 the proportion of high school dropouts 16- to 24-year-old was higher for males than females as well as was higher for Hispanics and Blacks than for Whites (Snyder & Dillow, 2010). Studies examining dropout rates of high school aged individuals (i.e., 14- to 18 years old) have found that females are more likely than males to drop out. These studies findings, however, vary in terms of whether or not these differences are statistically significant as well as what factors are included in the analyses (Ekstrom et al., 1986; Bryk & Thum, 1989; Lee & Burkam, 2003; Rumberger, 1983, 1995; Rumberger & Larson, 1998; Rumberger & Lim, 2008). After controlling for family and academic background, one study documented no significant relationship between gender and dropping out, but after controlling for a variety of attitudes, behaviors, and indicators of educational performance eighth-grade female students had significantly higher dropout rates than male students (Rumberger, 1995).

Students’ race and ethnicity have also been found to predict dropping out. Studies have demonstrated that Black, Hispanic, and Native American students have significantly higher odds of dropping out than White students (Rumberger, 1983, 1995; Rumberger & Larson, 1998). Although many studies suggest that this relationship can be explained by other factors, such as
family background or educational performance (Rumberger & Lim, 2008). Rumberger and Larson (1998) found that after controlling for differences in family and educational background characteristics, only Hispanic and Native American students were more likely to drop out compared to white students. Another study revealed that regardless of students’ race and ethnicity, Black and Hispanic students with the same background characteristics as White students were just as likely or even less likely to drop out of high school as Whites (Rumberger, 1983).

Language background is an important indicator of whether or not students are able to participate in school, given that the primary language of instruction in school is English. Studies have found that students with higher English language proficiency have lower dropout rates, after controlling for other background characteristics (Griffen & Heidorn, 1996; Perreira, Harris, & Lee, 2006; Zsembik & Llanes, 1996). On the contrary, Lutz (2007) found that biliterate Hispanic students had higher graduation rates than other English-proficient and Spanish-dominant Hispanics as well as had higher graduation rates than non-Hispanic whites, after controlling for other background characteristics.

Another demographic indicator of dropping out is whether or not students have a learning disability. Students with learning disabilities have much higher dropout rates than students without learning disabilities. Data from the NELS:88 show that the dropout rate for students with learning disabilities was 26 percent and the dropout rate for students with emotional or behavioral disorders was 50 percent, while the dropout rate for students without disabilities was 15 percent (Reschly & Christenson, 2006). Similar to the other demographic variables, the effects of disabilities are mediated by other factors. Reschly and Christenson (2006) found that after accounting for achievement test scores, grade retention, and socioeconomic status (SES),
students’ engagement (i.e., indicators of behavioral, emotional, and cognitive engagement) were significant predictors of school dropout for students with learning disabilities and emotional and behavioral disorders.

**Family background.** Research suggests that families exert an important influence on students’ decision to stay in school or drop out. There are three aspects of families that have been identified as having an influence on students: (1) family resources, (2) family structure, and (3) family practices. Much of the research indicates that students from families with more resources, a cohesive family structure, and a high level of parental involvement are less likely to drop out of school.

SES is a widely used indicator of family resources. SES is most commonly measured by parental education and income, although, many studies use an SES composite index based on measures of parents’ years of education, occupational status, and income. Research has demonstrated that students from high SES families are less likely to drop out than those from low SES families (Ekstrom et al., 1986; Janosz, LeBlanc, Boulerice, & Tremblay, 1997; McNeal, 1997; Rumberger, 1983, 1995; Rumberger & Larson, 1998). Students from low SES households are also twice as likely as students from average SES households to not complete high school (Rumberger & Larson, 1998).

Family structure refers to whether or not students live in a family with two biological parents, a single parent, or a step parent. Numerous studies have shown that students from single-parent families and step-families are more likely to drop out than students from two-parent families (Ekstrom et al., 1986; Goldschmidt & Wang, 1999; Rumberger, 1983, 1995; Rumberger & Larson, 1998). One study found that students, who changed from living with both parents in eighth grade to living with only their mother or father four years later, were more likely to drop
out of high school (Pong & Ju, 2000). However, after controlling for family demographics, income loss, and student achievement there was no evidence of increased risk.

Family resources and structure reveal little about the underlying processes that may influence dropout behavior. Research on family practices, however, provides insight as to how families influence students’ schooling (Ensminger & Slusarcick, 1992; Rumberger et al., 1990). Results from a study using a matched-pair design of students, who dropped out or remained in one California high school, suggest that families exert considerable influence on students’ persistence to stay in school (Rumberger et al., 1990). Compared to students who have similar demographic and grade profiles, dropouts are more likely to come from families in which they have to make decisions on their own and in which their parents are less involved in their education.

**Educational background.** Students’ educational background includes indicators of their academic achievement, coursework, retention, and transferring schools. Several studies have found that poor academic achievement in eighth and tenth grade, as measured by test scores and grades, is a strong predictor of dropping out (Ekstrom et al., 1986; Janosz et al., 1997; Lee & Burkam, 2003; Rumberger, 1995; Rumberger & Larson, 1998). Studies also show that academic achievement in elementary school can predict whether students will drop out in high school (Alexander et al., 1997; Ensminger & Slusarcick, 1992). Individually, first-grade students’ reading and mathematics report card grades and scores on a standardized achievement test were predictive of dropping out of high school. Yet, once students’ grades were accounted for, students’ achievement test scores were no longer statistically significant. In a review of literature, Rumberger and Lim (2008) indicate that the results are more consistent for grades than for test scores. They explain further that the results of test scores may represent students’ ability
measures on one day, whereas, grades reflect students’ effort as well as ability throughout the school year.

In general, students must take a prescribed number and specific types of courses to graduate from high school. Research has found that students who take less academically rigorous courses are more likely to drop out. Using the NELS:88 study, after accounting for student background characteristics, students who took remedial courses in ninth or tenth grade were more likely to drop out of high school than other students (Rumberger & Thomas, 2000). Lee and Burkam (2003) found similar findings, using the same dataset, for students who did not take academic mathematics courses (i.e., Algebra I or higher) by the end of tenth grade. Studies using the High School and Beyond study (HS&B), a nationally representative sample of high schools serving tenth and twelfth grades in 1980, have also found that students in an academic track were less likely to drop out than their peers, after controlling for student demographic characteristics and academic ability (McNeal 1995, 1997).

Research has also provided evidence supporting retention as an important predictor of whether students dropout. Most studies have examined the effect of retention in elementary or middle school (Brooks-Gunn, Guo, & Furstenberg, 1993; Goldschmidt & Wang, 1999; Rumberger, 1995; Rumberger & Larson, 1998; Rumberger & Palardy, 2005). Data from the NELS:88 suggest that students who were retained in grades one to eight were four times more likely to drop out between eighth and tenth grades than students who were not retained, even after controlling for students’ family SES and academic achievement (Rumberger, 1995). Students’ age has also been used as an indicator of retention. It is assumed that students who are older than other students in their grade level are over-age and could have been retained.4 Similar

4 Not all students who are over-age were retained in school. Students may be over-age due to entering school at an above-average age for a particular grade.
to the results examining the impact of retention, students who are over-age are more likely to
drop out of high school (Cairns et al., 1989; Janosz et al., 1997; Jimerson, Anderson, & Whipple,
2002)

Transferring schools is another predictor of dropping out (Rumberger, 1995; Rumberger
& Larson, 1998; Rumberger & Thomas, 2000; Swanson & Schneider, 1999). Students may
transfer schools voluntarily (e.g., they find a more suitable school) or involuntary (e.g., due to
behavior problems or their family relocates). The findings from one study, using the NELS:88
data, revealed that after controlling for demographic and family background characteristics, each
time a student changed schools between first and eighth grade (other than regular promotion)
increased the odds of dropping out by 23 percent (Rumberger, 1995). Another study using the
NELS:88, found that after controlling for student and family background and educational
experiences in eighth grade, students whose families moved between the eighth and twelfth
grades were more likely to drop out than students whose families did not move (Rumberger &

School Contextual Factors

As discussed previously, theories on why students drop out of school not only consider
individual student factors, but also suggest that school contextual factors influence students’
decision to leave school early (Wehlage et al., 1992; Rumberger & Larson, 1998). Empirically,
research has found that dropout rates vary between schools, even after controlling for student
background characteristics (Rumberger, 1995, 2004; Rumberger & Palardy, 2005; Rumberger &
Thomas, 2000). Rumberger (2004) reported that the dropout rates for a sample of 247 suburban
and urban high schools in 1990 varied from less than two percent to over 40 percent. These rates
were less variable after adjusting for differences in the background characteristics of students, yet the rates still showed fairly large differences among the schools.

The research literature references four types of school contextual factors that account for the variation in dropout rates between schools: (1) student composition, (2) school resources, (3) school structural characteristics, and (4) school processes. Although each of these factors could be altered through policy, schools have more direct control over changing their own processes (Rumberger, 2004). The first three factors are often referred to as school “inputs” because they are given to the school by the state education agency or local school district (Hanushek, 1989). As described below research has explored how these school factors influence dropout rates, yet, the literature is limited in presenting evidence on how school factors influence student engagement to reduce dropout rates. The influence of school processes on students’ engagement is of particular interest in this study, given that schools can change these processes directly.

**Student composition.** The student composition of a school includes the demographic characteristics and educational performance of students within the school. Research has demonstrated that student characteristics not only influence student dropout rates at an individual level, but also at the school level. Several studies have found that the student composition of schools predicts dropout rates even after controlling for the individual effects of student background characteristics (Bryk & Thum, 1989; Goldschmidt & Wang, 1999; McNeal, 1997; Rumberger, 1995; Rumberger & Thomas, 2000).

Indicators used to measure student composition within a school include percent minority, mean SES, and mean academic achievement. Using a national sample of schools serving eighth-grade, Rumberger (1995) found that eighth-grade students in schools with high SES students (i.e., more than 50 percent of students receive free lunch) and a low percentage of minorities
(i.e., more than 40 percent of students are black or Hispanic) had lower odds of dropping out of school. Similar findings were found using a national sample of schools serving tenth grade. After controlling for differences in the background characteristics of students and differences in other school-level predictors, low-SES high schools had dropout rates about 60 percent higher than average-SES high schools (Rumberger & Thomas, 2000). Using the same dataset, Lee and Burkam (2003) found that after controlling for students’ achievement prior to high school, high school dropout rates no longer had a statistically significant relationship with school SES, minority concentration, or students’ average GPA in mathematics in ninth grade. Another study also found that after controlling for a number of school resource, structural, and process variables, the composition variables were not statistically significant (Rumberger & Palardy, 2005).

**School resources.** School resources consist of both fiscal and material resources schools provide, such as teachers, textbooks, and space. Amongst the school effectiveness literature, there is much debate as to what extent school resources have an impact on school outcomes (Greenwald, Hedges, & Laine, 1996; Hanushek, 1997). Dropout studies have measured school resources through student-teacher ratios, teacher salaries, and measures of teacher quality (e.g., percentage of teachers with advanced degrees). Results of studies examining the impact of student-teacher ratios on dropping out and teacher salaries, revealed that low student-teacher ratios and high teacher salaries had positive and significant effects on high school dropout rates, even after controlling for student factors and student composition (McNeal, 1997, Rumberger, 1995; Rumberger & Palardy, 2005; Rumberger & Thomas, 2000). Relatively few studies found significant effects of teacher quality, as measured by the percentage of teachers with advanced degrees, on dropout rates (McNeal, 1997; Rumberger & Palardy, 2005).
**School structural characteristics.** Structural characteristics include school location (urban, suburban, rural), type of control (public, private), and school size. Research examining the extent to which structural characteristics contribute to school dropout rates provides mixed results. Rumberger and Lim (2008) argue that the variation in findings is due to high correlations between the structural characteristics of schools and other school inputs, such as student composition and resources. One study found that after controlling for student background characteristics, attending an urban school in eighth grade increased the odds of dropping out by 50 percent compared to students attending a suburban or rural school (Rumberger & Larson, 1998). Using the same dataset, but with a focus on schools serving tenth-grade students, another study found that attending an urban school decreased the odds of dropping out compared to students in suburban schools, after taking into consideration student characteristics and the schools’ student composition and resources (Rumberger & Thomas, 2000).

School control refers to whether or not a school is public or private. Private schools include Catholic, other religious, and non-religious schools. Most studies have found that dropout rates from Catholic and other private schools are lower than dropout rates from public schools, even after controlling for differences in the background characteristics of students (Bryk & Thum, 1989; McNeal, 1997; Rumberger & Larson, 1998; Rumberger & Thomas, 2000). Another study found lower dropout rates among Catholic schools after controlling for schools’ student composition and resources, but no statistically significant effect after controlling for school processes, such as the mean number of advanced courses, principal leadership, and teacher control (Rumberger & Palardy, 2005).

School size also appears to influence school dropout rates. One study, using the NELS:88, found that students who attended high schools with enrollment between 1,501 and
2,500 students (large schools) were more likely to drop out than students who attended high schools with enrollment between 601 and 1,500 (medium sized schools) (Lee & Burkam, 2003). Another study, using the same dataset and different selection of control variables, as well as a single measure of school size found that larger high schools had lower dropout rates than smaller sized high schools (Rumberger & Thomas, 2000). Pittman and Haughwout (1987) used the HS&B data and found an indirect effect on high school size and dropping out. The results indicated that high school size influenced course availability and school climate, but did not influence dropping out directly. Both course availability and school climate had a direct impact on dropping out. The larger the high school the more courses and programs were available, but the less positive the school social climate and the lower the high schools’ dropout rate.

Within the engagement literature, research has demonstrated that school size also influences students’ engagement. Finn and Voelkl (1993) found that students attended school less frequently, did not attend class prepared, and were less engaged (based on teachers’ reports of homework completion, attentiveness, and disruptions in class) in schools with larger eighth-grade enrollment. Weiss et al. (2010) found significant differences related to tenth-grade student engagement (composite capturing students’ behavioral and cognitive attitudes and behaviors) between high schools of different sizes. Compared with students attending small high schools (1-599 students), students in high schools with 1,000 to 1,599 students or with more than 1,600 students had lower levels of engagement.

**School processes.** School processes refer to school policies and practices, related to how the school is managed, the teacher practices used, and the climate created for student learning. Compared to schools’ student composition, resources, and structural characteristics, schools have a fair amount of control over their own processes (Rumberger, 2004). The research literature
suggests that there are two ways school policies and practices can influence students from dropping out of school. One way is indirectly, through school processes that promote student disengagement. Students indirectly influenced by school processes will voluntarily withdraw from school. The other way is directly, through explicit policies that cause students to involuntarily leave school prior to graduation. These policies may be related to low grades, poor attendance, misbehavior, or being over-age. Qualitative studies have revealed how schools will exclude and discharge low-achieving and problematic students (Fine, 1986, 1991; Riehl, 1999). From interviews in 10 high schools, Riehl (1999) found that instead of assisting students who are having difficulty in school, schools would recommend that problematic students enroll in GED or alternative education programs. Enrollment in GED or alternative education programs would benefit the schools, because these students are typically not considered dropouts by school districts and keep the schools’ dropout rates low.

A number of school processes have been shown to have a relationship with school dropout rates. One study found that high schools where teachers had high expectations for student learning and more control over curriculum and discipline policy had lower dropout rates (Rumberger & Palardy, 2005), even after controlling for student and other school contextual factors. The results of this study also indicated that schools had higher dropout rates where teachers reported strong principal leadership. The authors suggest that together these results reveal potential differences in how teachers and principals handle students at-risk of dropping out. Another study found that after controlling for student and other high school factors, administrators’ perceptions of their school’s morale and academic press were associated with a significant decrease in dropout rates (Werblow et al., 2010).
Other studies have revealed impacts of academic and social climate on dropping out. Several studies have found that after controlling for student and other school factors, schools where students reported feeling unsafe and having a poor disciplinary climate had higher dropout rates (Bryk & Thum, 1989; Rumberger, 1995; Rumberger & Palardy, 2005). Academic climate has also been found to alleviate dropping out. Students were less likely to drop out if they attended schools with more students taking academic or advanced courses (Bryk & Thum, 1989; Lee & Burkam, 2003; Rumberger & Palardy, 2005).

Research on school effectiveness and student engagement revealed that certain school processes influence high levels of student engagement. Using the NELS:88, Lee and Smith (1993, 1995) demonstrated that students in schools characterized as communal organizations (i.e., a shared commitment to a common set of goals, communication in decision making, and expectations) showed higher engagement and greater gains in engagement over time. Engagement was measured as students’ behaviors and attitudes about their current high school and classes.
Method

This study used data from the Educational Longitudinal Study of 2002 (ELS:2002) (extracted from the restricted-use CD), a national longitudinal panel study sponsored by the United States Department of Education (USDOE) and the National Center of Educational Statistics (NCES). The purpose of the ELS:2002 was to monitor students as they progress from tenth grade through high school on to postsecondary education and/or the workforce. The ELS:2002 targeted students who were enrolled in tenth grade in public, Catholic, and other private schools in the 2001-2002 school year. Data were collected from five surveys (administered to students, their parents, teachers, school librarians, and administrators), two achievement tests (reading and mathematics), a school observation form (facilities checklist), and high school transcripts. These data were well suited for this study because they contain extensive information on both students who graduated from high school and those who did not. More specifically, the ELS:2002 collected information related to students’ demographics, family background, educational background, engagement, and dropout status. In addition to student-level data, the ELS:2002 includes school-level indicators regarding the schools’ student composition, resources, structural characteristics and processes. Given that this study uses the ELS:2002 restricted-use data, all Ns are rounded to the nearest 10 unless the data are publically available.

Sample

The ELS:2002 sample was comprised using a two-stage sample selection process, with schools selected in the first stage and students selected in the second stage (Ingles, Pratt, Rogers, Siegel, Stutts, & Owings, 2004). The base-year included two primary target populations: schools with tenth-grade enrollment and tenth-grade students enrolled in the spring term of the 2001-
2002 school year. The following section provides a description of the base-year and first follow-up sampling design as well as the criteria for the sample selected for the proposed study.

**Base year schools.** Schools were selected in the first stage of the stratified random sampling design. The target population of schools consisted of regular public schools (including state Department of Education schools and charter schools), Catholic, and other private schools that had tenth-grade enrollment and were located in the United States (the 50 states and the District of Columbia). All public and private schools with tenth-grade student enrollment were eligible to participate except for: ungraded schools, Bureau of Indian Affairs Schools, special education schools, detention centers or correctional facilities, and Department of Defense schools outside of the United States.

The sampling frame of schools was created using the 1999-2000 Common Core of Data (CCD) and the 1999-2000 Private School Survey (PSS). A sample of schools was selected using a stratified sampling procedure with probabilities proportional to school size. The stratification process was conducted separately for public and private schools. The sampling frame of public schools was stratified by the nine United States Census divisions, which divide the 50 states into geographic regions.\(^5\) Within each of the United States Census division strata, the schools were then stratified by metropolitan status (i.e., urban, suburban, and rural). The sampling frame of private schools was stratified by the four-level Census regions (i.e., Northeast, Midwest, South, and West) and then stratified again by metropolitan status.

As reported in Ingels et al. (2004), of the approximately 27,000 schools across the nation, a total of 1,268 (4.7%) schools were sampled—953 (3.5%) public schools, 140 Catholic schools

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\(^5\) The nine United States Census divisions include New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific. To be consistent with the National Educational Longitudinal Study of 1988 (NELS:88) stratification, the New England and Middle Atlantic Census divisions were combined (Ingels et al., 2004).
(0.5%), and 175 (0.6%) other private schools. Of the 1,268 schools sampled, 1,221 (96.3%) met the definition of the target population. Out of the 1,221 eligible schools, 752 (61.6%) schools agreed to participate, that is, agreed to conduct a Survey Day, where data collection would occur. The 752 participating schools included 580 (77.1%) public schools, 95 (12.6%) Catholic schools, and 77 (10.2%) other private schools.

**Base-year students.** In the second stage of sampling, the target population of students consisted of tenth-grade students enrolled in the target population schools in spring 2002 (excluding foreign exchange students). Each school was asked to provide tenth-grade lists to establish a student sampling frame. Students were selected using a stratified systematic sampling procedure, stratified by student ethnicity (Hispanic, Asian, black, and other). Hispanic and Asian students were oversampled to ensure a minimum sample size. Ingels et al. (2004) reported that approximately 26 students from each participating school were selected, resulting in a sample of 19,218 tenth-grade students of which 17,591 (91.5%) students were eligible to participate and 15,362 (79.9%) responded to the student base-year survey. On average 22.1 students from each school participated; however, the number of participants ranged from as few as four students to as many as 38 students across the participating schools (Ingels et al., 2004).

All students selected were eligible to participate, including students who received special education services, had Individualized Education Plans (IEPs), received bilingual education or English as a Second Language (ESL) services. However, students with disabilities were excluded from the achievement tests if their IEP recommended that they should be excluded from standardized assessments. If the students’ IEP stated that they could be assessed with accommodations (e.g., increased time, alternative setting, test preparation, or response), then the students participated in the test administration, as long as the school provided the
accommodations. Students’ whose native language was not English were excluded from the achievement tests and survey if they had not received at least three years of academic instruction primarily in English or the school staff judged the student was not capable of participating. During the base year, 163 students were excluded (119 due to mental or physical disability, 44 due to language barriers) and 114 students received accommodations (Ingels et al., 2004).

**First follow-up schools and students.** In spring 2004, two years after the base-year data collection, the first follow-up sample consisted of students and schools who participated in the ELS:2002 base year. Four of the participating base-year schools split up and five new schools were created, resulting in a total of 757 schools (Ingels et al., 2004). Participating students in these schools were followed to their new school. Students in the follow-up sample included those who remained in the same school, graduated early, dropped out, switched to being home schooled, or transferred schools. Any selected ELS:2002 base-year student who did not participate due to a disability or limited English proficiency was also included in the follow-up sample. Students who were institutionalized, out of the country, or who died between the base and follow-up year were considered “out of scope” (n=121) and were excluded from the study (Ingels et al., 2004).

**Study sample selection and weights.** The data for this study were downloaded from the ELS:2002 First Follow-up Transcript Component Data File CD. To select the sample, it is necessary to use sampling design weights provided by NCES. The weights adjust for unequal probabilities of selection of schools and students. The student weights also adjust for students in the sample that were selected but did not participate in the study. Values of the weights for the school and student samples are inversely proportional to their probabilities of selection. The value of the weights represents the number of individuals in the population (Ingles et al., 2004).
For example, a weight of 100 for a student means that the student represents 100 other students in the population. The weights are also needed when conducting analyses to obtain accurate population estimates.

The purpose of this study is to examine the relationship between student engagement in tenth grade, school processes, when the students were enrolled in tenth grade, and whether or not students dropped out of the base-year school prior to graduation. To obtain the relevant student subsample for this study, the G10COHRT, F1UNIV2A, F1TRSCWT variables were used. The G10COHRT variable is a filter and flags all tenth-grade students in the base year (G10COHRT = 1). The F1UNIV2A (F1UNIV2A = 1) variable flags students who were eligible to complete the student survey in the base year. The F1TRSCWT variable is a cross-sectional transcript weight for students who have transcript data (F1TRSCWT > 0). As explained in more detail below, students’ high school transcripts were collected after the students were scheduled to graduate from high school. The use of the F1TRSCWT weight is needed to select students in the sample that have achievement data (i.e., grade point average) and dropout status. With these parameters set, there are 13,990 students in the sample.

In order to determine whether school processes effect students’ engagement and their dropout status, this study will only include students who dropped out or graduated from their base-year school. Students who transferred out of their base-year school or identified themselves as homeschooled in the follow-up year are not included in this study. This restriction increases the internal validity of this study, by ensuring that the students were only exposed to one “treatment” (i.e., the base-year school) between the base and follow-up years. It has also been well documented that students who transfer schools for reasons other than promotion are more
likely to drop out of school than those who do not transfer schools (Rumberger & Larson, 1998; Rumberger & Thomas, 2000; Swanson & Schneider, 1999).

To identify these students the F1ENRFIN, F1RTROUT, and F1RSCH2 variables were used and a new variable was created called DOSTATUS. The F1ENRFIN identifies whether students were enrolled, graduated early, or dropped out of their base-year school in spring 2004. The F1RTROUT variable indicates the final student status as it appears on the most recent school transcript (Bozick, Lyttle, Siegal, Ingels, Rogers, Lauff, & Planty, 2006). To ensure that the information provided in the F1RTROUT variable is from the base-year school, the F1RSCH2 variable was also used. F1RSCH2 indicates if a student transcript was collected from a transfer school. If F1SCH2 is missing, then the information in the F1RTROUT variable was provided by the base-year school (Bozick et al., 2006). See Appendix A for the DOSTATUS syntax.

Based on the categories in the F1RTROUT variable, a graduate is defined here as a student who graduated between fall 2003 and summer 2004; post-summer 2004; pre-fall 2003; graduation date unknown; or received a diploma with special education adjustments. Transcripts were collected between December 2004 and summer 2005, therefore, a dropout is defined as a student who dropped out between the base-year survey and summer 2005 (Bozick et al., 2006). Students who did not graduate, but were still enrolled in the school were not included. Additionally, students who received a GED certificate were not of interest in this study and therefore were not counted as graduates or dropouts. The DOSTATUS variable includes a total of 11,450 students (10,840 [94.7%] graduates and 610 [5.3%] dropouts).

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Evidence suggests that GED recipients do not fall into the same category as high school graduates or dropouts. High school diploma recipients tend to outperform GED recipients in the job market and in postsecondary institutions and yet GED recipients perform better than dropouts (Boesel, et al., 1998; Cameron & Heckman, 1993; Chaplin, 2002; Tyler, et al., 2000).
Lastly, to obtain the relevant school subsample for this study, the BYADMFLG and BYSCHWT variables were used. The BYADMFLG variable flags schools with a completed administrator survey (BYADMFLG = 1). The BYSCHWT variable is a cross-sectional weight for base-year schools with data (BYSCHWT > 0). With these last filters set, there are a total of 11,370 students (10,770 [94.7%] graduates and 600 [5.3%] dropouts) in the student sample from 700 schools.

Descriptive statistics of the base and the selected student samples were calculated to identify differences between the two sample distributions. Differences between the two samples may limit the generalizability of the study’s findings. Table 1 displays the demographics of both the base and the selected student samples. Compared to the base student sample, the selected sample includes a slightly smaller proportion of Black/African American students (12.7% and 11.7%, respectively), Hispanic students (14.4% and 13.1%, respectively), and students whose native language is English (83.2% and 84.4%, respectively). In contrast, the selected student sample includes a higher proportion of White students (60.5%), as compared to in the base sample (57.7%). The selected sample also has a higher mean socioeconomic status (SES) index (0.09) and mean reading (51.72) and mathematics (51.50) achievement as compared to the base sample (0.05, 50.7, and 50.9, respectively).
Table 1. Demographics of Base and Selected Student Samples

<table>
<thead>
<tr>
<th></th>
<th>Base Sample (N=13,990)</th>
<th>Selected Sample (N=11,370)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (%)</td>
<td>50.4</td>
<td>50.8</td>
</tr>
<tr>
<td>Asian, Hawaiian/Pacific Islander (%)</td>
<td>9.6</td>
<td>9.3</td>
</tr>
<tr>
<td>Black/African American (%)</td>
<td>12.7</td>
<td>11.7</td>
</tr>
<tr>
<td>Hispanic (%)</td>
<td>14.4</td>
<td>13.1</td>
</tr>
<tr>
<td>Other (%)</td>
<td>5.6</td>
<td>5.4</td>
</tr>
<tr>
<td>White (%)</td>
<td>57.7</td>
<td>60.5</td>
</tr>
<tr>
<td>Mean Age</td>
<td>15.7</td>
<td>15.7</td>
</tr>
<tr>
<td>Native Language is English (%)</td>
<td>83.2</td>
<td>84.4</td>
</tr>
<tr>
<td>Mean SES (SD)</td>
<td>0.05 (0.74)</td>
<td>0.09 (0.74)</td>
</tr>
<tr>
<td>Mean Reading Achievement</td>
<td>50.7 (9.95)</td>
<td>51.72 (9.76)</td>
</tr>
<tr>
<td>Mean Mathematics Achievement</td>
<td>50.9 (9.94)</td>
<td>51.50 (9.80)</td>
</tr>
</tbody>
</table>

NCES Data Collection

Data collection for the ELS:2002 in the base year consisted of the administration of surveys to participating students, parents, teachers, librarians, and school administrators. Administrators also completed a facilities checklist at each school. In addition, participating students completed reading and math achievement tests. In the first follow-up year, students were administered a follow-up survey, reassessed in their math skills, and transcripts were collected. A school administrator follow-up survey was also administered. The preceding paragraphs below discuss the data collection procedures and instrumentation of the ELS:2002.

Data collection process. Prior to data collection in the base year, approximately 135 survey administrators completed a two-day training to conduct data collection in the schools. For the follow-up year, 10 field supervisors and 85 survey administrators attended a three-day training (a number of the field supervisors and survey administrators had worked on the ELS:2002 in the base year). Ninety-two additional staff were hired and trained to assist with the data collection.
Once schools were selected to participate, NCES obtained permission from the proper state and district officials to contact the schools. If the school agreed to participate, dates for a Survey Day (i.e., a day when data collection would occur for students in the school) were scheduled. Base-year Survey Days were conducted from mid-January 2002 through the beginning of June 2002. Prior to the schools’ Survey Day, parent consent was received from the participating students.

In general, students completed the ELS:2002 base-year student survey in a group setting at their school site. The full-version of the student survey was only available in English, although, a shortened version of the survey was available in Spanish. The English and mathematics achievement tests were administered on the same day as the survey. A 45-minute time period was allotted to complete the survey and test battery. If more than three students in a school missed the Survey Day, a make-up day was assigned. A Survey Day and one make-up day were held at 320 schools, during the base year (Ingels et al., 2004). As discussed in the previous section, accommodations were made for students with disabilities. For students not able to complete the survey in school, telephone surveys, mail surveys, or field interviews were conducted. NCES also offered incentives for participation in the study. When NCES felt the response rates would be low, students were offered $20 gift certificates for participation.

The base-year surveys for teachers, administrators, librarians, and parents were self-administered. The teacher survey was administered to the participating students’ fall English and mathematics teachers. If the student was not enrolled in an English and/or mathematics course in the fall, the survey was administered to the spring teacher. An administrator or staff member at the school was designated to complete the administrator survey, given that the bulk of the survey items asked about general school characteristics. It was required that the final section of the
survey, however, be completed by the principal of the school. The librarian or school staff
designee completed the library media center survey. Lastly, parents were mailed the parent
survey (the survey was available in English and in Spanish). It was asked that the parent who
was most knowledgeable about the child’s education complete the survey.

In addition to reports from students and school staff about each school, the survey
administrators completed an observation of the school facilities on the school’s Survey Day. The
form was designed to be completed by the survey administrator without assistance from school
personnel. To achieve a measure of standardization in the observations, the survey administrators
were instructed to complete the form in the morning.

During the follow-up year, students who participated in the ELS:2002 base-year survey
were resurveyed and tested in mathematics in the spring term of 2004. Similar to the base year,
Survey Days were held to administer the survey and mathematics achievement test. Incentives
were given to participating students in the follow-up year if preapproved by the school. For
students who were no longer enrolled in the base-year school, the school provided the students’
contact information. These students were contacted via phone, mail, or in the field.
Administrator follow-up surveys were sent to the schools for the administrator to complete.

In the winter of 2004, the base-year, first follow-up, and transfer schools were contacted
to provide student transcripts, which included basic enrollment, testing, and course-taking
information for each participating student. Schools were also asked to provide information about
the school’s grading and graduation policies and requirements. Transcripts were not requested
from 10 base-year schools, because they had refused to participate in the first follow-up survey.
Additionally, transcripts were not requested from one base-year school that had no eligible
students. Ninety-five schools required explicit consent from students or their parents before
releasing transcript information. Of the 716 sample members who attended these schools, 181 (25.3%) provided signed release forms (Ingels et al., 2004). Schools were paid $5 for each transcript. Collection of these data lasted through June 2005.

**Instrumentation.** The content of the ELS:2002 survey items were largely drawn from existing NCES studies (e.g., National Assessment of Educational Progress [NAEP], National Education Longitudinal Study of 1988 [NELS:88], and the Program for International Study Assessment [PISA]). Given that the primary research objectives of the ELS:2002 were longitudinal, items were selected that would be most useful in predicting or explaining future outcomes. The base-year surveys contained predominately multiple-choice questions, with a few short answer and fill-in-the blank questions. The process for selection of items on the base-year and first follow-up surveys can be found in the ELS:2002 manuals (Ingels et al., 2004; Ingles, Pratt, Rogers, Siegel, & Stutts, 2005).

The current study uses several base-year student, parent, and administrator survey items as well as transcript data. The ELS:2002 surveys used in the study are available on the NCES website (http://nces.ed.gov/surveys/els2002/). The student base-year survey covered topics related to students’ school experience; future plans; language fluency other than English; work and money; family; and perspectives and opinions about school and the future. The parent survey covered topics on family background, the child’s school experience, the child’s family experiences, opinions about school, and future plans for themselves and their child. The school administrator survey collected data on the schools’ characteristics, teacher characteristics, and school policies and programming (e.g., technology use, governance, and climate).

Transcripts were collected after the first follow-up survey administration to collect student course taking histories for grades nine through 12. Transcript data included: cumulative
grade point average (GPA); type of diploma awarded and date awarded; and date student left school and reason student left (e.g., graduated or transferred). Data on the schools’ grading and term system was also collected in order to standardize the course information (using Carnegie units) and GPAs across schools.

**Test design.** The design of the base-year ELS: 2002 reading and mathematics achievement tests was adapted from the NELS:88. The reading test consisted of reading passages of one paragraph to one page in length, followed by three to six questions based on each passage. The passages included literary material as well as topics in the natural and social sciences. Several passages required interpretation of graphs. Questions were categorized as reproduction of detail, comprehension, or inference/evaluation. The mathematics test contained items in arithmetic, algebra, geometry, data/probability, and advanced topics. These items were divided into process categories of skill/knowledge, understanding/comprehension, and problem solving. All of the reading questions and most of the mathematics questions were multiple-choice; some of the mathematics questions were open-ended and were scored as right or wrong (no partial credit was given).

The tests were administered in two stages. All students received a multiple-choice routing test composed of a 15-question mathematics section, followed by 14 reading questions. The answers were scored by survey administrators, who then assigned each student to a low, middle, or high difficulty form for the second half of the mathematics and reading tests. Two of the schools were unable to allot enough time for students to participate in the two-stage testing process. In these schools, only the mathematics test was administered.

The scores on both tests are based on Item Response Theory (IRT) (Ingels et al., 2004). IRT uses patterns of correct, incorrect, and omitted answers to obtain ability estimates. It also
accounts for each test questions’ difficulty, discriminating ability, and a guessing factor. The estimates of the tests are the number of items students would have answered correctly if they had responded to all questions. These estimates are used to calculate the probability of students answering each of the items correctly. The probabilities are summed to produce the IRT-estimate scores. NCES also calculated standardized T-scores to provide norm-referenced measurements of achievement. The reliabilities for the base-year reading and mathematics tests were 0.86 and 0.92, respectively. For more information on the ELS:2002 test design and scoring see Ingels et al. (2004).

Variables of Interest

The variables of interest were drawn from the ELS:2002 base-year student, parent, and administrator surveys; student transcripts, collected in the first follow-up year; and school base-year data NCES gathered from the CCD and PSS. Table 2 provides an overview of the outcome variable and the student- and school-level control and explanatory variables that were used in this study. The section below defines the variables and describes how they were measured in the analyses.
Table 2. Variables of Interest

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>Control Variables</th>
<th>Explanatory Variables</th>
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</thead>
<tbody>
<tr>
<td>Dropout Status</td>
<td><strong>Student Background</strong></td>
<td>Behavioral Engagement</td>
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<tr>
<td></td>
<td>Gender</td>
<td>Emotional Engagement</td>
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<td></td>
<td>Race/ethnicity</td>
<td>Cognitive Engagement</td>
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<td>Age</td>
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<td>Native Language</td>
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<td>SES</td>
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<td>IEP in Grade 10</td>
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<tr>
<td></td>
<td>Grade 10 Reading and Math</td>
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<tr>
<td></td>
<td>Achievement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grade 9 GPA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High School Program</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Student Composition</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% Free-Reduced Priced Lunch</td>
<td><strong>School Processes</strong></td>
</tr>
<tr>
<td></td>
<td>% Minority</td>
<td>Administrator Control</td>
</tr>
<tr>
<td></td>
<td>Mean Grade 9 Grade Point Average</td>
<td>School Morale</td>
</tr>
<tr>
<td></td>
<td><strong>Resources</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean Teacher Salary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of Teachers Subject Certified</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Structural Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>School Control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grade 10 Students Enrolled</td>
<td></td>
</tr>
</tbody>
</table>

**Student-level variables.** The following student-level variables were used in the analyses:

**Dropout status.** Student dropout status is the dependent variable for this study. The dropout status variable (DOSTATUS) is a dichotomous variable with zero representing Graduate and one representing Dropout. A graduate is defined as a student who was enrolled in tenth grade in 2002 and received a high school diploma by 2004 from the same high school. A
dropout is defined as a student who was enrolled in tenth grade in 2002, but did not receive from a high school diploma by the end of the 2003-2004 school year, did not transfer high schools, or was not still enrolled in school. See the Study Sample Selection and Weights subsection for a more detailed description of how the DOSTATUS variable was created.

**Student-level control variables.** Student-level control variables were selected based on previous research. Variables were selected that would have a relationship with the outcome variable or explanatory variables and that would reduce internal validity threats of history and selection bias. Student-level control variables include student demographic characteristics, family characteristics, and educational background. Most of the demographic characteristics were measured on the ELS:2002 base-year student surveys. If demographic data were missing from the student survey, NCES retrieved the data from the school rosters and/or parent surveys (see Ingels et al., 2004, section 3.3 for further discussion).

Demographic characteristics that were used as student-level control variables include: gender, race/ethnicity, age, and students’ native language. Students were asked to identify themselves as male or female and as one or more race/ethnicities. The BYSEX variable, which denotes student gender, was dummy coded (0 = male, 1 = female). The BYRACE variable, which denotes students race/ethnicity, was categorized as a series of dummy coded variables: Asian, Hawaiian/Pacific Islander (0 = no, 1 = yes), Black/African American (0 = no, 1 = yes), Hispanic (0 = no, 1 = yes), Other (0 = no, 1 = yes). The Other category includes students with a race/ethnicity of American Indian/Alaskan Native or Multi-racial, non-Hispanic. Students of White, non-Hispanic race/ethnicity served as the comparison group. As an indicator of retention, students’ age, in years was included as a background variable.\textsuperscript{7} Age was calculated by

\textsuperscript{7} It is assumed that students who are older than other students in their grade level are over-age and may have been retained in school (Cairns et al., 1989; Janosz et al., 1997; Jimerson, Anderson, & Whipple, 2002).
subtracting the students’ date of birth (BYDOB_R) from the base year of data collection (i.e. 2002). The BYSTLANG variable indicated whether the student’s native language is English and was dummy coded (0 = native language other than English, 1 = native language is English).

Student family characteristics were measured by family SES, family composition, and a variable measuring parental involvement in the students’ schooling. NCES constructed a composite variable from parent survey data to measure family SES. The variable, BYSES1, is measured using five equally weighted, standardized components: father’s/guardian’s education, mother’s/guardian’s education, family income, father’s/guardian’s occupation, and mother’s/guardian’s occupation. The occupational scores were based on the 1961 Duncan index (Ingels et al., 2004). Family composition was measured by whether or not the student lives with both birth parents (BYFCOMP). The BYFCOMP variable was recoded to categorize students into two groups, those that lived with both birth parents and those that did not (0 = did not live with both birth parents, 1 = lived with both birth parents).

Table 3 presents the items and original scale from the ELS:2002 base-year parent survey that was included in the parental involvement variable. The items were recoded to begin with zero, indicating low parental involvement, and then standardized using z-scores, given that some of the items were on different scales. The parental involvement scale consisted of seven items and had a Cronbach’s alpha of .68. The items were averaged for each student.8

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8 The ELS:2002 surveys were drafted with specific concepts in mind, such as parental involvement in school (Ingels et al., 2004). To ensure the validity and reliability of the items measuring parental involvement, the items underwent a thorough review process and field testing. Given the ELS:2002 review process and the acceptable reliability of the parental involvement scale, factor analysis was not conducted.
### Table 3: Parental Involvement Variable and ELS:2002 Survey Items

<table>
<thead>
<tr>
<th>NCES Name</th>
<th>Description</th>
<th>Original Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYP55A</td>
<td>How often check that homework is completed</td>
<td>1 = Never, 2 = Seldom, 3 = Usually, 4 = Always</td>
</tr>
<tr>
<td>BYP55B</td>
<td>How often discuss report card</td>
<td>1 = Never, 2 = Seldom, 3 = Usually, 4 = Always</td>
</tr>
<tr>
<td>BYP56A</td>
<td>Provide advice about selecting courses or programs</td>
<td>1 = Never, 2 = Sometimes, 3 = Often</td>
</tr>
<tr>
<td>BYP56B</td>
<td>Provide advice about plans for college entrance exams</td>
<td>1 = Never, 2 = Sometimes, 3 = Often</td>
</tr>
<tr>
<td>BYP56C</td>
<td>Provide advice about applying to college/school after high school</td>
<td>1 = Never, 2 = Sometimes, 3 = Often</td>
</tr>
<tr>
<td>BYP57A</td>
<td>Attended school activities with 10\textsuperscript{th} grader</td>
<td>1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently</td>
</tr>
<tr>
<td>BYP57B</td>
<td>Worked on homework/school projects with 10\textsuperscript{th} grader</td>
<td>1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently</td>
</tr>
</tbody>
</table>

Student educational background was measured by whether or not the student had an IEP in grade 10, students’ achievement scores on the ELS:2002 reading and mathematics achievement tests, ninth-grade GPA, and program of study in tenth grade. Information as to which students had an IEP was provided on the school rosters. The variable BYIEPFLG was coded as a dummy variable (0 = no IEP, 1 = IEP).

The NCES reading and mathematics achievement tests composite scores were used to assess students’ achievement in tenth grade (BYTXCSTD). The composite scores are the average of the reading (BYTXRSTD) and mathematics (BYTXMSTD) standardized scores, restandardized to a national mean of 50 and standard deviation of 10. For students who did not have both scores, the composite is based on the single score that was available. The decision was made to use the composite score over the individual scores, given that the reading and mathematics standardized scores has a statistically significant high correlation ($r = .742$, $p < .001$). The standardized scores are based on the IRT-estimate score and provide a norm-referenced measurement of achievement, relative to the population (spring 2002 tenth-graders).
Students’ ninth-grade GPA (F1RGP9) was included to control for students’ performance in school prior to the base year. The F1RGP9 variable ranged from zero (‘F’) to 4.0 (‘A’ or ‘A+’). The program of study (BYSCHPRG) was self-reported by the student. Students’ program of study was dummy coded into two dummy variables, Academic (College/Preparatory) and Vocational (0 = no, 1 = yes). The General (0 = no, 1 = yes) track group was the comparison group.

Engagement. Using face validity and previous research on engagement, items were selected from the base-year survey that measure behavioral, emotional, and cognitive engagement. Table 4 lists the survey items by domain, the original scale for each item, and whether or not the item was reverse coded. Where applicable, items were recoded to ensure that the lower values represent low levels of engagement. They were also recoded to ensure the lowest value on the range begins with zero.
<table>
<thead>
<tr>
<th>Domain of Engagement</th>
<th>NCES Name</th>
<th>Description</th>
<th>Original Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct</td>
<td>BYS24A*</td>
<td>I was late for school</td>
<td>1 = Never, 2 = 1-2 times, 3 = 3-6 times, 4 = 7-9 times, 5 = 10 or more</td>
</tr>
<tr>
<td></td>
<td>BYS24B*</td>
<td>I cut or skipped class</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS24C*</td>
<td>I was absent from school</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS22D*</td>
<td>I got into a physical fight at school</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS24D*</td>
<td>I got in trouble for not following school rules</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS24E*</td>
<td>I was put on in-school suspension</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS24F*</td>
<td>I was suspended or put on probation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS24G*</td>
<td>I was transferred to another school for disciplinary reason</td>
<td></td>
</tr>
<tr>
<td>Participation in School</td>
<td>BYS29B</td>
<td>Listen to the teacher lecture in your current or most recent math class</td>
<td>1 = Never, 2 = Rarely,  3= Less than once a week, 4 = Once or twice a week, 5 = Every day or almost every day</td>
</tr>
<tr>
<td></td>
<td>BYS29C</td>
<td>Copy the teacher’s notes from the board in your current or most recent math class</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS29E</td>
<td>Do word problems or problem solving activities in your current or most recent math class</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS29I</td>
<td>Explain your work to the class orally in your current or most recent math class</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS29J</td>
<td>Participate in student-led discussions in your current or most recent math class</td>
<td></td>
</tr>
<tr>
<td>Prepared for Class</td>
<td>BYS38A*</td>
<td>How often do you come to class without a pencil/pen or paper</td>
<td>1 = Never, 2 = Seldom, 3 = Often, 4 = Usually</td>
</tr>
<tr>
<td></td>
<td>BYS38B*</td>
<td>How often do you come to class without books</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS38C*</td>
<td>How often do you come to class without homework done</td>
<td></td>
</tr>
<tr>
<td>Participation in Extracurricular Activities</td>
<td>BYNSPRTS</td>
<td>Number of interscholastic or intramural sports activities student participated in</td>
<td>0-8</td>
</tr>
<tr>
<td></td>
<td>BYNARTCLUB</td>
<td>Number of fine arts or club activities student participated in</td>
<td>0-9</td>
</tr>
<tr>
<td>Domain of Engagement</td>
<td>NCES Name</td>
<td>Description</td>
<td>Original Scale</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Teachers</td>
<td>BYS20A</td>
<td>Students get along well with teachers</td>
<td>1 = Strongly agree, 2 = Agree, 3 = Disagree, 4 = Strongly disagree</td>
</tr>
<tr>
<td></td>
<td>BYS20E</td>
<td>The teaching is good</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS20F</td>
<td>Teachers are interested in students</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS20G</td>
<td>When I work hard on schoolwork, my teachers praise my effort</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS20H*</td>
<td>In class I often feel “put down” by my teachers</td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>BYS20B</td>
<td>There is real school spirit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS20J*</td>
<td>I don’t feel safe at this school</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS27A</td>
<td>Classes are interesting and challenging</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS27B</td>
<td>Satisfied by doing what is expected in class</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS28</td>
<td>How much do you like school</td>
<td>1 = Not at all, 2 = Somewhat, 3 = A great deal</td>
</tr>
<tr>
<td>Students</td>
<td>BYS20D*</td>
<td>Other students often disrupt class</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS20I*</td>
<td>In class I often feel “put down” by other students</td>
<td>1 = Strongly agree, 2 = Agree, 3 = Disagree, 4 = Strongly disagree</td>
</tr>
<tr>
<td></td>
<td>BYS20K*</td>
<td>Disruptions by other students get in the way of my learning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS20L*</td>
<td>Misbehaving students often get away with it</td>
<td></td>
</tr>
<tr>
<td>Persistence</td>
<td>BYS89E</td>
<td>When I sit myself down to learn something really hard, I can learn it</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS89G</td>
<td>When I study, I make sure that I remember the most important things</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS89N</td>
<td>If I decide not to get any bad grades, I can really do it</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS89O</td>
<td>When studying, I keep working even if the material is difficult</td>
<td>1 = Almost Never, 2 = Sometimes, 3 = Often, 4 = Almost, 5 = Always</td>
</tr>
<tr>
<td></td>
<td>BYS89Q</td>
<td>If I decide not to get any problems wrong, I can really do it</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS89T</td>
<td>If I want to learn something well, I can</td>
<td></td>
</tr>
<tr>
<td>Effort</td>
<td>BYS89J</td>
<td>When studying, I try to work as hard as possible</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS89S</td>
<td>When studying, I try to do my best to acquire the knowledge and skills taught</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BYS89V</td>
<td>When studying, I put forth my best effort</td>
<td></td>
</tr>
</tbody>
</table>

*Items were reversed coded.*
The two extracurricular activity variables, BYNSPRTS and BYNARTCLUB, were constructed using the variables listed in Table 5. First the scales for the BYNSPRTS variables were transformed to a binary measure, 1 = participated in activity and 0 = did not participate in activity. Then the variables were summed together to determine a total number of activities. BYNSPRTS represents the number of interscholastic or intramural sports teams and the BYNARTCLUB represents the number of fine arts or club activities students belonged to through their sophomore year of high school.
To construct the engagement variables factor analyses were conducted, using the selected survey items listed in Table 4. The results of the factor analysis were used to determine if the selected items adequately measured each of the dimensions and domains of engagement. See the Factor Analysis subsection of the Methods section and the Results section for more details on how the engagement variables were constructed. The items included in the final measurement
model were then averaged for each dimension as well as for the domains overall. Items within the same construct with different response scales were standardized using z-scores.

**School-level variables.** The following school-level variables were used in the analyses:

*School-level control variables.* School-level control variables included school “input” variables, that is, student composition, school resources, and school structural characteristics. These measures were collected on the base-year school administrator survey or were provided by NCES from the CCD or PSS and are described in more detail below.

To measure schools’ student composition the following indicators were used: percent of tenth-grade students who received free- or reduced-priced lunch (FRL), percent of minorities in the school, and the average ninth-grade GPA. The FRL variable (BYA21) was reported on the administrator survey and represents the composition of the tenth-grade students enrolled in the 2001-2002 school year. The percent of minorities in the school (CP02PMIN) was retrieved from the CCD or PSS and represents the percent of minorities in the school during the 2001-2002 school year. Lastly, the schools’ average ninth-grade GPA was calculated by averaging the sampled students’ ninth-grade GPA in each school (F1RGP9).

School resources were measured by the schools’ average teacher salary and the percent of full-time teachers who were certified in the subject area they teach. The school’s average teacher salary in the 2001-2002 school year was calculated by adding the lowest teacher salary in a school (BYA26A) to the highest teacher salary (BYA26B) and dividing the sum by two. The percent of full-time teachers who were not certified in the subject area they teach (BYA25A) was collected on the administrator survey. The BYA25A variable was subtracted by 100 to reverse its meaning.
School structural characteristics were measured by schools’ Control (i.e., the type of school) and Grade 10 Enrollment. The control of a school was defined using the CCD and PSS. The BYSCNTRL variable was dummy coded Public (0 = no, 1 = yes), with Catholic or Other Private schools used as the comparison group. The schools’ tenth-grade enrollment (BYG10ER), was as of October of the 2001-2002 school year.

School process variables. The school process variables, administrator control and school morale, were collected on the base-year administrator survey. Table 6 lists the school processes variables, the survey items that make-up the variables, the original scale for each item, and items that were reverse coded. Composite measures were created to measure schools’ administrator control and morale. Where applicable, items were recoded to ensure the lowest value on the range begins with zero. The administrator control scale consisted of eight items and had a Cronbach’s alpha of .79 and the school morale scale consisted of five items and had a Cronbach’s alpha of .87. Both scales were averaged for each school. 9

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9 The ELS:2002 surveys were drafted with specific concepts in mind, such as administrator control and school morale (Ingels et al., 2004). To ensure the validity and reliability of these items measuring these concepts, the items underwent a thorough review process and field testing. Given the ELS:2002 review process and the acceptable reliability of the administrator control and school morale scales, factor analyses were not conducted.
Table 6: School Processes Variables and ELS:2002 Survey Items

<table>
<thead>
<tr>
<th>School Process</th>
<th>NCES Name</th>
<th>Description</th>
<th>Original Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator Control</td>
<td>BYA46A</td>
<td>Principal’s influence hiring/firing teachers</td>
<td></td>
</tr>
<tr>
<td>Administrator Control</td>
<td>BYA46B</td>
<td>Principal’s influence on grouping students</td>
<td></td>
</tr>
<tr>
<td>Administrator Control</td>
<td>BYA46C</td>
<td>Principal’s influence on course offerings</td>
<td></td>
</tr>
<tr>
<td>Administrator Control</td>
<td>BYA46D</td>
<td>Principal’s influence on instructional materials</td>
<td>1 = No influence, 2 = Some influence, 3 = Major influence</td>
</tr>
<tr>
<td>Administrator Control</td>
<td>BYA46E</td>
<td>Principal’s influence on curricular guidelines</td>
<td></td>
</tr>
<tr>
<td>Administrator Control</td>
<td>BYA46F</td>
<td>Principal’s influence on grading and evaluation</td>
<td></td>
</tr>
<tr>
<td>Administrator Control</td>
<td>BYA46G</td>
<td>Principal’s influence discipline policies</td>
<td></td>
</tr>
<tr>
<td>Administrator Control</td>
<td>BYA46H</td>
<td>Principal’s influence on school funds</td>
<td></td>
</tr>
<tr>
<td>School Morale</td>
<td>BYA51A</td>
<td>Student morale is high</td>
<td></td>
</tr>
<tr>
<td>School Morale</td>
<td>BYA51B</td>
<td>Teacher press students to achieve</td>
<td>1 = Not accurate at all, 2 = Between not at all and somewhat accurate, 3 = Somewhat accurate, 4 = Between somewhat accurate and very accurate, 5 = Very accurate</td>
</tr>
<tr>
<td>School Morale</td>
<td>BYA51C</td>
<td>Teacher morale is high</td>
<td></td>
</tr>
<tr>
<td>School Morale</td>
<td>BYA51D</td>
<td>Learning is a high priority for students</td>
<td></td>
</tr>
<tr>
<td>School Morale</td>
<td>BYA51E</td>
<td>Students expected to do homework</td>
<td></td>
</tr>
</tbody>
</table>

Data Analysis

Using the selected sample, several stages of analysis were conducted to answer this study’s research questions. First, the data were screened to determine if they met the assumptions necessary for analysis and the extent to which data were missing. Second, factor analysis was conducted to test the hypothesis that engagement is a meta-construct consisting of multiple dimensions within three domains of engagement—behavioral, emotional, and cognitive. Third, values for missing student-level and school-level variables were estimated using multiple imputation methods. Lastly, models estimating the influence of the domains of engagement and
school processes on dropping out of school were estimated and tested using hierarchical
generalized linear modeling (HGLM).

**Descriptive Analysis.** Prior to the factor and HGLM analyses descriptive statistics for
each variable were calculated on the variables of interest. Descriptive analyses included:
frequency distributions; means; standard deviations; estimates of skewness and kurtosis;
histograms; and box and whisker plots. The data were examined to determine the extent to which
they were normally distributed and had missing data. Lack of normality and a high proportion of
missingness can lead to biases in standard errors. In addition, differences between graduates and
dropouts on the variables of interest were also examined using independent samples \( t \)-tests, for
continuous variables, and chi-square tests of independence, for categorical variables.

**Factor analysis.** To answer **Research Question 1**, factor analysis, or more specifically
exploratory factor analysis, was selected as the appropriate analytic tool. Factors, or latent
variables, represent an underlying construct (e.g., intelligence, ability, and engagement) that
explains the relationship between observed, or measured, variables. The primary purpose of
factor analysis is to determine the nature and number of latent variables needed to explain the
shared variability among a set of measured variables (Brown, 2006). Latent variables account for
the correlation patterns among the observed variables they represent. Latent variables are
considered to be a parsimonious representation of the correlation patterns, because there are
fewer latent factors than observed variables.

Factor analysis models are often presented in diagrammatic form (Brown, 2006). An
example of a factor model diagram, more specifically a confirmatory factor model, is presented
in Figure 2. The circles represent the latent variables and the squares represent the observed
variables. In this example, there are two latent constructs, *persistence* and *effort*, that measure
cognitive engagement. The $\phi$ label represents a correlation between the two factors. The arrows from the latent variables to the observed variables indicate that the latent variables are measures of the observed variables. The label $\lambda$ represents factor loadings, which indicates how well the observed variables measure the latent variable. Given that this example represents a confirmatory model, the arrows point to the specific observed variables the latent variables are expected to measure. This study uses, an exploratory factor model, where the arrows from the latent variables to the observed variables point in all directions to identify the underlying structure of the model. Lastly, the $\delta$ label represents the unique factors that include the specific effects of the variable as well as measurement error. These unique factors are not accounted for by the latent variables.

Figure 2. Diagram of a Hypothesized Confirmatory Factor Model for Persistence and Effort
The actual factor analysis model is a series of linear equations implied by the diagram (Brown, 2006). There is an equation for each indicator variable:

\[
\begin{align*}
BYS89E &= \lambda_{11}(Persistence) + \delta_1 \\
BYS89G &= \lambda_{21}(Persistence) + \delta_2 \\
BYS89N &= \lambda_{31}(Persistence) + \delta_3 \\
BYS89O &= \lambda_{41}(Persistence) + \delta_4 \\
BYS89Q &= \lambda_{51}(Persistence) + \delta_5 \\
BYS89T &= \lambda_{61}(Persistence) + \delta_6 \\
BYS89J &= \lambda_{72}(Effort) + \delta_7 \\
BYS89S &= \lambda_{82}(Effort) + \delta_8 \\
BYS89V &= \lambda_{92}(Effort) + \delta_9
\end{align*}
\]

The factor loading in each equation is a standardized estimate of the regression slope that explains the relationship between the latent construct and the measured variable or between both latent constructs. The amount of variance in the indicator variable accounted for by the latent variable is called the _communality_. The communality is calculated by taking the sum of squares of the factor loadings. The unique variance is calculated by taking the difference between one and the communality.

The data in a factor analysis are used to determine the nature and number of latent variables rather than a priori theory (Brown, 2006). Given that the relationships between the latent and measured variables are not specified, factor analysis provides an estimate for the appropriate number of latent variables and reveals the measured variables that would be considered adequate indicators of each latent variable. In the figure and equations above, the relationships are specified; therefore, the factor loadings for the unspecified relationship are
constrained to zero. That is, the factor loadings for *Effort* on the observed measures BYS89E, BYS89G, BYS89N, BYS89O, BYS89Q, and, BYS89T and for *Persistence* on the observed measures BYS89J, BYS89S, and BYS89V are not estimated. Yet in an exploratory factor analysis, estimates for these factor loadings are calculated for all factors and observed measures.

As described earlier in the *Variables of Interest* section, several measured variables were selected that were hypothesized to measure the dimensions of each domain of engagement. Factor analysis was used to determine if these measured variables were adequate, and to determine how many dimensions were considered optimal. Stata/IC 12.0, Maximum Likelihood was used as the estimator and an oblimin oblique rotation of the results was used to make the results more interpretable. An oblique rotation assumes that all the factors are correlated. To account for the ELS:2002 complex survey design, the *svyset* command was used with the stratification and cluster indicators, STRAT_ID and PSU, (see the *Issues related to complex sample design* section for further explanation). In addition, F1TRSCWT was applied to weight the analysis.

Two sets of factor analyses were conducted. The first factor analysis examined the first-order factors and the second factor analysis examined the second-order factors. The first-order factors consist of the dimensions that measure the domains of engagement (e.g., Conduct, Participation in School, Class Preparedness). The second-order factors consists of the domains of engagement—Behavior, Emotional, and Cognitive. Figures 3 and 4 display the hypothesized factor model. Figure 3 displays the first-order factor model and Figure 4 displays the second-order factor model.
Figure 3. Diagram of the Study's Hypothesized First-Order Factor Model

- Conduct
- Participation in School
- Prepared for Class
- Attitudes about Teachers
- Attitudes about Social Environment
- Attitudes about Academics
- Persistence
- Effort

Variables:
- $X_1$
- $X_2$
- $X_3$
- $X_4$
- $X_5$
- $X_6$
- $X_7$
- $X_8$
- $X_9$
- $X_{10}$
- $X_{11}$
- $X_{12}$
- $X_{13}$
- $X_{14}$
- $X_{15}$
- $X_{16}$
The following steps were used in the factor analyses (Brown, 2006):

1. To determine the appropriate number of factors three different methods were reviewed.
   a. Using the Kaiser-Guttman rule, the eigenvalues were reviewed to determine how many eigenvalues were greater than one.
b. A scree plot of the eigenvalues was reviewed to determine where the line representing the factors began to level off. Factors, after the leveling off, are considered redundant and not necessary to include in the model.

c. The Chi-Square goodness-of-fit statistic for each model was reviewed and the *normed fit index* (NFI) was calculated to compare to the “null” model (a baseline model in which the covariances of all measured variables are set to zero). Models with a NFI of greater than .90 is considered having good fit.

2. Factors loadings were reviewed and evaluated using two criteria:

   a. Items with loadings less than .3 on all factors (i.e., low communalities) were eliminated

   b. Items with high loadings (i.e., .2 or greater) on more than one factor were eliminated

   c. Factors were eliminated if they did not have substantive meaning or empirical relevance

3. After items and/or factors were dropped, the factor analysis was rerun until a solution that met the criteria of an adequate model was found. An adequate model is one that has factors with substantive meaning, two or more measured variables with adequate loadings, and adequate fit statistics.

   Using the measured items in the final model, composites of the dimensions were calculated and the internal consistencies (i.e., Cronbach’s alpha) of the composites were reviewed. To examine the convergent and discriminant validity of the dimensions the correlations among the dimensions were reviewed. Composites of each of the domains were also
calculated. The correlations between the domains were reviewed as well as the internal consistencies.

**Missing data.** In large survey studies, such as the ELS:2002, missing data are a potential threat to the validity of the study. As mentioned previously, NCES staff went to great lengths to reduce missing data due to attrition; however, missing data can also result from nonresponse to individual survey items. Ingels et al. (2004) reported that item nonresponse was primarily an issue for the student survey, because not all students reached the final items. Many schools restricted survey completion to one class period, which did not leave enough time to complete the survey. There were 78 items on the student survey with response rates that fell below 85 percent. Of the variables of interest in this study, the BYS89 variables have the highest nonresponse rates, ranging from 70.7 percent to 75.3 percent of the overall weighted sample.

To reduce bias due to missing data, values were calculated using multiple imputation. Assuming the data were Missing at Random (MAR), the *mi impute chained* command was used in Stata/IC 12.0. The *chained* command makes it possible to use different imputation methods for different variables types. The *pmm* command was used for continuous variables and the *logit* command was used for categorical variables. All analysis variables, independent and dependent, were included in the imputation analyses as well as other variables included in the ELS:2002 dataset that were likely to be predictive of missingness (Enders, 2010; Honaker & King, 2010). Appendix B includes a list of variables used in the imputation models.

Separate imputations were calculated at the student- and school-level. A total of 10 data sets were imputed at each level. Two of this studies research questions examine the differential effects of the variables of interest on dropping out of school for students in various subgroups and of schools with varying structural characteristics. If the interaction effects are not considered
in the imputation models, the magnitude of the effects is weakened. In order to preserve the interaction effects, imputations for each of the student- and school-level subgroups were calculated separately, using the *by()* command in Stata/IC 12.0. A total of 10 data sets were imputed for each subgroup at each level. Imputations were conducted for the following student subgroups: gender, race/ethnicity, native language other than English, socioeconomic status, and, academic achievement (ninth-grade GPA). The school-level interactions include school control and tenth-grade enrollment.

**Hierarchical generalized linear modeling.** The ELS:2002 student samples nested within schools, therefore hierarchical linear modeling (HLM) is an appropriate analytic tool for this study. HLM methods have been developed to deal with issues specific to nested or multilevel datasets, including aggregation bias, misestimation of errors, and the unit of analysis problem (Raudenbush & Bryk, 2002). HLM produces two distinct submodels: (a) models for student-level outcomes within schools, known as *within-school models* (Level 1), and (b) models for school-level outcomes, known as *between-school models* (Level 2), in which the parameters from the within-school model serve as dependent variables in the between-school model. The within-school model may contain a number of parameters, depending on the number of predictors in the model. Each parameter produces its own between-school equation. Typically, a series of models is estimated that begin with relatively simple models and then parameters are added to develop more complete models (Rumberger & Palardy, 2004).

To estimate a model using HLM, the outcome must be linear and have a normal distribution (e.g., student achievement). The outcome variable in this study, however, is binary, taking on one value if the outcome is present and another value if the outcome is not (e.g., 1 = the student dropped out, 0 = student did not). An outcome with only two values does not have a
normal distribution and is therefore analyzed using nonlinear models. To account for the binary nature of dropout rates a hierarchical generalized linear model (HGLM) was used to answer this study’s research questions.

To conduct an HGLM analysis, it is necessary to specify both a Level 1 (within-school) sampling model, link function, and structural model (Raudenbush & Bryk, 2002). A standard HLM sampling model has a predicted value with a mean, $u_{ij}$, a variance, $\sigma$, that is normally distributed. With a binary outcome, a link function is needed to transform the predicted value, dropping out (1) or not dropping out (0), into a value that can be estimated with a linear model. In the linear case, this link function is simply the value one because no transformation is required. A structural model is then used to estimate the transformed predicted value (Rumberger & Palardy, 2004).

The Level 1 sampling model is a Bernoulli model,

$$Y_{ij} | \phi_{ij} \sim B(\phi_{ij})$$

where $Y_{ij}$ is the number of dropouts and $\phi_{ij}$ is the probability of student $i$ in school $j$ dropping out on each trial. The Level 1 link function is a log-odds ratio,

$$\eta_{ij} = \log[\phi_{ij} / (1 - \phi_{ij})],$$

where $\eta_{ij}$, the predicted value, is the log of the odds of dropping out. If the probability of dropping out, $\phi_{ij}$, is 0.5, the odds of dropping out is $(0.5/1-0.5) = 1$ and the log-odds or “logit” is $\log(1.0) = 0$. When the probability of success is less than half, the odds are less than one and the logit is negative. When the probability is greater than half, the odds are greater than one and the logit is positive. Note that although the probability values are constrained to fall within the interval zero to one, the logit can take on any real value. Lastly, the Level 1 structural model converts the predicted log-odds to a predicted probability:
\[ \varphi_{ij} = 1/[1 + \exp(-\eta_{ij})]. \]

Combining the Level 1 sampling model, link function, and structural model reproduces the standard Level 1 model of HLM using the following formula:

\[ n_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \cdots + \beta_{pj}X_{pj} \]

where \( \beta_{0j} \) is the intercept and \( \beta_{1j} \) is the slope or the expected change in the outcome variable associated with an increase in \( X_{1ij} \), a student predictor variable. The HGLM Level 2 model is the same as an HLM Level 2 model:

\[ \beta_{qj} = \gamma_{q0} + \sum \gamma_{qs} W_{sj} + u_{qj}, \]

where \( \gamma_{q0} \) is the intercept, \( \sum \gamma_{qs} W_{sj} \) is the sum of a set of regression coefficients and predictors, and \( u_{qj} \) is the residual variable. The error term, \( u_{qj} \), is assumed to have a mean of zero and a variance of \( \tau_{qj} \).

The first step of analysis is to apply a fully unconditional or “null” model that specifies no predictors at Level 1 or Level 2 (Raudenbush & Bryk, 2002). The unconditional Level 1 model is simply

\[ n_{ij} = \beta_{0j}, \]

and Level 2 model is

\[ \beta_{0j} = \gamma_{00} + u_{0j}. \]

Substituting the equations yields the combined model

\[ n_{ij} = \gamma_{00} + u_{0j}, \]

where \( \gamma_{00} \) is the average log-odds of dropping of school across schools and \( u_{0j} \) is the school random error. The estimated residual variance \( \text{variance}(u_{0j}) \), \( \tau_{00} \), is the variance between schools in school-average log-odds of dropping out.
The second step in the analysis is to build a conditional model at Level 1. In this model, the student control variables and the explanatory variables are included at Level 1. This conditional model determined if there was a relationship between engagement and dropping out, after controlling for student background characteristics (Research Question 2). The equation below reflects the Level 1 conditional model:

\[
H_{ij} = \beta_{0j} + \beta_{1j}FEMALE_{ij} + \beta_{2j}AGE_{ij} + \beta_{3j}ASIAN_{ij} + \beta_{4j}BLACK + \beta_{5j}HISPANIC_{ij} + \beta_{6j}OTHER_{ij} + \beta_{7j}BYSTLANG_{ij} + \beta_{8j}BYESES1_{ij} + \beta_{9j}FCOMP_{ij} + \beta_{10j}PRNTINV_{ij} + \beta_{11j}BYIEP_{ij} + \beta_{12j}BYTXCSTD_{ij} + \beta_{13j}F1RGP9_{ij} + \beta_{14j}VOCATIONAL_{ij} + \beta_{15j}ACADEMIC_{ij} + \beta_{16j}BEHAVIORAL_{ij} + \beta_{17j}EMOTIONAL_{ij} + \beta_{18j}COGNITIVE_{ij}.
\]

The Level 1 intercept is represented by \( \beta_{0j} \), which was allowed to vary freely from student to student. The Level 1 slopes are represented by \( \beta_{1j} - \beta_{18j} \) and were constrained to represent student-level variable estimates.

The between-school model in this case contains no school-level predictors:

\[
\beta_{0j} = \gamma_{00} + u_{0j},
\]
\[
\beta_{1j} = \gamma_{10}
\]
\[
\vdots
\]
\[
\beta_{18j} = \gamma_{18,0}.
\]

The Level 2 intercept is represented by \( \gamma_{00} \) and \( u_{0j} \) is the school random error. The intercept, at Level 2, was allowed to vary by school (i.e., the error term for this equation was freed). The Level 2 slopes are represented by \( \gamma_{10} - \gamma_{18,0} \). All Level 2 slopes were “fixed” (i.e., set as equal) across schools.

To answer Research Question 3 of this study, the unconditional and conditional models, described above, were estimated separately by subgroup. The effects of the explanatory variables were examined for each subgroup of interest to determine if they were statistically significant interaction effects of engagement on dropping out after controlling for other student
characteristics. More specifically, the following subgroups were examined: gender (female vs. male), race/ethnicity (Asian, Hawaiian/Pacific Islander, Black/African American, Hispanic, White, Other), native language other than English (native language other than English vs. English is native language), SES, and GPA.

**Research Question 4** examined the effects of school processes, more specifically, administrator control and school morale, on the domains of engagement and dropping out, after controlling for student characteristics and school contextual factors. To answer Research Question 4, a Level 2 unconditional model is analyzed first to examine the amount of Level 2 variance between schools. The equation below reflects the Level 2 unconditional model:

\[ n_{ij} = \beta_{0j} + \beta_{1j}FEMALE_{ij} + \beta_{2j}AGE_{ij} + \beta_{3j}ASIAN_{ij} + \beta_{4j}BLACK + \beta_{5j}HISPANIC_{ij} + \beta_{6j}OTHER_{ij} + \beta_{7j}BYSTLANG_{ij} + \beta_{8j}BYESSES1_{ij} + \beta_{9j}FCOMP_{ij} + \beta_{10j}PRNTINVL_{ij} + \beta_{11j}BYIEP_{ij} + \beta_{12j}BYTCSTD{i}_{ij} + \beta_{13j}F1RGP9_{ij} + \beta_{14j}VOCATIONAL_{ij} + \beta_{15j}ACADEMIC_{ij} + \beta_{16j}BEHAVIORAL_{ij} + \beta_{17j}EMOTIONAL_{ij} + \beta_{18j}COGNITIVE_{ij}; \]

\[ \beta_{0j} = \gamma_{00} + u_{0j}, \]

\[ \beta_{1j} = \gamma_{10}, \]

\[ \beta_{2j} = \gamma_{20}, \]

\[ \beta_{3j} = \gamma_{30}, \]

\[ \beta_{4j} = \gamma_{40}, \]

\[ \beta_{5j} = \gamma_{50}, \]

\[ \beta_{6j} = \gamma_{60}, \]

\[ \beta_{7j} = \gamma_{70}, \]

\[ \beta_{8j} = \gamma_{80}, \]

\[ \beta_{9j} = \gamma_{90}, \]

\[ \beta_{10j} = \gamma_{10.0}, \]

\[ \beta_{11j} = \gamma_{11.0}, \]

\[ \beta_{12j} = \gamma_{12.0}, \]

\[ \beta_{13j} = \gamma_{13.0}, \]

\[ \beta_{14j} = \gamma_{14.0}, \]

\[ \beta_{15j} = \gamma_{15.0}, \]

\[ \beta_{16j} = \gamma_{160} + u_{16j}; \]

\[ \beta_{17j} = \gamma_{170} + u_{17j}, \]

\[ \beta_{18j} = \gamma_{180} + u_{18j}. \]
The Level 1 equation (Model 2) remained the same, but the Level 2 intercept ($\gamma_{00}$) and slopes of the variables of interest (i.e., behavioral [$\gamma_{16,0}$], emotional [$\gamma_{17,0}$], and cognitive [$\gamma_{18,0}$] engagement) were allowed to vary by school. The random error terms are represented by $u_{0j}$, $u_{16j}$, $u_{17j}$, $u_{18j}$. The slopes for the control variables ($\gamma_{10} - \gamma_{15,0}$) were fixed across schools.

Once the variation between schools was examined, a conditional model at Level 2 was built. This Level 2 conditional model was used to model the association between student engagement and dropping out as a function of administrator control and school morale. In this model, school-level predictors were added to the Level 2 equations. More specifically, school control and explanatory variables were entered into the equations predicting the Level 1 intercept (an exploratory analysis) and the slopes of the school explanatory variables (the confirmatory analysis). The equations below reflect the Level 2 conditional model:

\[
\begin{align*}
n_{ij} &= \beta_{0j} + \beta_{1j}FEMALE_{ij} + \beta_{2j}AGE_{ij} + \beta_{3j}ASIAN_{ij} + \beta_{4j}BLACK + \beta_{5j}HISPANIC_{ij} + \\
&\quad + \beta_{6j}OTHER_{ij} + \beta_{7j}BYSTLANG_{ij} + \beta_{8j}BYSES1_{ij} + \beta_{9j}FCOMP_{ij} + \beta_{10j}PRNTINV{L}_{ij} + \\
&\quad + \beta_{11j}BYIEP_{ij} + \beta_{12j}BYTXCSTD_{ij} + \beta_{13j}F1RGP9_{ij} + \beta_{14j}VOCATIONAL_{ij} + \\
&\quad + \beta_{15j}ACADEMIC_{ij} + \beta_{16j}BEHAVIORAL_{ij} + \beta_{17j}EMOTIONAL_{ij} + \beta_{18j}COGNITIVE_{ij};
\end{align*}
\]

\[
\begin{align*}
\beta_{0j} &= \gamma_{00} + \gamma_{01}BYA21_{j} + \gamma_{02}CP02PMIN_{j} + \gamma_{03}F1GP9\_mean_{j} + \\
&\quad + \gamma_{04}AVERTCHRSALARY_{j} + \gamma_{05}PERFTCTT_{j} + \gamma_{06}PUBLIC_{j} + \gamma_{07}BYG10ER_{j} + \\
&\quad + \gamma_{08}ADMINISTCTRL_{j} + \gamma_{09}SCHLMRLE_{j} + u_{0j},
\end{align*}
\]

\[
\begin{align*}
\beta_{1j} &= \gamma_{10}, \\
\beta_{2j} &= \gamma_{20}, \\
\beta_{3j} &= \gamma_{30}, \\
\beta_{4j} &= \gamma_{40}, \\
\beta_{5j} &= \gamma_{50}, \\
\beta_{6j} &= \gamma_{60}, \\
\beta_{7j} &= \gamma_{70}, \\
\beta_{8j} &= \gamma_{80}, \\
\beta_{9j} &= \gamma_{90}, \\
\beta_{10j} &= \gamma_{10,0}, \\
\beta_{11j} &= \gamma_{11,0}, \\
\beta_{12j} &= \gamma_{12,0}.
\end{align*}
\]
\[
\begin{align*}
\beta_{13j} &= \gamma_{13,0} + \\
\beta_{14j} &= \gamma_{14,0} + \\
\beta_{15j} &= \gamma_{15,0} + \\
\beta_{16j} &= \gamma_{16,0} + \gamma_{16,1}BYA21j + \gamma_{16,2}CP02PMINj + \gamma_{16,3}F1GP9_{\text{mean}}j + \\
&\quad \gamma_{16,4}AVERTCHRSALARYj + \gamma_{16,5}PERFTCCTTj + \gamma_{16,6}PUBLICj + \gamma_{16,7}BYG10ERj + \\
&\quad \gamma_{16,8}\text{ADMINISTCTRL}j + \gamma_{16,9}\text{SCHLMRLE}j + u_{16j}, \\
\beta_{17j} &= \gamma_{17,0} + \gamma_{17,1}BYA21j + \gamma_{17,2}CP02PMINj + \gamma_{17,3}F1GP9_{\text{mean}}j + \\
&\quad \gamma_{17,4}AVERTCHRSALARYj + \gamma_{17,5}PERFTCCTTj + \gamma_{17,6}PUBLICj + \gamma_{17,7}BYG10ERj + \\
&\quad \gamma_{17,8}\text{ADMINISTCTRL}j + \gamma_{17,9}\text{SCHLMRLE}j + u_{17j}, \\
\beta_{18j} &= \gamma_{18,0} + \gamma_{18,1}BYA21j + \gamma_{18,2}CP02PMINj + \gamma_{18,3}F1GP9_{\text{mean}}j + \\
&\quad \gamma_{18,4}AVERTCHRSALARYj + \gamma_{18,5}PERFTCCTTj + \gamma_{18,6}PUBLICj + \gamma_{18,7}BYG10ERj + \\
&\quad \gamma_{18,8}\text{ADMINISTCTRL}j + \gamma_{18,9}\text{SCHLMRLE}j + u_{18j}.
\end{align*}
\]

The Level 2 intercept is represented by, \(\gamma_{00}\), and \(u_{0j}\) is the error term, which was allowed to vary freely. The Level 2 slopes are represented by \(\gamma_{10} - \gamma_{18,0}\). All Level 2 slopes, \(\gamma_{10} - \gamma_{15,0}\), were fixed across schools except for the slopes of the engagement variables, \(\gamma_{16,0} - \gamma_{18,0}\), which varied, allowing the slopes to be modeled as outcomes. The intercept terms for the slope equations are represented by \(\gamma_{16,1}, \gamma_{17,1}, \gamma_{18,1}\) and the respective error terms are \(u_{16j}, u_{17j}, u_{18j}\).

Interaction terms were explored between specific school-level variables of interest to determine if there were effects of school processes by school structural characteristics on student engagement that explain dropping out, after controlling for other student and school characteristics (Research Question 5). A model including grade 10 enrollment by administrator control and school morale interactions was examined as well as a separate model with school control (i.e., public vs. Catholic or other private) by administrator control and school morale interactions.

Data to answer Research Questions 2 through 5 were analyzed in the HLM 6.0 software. All HGLM analyses were conducted using the imputed datasets. The \(m=1\) student-level dataset was paired with the \(m=1\) school-level dataset, the \(m=2\) student-level dataset was paired with the
m=2 school-level dataset and so on, which created a total of 10 files. The HLM 6.0 multiple imputation estimation settings were used to combined the effects of the 10 datasets.

**Issues related to complex sample design.** As described above, the ELS:2002 base-year sampling design was a stratified two-stage sample design. Given this complex sample design, statistical analyses must be conducted using software that properly accounts for the complex survey design (Ingles et al., 2004). In general, statistical analysis software assumes the data were obtained from a simple random sample, meaning that all members of the population have the same probability of selection. The ELS:2002 sample design, however, differs from a simple random sample in three ways: (1) both schools and student samples were stratified by school and student characteristics, respectively; (2) both schools and students were selected with unequal probabilities of selection; and (3) the sample of students was clustered by school. Relative to a simple random sample, clustering and unequal probabilities of selection tend to increase the variance of sample estimates and stratification tends to decrease the variance of the estimates. These two effects do not cancel each other out. On the contrary, when analyzing the data that were collected with a complex sampling design, using the simple random sampling assumption is more likely to lead to a Type I error (i.e., rejecting the null hypothesis when it is in fact true) (Carlson, Johnson, & Cohen, 1993; Ingles et al., 2004).

To account for the complex survey design, NCES created student- and school-level weights, strata, and primary sampling unit (PSU) indicators (Ingles et al., 2004). The weights adjust for unequal probabilities of selection of schools and students. The strata were formed from the sampling strata used in the first stage of sampling (i.e., U.S. Census regions, urbanicity, and school control). The PSU indicator was formed at the school level, which was the first stage of clustering. The `svyset` command in Stata/IC 12.0 was used for the factor analyses with the
student-level weight (F1TRSCWT), stratification (STRATA), and cluster (PSU) variables. Unfortunately, both Stata/IC 12.0 and HLM 6.0 will not account for both the student- and school-level weights and clustering indicators, when conducting HGLM analyses. Given that HLM 6.0 was selected for the HGLM analyses, it is important to note this limitation of the study. While the stratification and cluster variables were not accounted for in the analyses, both the student (F1TRSCWT) and school (BYSCHWT) weights were included.

**Validity of Study**

The lack of randomization of the ELS:2002 poses a number of potential threats to this study’s internal validity (e.g., selection, history, and maturation), which restricts the conclusions that can be made about the hypotheses tested (Campbell & Stanley, 1963; Schneider, Carnoy, Kipatrick, Schmidt, & Shavelson, 2007). NCES took a number of steps to increase internal validity of the ELS:2002 data. First, the ELS:2002 survey items went through a structured development process with the content specification documents drawing heavily on preexisting NCES survey items (e.g., High School & Beyond [HS&B] and NELS:88). The reading and mathematics achievement tests went through a similar process. Second, the surveys and tests were administered by trained NCES staff, reducing the influence of random error associated with variation in administration. Third, NCES staff went to great lengths to reduce missing data due to attrition, including contacting students via phone or in person. In addition to these steps, this study used statistical controls in the multi-level models to reduce threats caused by history and selection bias. Despite these measures, the findings of this study support correlational relationships and do not provide evidence of causation; therefore, the results should be interpreted with caution.
In regards to external validity, the ELS:2002 survey was designed to provide an abundance of student data over a period of time, which could be generalized to students throughout the United States. More specifically, the NCES sampling plan devised a nationally representative sample with student and school weights that allow for findings to be generalizable to high school sophomores in schools with tenth-grade in 2002; therefore, this study has strong external validity.
Results

Using the selected Educational Longitudinal Study: 2002 (ELS:2002) sample, separate analyses were conducted to answer the research questions posed by this study. The results of these analyses are presented in this section by research question. In addition, descriptive statistics of the analysis sample are presented. Given that this study uses the ELS:2002 restricted-use data, all Ns and degrees of freedom are rounded to the nearest 10. The degrees of freedom are suppressed if less than 10.

Descriptive Analyses

Descriptive statistics of the variables of interest for the sample used in the factor analysis (Research Question 1) are displayed in Table 7. Of the 13,990 tenth-grade students in the ELS:2002 sample selected, four percent of the sample dropped out of high school two years later, 76 percent graduated, and 18 percent have a status of other (e.g., still enrolled, transferred to another school or the status was unknown). There are equal proportions of female (50%) and male (50%) students. The race/ethnicity of the sample includes: 58 percent White, 14 percent Hispanic, 13 percent Black/African American (hereafter referred to as Black), 10 percent Asian, Hawaiian/Pacific Island (hereafter referred to as Asian), and six percent Other. The average tenth-grade student age at the time of the survey is 15.7 years old (SD=0.65). The majority (83%) of students in the sample speak English as a native language.
Table 7: Descriptive Statistics of Student-Level Variables Used in the Factor Analysis (N=13,990)

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>0.76</td>
<td>0.42</td>
</tr>
<tr>
<td>Dropout</td>
<td>0.44</td>
<td>0.20</td>
</tr>
<tr>
<td>Other (e.g., Still Enrolled, Transfer, Status Unknown)</td>
<td>0.18</td>
<td>0.39</td>
</tr>
<tr>
<td>Female</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>0.10</td>
<td>0.30</td>
</tr>
<tr>
<td>Black</td>
<td>0.13</td>
<td>0.33</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.14</td>
<td>0.35</td>
</tr>
<tr>
<td>Other</td>
<td>0.06</td>
<td>0.23</td>
</tr>
<tr>
<td>White</td>
<td>0.58</td>
<td>0.49</td>
</tr>
<tr>
<td>Age in years (Range: 14-19)</td>
<td>15.7</td>
<td>0.65</td>
</tr>
<tr>
<td>English is Native Language</td>
<td>0.83</td>
<td>0.37</td>
</tr>
<tr>
<td>Socioeconomic Status Index (Range: -2.11-1.82)</td>
<td>0.05</td>
<td>0.74</td>
</tr>
<tr>
<td>Lives with both Parents</td>
<td>0.60</td>
<td>0.49</td>
</tr>
<tr>
<td>IEP in Grade 10</td>
<td>0.06</td>
<td>0.24</td>
</tr>
<tr>
<td>Grade 10 Reading and Math Achievement (Range: 22.57-78.76)</td>
<td>50.7</td>
<td>9.95</td>
</tr>
<tr>
<td>Grade 9 Grade Point Average (Range: 0.00-4.00)</td>
<td>2.74</td>
<td>0.82</td>
</tr>
<tr>
<td>High School Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>0.35</td>
<td>0.48</td>
</tr>
<tr>
<td>General</td>
<td>0.56</td>
<td>0.50</td>
</tr>
<tr>
<td>Vocational</td>
<td>0.09</td>
<td>0.29</td>
</tr>
</tbody>
</table>

In the factor analysis sample, the mean family socioeconomic status (SES) index is 0.05 (SD=0.74), which is slightly higher than the overall ELS:2002 sample mean of 0.04 (SD=0.74).

Sixty percent of the sample lives with both parents in tenth grade. Few students (6%) have an individualized education plan (IEP) in grade 10 and a little more than half (56%) are enrolled in a general high school program, as compared to 35 percent who are enrolled in an academic-based program and nine percent who were enrolled in a vocational program. The students’ average grade 10 reading and math achievement score equals 50.7 (SD=9.95) and their mean grade 9 grade point average (GPA) equals 2.74 (SD=0.82).

Research Questions 2 through 5 focus on identifying differences between students who dropped out compared to students who graduated; therefore, students who transferred, were still
enrolled in school, or whose status could not be determined were removed from the sample prior to analysis (see the Method section for more detail). Without the Other subsample and with the student and school flags and weights assigned, there are a total of 11,370 students and 700 schools in the sample. To reduce bias due to missing survey data, values of all variables of interest at the student- and school-level were calculated using multiple imputation. After the multiple imputation, 7,340 students from 460 schools had complete data on all variables of interest used in the hierarchical generalized linear modeling (HGLM) analyses reduced to a total. Tables 8 and 9 present the student-level and school-level descriptives of the sample after multiple imputation. The descriptives represent the average across the 10 imputed student-level and 10 imputed school-level datasets.

Table 8 displays the student-level variables by dropout status (dropout vs. graduate) used in the hierarchical generalized linear modeling (HGLM) analyses. The HGLM analysis sample includes about four percent of students who dropped out of high school and 96 percent of students who graduated. A smaller proportion of females are dropouts (45%), as compared to the proportion of female graduates (53%) ($\chi^2 = 8.16, p < .05$). A smaller proportion of students who dropped out are of a White race/ethnicity (47%) as compared to the proportion of graduates who are of a White race/ethnicity (66%) ($\chi^2 = 43.55, p < .001$). Similarly, fewer dropouts are Asian (4%) as compared to graduates who are of an Asian (8%) ($\chi^2 = 7.65, p < .05$). A larger proportion of drop outs were Hispanic (26%) than graduates who were Hispanic (11%) ($\chi^2 = 57.41, p < .001$). Of students who dropped out 12 percent are of an Other race as compared to 5 percent of graduates of an Other race ($\chi^2 = 25.732, p < .001$). The proportion of dropouts from a Black race/ethnicity (11%) is similar to the proportion of graduates from a Black race/ethnicity (9%) ($\chi^2 = 1.24, p > .05$). There is a one year difference in the mean age of dropouts (M = 16.2,
SD = 0.82) as compared to graduates (M = 15.6, SD = 0.58) (t = 15.34, df = 7,330, p < .001). Of high school graduates, 87 percent speak English as their native language as compared to 79 percent of dropouts who speak English as their native language (χ² = 14.76, p < .001).

Table 8: Descriptive Statistics of Student-Level Variables Used in the HGLM by Dropout Status

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Dropout (N=290)</th>
<th>Graduate (N=7,050)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Female</td>
<td>0.45**</td>
<td>0.50</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>0.04*</td>
<td>0.19</td>
</tr>
<tr>
<td>Black</td>
<td>0.11</td>
<td>0.31</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.26**</td>
<td>0.44</td>
</tr>
<tr>
<td>Other</td>
<td>0.12**</td>
<td>0.32</td>
</tr>
<tr>
<td>White</td>
<td>0.47**</td>
<td>0.50</td>
</tr>
<tr>
<td>Age (Range: 14-19)</td>
<td>16.2**</td>
<td>0.82</td>
</tr>
<tr>
<td>English is Native Language</td>
<td>0.79**</td>
<td>0.41</td>
</tr>
<tr>
<td>SES (Range: -1.97-1.82)</td>
<td>-0.40**</td>
<td>0.64</td>
</tr>
<tr>
<td>Lives with both Parents</td>
<td>0.37**</td>
<td>0.48</td>
</tr>
<tr>
<td>Parental Involvement (Range: -2.41-1.11)</td>
<td>-0.21**</td>
<td>0.60</td>
</tr>
<tr>
<td>Individual Education Plan in Grade 10</td>
<td>0.07*</td>
<td>0.26</td>
</tr>
<tr>
<td>Grade 10 Reading and Math Achievement(Range: 22.57-78.76)</td>
<td>44.8**</td>
<td>8.95</td>
</tr>
<tr>
<td>Grade 9 GPA (Range: 0.00-4.00)</td>
<td>1.90**</td>
<td>0.77</td>
</tr>
<tr>
<td>High School Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>0.29**</td>
<td>0.46</td>
</tr>
<tr>
<td>General</td>
<td>0.54**</td>
<td>0.50</td>
</tr>
<tr>
<td>Vocational</td>
<td>0.16**</td>
<td>0.37</td>
</tr>
<tr>
<td>Behavioral Engagement (Range: -4.61-2.52)</td>
<td>0.96**</td>
<td>0.59</td>
</tr>
<tr>
<td>Emotional Engagement (Range: -0.72-2.57)</td>
<td>1.00**</td>
<td>0.47</td>
</tr>
<tr>
<td>Cognitive Engagement (Range: 0-3)</td>
<td>1.57**</td>
<td>0.75</td>
</tr>
</tbody>
</table>

*p < .05; ** p < .001.

Tenth-grade students who dropped out after two years tend to come from families with a similar mean SES index (M = -0.40, SD = 0.64) than students who graduated (M = -0.20, SD = 0.72) (t = 13.75, df = 7,330, p < .001). More than half (67%) of tenth-grade students who graduated live with both parents whereas, less than half (37%) dropped out (χ² = 109.32, p < .001). Additionally, students who dropped out had parents that were less involved in their
schooling in tenth grade (M = -0.21, SD=0.60) than students who graduated (M = 0.02, SD=0.59) (t = 6.37, df = 7,330, p < .001).

A higher percentage of students who dropped out (7%) had an IEP in tenth grade than those who graduated (4%) (χ² = 8.08, p < .05). Students who dropped out have a lower grade 10 reading and math achievement score (M = 44.8, SD = 8.95) (t = 16.84, df = 7,330, p < .001) and grade 9 GPA (M=1.90, SD=0.77), as compared to students who graduated (M=53.3, SD=9.56 and M=2.98, SD=0.72, respectively) (t = 24.88, df = 7,330, p < .001). A larger proportion of students who graduated were enrolled in an academic high school program in tenth-grade (62%) as compared to dropped out (29%) (χ² = 70.96, p < .001). More drop outs were enrolled in a general high school program in tenth-grade (54%) than graduated (30%) (χ² = 121.52, p < .001). Similarly, more students who dropped out were enrolled in a vocational high school program (16%) than graduated (8%) (χ² = 29.86, p < .001). Furthermore, students who dropped out have lower levels of behavioral (M=0.96, SD=0.59), emotional (M=1.00, SD=0.47), and cognitive engagement (M=1.21, SD=0.44) in tenth grade as compared to students who graduated (Behavioral: M=1.22, SD=0.53; Emotional: M=1.21, SD=0.44; Cognitive: M=1.83, SD=0.69) (Behavioral: t = 8.02, df = 7,330, p < .001; Emotional: t = 7.71, df = 7,330, p < .001; Cognitive: t = 6.35, df = 7,330, p < .001).

Table 9 displays the descriptive statistics of student-level variables used in an HGLM exploratory analysis conducted using the dimensions of engagement. The means on each of the dimensions are lower for dropouts than for graduates. These differences are statistically significant, expect for Class Participation (t = 1.62, df = 7,100, p > .05). As compared to students who graduate, dropouts have poor conduct (t = 19.90, df = 7,100, p < .001); are not prepared for class (t = 4.64, df = 7,100, p < .001); have negative attitudes teachers (t = 7.24, df =
7,100, \( p < .001 \), the school social environment (\( t = 4.73, \text{df} = 7,100, p < .001 \)), and about the school academic environment (\( t = 5.44, \text{df} = 7,100, p < .001 \)); do not persist when facing challenging school work (\( t = 6.17, \text{df} = 7,100, p < .001 \)); and do not work hard as possible when studying (\( t = 4.15, \text{df} = 7,100, p < .001 \)).

Table 9: Descriptive Statistics of the Dimensions of Engagement Used in an Exploratory HGLM by Dropout Status

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Dropout (N=270)</th>
<th>Graduate (N=6,830)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Conduct (Range:-7.88-0.66)</td>
<td>-0.60**</td>
<td>0.90</td>
</tr>
<tr>
<td>Class Participation (Range: 0-4)</td>
<td>1.51</td>
<td>1.28</td>
</tr>
<tr>
<td>Prepared for Class (Range: 0-3)</td>
<td>2.01**</td>
<td>0.77</td>
</tr>
<tr>
<td>Attitudes About Teachers (Range: 0-3)</td>
<td>1.67**</td>
<td>0.60</td>
</tr>
<tr>
<td>Attitudes About the School Social Environment (Range: 0-3)</td>
<td>1.59**</td>
<td>0.51</td>
</tr>
<tr>
<td>Attitudes About the School Academic Environment (Range: -2.24-1.83)</td>
<td>-0.27**</td>
<td>0.87</td>
</tr>
<tr>
<td>Persistence (Range: 0-3)</td>
<td>1.62**</td>
<td>0.77</td>
</tr>
<tr>
<td>Effort (Range: 0-3)</td>
<td>1.59**</td>
<td>0.79</td>
</tr>
</tbody>
</table>

* \( p < .05 \); ** \( p < .001 \).

Table 10 displays the school-level variables used in the HGLM analyses. The average dropout rate across the participating schools is six percent. The majority (77%) of schools are public schools and less than a third (23%) are Catholic or other private schools. Across all schools the average tenth-grade enrollment was 308 (SD=223.5). On average, 22 percent of tenth-grade students in the participating schools receive free-reduced priced lunch (FRL) and 30 percent of the student enrollment is of a minority race/ethnicity. The school average grade 9 GPA equals 2.85 (SD=0.38).
Table 10: Descriptive Statistics of School-Level Variables Used in the HGLM by Graduation Status (N=460)

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropout Rate (Range: 0-1)</td>
<td>0.06</td>
<td>0.11</td>
</tr>
<tr>
<td>Percent Grade 10 FRL (Range: 0-100)</td>
<td>22.3</td>
<td>23.5</td>
</tr>
<tr>
<td>Percent Minority (Range: 0-100)</td>
<td>29.9</td>
<td>28.9</td>
</tr>
<tr>
<td>Grade 9 GPA (Range:1.35-4.00)</td>
<td>2.85</td>
<td>0.38</td>
</tr>
<tr>
<td>Teacher Salary (Range:14800-69500)</td>
<td>41711.8</td>
<td>9024.8</td>
</tr>
<tr>
<td>Percent Teachers with Subject Certification (Range:0-100)</td>
<td>95.8</td>
<td>15.4</td>
</tr>
<tr>
<td>Public</td>
<td>0.77</td>
<td>0.42</td>
</tr>
<tr>
<td>Grade 10 Enrollment (Range:5-1156)</td>
<td>307.6</td>
<td>223.5</td>
</tr>
<tr>
<td>Administrator Control (Range:1.50-3.00)</td>
<td>2.59</td>
<td>0.31</td>
</tr>
<tr>
<td>School Morale (Range:2-5)</td>
<td>3.95</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Across the schools in the selected sample, the majority (96%) of teachers are certified in the subject area they teach. The mean teacher salary in the school sample equals $41,712 (SD=9024.8). Lastly, across the schools, the average administrator control equals 2.59 (SD=0.31) and the average school morale equals 3.95 (SD=0.67).

**Research question 1: Domains and dimensions of engagement**

The first research question of this study, asked whether factor analysis supports the hypothesis that engagement is a meta-construct consisting of multiple dimensions within the behavioral, emotional, and cognitive domains. More specifically, the model of engagement in this study was hypothesized as a second-order factor model. It is hypothesized that the second-order factors consist of behavioral, emotional, and cognitive domains, and the first-order factors consist of the dimensions that measure these domains. See Figures 3 and 4 in the Methods section for a graphic of the hypothesized models.

Factor analysis was selected as the appropriate tool to answer this research question, because it is based on the theory that factors, or latent variables, represent underlying constructs, such as engagement. The purpose of factor analysis is to determine the nature and number of
latent variables that fit the data. More specifically, exploratory factor analysis was run to
determine if the measured variables were adequate. The results of the factor analysis are
described below.

Based on the literature review of engagement, 41 measured variables were selected for
the factor analysis of the first-order factors (see Table 4 for a description of these variables). It
was hypothesized that the following eight latent factors would emerge from the 41 measured
variables measuring students’ conduct; participation in school; class preparedness; attitudes
about teachers; attitudes about classmates; attitudes about school overall; persistence; and effort.

In the first run of the factor analysis all 41 measured variables were included. The factor
command in Stata/IC 12.0 was used, with a maximum likelihood estimator method, and the
minimum eigenvalue to be retained equaled one. To determine the appropriate number of factors,
the eigenvalues and scree plot were reviewed. A review of the eigenvalues suggests that a model
with up to nine factors would be appropriate for the data. The ninth-factor eigenvalue equals
1.03, which is above the 1.00 cutoff. The eighth-factor eigenvalue equals 1.08. The scree plot
generated for this analysis is shown in Figure 5. The scree plot for this analysis suggests that the
optimal number of factors would likely be around 10, because the slope of the line began to
flatten out below one after the ten-factor model.
Based on the initial review of the eigenvalues and scree plot, obimin oblique rotations with a Maximum Likelihood estimator were run for the six- to 10-factor models. The chi-square goodness-of-fit statistics were reviewed for each model and the normed fit index (NFI) was calculated to compare each model with the null model. The fit statistics are shown in Table 11. The chi-square values for each model are statistically significant, which indicates poor fit. Large sample sizes, however, often distort the chi-squares and the significant $p$-values do not necessarily indicate a poor-fitting model. The NFI is another indicator of model fit. When comparing each of the models to the null model, models with fit index of greater than .90 are considered having good fit. The NFI values range from .90 for the six-factor model to .97 for the ten-factor model, suggesting that the models have good fit compared to the null model.
After reviewing the overall fit of the models, the factor loadings for the measured variables were reviewed. Although the fit statistics indicated that each of the models provided adequate fit for the data, overall fit statistics do not test the performance of individual observed variables. The factor loadings were reviewed for the eight-factor model, given that it was the hypothesized model. The following two criteria were used when evaluating each measured variable and whether or not it should be retained in the model: (1) the magnitude of the factor loading should be greater than or equal to .3; and (2) variables should not load on to more than one factor with a factor loading greater than or equal to .2.

Five variables have factor loadings below .3 on all of the ten factors. These variables include BYS20B (*There is real school spirit*), BYS29B (*Listen to the teacher lecture in your current or most recent math class*), BYS29C (*Copy the teacher’s notes from the board in your current or most recent math class*), ExtrAct_Sports (*Participates in sports at school*), and ExtrAct_FineArtsandClubs (*Participates in an arts or other club at school*). Another four variables load on more than one factor at .2 or above. The cross loadings are shown in Table 12. These eight variables were removed from the model.
Table 12: Variables with Cross Loadings from the First Factor Analysis of the First-Order Factors

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F6</th>
<th>F7</th>
<th>F9</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYS20H</td>
<td>In class I often feel “put down” by my teachers</td>
<td></td>
<td></td>
<td></td>
<td>.30</td>
<td>.32</td>
<td></td>
</tr>
<tr>
<td>BYS89G</td>
<td>When I study, I make sure that I remember the most important things</td>
<td></td>
<td></td>
<td>.44</td>
<td>.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS89O</td>
<td>When studying, I keep working even if the material is difficult</td>
<td></td>
<td>.45</td>
<td>.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS89S</td>
<td>When studying, I try to do my best to acquire the knowledge and skills taught</td>
<td></td>
<td>.41</td>
<td>.48</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

After removing the eight variables, the factor analysis was rerun with the same methods as described above. A review of the eigenvalues suggests that a model with up to six factors would be appropriate for the data. The eigenvalue for the sixth-factor equals 1.70. The eigenvalue for the eighth-factor was .75. The scree plot, as shown in Figure 6 suggests that the optimal number of factors would be between eight and nine, where the slope begins to flatten out.

Figure 6. Scree Plot of the Second Factor Analysis of the First-Order Factors
The factor analysis models were generated with six- to nine-factors. The fit statistics are presented in Table 13. The chi-square values for each model are statistically significant, indicating poor fit. The NFI values, however, range from .91 for the six-factor model to .98 for the nine-factor model, suggesting that the models have good fit compared to the null model. One variable has factor loadings below .3 on each of the eight factors, BYS29E (Listen to the teacher lecture in your current or most recent math class). This variable was removed from the model.

Table 13: Model Fit Statistics for the Second Factor Analysis of the First-Order Factors

<table>
<thead>
<tr>
<th>Model Test</th>
<th>Model</th>
<th>( \chi^2 )</th>
<th>df</th>
<th>Model Comparison</th>
<th>( \chi^2 )</th>
<th>NFI</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>M₀, Null model</td>
<td>72000.00**</td>
<td>500</td>
<td></td>
<td>Comparison</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M₆, 6-factor</td>
<td>6682.21**</td>
<td>320</td>
<td></td>
<td>M₀-M₆</td>
<td>65317.79</td>
<td>.91</td>
<td>180</td>
</tr>
<tr>
<td>M₇, 7-factor</td>
<td>4892.93**</td>
<td>290</td>
<td></td>
<td>M₀-M₇</td>
<td>67107.04</td>
<td>.93</td>
<td>200</td>
</tr>
<tr>
<td>M₈, 8-factor</td>
<td>2649.42**</td>
<td>270</td>
<td></td>
<td>M₀-M₈</td>
<td>69350.58</td>
<td>.96</td>
<td>230</td>
</tr>
<tr>
<td>M₉, 9-factor</td>
<td>1138.35**</td>
<td>240</td>
<td></td>
<td>M₀-M₉</td>
<td>70861.65</td>
<td>.98</td>
<td>250</td>
</tr>
</tbody>
</table>

**p < .001

The factor analysis was rerun for a third time with the same methods as above. A review of the eigenvalues suggests that a model with up to seven factors would be appropriate for the data. The eigenvalue for the seventh-factor equals 1.05. The eigenvalue for the hypothesized eighth-factor equals 0.94. The scree plot, as shown in Figure 7 suggests that the optimal number of factors would likely be around 10, when the slope of the line begins to flatten out.
The factor analysis models were generated with seven- to 10-factors. The fit statistics are presented in Table 14. Again, the chi-square values for each model are statistically significant, indicating poor fit. The NFI values, however, range from .93 for the seven-factor model to .98 for the nine-factor model, suggesting that the models have good fit compared to the null model. An inspection of the factor loadings for each model revealed that the eight-factor model was superior compared to the previous models. The eight-factor model has strong loadings (i.e., the factor loadings were greater than .3) for all measured variables. In addition, the measured variables for each factor made sense and connected to the constructs as hypothesized. Table 15 provides the names and factor loadings for each of the constructs that emerged from the factor analysis. The final model included 31 measured variables loading on to eight factors, representing the dimensions of engagement.
<table>
<thead>
<tr>
<th>Model Test</th>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>Model Comparison</th>
<th>Comparison</th>
<th>$\chi^2$</th>
<th>NFI</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>M₀, Null model</td>
<td>72000.00**</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M₇, 7-factor</td>
<td>4854.27**</td>
<td>270</td>
<td>M₀-M₇</td>
<td></td>
<td>67145.73</td>
<td>.93</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>M₈, 8-factor</td>
<td>2609.45**</td>
<td>250</td>
<td>M₀-M₈</td>
<td></td>
<td>69390.55</td>
<td>.96</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>M₉, 9-factor</td>
<td>1097.70**</td>
<td>220</td>
<td>M₀-M₉</td>
<td></td>
<td>70902.30</td>
<td>.98</td>
<td>270</td>
<td></td>
</tr>
</tbody>
</table>

**$p < .001$**
Table 15: *Latent Construct and Measured Variables from the Final Factor Analysis Model of the First-Order Factors*

<table>
<thead>
<tr>
<th>Latent Construct</th>
<th>Observed Variables</th>
<th>Description</th>
<th>Factor Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct</td>
<td>BYS22D</td>
<td>I got into a physical fight at school</td>
<td>.42</td>
</tr>
<tr>
<td></td>
<td>BYS24A</td>
<td>I was late for school</td>
<td>.44</td>
</tr>
<tr>
<td></td>
<td>BYS24B</td>
<td>I cut or skipped class</td>
<td>.55</td>
</tr>
<tr>
<td></td>
<td>BYS24C</td>
<td>I was absent from school</td>
<td>.34</td>
</tr>
<tr>
<td></td>
<td>BYS24D</td>
<td>I go in trouble for not following school rules</td>
<td>.61</td>
</tr>
<tr>
<td></td>
<td>BYS24E</td>
<td>I was put on in-school suspension</td>
<td>.69</td>
</tr>
<tr>
<td></td>
<td>BYS24F</td>
<td>I was suspended or put on probation</td>
<td>.66</td>
</tr>
<tr>
<td></td>
<td>BYS24G</td>
<td>I was transferred to another school for disciplinary reasons</td>
<td>.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class Participation</td>
<td>BYS29I</td>
<td>Explain your work to the class orally in your current or most recent math class</td>
<td>.56</td>
</tr>
<tr>
<td></td>
<td>BYS29J</td>
<td>Participate in student-led discussions in your current or most recent math class</td>
<td>.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepared for Class</td>
<td>BYS38A</td>
<td>How often do you come to class without a pencil/pen or paper</td>
<td>.81</td>
</tr>
<tr>
<td></td>
<td>BYS38B</td>
<td>How often do you come to class without books</td>
<td>.84</td>
</tr>
<tr>
<td></td>
<td>BYS38C</td>
<td>How often do you come to class without homework</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitudes About Teachers</td>
<td>BYS20A</td>
<td>Students get along well with teachers</td>
<td>.42</td>
</tr>
<tr>
<td></td>
<td>BYS20E</td>
<td>The teaching is good</td>
<td>.68</td>
</tr>
<tr>
<td></td>
<td>BYS20F</td>
<td>Teachers are interested in students</td>
<td>.83</td>
</tr>
<tr>
<td></td>
<td>BYS20G</td>
<td>When I work hard on schoolwork, my teachers praise my effort</td>
<td>.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitudes About the School Social Environment</td>
<td>BYS20D</td>
<td>Other students often disrupt class</td>
<td>.46</td>
</tr>
<tr>
<td></td>
<td>BYS20I</td>
<td>In class I often feel “put down” by other students</td>
<td>.45</td>
</tr>
<tr>
<td>Latent Construct</td>
<td>Observed Variables</td>
<td>Description</td>
<td>Factor Loadings</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>BYS20J</td>
<td>I don’t feel safe at this school</td>
<td>.37</td>
</tr>
<tr>
<td></td>
<td>BYS20K</td>
<td>Disruptions by other students get in the way of my learning</td>
<td>.64</td>
</tr>
<tr>
<td></td>
<td>BYS20L</td>
<td>Misbehaving students often get away with it</td>
<td>.60</td>
</tr>
<tr>
<td>Attitudes About the School</td>
<td>BYS27A</td>
<td>Classes are interesting and challenging</td>
<td>.82</td>
</tr>
<tr>
<td>Academic Environment</td>
<td>BYS27B</td>
<td>Satisfied by doing what is expected in class</td>
<td>.77</td>
</tr>
<tr>
<td></td>
<td>BYS28</td>
<td>How much do you like school</td>
<td>.49</td>
</tr>
<tr>
<td>Persistence</td>
<td>BYS89E</td>
<td>When I sit myself down to learn something really hard, I can learn it</td>
<td>.66</td>
</tr>
<tr>
<td></td>
<td>BYS89N</td>
<td>If I decide not to get any bad grades, I really can do it</td>
<td>.75</td>
</tr>
<tr>
<td></td>
<td>BYS89Q</td>
<td>If I decide not to get any problems wrong, I can really do it</td>
<td>.66</td>
</tr>
<tr>
<td></td>
<td>BYS89T</td>
<td>If I want to learn something well, I can</td>
<td>.78</td>
</tr>
<tr>
<td>Effort</td>
<td>BYS89J</td>
<td>When studying, I try to work hard as possible</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td>BYS89V</td>
<td>When studying, I put forth my best effort</td>
<td>.76</td>
</tr>
</tbody>
</table>
Using the final factor analysis model, the internal consistency of the items was examined using Cronbach’s alpha. As shown in Table 16, the alpha values range from .52 for the construct of Prepared for Class to .83 for the Persistence construct. Alpha values of .70 or higher are considered acceptable, values between .50 and .60 are considered questionable, and values less than .50 are considered poor. The dimensions Prepared for Class, Class Participation, and Attitudes about the School Social Environment have alpha values less than .70, therefore they were used with caution in the analysis models.

Table 16: Internal Consistency for the First-Order Factors

<table>
<thead>
<tr>
<th>Latent Construct</th>
<th>N of Items</th>
<th>( \alpha )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct</td>
<td>8</td>
<td>.71</td>
</tr>
<tr>
<td>Class Participation</td>
<td>2</td>
<td>.60</td>
</tr>
<tr>
<td>Prepared for Class</td>
<td>3</td>
<td>.52</td>
</tr>
<tr>
<td>Attitudes About Teachers</td>
<td>4</td>
<td>.72</td>
</tr>
<tr>
<td>Attitudes About the School Social Environment</td>
<td>5</td>
<td>.64</td>
</tr>
<tr>
<td>Attitudes About the School Academic Environment</td>
<td>3</td>
<td>.77</td>
</tr>
<tr>
<td>Persistence</td>
<td>4</td>
<td>.83</td>
</tr>
<tr>
<td>Effort</td>
<td>2</td>
<td>.82</td>
</tr>
</tbody>
</table>

Composite scores were then created for each of the eight factors, by calculating the mean of the items. Table 17 presents the factor correlations. Based on the hypothesized model the factor correlations between the dimensions should be low to moderate given that they measure different constructs. Correlations above .80 may indicate that two factors are measuring the same construct. The factor correlations indicated good discriminant validity, suggesting that the dimensions were each distinct latent variables.
Table 17: Factor Correlations for the First-Order Factors

<table>
<thead>
<tr>
<th>Latent Construct</th>
<th>1*</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conduct</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Class Participation</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Prepared for Class</td>
<td>.24</td>
<td>.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Attitudes About Teachers</td>
<td>.28</td>
<td>.20</td>
<td>.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Attitudes About the School Social Environment</td>
<td>.13</td>
<td>.07</td>
<td>.09</td>
<td>.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Attitudes About the School Academic Environment</td>
<td>.31</td>
<td>.23</td>
<td>.15</td>
<td>.47</td>
<td>.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Effort</td>
<td>.22</td>
<td>.14</td>
<td>.18</td>
<td>.25</td>
<td>.08</td>
<td>.39</td>
<td>.58</td>
<td></td>
</tr>
</tbody>
</table>

*all significant at $p < .001$.

The composite scores of the final eight factors were then included in the second set of factor analyses to identify the first-order factors. It was hypothesized that three latent first-order factors would emerge: behavioral, emotional, and cognitive engagement. The eigenvalues suggest that a model with one factor would be appropriate for the data. The first-factor eigenvalue equals 2.03. The scree plot generated for this analysis is shown in Figure 8. Based on the data in the scree plot, there is not a clear picture of where the slope of the line flattens out, given that it stops at a four-factor model.
The factor analysis models were generated with one- to four-factors. The chi-square goodness-of-fit statistics were reviewed for each model and the NFI was calculated to compare each model with the null model. The fit statistics are shown in Table 18. The chi-square values for each model are statistically significant, which indicates poor fit. The NFI values for the two- (.94), three- (.98) and four-factor (1.0) models, suggest that these models have good fit compared to the null model; whereas, with an NFI less than .9, the one-factor model (.74) does not have good fit compared to the null model.

Table 18: Model Fit Statistics for the First Factor Analysis of the Second-Order Factors

<table>
<thead>
<tr>
<th>Model Test</th>
<th>Model Comparison</th>
<th>( \chi^2 )</th>
<th>df</th>
<th>( \chi^2 )</th>
<th>NFI</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>M₀, Null model</td>
<td>M₀-M₁</td>
<td>12000.00**</td>
<td>30</td>
<td>8934.43</td>
<td>.74</td>
<td>-</td>
</tr>
<tr>
<td>M₁, 1-factor</td>
<td>M₀-M₁</td>
<td>3065.97**</td>
<td>20</td>
<td>11291.45</td>
<td>.94</td>
<td>20</td>
</tr>
<tr>
<td>M₂, 2-factor</td>
<td>M₀-M₂</td>
<td>708.55**</td>
<td>10</td>
<td>11780.54</td>
<td>.98</td>
<td>20</td>
</tr>
<tr>
<td>M₃, 3-factor</td>
<td>M₀-M₃</td>
<td>219.46**</td>
<td>-</td>
<td>11984.91</td>
<td>1.00</td>
<td>30</td>
</tr>
<tr>
<td>M₄, 4-factor</td>
<td>M₀-M₄</td>
<td>15.09**</td>
<td>-</td>
<td>-</td>
<td>.5</td>
<td>-</td>
</tr>
</tbody>
</table>

**p < .001
After reviewing the overall fit of the models, the factor loadings for the measured variables were reviewed. The factor loadings were reviewed for the three-factor model, given that it was the hypothesized model. Two of the measured variables have factor loadings below .3 on the three factors. These variables include Class Participation and Preparedness for Class. The measured variable Attitudes about the School Academic Environment loads on more than one factor at .2 or above. These three variables were removed from the model and the factor analysis was rerun.

A review of the eigenvalues of the second factor analysis of the first-order factors suggests that a model with up to one factor would be appropriate for the data. The eigenvalue for the first-factor equals 1.44. Figure 9 shows the scree plot for this analysis. Based on the scree plot two factors are optimal.

Figure 9. *Scree Plot of the Second Factor Analysis of the Second-Order Factors*
The factor analysis models were generated with one- to four-factors. The fit statistics are displayed in Table 19. The chi-square values for each model are statistically significant, which indicates poor fit. The NFI values for the one-factor model is .85 and the two-factor model is 1.00, which suggests that the two-factor model have good fit compared to the null model.

Table 19: Model Fit Statistics for the Second Factor Analysis of the Second-Order Factors

<table>
<thead>
<tr>
<th>Model Test</th>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>Model Comparison</th>
<th>Comparison</th>
<th>$\chi^2$</th>
<th>NFI</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>M₀, Null model</td>
<td></td>
<td>6893.35**</td>
<td>10</td>
<td>-</td>
<td>M₀-M₁</td>
<td>5826.81</td>
<td>.85</td>
<td>-</td>
</tr>
<tr>
<td>M₁, 1-factor</td>
<td></td>
<td>1066.54**</td>
<td>-</td>
<td>M₀-M₁</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M₂, 2-factor</td>
<td></td>
<td>4.03**</td>
<td>-</td>
<td>M₀-M₂</td>
<td></td>
<td>6889.32</td>
<td>1.00</td>
<td>-</td>
</tr>
</tbody>
</table>

**$p < .001$**

An inspection of the factor loadings for each model revealed that the two-factor model was superior compared to the one-factor model. The two-factor model has strong loadings (i.e., the factor loadings were greater than .3) for all measured variables. Table 20 provides the names and factor loadings for each of the constructs that emerged from the factor analysis. The measured variables for the second-factor are connected as hypothesized, resulting in a cognitive engagement latent construct. The measured variables for the first-factor with behavioral and emotional engagement components, however, do not appear related conceptually. Although attitudes about teachers and the school social environment are related based on students’ emotional engagement, it is unclear how conduct relates to these dimensions to create an overall construct.
Given that the resulting two-factor model does not appear valid, the hypothesized three-factor second-order model was further explored. Composite scores were calculated for each of the domains of engagement, by averaging across the dimensions that had a hypothesized association with the domains. Behavioral Engagement is comprised of the Conduct, Class Participation, and Preparedness for Class scales. Emotional Engagement comprises the Attitudes about Teachers, Attitudes About the School Social environment, and Attitudes About the School Academic Environment scales. Cognitive engagement is composed of the persistence and effort scales. The internal consistency of the items for each domain was examined using Cronbach’s alpha. The alpha values equal .66 (N items = 13) for Behavioral Engagement, .75 (N items = 12) for Emotional Engagement, and .86 (N items = 6) for Cognitive Engagement. As shown in Table 21, correlations between the calculated domains of engagement indicate moderate correlations between the domains, suggesting that the domains are distinct but related variables.

Table 21: Correlations for the Domains of Engagement

<table>
<thead>
<tr>
<th>Latent Construct</th>
<th>1*</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Behavioral Engagement</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2. Emotional Engagement</td>
<td>.35</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3. Cognitive Engagement</td>
<td>.26</td>
<td>.35</td>
<td>-</td>
</tr>
</tbody>
</table>

*all significant at $p < .001.$
Research question 2: Effect of engagement on dropping out

This study’s second research question asked how the domains of engagement influence dropping out of school in comparison to students who graduate, after controlling for other student characteristics. Data to answer this question were analyzed using HGLM in the HLM 6.0 software. Both the student (F1TRSCWT) and school (BYSCHWT) weights were used when conducting the analyses. When presenting the results of the HGLM analyses both the coefficients, which represent the logit or the log odds, as well as the odds ratio are shown. In contrast to the logit metric, the odds ratio is more easily interpretable. The odds ratio is a ratio between the odds of one event (e.g., drop outs) compared to the odds of another event (e.g., graduating). The odds ratio allows for an estimate of the percentage increase and decrease in the odds of dropping out (Lee & Burkham, 2003). For example, a change in the odds ratio of 1.50 represents a 50 percent increase in the odds of dropping out. A change in the odds ratio of .50 represents a 50 percent decrease in the odds of dropping out.

The results of HGLM analyses addressing Research Question 2 are presented in Tables 21 and 22. First the unconditional model (Model 1) was conducted. The unconditional model does not include student- or school-level variables and is used as a baseline for comparisons to the conditional models at the student-level. Second, an exploratory analysis was conducted to examine the effects of the dimensions of engagement on dropping out (Model 2). Lastly, the confirmatory analysis was conducted, which examined the effects of the domains of engagement on dropping out (Model 3). For Models 2 and 3 (the student-level conditional models), the student, family, and educational control variables were added to the Level 1 equation as well as the variables representing the dimensions or domains of engagement. All categorical variables
were dummy coded and the continuous variables were grand mean centered. At Level 2 the intercept was allowed to vary free; however, the Level 2 slopes were fixed.

The results of the unconditional model and the effects of the dimensions of engagement on dropping out are shown in Table 22. The intercept of the unconditional model ($\beta_{0j} = -3.14$) translates into a dropout rate of about four percent. The unconditional model resulted in a between-school variance ($\tau^2$) of .71. The exploratory analysis, examining the effects of the dimensions of engagement on dropping out, resulted in a between-school variance ($\tau^2$) of .32.
### Table 22: Results of the HGLM Unconditional and Conditional Student-Level Analyses

Examining the Effects of the Dimensions of Engagement

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>SE</td>
<td>df</td>
<td>Odd Ratio</td>
<td>Coefficient</td>
<td>SE</td>
</tr>
<tr>
<td>Intercept</td>
<td>-3.14**</td>
<td>0.12</td>
<td>460</td>
<td>0.04</td>
<td>-5.42**</td>
<td>0.68</td>
</tr>
<tr>
<td><strong>Student Background Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.64</td>
<td>0.35</td>
<td>4,880</td>
<td>1.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.62*</td>
<td>0.24</td>
<td>4,880</td>
<td>1.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>0.46</td>
<td>0.83</td>
<td>4,880</td>
<td>1.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>-0.84</td>
<td>0.59</td>
<td>4,880</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.16</td>
<td>0.47</td>
<td>4,880</td>
<td>1.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0.64</td>
<td>0.54</td>
<td>4,880</td>
<td>1.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English is Native Language</td>
<td>0.70</td>
<td>0.43</td>
<td>4,880</td>
<td>2.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family Background Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>-0.75*</td>
<td>0.28</td>
<td>4,880</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lives with both Birth Parents</td>
<td>-0.75*</td>
<td>0.28</td>
<td>4,880</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental</td>
<td>-0.55**</td>
<td>0.15</td>
<td>4,880</td>
<td>0.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Educational Background Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEP in Grade 10</td>
<td>-0.13</td>
<td>0.54</td>
<td>4,880</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 10 Reading and Math</td>
<td>-0.01</td>
<td>0.02</td>
<td>4,880</td>
<td>0.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 9 GPA</td>
<td>-1.46**</td>
<td>0.24</td>
<td>4,880</td>
<td>0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic Program</td>
<td>-0.04</td>
<td>0.38</td>
<td>4,880</td>
<td>0.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocational Program</td>
<td>0.30</td>
<td>0.41</td>
<td>4,880</td>
<td>1.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Engagement Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conduct</td>
<td>-0.65**</td>
<td>0.13</td>
<td>4,880</td>
<td>0.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class Participation</td>
<td>0.27</td>
<td>0.14</td>
<td>4,880</td>
<td>1.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepared for Class</td>
<td>0.18</td>
<td>0.18</td>
<td>4,880</td>
<td>1.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitudes About</td>
<td>-0.29</td>
<td>0.25</td>
<td>4,880</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitudes About the School Social</td>
<td>0.19</td>
<td>0.32</td>
<td>4,880</td>
<td>1.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Attitudes About the School Academic</td>
<td>-0.27</td>
<td>0.21</td>
<td>4,880</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistence</td>
<td>0.05</td>
<td>0.26</td>
<td>4,880</td>
<td>1.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effort</td>
<td>0.26</td>
<td>0.24</td>
<td>4,880</td>
<td>1.30</td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>Random Effects</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tau</td>
<td>0.71</td>
<td>0.32</td>
</tr>
</tbody>
</table>
Among the student background variables, students’ age in tenth grade ($\beta = 0.62, p < .05$) significantly predicts dropping out of high school. A one-year difference in age in tenth grade leads to an 86 percent increase in the odds of dropping out for older students. After controlling for other relevant indicators, Female ($\beta = 0.64, p > .05$), the Race/Ethnicity variables (Asian: $\beta = 0.46, p > .05$; Black: $\beta = -0.84, p > .05$; Hispanic: $\beta = 0.16, p > .05$; Other: $\beta = 0.64, p > .05$), and Native Language is English ($\beta = 0.70, p > .05$) are not statistically significant predictors of dropping out.

Each of the family background variables are statistically significant predictors of dropping out of high school. A one-unit difference in the SES index decreases the likelihood of tenth-grade students with a higher SES from dropping out of high school by 47 percent ($\beta = -0.75, p < .05$). Similarly, tenth-grade students who live with both parents ($\beta = -0.75, p < .05$) or have parents that are involved in their child’s schooling ($\beta = -0.55, p < .05$) are also less likely to drop out of high school. Living with both parents decreases the odds of students dropping out by 47 percent. A one-unit difference in Parent Involvement decreases the likelihood of dropping out by 58 percent for students with higher parental involvement.

Of the educational background variables, students’ ninth-grade GPA significantly predicts dropping out of school ($\beta = -1.46, p < .001$). A one-unit difference in student’s ninth-grade GPA decreases the likelihood of dropping out by 23 percent for students with a higher GPA. Having an IEP in grade 10 ($\beta = -0.13, p > .05$), students’ grade 10 Reading and Math Achievement ($\beta = -0.01, p > .05$), as well as students’ program of study in high school, academic
(β = -0.04, p > .05) or vocational (β = 0.30, p > .05), are not statistically significant predictors of dropping out.

After controlling for students’ demographic, family, and educational background, tenth-grade students’ conduct (β = -0.65, p < .05) is the only dimension of engagement that is a statistically significant predictor of dropping out. A one-point difference on the conduct scale (i.e., the less likely students got into a physical fight at school, was late for school, cut class, etc.) decreases the likelihood of dropping out by 52 percent for students with a lower conduct score. The remaining dimensions of engagement are not statistically significant predictors of dropping out of high school: Class Participation (β = 0.27, p > .05); Prepared for Class (β = 0.18, p > .05); Attitudes About Teachers (β = -0.29, p > .05); Attitudes About the School Social Environment (β = 0.19, p > .05); Attitudes About the School Academic Environment (β = -0.27, p > .05); Persistence (β = 0.05, p > .05); and Effort (β = 0.26, p > .05).

After controlling for students’ demographic, family, and educational background, tenth-grade students’ conduct (β = -0.65, p < .05) is the only dimension of engagement that is a statistically significant predictor of dropping out. A one-point difference on the conduct scale (i.e., the less likely students got into a physical fight at school, was late for school, cut class, etc.) decreases the likelihood of dropping out by 52 percent for students with a lower conduct score. The remaining dimensions of engagement are not statistically significant predictors of dropping out of high school: Class Participation (β = 0.27, p > .05); Prepared for Class (β = 0.18, p > .05); Attitudes About Teachers (β = -0.29, p > .05); Attitudes About the School Social Environment (β = 0.19, p > .05); Attitudes About the School Academic Environment (β = -0.27, p > .05); Persistence (β = 0.05, p > .05); and Effort (β = 0.26, p > .05).
Table 23 presents the results of the conditional student-level model that examined the effects of the domains of engagement on dropping out of school. Similar to Model 2, the student, family, and educational control variables were added to the Level 1 equation as well as the domains of engagement variables. All categorical variables were dummy coded and the continuous variables were grand mean centered. At Level 2 the intercept was allowed to vary free; however, the Level-2 slopes were fixed. The confirmatory analysis, Model 3, resulted in a between-school variance ($\tau^2$) of .34.
Table 23: Results of the HGLM Conditional Student-Level Analyses Examining the Effects of the Domains of Engagement

<table>
<thead>
<tr>
<th></th>
<th>Model 3</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>SE</td>
<td>df</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>Intercept</td>
<td>-5.27**</td>
<td>0.61</td>
<td>460</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Student Background Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.58</td>
<td>0.33</td>
<td>5,050</td>
<td>1.79</td>
</tr>
<tr>
<td>Age</td>
<td>0.62*</td>
<td>0.24</td>
<td>5,050</td>
<td>1.87</td>
</tr>
<tr>
<td>Asian</td>
<td>0.44</td>
<td>0.84</td>
<td>5,050</td>
<td>1.55</td>
</tr>
<tr>
<td>Black</td>
<td>-0.68</td>
<td>0.61</td>
<td>5,050</td>
<td>0.51</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.03</td>
<td>0.47</td>
<td>5,050</td>
<td>1.03</td>
</tr>
<tr>
<td>Other</td>
<td>0.58</td>
<td>0.46</td>
<td>5,050</td>
<td>1.78</td>
</tr>
<tr>
<td>English is Native Language</td>
<td>0.71</td>
<td>0.37</td>
<td>5,050</td>
<td>2.04</td>
</tr>
<tr>
<td><strong>Family Background Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>-0.57*</td>
<td>0.24</td>
<td>5,050</td>
<td>0.57</td>
</tr>
<tr>
<td>Lives with both Birth Parents</td>
<td>-0.72*</td>
<td>0.30</td>
<td>5,050</td>
<td>0.49</td>
</tr>
<tr>
<td>Parental Involvement</td>
<td>-0.52*</td>
<td>0.15</td>
<td>5,050</td>
<td>0.59</td>
</tr>
<tr>
<td><strong>Educational Background Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEP in Grade 10</td>
<td>-0.21</td>
<td>0.45</td>
<td>5,050</td>
<td>0.81</td>
</tr>
<tr>
<td>Grade 10 Reading and Math</td>
<td>-0.03</td>
<td>0.02</td>
<td>5,050</td>
<td>0.97</td>
</tr>
<tr>
<td>Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 9 GPA</td>
<td>-1.56**</td>
<td>0.23</td>
<td>5,050</td>
<td>0.21</td>
</tr>
<tr>
<td>Academic Program</td>
<td>0.01</td>
<td>0.35</td>
<td>5,050</td>
<td>1.01</td>
</tr>
<tr>
<td>Vocational Program</td>
<td>0.37</td>
<td>0.38</td>
<td>5,050</td>
<td>1.45</td>
</tr>
<tr>
<td><strong>Engagement Variables</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral</td>
<td>0.11</td>
<td>0.26</td>
<td>5,050</td>
<td>1.12</td>
</tr>
<tr>
<td>Emotional</td>
<td>-0.70*</td>
<td>0.25</td>
<td>5,050</td>
<td>0.50</td>
</tr>
<tr>
<td>Cognitive</td>
<td>0.23</td>
<td>0.19</td>
<td>5,050</td>
<td>1.26</td>
</tr>
<tr>
<td><strong>Random Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tau</td>
<td>0.34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi Square (df)</td>
<td>608.28** (460)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05; ** p < .001.

Model 3 had similar results as compared to Model 2. Older students in tenth grade were more likely to drop out of high school than younger students in tenth grade ($\beta = 0.62, p < .05$). For each year older, students in tenth grade were 87 percent more likely to drop out of high school. Female ($\beta = 0.58, p > .05$), Race/Ethnicity (Asian: $\beta = 0.62, p > .05$; Black: $\beta = 0.44, p > .05$).
Hispanic: $\beta = -0.68, p > .05$; Other: $\beta = 0.58, p > .05$), and English is Native Language ($\beta = 0.71, p > .05$) are not statistically significant predictors of dropping out.

The family background variables are statistically significant predictors of dropping out of high school. A one-unit increase in the SES index ($\beta = -0.57, p < .05$) and a one-unit increase in the Parental Involvement scale ($\beta = -0.52, p < .05$) decreases the likelihood of tenth-grade students of dropping out of high school. Tenth-grade students who live with both parents ($\beta = -0.72, p < .05$) are also less likely to drop out of high school.

Tenth-grade students’ ninth-grade GPA is a statistically significant predictor of dropping out of high school ($\beta = -1.56, p < .001$). A one-unit difference in students’ grade 9 GPA decreases the expected odds of dropping out of high school by 21 percent for students with a higher grade 9 GPA. The other educational background characteristics, however, are not statistically significant of dropping out (IEP in grade 10: $\beta = -0.21, p > .05$; grade 10 Reading and Math Achievement: $\beta = -0.03, p > .05$; Academic program: $\beta = 0.01, p > .05$; and Vocational Program: $\beta = 0.37, p > .05$).

Of the domains of engagement, emotional engagement in tenth grade is a statistically significantly predictor of dropping out of high school ($\beta = -0.70, p < .05$). A one-unit difference on the Emotional Engagement scale results in a 50 percent decrease in the likelihood of dropping out for students with a higher emotional engagement scale. The Behavioral ($\beta = 0.11, p > .05$) and Cognitive ($\beta = 0.23, p > .05$) indicators of engagement, however, are not statistically significant predictors of dropping out.

The Model 3 findings on the domains of engagement provide a different view of the relationship between engagement and dropping out as compared to the findings on the dimensions of engagement in Model 2. In Model 2 tenth-grade students’ conduct is the only
dimension of engagement that is a statistically significant predictor of dropping out; whereas, in
Model 3 students’ behavioral engagement is not a statistically significant predictor and their
emotional engagement is a significant predictor. These findings suggest that the measured
variables, Class Participation and Prepared for Class, may not be precise measures of Behavioral
Engagement. This is supported by the results of the second-run first-order factor analysis (see
Table 19) and the moderate reliability value of Behavioral Engagement ($\alpha = .66$). The findings
also suggest that tenth-grade students’ attitudes about teachers, the school social environment,
and the school academic environment are more precise measures as a combined factor, than as
individual factors.

Research question 3: Interaction effects of engagement by student subgroups on dropping out

To determine the effects of the domains of engagement on dropping out of school, by
various student characteristics, interactions between the domains of engagement and the
demographic subgroups were included in the conditional Level 1 model. Separate models were
built for each of the following student characteristics: gender, race/ethnicity, English is native
language, SES, and GPA. All categorical variables were dummy coded and the continuous
variables were grand mean centered, including the interaction variables. Tables 24 through 28
display the results of the HGLM analyses addressing Research Question 3. The interaction
models have between-school variances ($\tau^2$) ranging from .33 to .41, which are similar to the
between-school variance of Model 3.

Engagement x Female Interactions. Table 24 shows the results of the conditional
student-level model with the engagement by female interactions included. There is a statistically
significant main effect of Female ($\beta = 1.86, p < .05$). There are no statistically significant main
effects of Behavioral ($\beta = 0.00, p > .05$), Emotional ($\beta = -0.14, p > .05$), or Cognitive ($\beta = 0.44, p > .05$) engagement. Nor are the interactions of Behavioral Engagement and Female ($\beta = 0.19, p > .05$), Emotional Engagement and Female ($\beta = -1.08, p > .05$), and Cognitive Engagement and Female ($\beta = -0.28, p > .05$) statistically significant. These findings indicate that tenth-grade female students are more likely to drop out of high school than tenth-grade male students; however, female students dropping out of high school is not dependent on their engagement.
Table 24: *HGLM Conditional Student-Level Analysis Results with Engagement by Female*

**Interactions**

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Coefficient</th>
<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-6.03**</td>
<td>0.71</td>
<td>460</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Student Background Variables</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.86*</td>
<td>0.80</td>
<td>5,040</td>
<td>6.40</td>
</tr>
<tr>
<td>Age</td>
<td>0.63*</td>
<td>0.24</td>
<td>5,040</td>
<td>1.88</td>
</tr>
<tr>
<td>Asian</td>
<td>0.44</td>
<td>0.81</td>
<td>5,040</td>
<td>1.55</td>
</tr>
<tr>
<td>Black</td>
<td>-0.77</td>
<td>0.63</td>
<td>5,040</td>
<td>0.46</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.03</td>
<td>0.47</td>
<td>5,040</td>
<td>1.03</td>
</tr>
<tr>
<td>Other</td>
<td>0.51</td>
<td>0.48</td>
<td>5,040</td>
<td>1.66</td>
</tr>
<tr>
<td>English is Native Language</td>
<td>0.82*</td>
<td>0.40</td>
<td>5,040</td>
<td>2.28</td>
</tr>
<tr>
<td><strong>Family Background Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>-0.57*</td>
<td>0.25</td>
<td>5,040</td>
<td>0.57</td>
</tr>
<tr>
<td>Lives with both Birth Parents</td>
<td>-0.70*</td>
<td>0.30</td>
<td>5,040</td>
<td>0.49</td>
</tr>
<tr>
<td>Parental Involvement</td>
<td>-0.51*</td>
<td>0.16</td>
<td>5,040</td>
<td>0.60</td>
</tr>
<tr>
<td><strong>Educational Background Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEP in Grade 10</td>
<td>-0.26</td>
<td>0.45</td>
<td>5,040</td>
<td>0.77</td>
</tr>
<tr>
<td>Grade 10 Reading and Math</td>
<td>-0.03</td>
<td>0.02</td>
<td>5,040</td>
<td>0.97</td>
</tr>
<tr>
<td>Achievement</td>
<td>-1.56*</td>
<td>0.23</td>
<td>5,040</td>
<td>0.21</td>
</tr>
<tr>
<td>Grade 9 GPA</td>
<td>-0.05</td>
<td>0.36</td>
<td>5,040</td>
<td>0.95</td>
</tr>
<tr>
<td>Academic Program</td>
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<td>0.39</td>
<td>5,040</td>
<td>1.46</td>
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<tr>
<td>Vocational Program</td>
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<td>0.39</td>
<td>5,040</td>
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<tr>
<td><strong>Engagement Variables</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral</td>
<td>0.00</td>
<td>0.21</td>
<td>5,040</td>
<td>1.00</td>
</tr>
<tr>
<td>Emotional</td>
<td>-0.14</td>
<td>0.37</td>
<td>5,040</td>
<td>0.87</td>
</tr>
<tr>
<td>Cognitive</td>
<td>0.44</td>
<td>0.26</td>
<td>5,040</td>
<td>1.55</td>
</tr>
<tr>
<td><strong>Engagement x Female Variables</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral x Female</td>
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<td>0.57</td>
<td>5,040</td>
<td>1.21</td>
</tr>
<tr>
<td>Emotional x Female</td>
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<td>0.60</td>
<td>5,040</td>
<td>0.76</td>
</tr>
<tr>
<td>Cognitive x Female</td>
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<td>0.35</td>
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<tr>
<td><strong>Random Effects</strong></td>
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<td></td>
</tr>
<tr>
<td>Tau</td>
<td>0.35</td>
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</tr>
<tr>
<td>Chi Square (df)</td>
<td>591.95**</td>
<td>(460)</td>
<td></td>
<td></td>
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</tbody>
</table>

*p < .05; **p < .001.

**Engagement x Race/Ethnicity Interactions.** The results of the conditional student-level model with engagement by race/ethnicity interactions are shown in Table 25. There are no statistically significant main effects of the race/ethnicity variables (Asian: $\beta = 1.82, p > .05$; Black: $\beta = 1.92, p > .05$; Hispanic: $\beta = 1.19, p > .05$; Other: $\beta = -0.52, p > .05$) on dropping out of high school.
Similarly, there are no statistically significant main effects of the engagement variables (Behavioral: $\beta = -0.11, p > .05$; Emotional: $\beta = -0.28, p > .05$; Cognitive: $\beta = 0.24, p > .05$). The Behavioral Engagement by race/ethnicity (Behavioral x Asian: $\beta = -1.38, p > .05$; Behavioral x Black: $\beta = 1.48, p > .05$; Behavioral x Hispanic: $\beta = 0.21, p > .05$; Behavioral x Other: $\beta = 0.28, p > .05$) and Cognitive Engagement by race/ethnicity (Cognitive x Asian: $\beta = -1.39, p > .05$; Cognitive x Black: $\beta = -1.22, p > .05$; Cognitive x Hispanic: $\beta = -0.20, p > .05$; Cognitive x Other: $\beta = 1.18, p > .05$) interactions also are not statistically significant predictors of dropping out. There is a statistically significant interaction between emotional engagement and Black students ($\beta = -2.51, p < .05$). A one-point increase on the emotional engagement scale decreases the likelihood of Black students dropping out of school, as compared to White students. The remaining Emotional Engagement by race/ethnicity variables interactions are not statistically significant predictors of dropping out (Emotional x Asian: $\beta = 1.66, p > .05$; Emotional x Hispanic: $\beta = -1.10, p > .05$; Emotional x Other: $\beta = -1.03, p > .05$).
Table 25: HGLM Conditional Student-Level Analysis Results with Engagement by Race/Ethnicity Interactions

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Coefficient</th>
<th>SE</th>
<th>Df</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>5.68**</td>
<td>0.61</td>
<td>460</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Student Background Variables</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.56</td>
<td>0.33</td>
<td>5,040</td>
<td>1.76</td>
</tr>
<tr>
<td>Age</td>
<td>0.65*</td>
<td>0.23</td>
<td>5,040</td>
<td>1.92</td>
</tr>
<tr>
<td>Asian</td>
<td>1.82</td>
<td>1.86</td>
<td>5,040</td>
<td>6.20</td>
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<tr>
<td>Black</td>
<td>1.92</td>
<td>1.20</td>
<td>5,040</td>
<td>6.83</td>
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<td>Hispanic</td>
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<td>0.86</td>
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<td>Other</td>
<td>-0.52</td>
<td>1.59</td>
<td>5,040</td>
<td>0.59</td>
</tr>
<tr>
<td>English is Native Language</td>
<td>0.53</td>
<td>0.35</td>
<td>5,040</td>
<td>1.69</td>
</tr>
<tr>
<td><strong>Family Background Variables</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>SES</td>
<td>-0.59*</td>
<td>0.24</td>
<td>5,040</td>
<td>0.56</td>
</tr>
<tr>
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<td>-0.80*</td>
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<td>5,040</td>
<td>0.45</td>
</tr>
<tr>
<td>Parental Involvement</td>
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<td>0.16</td>
<td>5,040</td>
<td>0.58</td>
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<tr>
<td><strong>Educational Background Variables</strong></td>
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</tr>
<tr>
<td>IEP in Grade 10</td>
<td>-0.30</td>
<td>0.44</td>
<td>5,040</td>
<td>0.74</td>
</tr>
<tr>
<td>Grade 10 Reading and Math</td>
<td>-0.03</td>
<td>0.02</td>
<td>5,040</td>
<td>0.97</td>
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<tr>
<td>Achievement</td>
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<td></td>
</tr>
<tr>
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<td>0.23</td>
<td>5,040</td>
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<td>5,040</td>
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<tr>
<td>Vocational Program</td>
<td>0.36</td>
<td>0.39</td>
<td>5,040</td>
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<tr>
<td><strong>Engagement Variables</strong></td>
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<td></td>
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</tr>
<tr>
<td>Behavioral</td>
<td>-0.11</td>
<td>0.40</td>
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</tr>
<tr>
<td>Emotional</td>
<td>-0.28</td>
<td>0.30</td>
<td>5,040</td>
<td>0.76</td>
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<tr>
<td>Cognitive</td>
<td>0.24</td>
<td>0.22</td>
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<tr>
<td><strong>Engagement x Race/Ethnicity Variables</strong></td>
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<td></td>
</tr>
<tr>
<td>Behavioral x Asian</td>
<td>-1.38</td>
<td>1.50</td>
<td>5,040</td>
<td>0.25</td>
</tr>
<tr>
<td>Behavioral x Black</td>
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<td>1.32</td>
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</tr>
<tr>
<td>Behavioral x Hispanic</td>
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<td>0.64</td>
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<td>1.24</td>
</tr>
<tr>
<td>Behavioral x Other</td>
<td>0.28</td>
<td>0.52</td>
<td>5,040</td>
<td>1.32</td>
</tr>
<tr>
<td>Emotional x Asian</td>
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<td>1.37</td>
<td>5,040</td>
<td>5.24</td>
</tr>
<tr>
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<td>-2.51*</td>
<td>0.52</td>
<td>5,040</td>
<td>0.08</td>
</tr>
<tr>
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<td>-1.10</td>
<td>0.94</td>
<td>5,040</td>
<td>0.33</td>
</tr>
<tr>
<td>Emotional x Other</td>
<td>-1.03</td>
<td>0.84</td>
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</tr>
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<td>1.02</td>
<td>5,040</td>
<td>0.25</td>
</tr>
<tr>
<td>Cognitive x Black</td>
<td>-1.22</td>
<td>1.08</td>
<td>5,040</td>
<td>0.29</td>
</tr>
<tr>
<td>Cognitive x Hispanic</td>
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<td>0.82</td>
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<tr>
<td>Cognitive x Other</td>
<td>1.18</td>
<td>0.90</td>
<td>5,040</td>
<td>3.25</td>
</tr>
</tbody>
</table>

| Random Effects                    | Model 5     |     |     |            |
| Tau                               | 0.38        |     |     |            |
| Chi Square (df)                   | 685.63 ** (460) | |     |            |

* p < .05; ** p < .001.
Engagement x English is Native Language Interactions. Table 26 shows the results of the conditional student-level model with the engagement by English is Native Language interactions. There are no statistically significant main effects of English is Native Language ($\beta = -0.06, p < .05$) or Engagement (Behavioral: $\beta = 0.09, p > .05$; Emotional: $\beta = -0.62, p > .05$; Cognitive: $\beta = -0.33, p > .05$). In addition, there are no statistically significant interactions between Engagement and English is Native Language (Behavioral x English is Native Language: $\beta = 0.04, p > .05$; Emotional x English is Native Language: $\beta = 0.62, p > .05$; Cognitive x English is Native Language: $\beta = -0.13, p > .05$).
Table 26: HGLM Conditional Student-Level Analysis Results with Engagement by English is Native Language Interactions

<table>
<thead>
<tr>
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<th>Model 6</th>
</tr>
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<tbody>
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<td>Coefficient</td>
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</tr>
<tr>
<td>SE</td>
<td></td>
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<tr>
<td>Df</td>
<td></td>
</tr>
<tr>
<td>Odds Ratio</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
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<tr>
<td>SE</td>
<td>0.99</td>
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<tr>
<td>Df</td>
<td>460**</td>
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<tbody>
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<td>SE</td>
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<tr>
<td>Df</td>
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<tr>
<td>Odds Ratio</td>
<td>1.77</td>
</tr>
<tr>
<td><strong>Age</strong></td>
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<tr>
<td>Coefficient</td>
<td>0.62*</td>
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<tr>
<td>SE</td>
<td>0.24</td>
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<tr>
<td>Df</td>
<td>5,040</td>
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<tr>
<td>Odds Ratio</td>
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<tr>
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<td><strong>Black</strong></td>
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<tr>
<td>Coefficient</td>
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<td>5,040</td>
</tr>
<tr>
<td>Odds Ratio</td>
<td>0.50</td>
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<tr>
<td><strong>Hispanic</strong></td>
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<tr>
<td>Coefficient</td>
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<td>SE</td>
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<td>Df</td>
<td>5,040</td>
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<tr>
<td>Odds Ratio</td>
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<tr>
<td><strong>Other</strong></td>
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</tr>
<tr>
<td>Coefficient</td>
<td>0.59</td>
</tr>
<tr>
<td>SE</td>
<td>0.46</td>
</tr>
<tr>
<td>Df</td>
<td>5,040</td>
</tr>
<tr>
<td>Odds Ratio</td>
<td>1.80</td>
</tr>
<tr>
<td><strong>English is Native Language</strong></td>
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</tr>
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<td>Coefficient</td>
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<td>SE</td>
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<tr>
<td>Df</td>
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<table>
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</tr>
<tr>
<td>SE</td>
<td>0.24</td>
</tr>
<tr>
<td>Df</td>
<td>5,040</td>
</tr>
<tr>
<td>Odds Ratio</td>
<td>0.57</td>
</tr>
<tr>
<td><strong>Lives with both Birth Parents</strong></td>
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</tr>
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<td>Coefficient</td>
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<td>SE</td>
<td>0.30</td>
</tr>
<tr>
<td>Df</td>
<td>5,040</td>
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<tr>
<td>Odds Ratio</td>
<td>0.49</td>
</tr>
<tr>
<td><strong>Parental Involvement</strong></td>
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</tr>
<tr>
<td>Coefficient</td>
<td>-0.53*</td>
</tr>
<tr>
<td>SE</td>
<td>0.15</td>
</tr>
<tr>
<td>Df</td>
<td>5,040</td>
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<tr>
<td>Odds Ratio</td>
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<table>
<thead>
<tr>
<th>Educational Background Variables</th>
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<tr>
<td>Df</td>
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<td>Odds Ratio</td>
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<td><strong>Grade 10 Reading and Math Achievement</strong></td>
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</tr>
<tr>
<td>SE</td>
<td>0.02</td>
</tr>
<tr>
<td>Df</td>
<td>5,040</td>
</tr>
<tr>
<td>Odds Ratio</td>
<td>0.97</td>
</tr>
<tr>
<td><strong>Grade 9 GPA</strong></td>
<td></td>
</tr>
<tr>
<td>Coefficient</td>
<td>-1.57**</td>
</tr>
<tr>
<td>SE</td>
<td>0.23</td>
</tr>
<tr>
<td>Df</td>
<td>5,040</td>
</tr>
<tr>
<td>Odds Ratio</td>
<td>0.21</td>
</tr>
<tr>
<td><strong>Academic Program</strong></td>
<td></td>
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<td>Coefficient</td>
<td>0.01</td>
</tr>
<tr>
<td>SE</td>
<td>0.36</td>
</tr>
<tr>
<td>Df</td>
<td>5,040</td>
</tr>
<tr>
<td>Odds Ratio</td>
<td>1.01</td>
</tr>
<tr>
<td><strong>Vocational Program</strong></td>
<td></td>
</tr>
<tr>
<td>Coefficient</td>
<td>0.34</td>
</tr>
<tr>
<td>SE</td>
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<td>Df</td>
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<table>
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<td><strong>Emotional</strong></td>
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<tr>
<td>Coefficient</td>
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</tr>
<tr>
<td>SE</td>
<td>0.54</td>
</tr>
<tr>
<td>Df</td>
<td>5,040</td>
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<tr>
<td>Odds Ratio</td>
<td>0.54</td>
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<tr>
<td><strong>Cognitive</strong></td>
<td></td>
</tr>
<tr>
<td>Coefficient</td>
<td>-0.33</td>
</tr>
<tr>
<td>SE</td>
<td>0.34</td>
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<td>Df</td>
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<tr>
<td>Odds Ratio</td>
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<table>
<thead>
<tr>
<th>Engagement x English is Native Language Variables</th>
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<tbody>
<tr>
<td><strong>Behavioral x English is Native Language</strong></td>
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<tr>
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<td>Odds Ratio</td>
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<tr>
<td>SE</td>
<td>0.41</td>
</tr>
<tr>
<td>Df</td>
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<tr>
<td><strong>Cognitive x English is Native Language</strong></td>
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<tr>
<td>Coefficient</td>
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</tr>
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<td>SE</td>
<td>0.63</td>
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<tr>
<td>Df</td>
<td>5,040</td>
</tr>
<tr>
<td>Odds Ratio</td>
<td>0.88</td>
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</table>

<table>
<thead>
<tr>
<th>Random Effects</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tau</strong></td>
<td>0.35</td>
</tr>
<tr>
<td><strong>Chi Square (df)</strong></td>
<td>619.00**</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .001.

**Engagement x SES Interactions.** The results of the conditional student-level analysis with Engagement by SES interactions are displayed in Table 27. The results indicate that there
are statistically significant main effects of SES ($\beta = -1.34, p < .05$) and Emotional Engagement ($\beta = -0.56, p < .05$) on dropping out of school. A one-point increase on the SES index results in a decrease in the likelihood of tenth-grade students dropping out of high school as compared to students who graduate. Similarly, a one-point increase on the Emotional Engagement scale results in a decrease in the likelihood of students dropping out. There are no statistically significant main effects of Behavioral ($\beta = 0.05, p > .05$) or Cognitive engagement ($\beta = 0.42, p > .05$). The interactions between SES and Engagement (Behavioral x SES: $\beta = -0.13, p > .05$; Emotional x SES: $\beta = 0.33, p > .05$; Cognitive x SES: $\beta = 0.36, p > .05$) are not statistically significant predictors of dropping out.
Table 27: HGLM Conditional Student-Level Analysis Results with Engagement by Socioeconomic Status Interactions

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Model 7</th>
</tr>
</thead>
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<td><strong>Student Background Variables</strong></td>
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</tr>
<tr>
<td>Female</td>
<td>0.58</td>
</tr>
<tr>
<td>Age</td>
<td>0.64*</td>
</tr>
<tr>
<td>Asian</td>
<td>0.48</td>
</tr>
<tr>
<td>Black</td>
<td>-0.65</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.05</td>
</tr>
<tr>
<td>Other</td>
<td>0.58</td>
</tr>
<tr>
<td>English is Native Language</td>
<td>0.71</td>
</tr>
<tr>
<td><strong>Family Background Variables</strong></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>-1.34*</td>
</tr>
<tr>
<td>Lives with both Birth Parents</td>
<td>-0.71*</td>
</tr>
<tr>
<td>Parental Involvement</td>
<td>-0.54*</td>
</tr>
<tr>
<td><strong>Educational Background Variables</strong></td>
<td></td>
</tr>
<tr>
<td>IEP in Grade 10</td>
<td>-0.21</td>
</tr>
<tr>
<td>Grade 10 Reading and Math</td>
<td>-0.03</td>
</tr>
<tr>
<td>Grade 9 GPA</td>
<td>-1.57**</td>
</tr>
<tr>
<td>Academic Program</td>
<td>0.01</td>
</tr>
<tr>
<td>Vocational Program</td>
<td>0.39</td>
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<td><strong>Engagement Variables</strong></td>
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<tr>
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<td>Emotional x SES</td>
<td>0.33</td>
</tr>
<tr>
<td>Cognitive x SES</td>
<td>0.36</td>
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<tr>
<td><strong>Random Effects</strong></td>
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</tr>
<tr>
<td>Tau</td>
<td>0.33</td>
</tr>
<tr>
<td>Chi Square (df)</td>
<td>551.24** (460)</td>
</tr>
</tbody>
</table>

*p < .05; ** p < .001.

**Engagement x Grade 9 GPA Interactions.** Lastly, Table 28 presents the results of the conditional student-level model with engagement by Grade 9 GPA interactions. The results of this model indicate that there is a statistically significant main effect of tenth-grade students' Grade 9 GPA ($\beta = -0.60$, $p < .05$). A one-unit increase in students’ ninth-grade GPA reduces the
likelihood of dropping out of high school by 0.21. There are no statistically significant mains
effects of Engagement (Behavioral: $\beta = 0.41, p > .05$; Emotional: $\beta = -0.26, p > .05$; Cognitive: $\beta = -0.11, p > .05$), nor are there statistically significant interactions between Grade 9 GPA and the
Engagement variables (Behavioral x Grade 9 GPA: $\beta = 0.39, p > .05$; Emotional x Grade 9 GPA: $\beta = 0.56, p > .05$; Cognitive x Grade 9 GPA: $\beta = -0.40, p > .05$).
Table 28: HGLM Conditional Student-Level Analysis Results with Engagement by Grade Nine

Grade Point Average Interactions

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Coefficient</th>
<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
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</thead>
<tbody>
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<td>0.65</td>
<td>460</td>
<td>0.00</td>
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<td><strong>Student Background Variables</strong></td>
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<tr>
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<td>0.60</td>
<td>0.25</td>
<td>5,010</td>
<td>1.82</td>
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<tr>
<td>Age</td>
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<td>5,010</td>
<td>1.88</td>
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<td>0.88</td>
<td>5,010</td>
<td>1.56</td>
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<td>0.61</td>
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<td>0.54</td>
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<tr>
<td>Hispanic</td>
<td>0.02</td>
<td>0.49</td>
<td>5,010</td>
<td>1.02</td>
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<tr>
<td>Other</td>
<td>0.64</td>
<td>0.45</td>
<td>5,010</td>
<td>1.89</td>
</tr>
<tr>
<td>English is Native Language</td>
<td>0.69</td>
<td>0.37</td>
<td>5,010</td>
<td>1.99</td>
</tr>
<tr>
<td><strong>Family Background Variables</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>-0.60*</td>
<td>0.25</td>
<td>5,010</td>
<td>0.55</td>
</tr>
<tr>
<td>Lives with both Birth Parents</td>
<td>-0.72*</td>
<td>0.30</td>
<td>5,010</td>
<td>0.49</td>
</tr>
<tr>
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<td><strong>Engagement x Grade 9 GPA</strong></td>
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<tr>
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<td>0.41</td>
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<tr>
<td>Emotional x Grade 9 GPA</td>
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<td>0.37</td>
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Random Effects

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Chi Square (df) 477.74 (460)

* p<.05; ** p<.001.

Research question 4: Effects of school processes by student engagement on dropping out

Research question four focuses on school-level impacts and examines how the domains of engagement interact with school processes (i.e., administrator control and school morale/press) to predict dropping out of school in comparison to students who graduate. The
Level 2 unconditional model was run first, followed by a Level 2 conditional model. The Level 2 unconditional model includes all student-level variables (similar to Model 3 above), but frees the error terms for each of the Level 2 equations of the domains of engagement variables, in addition to the intercept. No Level 2 predictors were included in the model. The unconditional model provides an estimate of the Level 2 variance that exists between schools. The Level 2 conditional model adds school-level control and explanatory variables to the Level 2 unconditional model. All categorical variables were dummy coded and the continuous variables were grand mean centered at both Level 1 and Level 2.

Table 29 presents the Level 2 unconditional model. The Level 2 unconditional model resulted in similar fixed effects as compared to Model 3, the Level 1 conditional model. The between-school variance ($\tau^2$) for the intercept is .24 and the between-school variance for the domains of engagement variables are .06 for cognitive engagement, .52 for emotional engagement, and 1.75 for behavioral engagement.
Table 29: HGLM Unconditional School-Level Analysis Results

<table>
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<tr>
<th>Fixed Effects</th>
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<th>SE</th>
<th>df</th>
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</thead>
<tbody>
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**Student Background Variables**

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<th>SE</th>
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<tr>
<td>Female</td>
<td>0.57</td>
<td>0.33</td>
<td>5,050</td>
<td>1.78</td>
</tr>
<tr>
<td>Age</td>
<td>0.61*</td>
<td>0.22</td>
<td>5,050</td>
<td>1.84</td>
</tr>
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<td>Asian</td>
<td>0.47</td>
<td>0.85</td>
<td>5,050</td>
<td>1.60</td>
</tr>
<tr>
<td>Black</td>
<td>-0.73</td>
<td>0.53</td>
<td>5,050</td>
<td>0.48</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.03</td>
<td>0.46</td>
<td>5,050</td>
<td>1.03</td>
</tr>
<tr>
<td>Other</td>
<td>0.58</td>
<td>0.49</td>
<td>5,050</td>
<td>1.78</td>
</tr>
<tr>
<td>English is Native Language</td>
<td>0.81</td>
<td>0.37</td>
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<td>2.25</td>
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**Family Background Variables**

<table>
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<th>Odds Ratio</th>
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<tbody>
<tr>
<td>SES</td>
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<td>0.24</td>
<td>5,050</td>
<td>0.58</td>
</tr>
<tr>
<td>Lives with both Birth Parents</td>
<td>-0.76*</td>
<td>0.29</td>
<td>5,050</td>
<td>0.47</td>
</tr>
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<td>Parental Involvement</td>
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<td>0.15</td>
<td>5,050</td>
<td>0.58</td>
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</table>

**Educational Background Variables**

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<th>df</th>
<th>Odds Ratio</th>
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</thead>
<tbody>
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<td>-0.23</td>
<td>0.45</td>
<td>5,050</td>
<td>0.80</td>
</tr>
<tr>
<td>Grade 10 Reading and Math</td>
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<td>0.02</td>
<td>5,050</td>
<td>0.91</td>
</tr>
<tr>
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<td>5,050</td>
<td>0.20</td>
</tr>
<tr>
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<td>0.35</td>
<td>5,050</td>
<td>1.07</td>
</tr>
<tr>
<td>Vocational Program</td>
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<td>0.39</td>
<td>5,050</td>
<td>1.57</td>
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</table>

**Engagement Variables**

<table>
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<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
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</thead>
<tbody>
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<td>460</td>
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</tr>
<tr>
<td>Emotional</td>
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<td>460</td>
<td>0.45</td>
</tr>
<tr>
<td>Cognitive</td>
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<td>0.19</td>
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<table>
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<th>Chi Square</th>
<th>df</th>
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<tr>
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<td>405.50</td>
<td>430</td>
</tr>
<tr>
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<td>430</td>
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<td>430</td>
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<td>Cognitive</td>
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<td>430</td>
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</table>

*p < .05; **p < .001.

To explain the variation in school-level dropout rates as well as explain the differences between schools in dropout rates as a results of engagement, the effects of administrator control and school morale were explored. The school-level control and explanatory variables were added to the intercept and of domains of engagement slope equations. The error terms for the intercept
and the engagement equations were freed and the error terms for the remaining slope equations were fixed. Table 30 presents the results of this Level 2 conditional model.

Table 30: HGLM Conditional School-Level Analysis Results

<table>
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<tr>
<th>Fixed Effects</th>
<th>Model 10</th>
<th></th>
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<th></th>
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<td>SE</td>
<td>df</td>
<td>Odds Ratio</td>
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<td>1.00</td>
</tr>
<tr>
<td>Percent Minority</td>
<td>0.00</td>
<td>0.01</td>
<td>450</td>
<td>1.00</td>
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<tr>
<td>Mean Grade 9 GPA</td>
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<td>0.50</td>
<td>450</td>
<td>1.00</td>
</tr>
<tr>
<td>School Resource Variables</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Teacher Salary</td>
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<td>0.00</td>
<td>450</td>
<td>1.00</td>
</tr>
<tr>
<td>Percent Teachers with Subject Certification</td>
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<td>1.00</td>
</tr>
<tr>
<td>School Structure Variables</td>
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<td></td>
<td></td>
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<td>1.00</td>
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<tr>
<td>School Process Variables</td>
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<td></td>
</tr>
<tr>
<td>Administrator Control</td>
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<td>0.79</td>
</tr>
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<tr>
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<td>df</td>
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<td></td>
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<th>df</th>
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</table>

* p < .05; ** p < .001.
The school student composition variables had little impact on school dropout rates. These variables, however, are not statistically significant (Grade 10 Percent FRL: \( \beta = 0.00, p > .05 \); Percent Minority: \( \beta = 0.00, p > .05 \); Mean Grade 9 GPA: \( \beta = 0.00, p > .05 \)). Similarly, the school resource variables also have no effect on school dropout rates and are not statistically significant (Mean Teacher Salary: \( \beta = 0.00, p > .05 \); Percent Teachers with Subject Certification: \( \beta = 0.00, p > .05 \)). Of the school structural characteristic variables, public schools had higher dropout rates than private schools. Students in public schools are more likely to dropout than students in private schools, but the public school effect is not statistically significant (\( \beta = 0.00, p > .05 \)). Grade 10 enrollment has no effect on dropout rates and the effect is not statistically significant (\( \beta = 0.00, p > .05 \)).

As for the school process variables, a one-point increase on the Administrator Control scale decreases dropout rates, but the effect is not statistically significant (\( \beta = -0.24, p > .05 \)). The direction of the effect for school morale is contrary to the hypothesis. A one-point increase on the School Morale scale increases dropout rates; yet, the School Morale scale is not statistically related to dropout rates (\( \beta = 0.23, p > .05 \)).

Grade 10 Percent FRL (\( \beta = 0.01, p < .05 \)) and Mean Teacher Salary (\( \beta = 0.00, p < .05 \)) had no effects on the Behavioral Engagement scale on predicting dropping out. The remaining control variables do not have statistically significant relationships between behavioral engagement and dropping out (Percent Minority: \( \beta = 0.00, p > .05 \); Mean Grade 9 GPA: \( \beta = 0.00, p > .05 \); Percent Teachers with Subject Certification: \( \beta = 0.00, p > .05 \); Public: \( \beta = -0.17, p > .05 \); Grade 10 Enrollment: \( \beta = 0.00, p > .05 \)). The school process variables also do not have statistically significant effects (Administrator Control: \( \beta = -0.44, p > .05 \); School Morale: \( \beta = 0.42, p > .05 \)).
Similar to the school effects on the intercept, school effects on students’ emotional and cognitive engagement are unrelated to dropping out of school. The student composition and school resources variables have small to no relationships with the Emotional Engagement (Grade 10 Percent FRL: $\beta = -0.01, p > .05$; Percent Minority: $\beta = 0.00, p > .05$; Mean Grade 9 GPA: $\beta = -0.31, p > .05$; Average Teacher Salary: $\beta = 0.00, p > .05$; Percent Teachers with Subject Certification: $\beta = 0.00, p > .05$) and Cognitive Engagement (Grade 10 Percent FRL: $\beta = -0.01, p > .05$; Percent Minority: $\beta = 0.01, p > .05$; Mean Grade 9 GPA: $\beta = 0.01, p > .05$; Average Teacher Salary: $\beta = 0.00, p > .05$; Percent Teachers with Subject Certification: $\beta = 0.00, p > .05$) scales on dropping out of school.

**Research question 5: Interaction effects of school processes and school structural characteristics by student engagement on dropping out**

The main focus of research question five was to determine if the effects of student engagement on dropping out were dependent on the effects of school processes and the school structural characteristics. To examine these effects separate models were built that included interactions between the school process variables and the school’s public school status as well as the school process variables and grade 10 enrollment. These interactions were included in the slope equations for each of the domains of engagement the intercept equation. The variables included in the interaction models were similar to Model 10, except the interaction terms were added to the model. All Level 1 and Level 2 categorical variables were dummy coded and the continuous variables were grand mean centered, including the interaction variables.

The school-level interaction effects between public school status and school processes could not be tested. The HGLM analysis with the public by school process interactions resulted
in unstable coefficients and large standard errors. Interpretations of these coefficients could result in an inaccurate analysis of findings.

Table 31 displays the results of the HGLM analyses, which includes the grade 10 enrollment by school process variable interactions. Model 12 resulted in similar fixed effects as compared to Models 3 and 10. The between-school variance ($\tau^2$) for the intercept is .25 and the between-school variance for the domains of engagement variables is .05 for cognitive engagement, .61 for emotional engagement, and 1.74 for behavioral engagement.

**Table 31: HGLM Conditional School-Level Analysis Results with Administrator Control and School Morale/Press by Grade 10 Enrollment**

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Model 12</th>
<th></th>
<th></th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>SE</td>
<td>df</td>
<td></td>
</tr>
<tr>
<td><strong>Intercept</strong></td>
<td>-6.77**</td>
<td>0.91</td>
<td>440</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Student Composition Variables</strong></td>
<td>Grade 10 Percent FRL</td>
<td>0.00</td>
<td>0.01</td>
<td>440</td>
</tr>
<tr>
<td>Percent Minority</td>
<td>0.00</td>
<td>0.01</td>
<td>440</td>
<td>1.00</td>
</tr>
<tr>
<td>Mean Grade 9 GPA</td>
<td>-0.46</td>
<td>0.51</td>
<td>440</td>
<td>0.63</td>
</tr>
<tr>
<td><strong>School Resource Variables</strong></td>
<td>Mean Teacher Salary</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
</tr>
<tr>
<td>Percent Teachers with Subject Certification</td>
<td>-0.01</td>
<td>0.00</td>
<td>440</td>
<td>0.99</td>
</tr>
<tr>
<td><strong>School Structure Variables</strong></td>
<td>Public</td>
<td>1.08</td>
<td>0.71</td>
<td>440</td>
</tr>
<tr>
<td>Grade 10 Enrollment</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>School Process Variables</strong></td>
<td>Administrator Control</td>
<td>-0.30</td>
<td>0.44</td>
<td>440</td>
</tr>
<tr>
<td>School Morale</td>
<td>0.01</td>
<td>0.20</td>
<td>440</td>
<td>1.01</td>
</tr>
<tr>
<td>Administrator Control x Grade 10 Enrollment</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
</tr>
<tr>
<td>School Morale x Grade 10 Enrollment</td>
<td>0.00*</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Interaction Effects</strong></td>
<td>Female</td>
<td>0.64</td>
<td>0.33</td>
<td>4,990</td>
</tr>
<tr>
<td>Age</td>
<td>0.72*</td>
<td>0.21</td>
<td>4,990</td>
<td>2.05</td>
</tr>
<tr>
<td>Asian</td>
<td>0.53</td>
<td>0.98</td>
<td>4,990</td>
<td>1.69</td>
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<tr>
<td>Black</td>
<td>-0.84</td>
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<td>0.43</td>
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<tr>
<td>Hispanic</td>
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<td>0.46</td>
<td>4,990</td>
<td>1.26</td>
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<tr>
<td>Other</td>
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<td>0.55</td>
<td>4,990</td>
<td>2.09</td>
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<tr>
<td>English is Native Language</td>
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<td>4,990</td>
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### Fixed Effects

<table>
<thead>
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<th>Variables</th>
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<th>Odds Ratio</th>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
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<td>0.23</td>
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<td>Lives with both Birth Parents</td>
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<tr>
<td>Parental Involvement</td>
<td>-0.56**</td>
<td>0.15</td>
<td>4,990</td>
<td>0.57</td>
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<tr>
<td>IEP in Grade 10</td>
<td>-0.26</td>
<td>0.46</td>
<td>4,990</td>
<td>0.77</td>
</tr>
<tr>
<td>Grade 10 Reading and Math</td>
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<td>0.02</td>
<td>4,990</td>
<td>0.96</td>
</tr>
<tr>
<td><strong>Educational Background Variables</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 9 GPA</td>
<td>-1.55**</td>
<td>0.24</td>
<td>4,990</td>
<td>0.21</td>
</tr>
<tr>
<td>Academic Program</td>
<td>0.08</td>
<td>0.34</td>
<td>4,990</td>
<td>1.08</td>
</tr>
<tr>
<td>Vocational Program</td>
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<td>0.44</td>
<td>4,990</td>
<td>1.51</td>
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</table>

<table>
<thead>
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<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 10 Percent FRL</td>
<td>0.03</td>
<td>0.02</td>
<td>440</td>
<td>1.03</td>
</tr>
<tr>
<td>Percent Minority</td>
<td>-0.01</td>
<td>0.01</td>
<td>440</td>
<td>0.99</td>
</tr>
<tr>
<td>Mean Grade 9 GPA</td>
<td>-0.36</td>
<td>0.91</td>
<td>440</td>
<td>0.70</td>
</tr>
<tr>
<td>Mean Teacher Salary</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
</tr>
<tr>
<td>Percent Teachers with Certification</td>
<td>0.00</td>
<td>0.01</td>
<td>440</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School Structure Variables</th>
<th>Coefficient</th>
<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>-0.32</td>
<td>1.14</td>
<td>440</td>
<td>0.73</td>
</tr>
<tr>
<td>Grade 10 Enrollment</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School Process Variables</th>
<th>Coefficient</th>
<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator Control</td>
<td>-0.31</td>
<td>0.65</td>
<td>440</td>
<td>0.73</td>
</tr>
<tr>
<td>School Morale</td>
<td>0.39</td>
<td>0.35</td>
<td>440</td>
<td>1.47</td>
</tr>
<tr>
<td>Administrator Control x Grade 10 Enrollment</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
</tr>
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</table>

### Interaction Effects

<table>
<thead>
<tr>
<th>Interaction Effects</th>
<th>Coefficient</th>
<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator Control x Grade 10 Enrollment</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
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</table>

### Emotional Engagement Intercept

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 10 Percent FRL</td>
<td>-0.01</td>
<td>0.02</td>
<td>440</td>
<td>0.99</td>
</tr>
<tr>
<td>Percent Minority</td>
<td>0.00</td>
<td>0.01</td>
<td>440</td>
<td>1.00</td>
</tr>
<tr>
<td>Mean Grade 9 GPA</td>
<td>0.05</td>
<td>0.69</td>
<td>440</td>
<td>1.05</td>
</tr>
<tr>
<td>Mean Teacher Salary</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
</tr>
<tr>
<td>Percent Teachers with Certification</td>
<td>-0.01</td>
<td>0.01</td>
<td>440</td>
<td>0.99</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School Structure Variables</th>
<th>Coefficient</th>
<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>-1.03</td>
<td>0.98</td>
<td>440</td>
<td>0.36</td>
</tr>
<tr>
<td>Grade 10 Enrollment</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School Process Variables</th>
<th>Coefficient</th>
<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator Control</td>
<td>-0.38</td>
<td>0.79</td>
<td>440</td>
<td>0.68</td>
</tr>
<tr>
<td>School Morale</td>
<td>0.14</td>
<td>0.38</td>
<td>440</td>
<td>1.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interaction Effects</th>
<th>Coefficient</th>
<th>SE</th>
<th>df</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator Control x Grade 10 Enrollment</td>
<td>0.00</td>
<td>0.00</td>
<td>440</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Fixed Effects | Coefficient | SE | df | Odds Ratio
---|---|---|---|---
School Morale x Grade 10 Enrollment | 0.00 | 0.00 | 440 | 1.00
Cognitive Engagement Intercept | 1.76* | 0.72 | 440 | 5.79
Student Composition Variables
  Grade 10 Percent FRL | 0.00 | 0.01 | 440 | 1.00
  Percent Minority | 0.01 | 0.01 | 440 | 1.01
  Mean Grade 9 GPA | 0.90 | 0.58 | 440 | 2.47
School Resource Variables
  Mean Teacher Salary | 0.00 | 0.00 | 440 | 1.00
  Percent Teachers with Subject Certification | 0.00 | 0.01 | 440 | 1.00
School Structure Variables
  Public | -1.46* | 0.74 | 440 | 0.23
  Grade 10 Enrollment | 0.00 | 0.00 | 440 | 1.00
School Process Variables
  Administrator Control | -0.52 | 0.52 | 440 | 0.59
  School Morale | -0.21 | 0.24 | 440 | 0.81
Interaction Effects
  Administrator Control x Grade 10 Enrollment | 0.00 | 0.00 | 440 | 1.00
  School Morale x Grade 10 Enrollment | 0.00* | 0.00 | 440 | 1.00

Random Effects | Model 12
---|---|---|---
Intercept | Tau | Chi Square | df
Intercept | 0.25 | 348.56 | 420
Behavioral | 1.74 | 411.68 | 420
Emotional | 0.61 | 172.58 | 420
Cognitive | 0.05 | 307.34 | 420

* p < .05; ** p < .001.

For the intercept, there are no statistically significant main effects of Grade 10 Enrollment ($\beta = 0.00, p > .05$) or the School Process variables (Administrator Control: $\beta = -0.29, p > .05$; School Morale: $\beta = 0.01, p > .05$). The interaction effect between Grade 10 Enrollment and Administrator Control are also not statistically related to school dropout rates (Administrator Control x Grade 10 Enrollment: $\beta = 0.00, p > .05$). Furthermore, there is no interaction effect between Grade 10 Enrollment and School Morale ($\beta = 0.00, p < .05$).

The effects of the domains of engagement on dropping out of school are not dependent on grade 10 enrollment and the school process variables. There are no statistically significant
main effects of Grade 10 Enrollment or the School Process variables on Behavioral (Grade 10 Enrollment: $\beta = 0.00, p > .05$; Administrator Control: $\beta = -0.31, p > .05$; School Morale: $\beta = 0.39, p > .05$), Emotional (Grade 10 Enrollment: $\beta = 0.00, p > .05$; Administrator Control: $\beta = -0.38, p > .05$; School Morale: $\beta = 0.14, p > .05$), or Cognitive Engagement (Grade 10 Enrollment: $\beta = 0.00, p > .05$; Administrator Control: $\beta = -0.52, p > .05$; School Morale/Press: $\beta = -0.21, p > .05$). The interaction effects between grade 10 enrollment and the school process variables are also not statistically related to Behavioral (Administrator Control x Grade 10 Enrollment: $\beta = 0.00, p > .05$; School Morale x Grade 10 Enrollment: $\beta = 0.00, p > .05$), Emotional (Administrator Control x Grade 10 Enrollment: $\beta = 0.00, p > .05$; School Morale x Grade 10 Enrollment: $\beta = 0.00, p > .05$), or Cognitive (Administrator Control x Grade 10 Enrollment: $\beta = 0.00, p > .05$) engagement on dropping out of school.
Discussion

Compared to high school graduates, high school dropouts are limited in their access to economic opportunities, which can affect the quality of their future well-being (Belfield & Levin, 2007; Harlow, 2003; Levin, et al., 2007; Muennig, 2007; Rouse, 2007; Waldfogel et al., 2007). Understanding why students choose to drop out of high school is an important first step in preventing students from leaving school before graduation. Theories on why students drop out of school have described dropping out of high school as a final stage in a process of disengagement from school (Finn, 1989; Newmann et al., 1992; Rumberger & Larson, 1998; Wehlage et al., 1989). The literature on the construct of engagement, however, is limited in that it varies in how it is defined and operationalized, which has resulted in an incomplete understanding of the relationship between engagement and dropping out (Appleton, Christenson, & Furlong, 2008; Fredricks et al., 2004; Glanville & Wildhagen, 2007). This study sought to further examine the concept of engagement and how engagement influences dropping out of school. In addition, school effectiveness research has provided evidence that the school context can influence students leaving school before graduation (Bryk & Thum, 1989; Fine, 1991; McNeal, 1997; Rumberger, 1995); yet, little is known about how the school context influences student engagement on dropping out. Therefore this study also examined the interactions between student engagement and school processes, more specifically administrator control and school morale, to determine their effects on dropping out of high school.

To further explore these areas of study, data from the Educational Longitudinal Study of 2002 (ELS:2002) were used. The ELS:2002 is a large-scale longitudinal panel study with a nationally representative sample of tenth-grade students from public, Catholic, and other private schools through the United States. Tenth-grade students were surveyed in 2002 and then again
two years later in 2004; high school transcripts were also collected. The survey data contain items rich with both student- and school-level measures. Student-level measures include student demographics, family background, educational background, engagement, and dropout status. School-level measures include student composition, school resources, school structural characteristics, and school processes.

The Discussion section summarizes the findings and provides an analysis of how these findings add to the previous literature as well as the implication of these findings to the field of education. In addition, the limitations of this study and recommendations for future research are discussed.

**Summary of Findings**

This subsection summarizes the findings of each of the posed research questions and discusses how these findings add to the existing literature. The findings are summarized under the following headings: (1) Engagement, (2) Engagement and Dropping Out, (3) Student Characteristics and Dropping out; (4) Engagement, School processes, and Dropping Out, and (5) School Characteristics and Dropping Out. The *Engagement* section provides a synthesis of findings answering the study’s first research question, which examined whether engagement is a meta-construct consisting of multiple dimensions within the three domains of engagement (i.e., behavioral, emotional, and cognitive). Research questions two and three examined the relationship between engagement and dropping out as well as the interaction effects between engagement and students’ background characteristics and are discussed in the *Engagement and Dropping Out* section. Findings observed concerning student background characteristics are presented in the *Student Background Characteristics and Dropping Out* section. The fourth and fifth research questions focused on how school processes interact with engagement to predict
dropping out of school as well as how these effects varied for schools with different characteristics. Findings from questions four and five are discussed in the Engagement, School processes, and Dropping Out section. Lastly, findings observed, concerning school characteristics are presented in the School Characteristics and Dropping Out section.

**Engagement.** As described above, this study hypothesized that dropping out is the final stage of a process of disengagement (or an absence of engagement) from school. The construct of engagement, however, lacks both a standard and comprehensive definition and measure within the research literature (Appleton, et al., 2008; Fredricks et al., 2004; Glanville & Wildhagen, 2007). To better understand the relationship between engagement and dropping out, this study adopted the definition of engagement as defined by Fredricks et al. (2004).

Broadly defined, engagement is students’ active commitment and involvement in learning and school activities (Fredricks et al., 2004; Newmann et al., 1992). Fredricks et al. (2004) define engagement as a meta-construct comprised of behavioral, emotional, and cognitive domains. The behavioral engagement domain includes dimensions of students’ involvement or participation in school as well as adhering to school rules. The emotional engagement domain includes dimensions of students’ affective reactions to their experiences in school. The cognitive engagement domain includes dimensions of students’ psychological investment in learning.

Factor analyses were conducted to test the hypothesis that engagement is a meta-construct consisting of multiple dimensions within the domains of behavioral, emotional, and cognitive engagement. This view of engagement comprises a second-order factor model. The second-order factors consist of the behavioral, emotional, and cognitive domains and the first-order factors consist of the dimensions that measure these domains. The findings of the factor analysis partially support the hypothesis. The first-order factor analysis results indicate that the

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10 See footnote 2.
data support a model with eight dimensions, including: Conduct, Class Participation, Preparedness for Class, Attitudes about Teachers, Attitudes about the School Social Environment, Attitudes about the School Academic Environment, Persistence, and Effort.

The results of the second-order factor analyses were inconclusive and did not support the hypothesis that engagement was composed of three domains of engagement. The final second-order factor analysis resulted indicated that engagement has two domains (a Behavioral/Emotional domain and a Cognitive domain). The first-factor with both behavioral and emotional components (i.e., attitudes about teachers, attitudes about the school social environment, and conduct) does not appear valid. Although attitudes about teachers and the school social environment are related based on students’ emotional engagement, it is unclear how conduct relates to these dimensions to create an overall construct.

Given the inconclusive findings of the second-order factor analysis, the correlations among the hypothesized domains (i.e., behavioral, emotional, and cognitive) were examined. Composites were calculated for each of the domains, using the associated dimensions, and correlations among the domains were examined. The correlations revealed that the domains are distinct but related factors. These findings emphasize the need to further explore the operational definition of engagement and the need for valid and reliable measures of engagement.

**Engagement and dropping out.** Hierarchical generalized linear modeling (HGLM) was used to test research questions two and three. It was hypothesized that the three domains of engagement would be statistically significant predictors of dropping out of school, after controlling for other student, family, and educational background characteristics. The results indicated that emotional engagement was the only domain that was a statistically significant predictor of dropping out. Emotional engagement is defined as students’ attitudes about their teachers (e.g., students get
along well with teachers; teachers praise students effort), the school social environment (e.g.,
other students often disrupt class; disruptions by other students get in the way of learning), and
about the school academic environment (e.g., classes are interested and challenging; satisfied by
doing what is expected in class). A one-point increase on the emotional engagement scale
reduced students’ risks of dropping out of high school by 50 percent.

These findings support ethnographic and empirical studies that revealed students who
drop out of school feel that teachers do not care about them and do not care about how they do in
school (Croniger & Lee, 2001; Fine, 1986, 1991; Wehlage et al., 1989). The findings also
support research by Ream and Rumberger (2009) that revealed students were less likely to drop
out of high school when they were viewed positively by their peers. Furthermore, it adds to
existing literature in that how tenth-grade students feel about their school environment (how
often students disrupt class and find the material in class interesting and challenging) is an
important factor in predicting whether or not they will graduate or drop out of high school.

The results of the HGLM analyses indicated that behavioral (i.e., students’ conduct, class
participation, and preparedness for class) and cognitive (i.e., students’ persistence and effort in
school) engagement were not statistically significant predictors of dropping out of high school,
after controlling for student, family, and educational background characteristics. These findings
were contrary to the hypothesis. Other studies of behavioral (e.g., attendance, conduct,
preparedness for class) and cognitive (e.g., flexibility when problem solving, independent work
styles ) engagement have found that these domains predict students who drop out of school
(Connell & Wellborn, 1991; Ekstrom, et al., 1986; Finn & Rock, 1997; Mahoney & Cairnes,
1997; McNeal, 1995; Ream & Rumberger, 2008; Rumberger & Larson, 1998; Rumberger &
Palardy, 2005). Previous studies, however, examine the individual dimensions of the domains of engagement, whereas, this current study examined the domains of engagement overall.

An exploratory analysis of the individual engagement dimensions revealed that after controlling for other student background characteristics, students’ conduct (e.g., frequency students got into a physical fight in school, cut or skipped class, were absent, were suspended) was the only statistically significant predictor of dropping out, whereas, the other dimensions were not significant predictors. These findings suggests that emotional engagement as a whole – students’ attitudes about teachers, peers, and school – and students’ conduct are important to gauge early on in high school in order to prevent students from dropping out. Students’ behavioral engagement overall as well as students’ overall cognitive engagement are not critical indicators in predicting whether or not students will drop out of school.

In addition to examining the main effects of the domains of engagement on dropping out, this study also examined interaction effects between the domains and student characteristics. The analysis of interaction effects can provide educators with information that would allow them to target a specific domain of engagement depending on the needs of a student (Lee & Burkham, 2003). The HGLM analyses resulted in few statistically significant interaction effects. After controlling for student background characteristics, there were no statistically significant interaction effects of gender, English as a native language, socioeconomic status (SES), or ninth-grade grade point average (GPA) with the domains of engagement. Similarly, there were no statistically significant interaction effects between the domains of engagement and Asian, Hispanic, or Other race/ethnicity students. There was, however, a statistically significant interaction effect for Black students and emotional engagement. When compared to White students, a one-unit increase on the emotional engagement scale decreases the likelihood of
Black students from dropping out. This finding emphasizes the importance to monitor tenth-grade students’ emotional engagement in order to prevent students from dropping out, especially for Black students. The interaction effects between Black students and behavioral and cognitive engagement were not significant.

**Student background characteristics and dropping out.** Student dropout rates disaggregated by student background characteristics (e.g., gender, ethnicity) reveal differences between groups (Ekstrom, et al., 1986; Bryk & Thum, 1989; Lee & Burkam, 2003; Perreira et al., 2006; Reschly & Christenson, 2006; Rumberger, 1995; Rumberger & Larsen, 1998). To control for these differences student background characteristics (i.e., student demographics, family background characteristics, and educational background characteristics) were included in the analysis models. The results of this current study revealed that the following student demographics and educational background variables were not statistically significant predictors of dropping out, after controlling for other background characteristics and the engagement variables: gender; race/ethnicity; English is native language; individualized education plan (IEP) status; grade 10 reading and math achievement; and school program. Although previous research on dropping out have revealed statistically significant effects of these indicators on dropping out, Rumberger and Lim (2008) argue that differences in effects from study to study may be due to what other factors are included in the analyses.

Age, family background characteristics (i.e., SES, living with both parents, and parent involvement), and ninth-grade GPA were statistically significant predictors of dropping out of school, after controlling for other student background characteristics and the student engagement variables. A one-year increase in students’ age in tenth grade increased the odds of dropping out of school by 86 percent. This finding supports previous research that examined the effects of
retention and being overage on dropping out of school (Brooks-Gunn et al., 1993; Cairnes, et al., 1989; Goldschmidt & Wang, 1999; Janosz, et al., 1997; Jimerson et al., 2002; Rumberger, 1995; Rumberger & Larsen, 1998; Rumberger & Palardy, 2005). Although age is a demographic characteristic, it is often used as an indicator of retention in the dropout literature (Cairnes, et al., 1989; Janosz, et al., 1997; Jimerson et al., 2002). Students older than other students in their grade level are considered overage and it is often assumed that they were retained at some point in their schooling.\footnote{See footnote 4.}

All family background variables were statistically significant predictors of dropping out of high school, after controlling for other student background characteristics and student engagement. These results highlight the importance of family stability and involvement in a students’ education. An increase in a student’s family SES decreases the likelihood of dropping out of school. This finding supports previous research that demonstrated students from high SES families are less likely to dropout as compared to low SES families (Ekstrom et al., 1986; Janosz et al., 1997; McNeal, 1997; Rumberger, 1983; Rumberger & Larsen, 1998). Similarly, students who live with both birth parents are less likely to drop out of high school as compared to students who do not live with both birth parents, which coincides with previous research (Ekstrom et al., 1986; Goldschmidt & Wang, 1999; Rumberger, 1983; Rumberger & Larsen, 1998). Furthermore, findings also revealed that an increase in parental involvement in their child’s schooling decreases the likelihood of dropping out. Parental involvement in schooling includes how often parents help with or check homework, discuss report cards with their child, attend school activities, provide advice about selecting courses, or provide advice about college. This finding adds to the existing dropout literature, which has primarily focused on the effects of family
practices and parenting style on dropping out (Ensminger & Slusarcick, 1992; Rumberger et al., 1990).

The ELS:2002 study was unique in that it collected participating students’ high school transcripts, including students’ ninth-grade GPA. Similar to previous research, students’ GPA was one of the strongest predictors of dropping out of high school. Previous research, however, focused on students’ eight-grade or tenth-grade academic achievement, whereas, this study used ninth-grade academic achievement (Ekstrom et al., 1986; Janosz et al., 1997; Lee & Burkam, 2003; Rumberger & Larson, 1998).

**Engagement, school processes, and dropping out.** The literature on engagement indicates that engagement results from an interaction between an individual and his/her environment (Finn & Rock, 1997; Fredricks et al., 2004; National Research Council, 2004; Newmann, et al., 1992; Wehlage et al., 1989; Weiss et al., 2010). This suggests that schools can promote high levels of engagement. To test this hypothesis, this study examined the effects of school processes, or the school policies and practices about how schools are organized and managed, on student engagement to predict dropping out. The specific school processes examined include the school administrator’s perceived control over policies and practices in the school building (e.g., principals influence of hiring/firing, grouping students, course offerings, grading, discipline, funds) as well as the administrator’s perception of the school morale (e.g., student and teacher morale, students are pressed to achieve, learning is a priority).

After controlling for student and school background characteristics, there were no statistically significant effects of administrator control or school morale on student engagement and dropping out. The administrator control and school morale variables also did not predict differences in school dropout rates. Other studies have revealed effects of school processes on
dropping out; yet, they focused on teachers’ and students’ perceptions of the school’s policies and practices (Bryk & Thum, 1989; Rumberger & Palardy, 2005). It is possible that teachers’ and/or students’ perceptions of school processes would have provided a more accurate measure to explain students’ engagement on dropping out of high school. Werblow et al. (2010) used a similar measure of school morale from the ELS:2002 data and found a significant effect on dropping out of school, but different student and school control variables were included in their model, which may explain the difference in results.

It was also hypothesized that the effects of school processes on student engagement to predict dropping out would differ for different types of schools. Much of the previous literature reports that dropout rates vary by type of school or school control (i.e., public or private) and by school size (Bryk & Thum, 1989; Lee & Burkam, 2003; McNeal, 1997; Rumberger & Larson, 1998; Rumberger & Thomas, 2000). The results revealed that after controlling for other student and school characteristics there were not statistically significant interaction effects between the school process variables and school control\(^{12}\) or school size on dropping out of high school.

**School contextual characteristics and dropping out.** In addition, to school processes, differences between school dropout rates can often be explained by the student composition of a school (i.e., grade 10 percent free-reduced priced lunch, percent minority, mean grade 9 GPA), school resources (i.e., mean teacher salary, percent teachers with subject certification), and school structural characteristics (i.e., public school status, grade 10 enrollment) (Byrk & Thum, 1989; Goldschmidt & Wang, 1999; McNeal, 1997; Rumberger, 2004; Rumberger & Palardy, 2005; Rumberger & Thomas 2000). The HGLM analyses included factors that measured these school characteristics to control for differences between schools. The results revealed that none

\(^{12}\) The school control by school process interactions could not be tested. The HGLM analysis with the school control by school process interactions resulted in unstable coefficients and large standard errors.
of the school contextual characteristics were statistically significant predictors of dropout rates between schools. In addition, these characteristics had either minimal statistically significant effects or were not statistically significant predictors of engagement on dropping out. Although these findings are contrary to previous research, it is possible that the combination of variables selected may explain the lack of significant findings.

**Implications for Practitioners**

The purpose of this study was to better understand how engagement influences dropping out of school and how school factors interact with engagement to mediate dropping out. The findings of this study have important implications for practitioners, including teachers, school administrators, and districts as well as parents and family members directly involved in students’ lives. If engagement is considered a malleable factor, then both schools and family members can influence students’ engagement to reduce their risk of dropping out of school (Fredricks et al., 2004). Furthermore, certain school processes (i.e., policies and practices) could also be manipulated to foster high levels of student engagement.

This study’s findings suggest that schools should foster an environment that leads to high levels of student engagement, particularly student emotional engagement. Although this study found that the two school processes explored, administrator control and the school morale, did not interact with student engagement to mediate dropping out, schools should consider other policies and practices that may influence students’ emotional engagement to prevent dropping out. More specifically, schools should consider processes that facilitate positive relationships between students and teachers, encourage a positive school social environment, and develop a school academic environment that is interesting for students. Schools need to ensure that teachers receive the support to show interest in their students’ work; assist those students who need
additional academic support in school; provide praise and encouragement for all students; and
provide interest in their students’ outside of class. Schools also need to work directly with their
students to ensure that there is a positive social environment in their schools, which would help
reduce feelings of being put down or not feeling safe at school. Additionally, it is important to
ensure that students are provided with interesting coursework in order not to lose their interest.
High schools that create these positive environments and supports for ninth- and tenth-grade
students can foster positive emotional engagement levels for students and prevent dropping out.

This study’s findings also support the need for schools and districts to consider
developing policies and practices that allow for tracking student engagement indicators from the
beginning of high school through graduation. This would allow schools to identify specific
students at-risk for dropping out. Along these lines, the results of this study revealed that
students’ age, conduct and poor grades were also important predictors of dropping out. Students’
age, conduct (i.e., lateness, cutting class, absent from school, not following school rules, and
suspensions) and their GPAs should be monitored to identify at-risk students and begin to
provide the supports needed to keep students on track for graduation, such as counseling,
tutoring, or academic advisement.

Lastly, this study’s findings also revealed a relationship between students’ family
background characteristics and dropping out of school. Although students’ family SES and
whether they live with both parents are inherent in the students’ lives and are not practical for
schools to address, schools and districts can try to address parents’ involvement in their
children’s schooling. Certain policies and practices of both schools and districts can be
developed to foster positive relationships with parents that aim to increase parent involvement.
For instance, providing parent workshops that introduce the parents to the curriculum, provide
information on applying to college or work after high school, and inform parents of school activities, among others. Schools should consider the needs of their students and their students’ families to develop a parent involvement model that will work best.

These suggestions are similar to the methods used in the Check & Connect program. Check & Connect is a mentoring intervention designed to promote student engagement and reduce dropping out (Reschly & Christenson, 2012; United States Department of Education Institute of Education Sciences What Works Clearinghouse [USDOE IES WWC], 2015). More specifically, Check & Connect has four components: (1) a mentor who works with students and families; (2) regular checks, utilizing data the school collects on school adjustment, behavior, and the educational process of the student; (3) timely interventions, driven by the data, to maintain students’ connection to school and learning; and (4) a partnership with families. Research on Check & Connect has been found to have positive effects on reducing poor attendance rates, suspensions, course failures, and dropout rates (USDOE IES WWC, 2015). The findings of the Check & Connect program further support the importance of schools and districts developing similar policies and practices that would help monitor student engagement to reduce the risk of dropping out.

**Study Limitations**

When interpreting the findings of this study, a number of limitations should be considered. First, non-experimental studies, such as this one, pose threats to internal validity, which restricts the conclusions that can be made about the tested hypotheses. The HGLM analyses provide relational or predictive evidence between engagement, school processes, and dropping out of high school. The results, however, do not provide evidence of causality. Student engagement in high school may not cause students to drop out. It is possible that even with
including multiple student and school background characteristics other factors may explain the relationships examined. For instance, students may initially enter high school with low levels of engagement. Previous research has documented that aspects of student engagement in elementary and middle school, such as students’ attendance and behavior, predicts high school completion (Alexander et al., 1997; Barrington and Hendricks, 1989; Rumberger & Larson, 1998). It is also possible that low levels of engagement are influenced by elementary and middle school characteristics.

Non-experimental studies also run the risk of selection bias and omitted variable bias. Although participating schools and students were randomly selected to participate, students’ were not randomly assigned to a high school. Students who are less likely to drop out of school may select high schools with more positive school morale or have parents who choose to live in neighborhoods where schools are known to have a higher morale. Even though a broad range of student and school characteristics were included in the model to account for issues of selection biases, it is still possible that other factors, observable or unobservable, related to dropping out were omitted from the model. For example, this study lacks measures of elementary and middle school performance, actual high school attendance, teacher perceptions of students, and students and teacher perceptions of school processes. Each of these factors may influence students from dropping out of high school.

Second, the findings are limited based on the data available in the ELS:2002 dataset, both in terms of the primary sample of interest and the data collected. The ELS:2002 sample design targeted students in the spring semester of tenth grade. This sample selection limited the possibility of exploring how a students’ engagement, within the first year of high school (in ninth grade), influenced their dropout status. Selecting a tenth-grade sample also excluded students
who may have dropped out of high school prior to tenth-grade. In addition, the data collected for the ELS:2002 was designed for broad use and not specifically for this study’s constructs of interest. Student engagement, administrator control, and the school morale were operationalized based on the survey items provided in the data that are closely related to these concepts. For instance, cognitive engagement as defined by Fredricks et al. (2004) is students’ investment in learning. That is students with high levels of engagement prefer hard work, use metacognitive strategies, and are able to self-regulate. The ELS:2002 items that relate to this definition focus on persistence and effort and do not necessarily measure a students’ use of metacognitive strategies or ability to self-regulate.

A third limitation is due to the self-reported nature of the ELS:2002 data collection. Self-reported data lend itself to response bias, response order effects, as well as issues with missing data. Survey respondents often will provide socially desirable responses as opposed to providing their actual perceptions. They also will check off the same response for multiple questions in a row, which falsely creates high construct reliabilities. For instance, the questions measuring administrator control and school morale were grouped together on the administrator survey making it easy for the administrator to check off the same response for each question. This may explain the high reliabilities of the administrator control and school morale constructs. In addition, the high means and low standard deviations of both administrator control and school morale indicate that most administrators responded favorably to the questions. Furthermore, self-reported data tend to result in missing data due to respondents skipping individual survey items. In the ELS:2002 study, missing data were primarily due to students not having enough time to complete the student survey. As discussed in the Method section more than 70 percent of the student sample did not respond to the questions at the end of the survey (Ingels et al., 2004).
A fourth limitation is due to the low sample sizes of interest. Many of the analyses testing the interactions between engagement and student characteristics (i.e., race/ethnicity, English native language, and IEP status) were underpowered. The final analysis sample had less than 300 dropouts. Of the dropouts in the sample only 21 percent did not speak English and 7 percent had IEP in tenth grade. Such few dropouts also led to power restrictions at the school-level. The 300 dropouts were across a total of about 450 schools, resulting in average of only a 6 percent dropout rate.

Lastly, the generalizability of these findings are limited given that the data are more than ten years old. With a new generation of students in high school, it is possible that what affects students today from dropping out may have changed from 2002. Therefore the age of the data should be considered when generalizing these findings to today’s high school students.

**Recommendations for Future Research**

To address the limitations discussed above and expand upon the findings of this study, further research examining the relationships between student engagement, school processes, and dropping out are needed. In order to better understand the dropout process, future studies should utilize large scale longitudinal designs to track students’ engagement from elementary school through school completion (i.e., graduation from high school or the decision to drop out). In addition, it would be useful to examine how a school’s processes influence student engagement in both elementary and middle school and examine if these effects vary over time.

Through an exploratory analysis, this study explored the effects of the dimensions of engagement (e.g., conduct, attitudes about teacher, persistence, etc.) on dropping out. Additional studies are need that further explore whether there are interaction effects between the individual
dimensions of engagement and student characteristics. Research is also needed on how school characteristics influence the individual dimensions of engagement to target dropping out.

The literature could also benefit from having more precise and valid measures of engagement and school processes. Appelton, Christenson, Kim, and Reschly (2006) have developed and assessed the validity and reliability of the Student Engagement Instrument (SEI) to measure emotional (i.e., teacher-student relationships; peer support for learning; and family support for learning) and cognitive (i.e., control and relevance of school work; future goals and aspirations; and extrinsic motivation) engagement (Betts, Appleton, Reschly, Christenson, & Huebner, 2010). The SEI scale, however, does not measure behavioral engagement dimensions (e.g., participation or preparedness in school and class).

Research identifying more precise and validated measures of administrator control and school morale are also needed. For instance, the school morale only consisted of five survey items that may not have targeted all aspects of the school morale. Increasing the number of items measuring the construct would increase the precision of the scale.

Further research is needed to examine what influences students’ engagement. The findings of this study indicate that tenth-grade students’ GPA in ninth-grade predicts their dropping out status. What is not known is whether students’ academic achievement predicts students’ engagement and when does students’ achievement begin to influence students’ engagement. The findings also support the importance of family characteristics on students’ dropout status. Research is needed to explore how family characteristics influence students’ engagement in school and how if at all families can help increase low levels of engagement. Furthermore, perhaps there are other factors not explored here that may influence student engagement.
Lastly, although this study focused on two specific school processes, administrator control and school morale, there are other school policies and practices that may influence student engagement on dropping out that were not explored. For instance, there is evidence to suggest that certain school policies around discharging low-achieving, problematic students influence students’ decision to drop out (Fine, 1986, 1991; Riehl, 1999), but no evidence on how these policies influence student engagement. There is also no evidence on how teacher control over the curriculum and certain teacher practices around discipline influence student engagement, yet there is evidence that these policies and practice influence dropping out (Rumberger & Palardy, 2005).
Appendix A: Dropout Status Syntax
To create the DOSTATUS variable the F1ENRFIN, F1RTROUT, F1RSCH2 variables were used. The F1ENRFIN variable indicates the students status in spring 2004 at the time of the first follow-up. The F1RTROUT variable indicates the final student status as it appears on the most recent school transcript (Bozick et al., 2006). See Table A1 below for the F1ENRFIN and F1RTROUT variable values and descriptions. To ensure that the information provided in the F1RTROUT variable is from the base-year school, the F1RSCH2 variable was also used. F1RSCH2 indicates if a student transcript was collected from a transfer school. If F1SCH2 is missing (missing = -8), then the information in the F1RTROUT variable was provided by the base-year school (Bozick et al., 2006). The following syntax was used to create the DOSTATUS variable:

IF (ANY(F1ENRFIN,1,3,4,6) & F1RSCH2=-8 & ANY(F1RTROUT,1,2,3,4,5)) DOSTATUS=0.
EXECUTE.
IF (ANY(F1ENRFIN,1,3,4,6) & F1RSCH2=-8 & ANY(F1RTROUT,8,12)) DOSTATUS = 1.
EXECUTE.

VALUE LABELS DOSTATUS
'0' 'Graduate'
'1' ‘Dropout’.

Variable Labels DOSTATUS 'Dropped out or Graduated from Base Year School (F1ENRFIN, F1RSCH2, F1RTROUT ‘.

Table A1. F1ENRFIN and F1RTROUT Values and Descriptions\(^\text{13}\)

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fall 2003 – summer 2004 graduate</td>
<td>10,990</td>
<td>72.1%</td>
</tr>
<tr>
<td>2</td>
<td>Post-summer 2004 graduate</td>
<td>60</td>
<td>0.4%</td>
</tr>
<tr>
<td>3</td>
<td>Pre-fall 2003 graduate</td>
<td>260</td>
<td>1.7%</td>
</tr>
<tr>
<td>4</td>
<td>Graduation date unknown</td>
<td>180</td>
<td>1.2%</td>
</tr>
<tr>
<td>5</td>
<td>Diploma w/special education adjustments</td>
<td>50</td>
<td>0.3%</td>
</tr>
<tr>
<td>6</td>
<td>Certificate of attendance</td>
<td>20</td>
<td>0.1%</td>
</tr>
<tr>
<td>7</td>
<td>Still enrolled</td>
<td>100</td>
<td>0.7%</td>
</tr>
<tr>
<td>8</td>
<td>Dropped out</td>
<td>850</td>
<td>5.6%</td>
</tr>
<tr>
<td>9</td>
<td>Transferred</td>
<td>1,070</td>
<td>7.0%</td>
</tr>
<tr>
<td>11</td>
<td>Left for health-related reason</td>
<td>-</td>
<td>0.04%</td>
</tr>
<tr>
<td>12</td>
<td>Received GED certificate</td>
<td>30</td>
<td>0.2%</td>
</tr>
<tr>
<td>13</td>
<td>Withdrew</td>
<td>40</td>
<td>0.3%</td>
</tr>
<tr>
<td>14</td>
<td>Dismissed</td>
<td>20</td>
<td>0.1%</td>
</tr>
<tr>
<td>15</td>
<td>Incarcerated</td>
<td>-</td>
<td>0.03%</td>
</tr>
<tr>
<td>16</td>
<td>Other</td>
<td>70</td>
<td>0.5%</td>
</tr>
<tr>
<td>17</td>
<td>Status cannot be determined</td>
<td>1,480</td>
<td>9.7%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>15,240</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

\(^\text{13}\) All Ns are rounded to the nearest 10. Values less than 10 are suppressed.
Appendix B: Variables Used in the Multiple Imputation Models
Table B1. *Imputed Student-Level Variables (N=11,370)*\(^{14}\)

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Number Missing</th>
<th>Percent Missing</th>
<th>Number Imputed</th>
<th>Percent Imputed</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td>Age (Age in years at time of survey): (BQXDATP - BYDOB_R)</td>
<td>60</td>
<td>0.6</td>
<td>20</td>
<td>0.1</td>
</tr>
<tr>
<td>F1RGP9</td>
<td>Grade Point Average in Grade 9</td>
<td>240</td>
<td>2.1</td>
<td>100</td>
<td>0.9</td>
</tr>
<tr>
<td>BYS20A</td>
<td>Students get along well with teachers</td>
<td>470</td>
<td>4.1</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS20B</td>
<td>There is real school spirit</td>
<td>520</td>
<td>4.5</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS20D</td>
<td>Other students often disrupt class</td>
<td>520</td>
<td>4.5</td>
<td>20</td>
<td>0.2</td>
</tr>
<tr>
<td>BYS20E</td>
<td>The teaching is good</td>
<td>590</td>
<td>5.2</td>
<td>50</td>
<td>0.5</td>
</tr>
<tr>
<td>BYS20F</td>
<td>Teachers are interested in students</td>
<td>650</td>
<td>5.7</td>
<td>70</td>
<td>0.6</td>
</tr>
<tr>
<td>BYS20G</td>
<td>When I work hard on schoolwork, my teachers praise my effort</td>
<td>560</td>
<td>4.9</td>
<td>30</td>
<td>0.2</td>
</tr>
<tr>
<td>BYS20H</td>
<td>In class I often feel “put down” by my teachers</td>
<td>520</td>
<td>4.6</td>
<td>20</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS20I</td>
<td>In class I often feel “put down” by other students</td>
<td>530</td>
<td>4.6</td>
<td>20</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS20J</td>
<td>I don’t feel safe at this school</td>
<td>580</td>
<td>5.1</td>
<td>40</td>
<td>0.3</td>
</tr>
<tr>
<td>BYS20K</td>
<td>Disruptions by other students get in the way of my learning</td>
<td>540</td>
<td>4.8</td>
<td>20</td>
<td>0.2</td>
</tr>
<tr>
<td>BYS20L</td>
<td>Misbehaving students often get away with it</td>
<td>530</td>
<td>4.7</td>
<td>20</td>
<td>0.2</td>
</tr>
<tr>
<td>BYS22D</td>
<td>I got into a physical fight at school</td>
<td>490</td>
<td>4.3</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS24A</td>
<td>I was late for school</td>
<td>480</td>
<td>4.2</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS24B</td>
<td>I cut or skipped class</td>
<td>540</td>
<td>4.7</td>
<td>30</td>
<td>0.2</td>
</tr>
<tr>
<td>BYS24C</td>
<td>I was absent from school</td>
<td>590</td>
<td>5.2</td>
<td>50</td>
<td>0.5</td>
</tr>
</tbody>
</table>

\(^{14}\) All Ns are rounded to the nearest 10. Values less than 10 suppressed.
<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Number Missing</th>
<th>Percent Missing</th>
<th>Number Imputed</th>
<th>Percent Imputed</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYS24D</td>
<td>I got in trouble for not following school rules</td>
<td>530</td>
<td>4.7</td>
<td>30</td>
<td>0.2</td>
</tr>
<tr>
<td>BYS24E</td>
<td>I was put on in-school suspension</td>
<td>490</td>
<td>4.3</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS24F</td>
<td>I was suspended or put on probation</td>
<td>520</td>
<td>4.6</td>
<td>20</td>
<td>0.2</td>
</tr>
<tr>
<td>BYS24G</td>
<td>I was transferred to another school for disciplinary reason</td>
<td>460</td>
<td>4.1</td>
<td>-</td>
<td>0.0</td>
</tr>
<tr>
<td>BYS27A</td>
<td>Classes are interesting and challenging</td>
<td>490</td>
<td>4.3</td>
<td>-</td>
<td>0.0</td>
</tr>
<tr>
<td>BYS27B</td>
<td>Satisfied by doing what is expected in class</td>
<td>500</td>
<td>4.4</td>
<td>-</td>
<td>0.0</td>
</tr>
<tr>
<td>BYS27C</td>
<td>Has nothing better to do than school</td>
<td>530</td>
<td>4.6</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS27D</td>
<td>Education is important to get a job later</td>
<td>520</td>
<td>4.6</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS27E</td>
<td>School is a place to meet friends</td>
<td>500</td>
<td>4.4</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS27F</td>
<td>Go to school to play on a team or belong to a club</td>
<td>530</td>
<td>4.7</td>
<td>20</td>
<td>0.2</td>
</tr>
<tr>
<td>BYS27G</td>
<td>Learns skills for job in school</td>
<td>500</td>
<td>4.4</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS27H</td>
<td>Teachers expect success in school</td>
<td>530</td>
<td>4.6</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS27I</td>
<td>Parents expect success in school</td>
<td>500</td>
<td>4.4</td>
<td>-</td>
<td>0.0</td>
</tr>
<tr>
<td>BYS28</td>
<td>How much do you like school</td>
<td>380</td>
<td>3.3</td>
<td>130</td>
<td>1.2</td>
</tr>
<tr>
<td>BYS29B</td>
<td>Listen to the teacher lecture in your current or most recent math class</td>
<td>610</td>
<td>5.4</td>
<td>40</td>
<td>0.4</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
<td>Number Missing</td>
<td>Percent Missing</td>
<td>Number Imputed</td>
<td>Percent Imputed</td>
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<tr>
<td>BYS29C</td>
<td>Copy the teacher’s notes from the board in your current or most recent math class</td>
<td>770</td>
<td>6.8</td>
<td>110</td>
<td>0.9</td>
</tr>
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<tr>
<td>BYS29E</td>
<td>Do word problems or problem solving activities in your current or most recent math class</td>
<td>600</td>
<td>5.2</td>
<td>20</td>
<td>0.2</td>
</tr>
<tr>
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<tr>
<td>BYS29I</td>
<td>Explain your work to the class orally in your current or most recent math class</td>
<td>620</td>
<td>5.4</td>
<td>30</td>
<td>0.3</td>
</tr>
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<tr>
<td>BYS29J</td>
<td>Participate in student-led discussions in your current or most recent math class</td>
<td>550</td>
<td>4.8</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS37</td>
<td>Importance of good grades to student</td>
<td>170</td>
<td>1.5</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS38A</td>
<td>How often do come to class without a pencil/pen or paper</td>
<td>580</td>
<td>5.1</td>
<td>20</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS38B</td>
<td>How often do come to class without books</td>
<td>580</td>
<td>5.1</td>
<td>20</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS38C</td>
<td>How often do come to class without homework done</td>
<td>600</td>
<td>5.3</td>
<td>20</td>
<td>0.1</td>
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<td>Variable Name</td>
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<td>Number Missing</td>
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</tr>
<tr>
<td>BYS89A</td>
<td>I’m confident that I can do an excellent job on my math tests</td>
<td>2650</td>
<td>23.3</td>
<td>-</td>
<td>0.0</td>
</tr>
<tr>
<td>BYS89E</td>
<td>When I sit myself down to learn something really hard, I can learn it</td>
<td>2,840</td>
<td>24.9</td>
<td>30</td>
<td>0.2</td>
</tr>
<tr>
<td>BYS89G</td>
<td>When I study, I make sure that I remember the most important things</td>
<td>2,840</td>
<td>25.1</td>
<td>-</td>
<td>0.0</td>
</tr>
<tr>
<td>BYS89J</td>
<td>When studying, I try to work as hard as possible</td>
<td>2,870</td>
<td>25.2</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS89N</td>
<td>If I decide not to get any bad grades, I can really do it</td>
<td>2,940</td>
<td>25.9</td>
<td>20</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS89O</td>
<td>When studying, I keep working even if the material is difficult</td>
<td>3,060</td>
<td>26.9</td>
<td>20</td>
<td>0.1</td>
</tr>
<tr>
<td>BYS89Q</td>
<td>If I decide not to get any problems wrong, I can really do it</td>
<td>3,100</td>
<td>27.2</td>
<td>10</td>
<td>0.1</td>
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<tr>
<td>BYS89R</td>
<td>I’m confident I can do an excellent job on my math assignments</td>
<td>3,070</td>
<td>27.0</td>
<td>20</td>
<td>0.2</td>
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<tr>
<td>BYS89S</td>
<td>When studying, I try to do my best to acquire the knowledge and skills taught</td>
<td>3,170</td>
<td>27.9</td>
<td>20</td>
<td>0.2</td>
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<tr>
<td>BYS89T</td>
<td>If I want to learn something well, I can</td>
<td>3,140</td>
<td>27.6</td>
<td>40</td>
<td>0.3</td>
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<tr>
<td>BYS89V</td>
<td>When studying, I put forth my best effort</td>
<td>3,130</td>
<td>27.5</td>
<td>20</td>
<td>0.2</td>
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<tr>
<td>ExtrAct_IntramuralSprts</td>
<td>Number of Intramural Sports Student Participated in (BYS39A-BYS39H)</td>
<td>190</td>
<td>1.7</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>ExtrAct_InterScholasticSprts</td>
<td>Number of Interscholastic Sports Student Participated in (BYS39E-BYS39H)</td>
<td>590</td>
<td>5.2</td>
<td>10</td>
<td>0.1</td>
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<td>Percent Missing</td>
<td>Number Imputed</td>
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<tr>
<td>ExtrAct_FineArtsandClubs</td>
<td>Number of Fine Arts and Clubs Student Belongs to (BYS41A-BYS41I)</td>
<td>170</td>
<td>1.5</td>
<td>-</td>
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<tr>
<td>BYP55A</td>
<td>How often check that homework is completed</td>
<td>1,920</td>
<td>16.9</td>
<td>850</td>
<td>7.5</td>
</tr>
<tr>
<td>BYP55B</td>
<td>How often discuss report card</td>
<td>1,900</td>
<td>16.7</td>
<td>830</td>
<td>7.3</td>
</tr>
<tr>
<td>BYP56A</td>
<td>Provide advice about selecting courses or programs</td>
<td>1,890</td>
<td>16.6</td>
<td>820</td>
<td>7.2</td>
</tr>
<tr>
<td>BYP56B</td>
<td>Provide advice about plans for college entrance exams</td>
<td>1,930</td>
<td>17.0</td>
<td>840</td>
<td>7.4</td>
</tr>
<tr>
<td>BYP56C</td>
<td>Provide advice about applying to college/school after high school</td>
<td>1,960</td>
<td>17.3</td>
<td>850</td>
<td>7.5</td>
</tr>
<tr>
<td>BYP57A</td>
<td>Attended school activities with 10th grader</td>
<td>1,880</td>
<td>16.6</td>
<td>820</td>
<td>7.2</td>
</tr>
<tr>
<td>BYP57B</td>
<td>Worked on homework/school projects with 10th grader</td>
<td>1,880</td>
<td>16.5</td>
<td>820</td>
<td>7.2</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Description</td>
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<td>F1TRSCWT</td>
<td>Transcript Weight</td>
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<td>STRAT_ID</td>
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<td>PSU</td>
<td>Primary Sampling Unit</td>
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<tr>
<td>DOSTATUS</td>
<td>Graduate vs. Drop out: Based on Enrollment Status Final Transcript Indicated Outcome (F1ENRFIN and F1TROUT)</td>
<td></td>
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<tr>
<td>Female</td>
<td>Gender: Male vs. Female (BYSEX)</td>
<td></td>
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<tr>
<td>BYRACE</td>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BYSTLANG</td>
<td>Native Language is English (Native language is English vs. Native language is not English)</td>
<td></td>
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<tr>
<td>BYSES1</td>
<td>Socioeconomic Status: Standardized continuous composite calculated by NCES based on family income, parents’ educational and occupational prestige</td>
<td></td>
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<tr>
<td>FCOMP</td>
<td>Family Composition (BYFCOMP)</td>
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<tr>
<td>BYIEP</td>
<td>Individualized Education Plan (IEP) in Grade 10</td>
<td></td>
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<tr>
<td>BYSCHPRG</td>
<td>High School Program</td>
<td></td>
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<tr>
<td>BYTXCSTD</td>
<td>Reading and Math Achievement in Grade 10: Standardized test composite score calculated by NCES</td>
<td></td>
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<tr>
<td>BYSTEXP</td>
<td>How far in school student thinks will get</td>
<td></td>
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<tr>
<td>BYS20C</td>
<td>Students friendly with other racial groups</td>
<td></td>
<td></td>
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<tr>
<td>BYS20M</td>
<td>There are gangs in school</td>
<td></td>
<td></td>
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<tr>
<td>BYS20N</td>
<td>Racial/ethnic groups often fight</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>BYS21A</td>
<td>Everyone knows what school rules are</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS21B</td>
<td>School rules are fair</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS21C</td>
<td>Punishment same no matter who you are</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS21D</td>
<td>School rules are strictly enforced</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS21E</td>
<td>Students know punishment for broken rules</td>
<td></td>
<td></td>
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<tr>
<td>BYS22A</td>
<td>Had something stolen at school</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>BYS22B</td>
<td>Someone offered drugs at school</td>
<td></td>
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<tr>
<td>BYS22C</td>
<td>Someone threatened to hurt 10th grader at school</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>BYS22E</td>
<td>Someone hit 10th grader</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>BYS22F</td>
<td>Someone forced money/things from 10th grader</td>
<td></td>
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<tr>
<td>Variable Name</td>
<td>Description</td>
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<tr>
<td>BYS22G</td>
<td>Someone damaged belongings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS22H</td>
<td>Someone bullied or picked on 10th grader</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BYS23A</td>
<td>Won an academic honor</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BYS23B</td>
<td>Recognized for good attendance</td>
<td></td>
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<tr>
<td>BYS23C</td>
<td>Recognized for good grades</td>
<td></td>
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<tr>
<td>BYS23D</td>
<td>Received community service award</td>
<td></td>
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<tr>
<td>BYS23E</td>
<td>Participated in science/math fair</td>
<td></td>
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<tr>
<td>BYS23F</td>
<td>Participated in vocational/tech skills competition</td>
<td></td>
<td></td>
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<tr>
<td>BYS29A</td>
<td>How often reviews work in math class</td>
<td></td>
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<tr>
<td>BYS29D</td>
<td>How often uses books besides math textbooks</td>
<td></td>
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<tr>
<td>BYS29F</td>
<td>How often uses calculators in math class</td>
<td></td>
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<tr>
<td>BYS29G</td>
<td>How often uses graphing calculators in math class</td>
<td></td>
<td></td>
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<tr>
<td>BYS29H</td>
<td>How often uses computers in math class</td>
<td></td>
<td></td>
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<tr>
<td>BYS33A</td>
<td>Ever in Advanced Placement program</td>
<td></td>
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<tr>
<td>BYS33B</td>
<td>Ever in International Baccalaureate program</td>
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<tr>
<td>BYS33C</td>
<td>Ever in part-time program at regional vocational school</td>
<td></td>
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<tr>
<td>BYS33D</td>
<td>Ever in a remedial English class</td>
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<tr>
<td>BYS33E</td>
<td>Ever in a remedial math class</td>
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<tr>
<td>BYS33F</td>
<td>Ever in bilingual/bicultural class</td>
<td></td>
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<tr>
<td>BYS33G</td>
<td>Ever in English as Second Language program</td>
<td></td>
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<tr>
<td>BYS33H</td>
<td>Ever in dropout prevention program</td>
<td></td>
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<tr>
<td>BYS33I</td>
<td>Ever in special education program</td>
<td></td>
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<tr>
<td>BYS33J</td>
<td>Ever in distance learning course</td>
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<tr>
<td>BYS33K</td>
<td>Ever in career academy</td>
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<tr>
<td>BYS33L</td>
<td>Ever in program to help prepare for college</td>
<td></td>
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<tr>
<td>BYS34A</td>
<td>Hours/week spent on homework in school</td>
<td></td>
<td></td>
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<tr>
<td>BYS34B</td>
<td>Hours/week spent on homework out of school</td>
<td></td>
<td></td>
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<tr>
<td>BYS39E</td>
<td>Hours/week spent on extracurricular activities</td>
<td></td>
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<tr>
<td>BYS42</td>
<td>Importance of being successful in line work</td>
<td></td>
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<tr>
<td>BYS54A</td>
<td>Importance of marrying right person/having happy family</td>
<td></td>
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<tr>
<td>BYS54B</td>
<td>Importance of having lots of money</td>
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<td>Variable Name</td>
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<tr>
<td>BYS54C</td>
<td>Importance of having strong friendships</td>
<td></td>
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<tr>
<td>BYC54D</td>
<td>Importance of being able to find steady work</td>
<td></td>
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<tr>
<td>BYS54E</td>
<td>Importance of helping others in community</td>
<td></td>
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<tr>
<td>BYS54F</td>
<td>Importance of giving children better opportunities</td>
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<tr>
<td>BYS54G</td>
<td>Importance of living close to parents/relatives</td>
<td></td>
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<tr>
<td>BYS54H</td>
<td>Importance of working to correct inequalities</td>
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<tr>
<td>BYS54J</td>
<td>Importance of having children</td>
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<tr>
<td>BYS54K</td>
<td>Importance of having leisure time</td>
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<tr>
<td>BYS54L</td>
<td>Importance of being expert in field of work</td>
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<tr>
<td>BYS54N</td>
<td>Importance of getting good education</td>
<td></td>
<td></td>
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<tr>
<td>BYS54O</td>
<td>Students friendly with other racial groups</td>
<td></td>
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<tr>
<td>BYS87A</td>
<td>Gets totally absorbed in mathematics</td>
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<td></td>
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</tr>
<tr>
<td>BYS87B</td>
<td>Thinks reading is fun</td>
<td></td>
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</tr>
<tr>
<td>BYS87C</td>
<td>Thinks math is fun</td>
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<tr>
<td>BYS87D</td>
<td>Reads in spare time</td>
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<tr>
<td>BYS87E</td>
<td>Gets totally absorbed in reading</td>
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<tr>
<td>BYS87F</td>
<td>Mathematics is important</td>
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<tr>
<td>BYS88A</td>
<td>Most people can learn to be good at math</td>
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<tr>
<td>BYS88B</td>
<td>Have to be born with ability to be good at math</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS89B</td>
<td>Can understand difficult math texts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS89C</td>
<td>Can understand difficult English texts</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BYS89D</td>
<td>Studies to get a good grade</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>BYS89F</td>
<td>Can understand difficult English class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS89H</td>
<td>Studies to increase job opportunities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BYS89I</td>
<td>Can do excellent job on English assignments</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BYS89K</td>
<td>Can do excellent job on English tests</td>
<td></td>
<td></td>
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<tr>
<td>BYS89L</td>
<td>Can understand difficult math class</td>
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<td></td>
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<tr>
<td>BYS89M</td>
<td>Can master skills in English class</td>
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<td></td>
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<tr>
<td>BYS89P</td>
<td>Studies to ensure financial security</td>
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<tr>
<td>BYS89U</td>
<td>Can master math class skills</td>
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</tbody>
</table>
Table B3. *Imputed School-Level Variables (N=710)* \(^{15}\)

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Number Missing</th>
<th>Percent Missing</th>
<th>Number Imputed</th>
<th>Percent Imputed</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYA46A</td>
<td>Principal’s influence hiring/firing teachers</td>
<td>120</td>
<td>16.7</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA46B</td>
<td>Principal’s influence on grouping students</td>
<td>120</td>
<td>16.7</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA46C</td>
<td>Principal’s influence on course offerings</td>
<td>120</td>
<td>16.9</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA46D</td>
<td>Principal’s influence on instructional materials</td>
<td>120</td>
<td>16.6</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA46E</td>
<td>Principal’s influence on curricular guidelines</td>
<td>120</td>
<td>16.7</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA46F</td>
<td>Principal’s influence on grading and evaluation</td>
<td>120</td>
<td>16.7</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA46G</td>
<td>Principal’s influence on discipline policies</td>
<td>120</td>
<td>16.6</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA46H</td>
<td>Principal’s influence on school funds</td>
<td>120</td>
<td>16.9</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA51A</td>
<td>Student morale is high</td>
<td>120</td>
<td>16.7</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA51B</td>
<td>Teacher press students to achieve</td>
<td>120</td>
<td>16.9</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA51C</td>
<td>Teacher morale is high</td>
<td>120</td>
<td>16.6</td>
<td>120</td>
<td>100.0</td>
</tr>
<tr>
<td>BYA51D</td>
<td>Learning is a high priority for students</td>
<td>120</td>
<td>16.7</td>
<td>120</td>
<td>99.2</td>
</tr>
<tr>
<td>BYA51E</td>
<td>Students expected to do homework</td>
<td>120</td>
<td>16.6</td>
<td>120</td>
<td>99.1</td>
</tr>
</tbody>
</table>

\(^{15}\) All Ns are rounded to the nearest 10.
Table B4. *School-Level Variables Included in the School-Level Multiple Imputation Models*

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYSCHWT</td>
<td>School Weight</td>
</tr>
<tr>
<td>STRAT_ID</td>
<td>Strata ID</td>
</tr>
<tr>
<td>PSU</td>
<td>Primary Sampling Unit</td>
</tr>
<tr>
<td>DOSTATUS_mean</td>
<td>Percent of Students Who Dropped Out (DOSTATUS: F1ENRFIN and F1TROUT)</td>
</tr>
<tr>
<td>BYURBAN</td>
<td>School Location</td>
</tr>
<tr>
<td>BYSCTRL</td>
<td>School Control</td>
</tr>
<tr>
<td>BYG10ER</td>
<td>School Tenth Grade Enrollment</td>
</tr>
<tr>
<td>APIBOffered</td>
<td>School Offers Advanced Placement or International Bachelorette Classes</td>
</tr>
<tr>
<td>BYSES1_mean</td>
<td>School Mean Socioeconomic Status</td>
</tr>
<tr>
<td>F1RGP9_mean</td>
<td>School Mean Grade 9 Grade Point Average</td>
</tr>
<tr>
<td>BYTXCSTD_mean</td>
<td>School Mean Grade 10 Reading and Math Achievement</td>
</tr>
<tr>
<td>FEMALE_mean</td>
<td>Percent Female Students in School</td>
</tr>
<tr>
<td>AFRICAMER_mean</td>
<td>Percent of African American Students in School</td>
</tr>
<tr>
<td>ASIAN_mean</td>
<td>Percent of Asian Students in School</td>
</tr>
<tr>
<td>HISPANIC_mean</td>
<td>Percent of Hispanic Students in School</td>
</tr>
<tr>
<td>OTHER_mean</td>
<td>Percent of Students with Other Race/Ethnicity in School</td>
</tr>
<tr>
<td>BYIEP_mean</td>
<td>Percent of Students with Individualized Education Plan</td>
</tr>
<tr>
<td>FCOMP_mean</td>
<td>Percent of Students who Live with Both Parents in Tenth Grade</td>
</tr>
<tr>
<td>AGE_mean</td>
<td>School Mean Age in Tenth Grade</td>
</tr>
<tr>
<td>BYSTLANG_mean</td>
<td>Percent of Students who Speak English as a Native Language</td>
</tr>
</tbody>
</table>
References


the Center for Social Organization of Schools website:
http://www.csos.jhu.edu/crespar/techReports/Report70.pdf


C. Wylie (Eds.), *Handbook of Research on Student Engagement* (pp. 3-19). New York, NY: Springer-Verlag.


# Curriculum Vitae
Tara Marie Mastrorilli
tmastrorilli@gmail.com

## EDUCATION

<table>
<thead>
<tr>
<th>Year</th>
<th>Institution</th>
<th>Degree(s)</th>
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<tbody>
<tr>
<td>2016</td>
<td>City University of New York (CUNY) Graduate School and University Center</td>
<td>PhD, Educational Psychology</td>
</tr>
<tr>
<td>2006</td>
<td>CUNY Graduate School and University Center</td>
<td>MA, Educational Psychology</td>
</tr>
<tr>
<td>2003</td>
<td>University of Delaware</td>
<td>BA, Psychology and Sociology</td>
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</tbody>
</table>

## EXPERIENCE

<table>
<thead>
<tr>
<th>Year</th>
<th>Organization</th>
<th>Position</th>
<th>Location</th>
<th>Responsibilities</th>
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</thead>
<tbody>
<tr>
<td>2008-present</td>
<td>Office of Institutional Research</td>
<td>Institutional Research Specialist</td>
<td>Staten Island, NY</td>
<td>Conduct college data analysis requests, Analyze college survey data and create presentations of findings, Manage college institutional profile using Tableau, Prepare Institutional Review Board (IRB) proposals</td>
</tr>
<tr>
<td>2008-2015</td>
<td>Metis Associates</td>
<td>Senior Research Associate</td>
<td>New York, NY</td>
<td>Provided direct oversight on and assist with multiple education-based program evaluations, Supervised and supported junior level staff with project activities, Developed mixed method research designs and analysis plans, Developed surveys, focus groups, and interview protocols, Conducted program observations and facilitate interviews and focus groups with stakeholders and participants, Conducted periodic meetings with clients to discuss project activities, Collected and analyze quantitative and qualitative implementation and outcome data, Built, cleaned, and managed large complex data files, Prepared Institutional Review Board (IRB) proposals, Wrote grant proposals and respond to local request for proposals (RFPs), Wrote grant-based as well as local reports and present findings to client</td>
</tr>
<tr>
<td>2007-2015</td>
<td>Murrow High School Intel Social Science Program</td>
<td>Consultant</td>
<td>Brooklyn, NY</td>
<td>Verified testable hypotheses, Assisted students with research method design, Conducted students’ statistical analyses, Helped students interpret findings and write-up results</td>
</tr>
</tbody>
</table>
2007-2008
Office of Academic Affairs
CUNY John Jay College of Criminal Justice  New York, NY
**ASSISTANT TO DIRECTOR OF OPERATIONS**
- Assisted the Director of Operations and the Provost set and maintain policies of the College
- Conducted teaching load and workload analyses as needed
- Created and managed faculty data files
- Assisted faculty with administrative needs

2006-2007
Office of Institutional Research and Program Assessment
CUNY Baruch College  New York, NY
**RESEARCH ANALYST**
- Conducted statistical analysis on student level data using SPSS
- Created a Factbook for the School of Arts and Sciences, 2005 & 2006
- Analyzed college-wide surveys
- Assisted in developing a hierarchical linear model to predict students’ first-year GPA
- Prepared a PowerPoint presentation on assessment and evaluation
- Prepared Institutional Review Board (IRB) proposals

May-September 2006
Teachers College, Columbia University  New York, NY
The National Center for the Study of Privatization in Education
**PROJECT ASSISTANT**
- Part of a research team that conducted the Carnegie Corporation’s Adolescent Literacy Project
- Interviewed program representatives at state, district, and school levels across the country
- Conducted qualitative and quantitative cost analysis of literacy programs at the State and district level
- Used Excel to simulate costs models of literacy programs
- Assisted in writing research reports

2004-20045
CUNY Graduate School and University Center  New York, NY
**RESEARCH ASSISTANT**
- Administered a reading program designed to increase literacy of at-risk 3rd graders
- Used various standardized literacy assessments
- Organized and analyzed data for the Evaluation of the Reading Rescue program in New York City schools
- Conducted literature reviews on evaluation research of reading programs

2003–2006
NYC Environmental Control Board  New York, NY
**PART-TIME CLERICAL ASSOCIATE**
- Assisted the Environmental Control Boards’ (ECB) Customer Service Unit
- Answered questions pertaining to city violations issued
- Used mainframe system, analyzed its functions, and reported results to the respondents and supervisors
- Reviewed and responded to letters in regards to violation hearing requests
TEACHING EXPERIENCE

Fall 2008  CUNY John Jay College
**ADJUNCT PROFESSOR**
- Research Methods in Public Administration

Spring 2008, Fall 2008  **New York University**
**ADJUNCT PROFESSOR**
- Statistics I

Fall 2005, Spring 2006  **CUNY Queens College**
Fall 2006, Spring 2007  **GRADUATE TEACHING FELLOW**
- Human Development and Learning in Adolescent Education

PUBLICATIONS


PRESENTATIONS


SOFTWARE SKILLS

Highly proficient in MS Office (Word, Excel, and PowerPoint) and SPSS. Knowledgeable of HLM, Stata and Tableau.