Early-Warning Indicators of High School Dropout

DISSERTATION

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Abstract

The purpose of this study was to determine the extent to which there are characteristics of sixth grade students and their schools that are predictive of whether students are promoted on time to the tenth grade, as an early-warning indication of dropout. Many studies have examined the reasons for dropout and determined it to be a multifaceted and challenging problem with no single reason for students’ to drop out. This study examined the variables associated with dropout and applied them to on-time arrival to the tenth grade using both variable- and person-centered approaches. The variables selected for this study are readily available data on students from schools including attendance, behavior, core academic performance, and sociodemographic factors.

The setting for this study was Columbus City Schools, the largest school district in the state of Ohio. To qualify for this participant set, students needed to have data from the end of sixth grade (school year 2009-2010) and the beginning of tenth grade (school year 2013-2014). The sample included 2162 sixth grade students from 34 Columbus City Schools who had an average rate for on-time promotion of 81.5% to the tenth grade, meaning that 18.5% of the students or 400 students in this sample were not promoted to the tenth grade on time.

There were three major findings. First, the results revealed that there were several student-level variables at sixth grade, which predicted on-time promotion to the tenth grade. Attendance, two core academic variables and two sociodemographic variables, were significant in predicting on-time promotion to the tenth grade. Second, there were
four reliable profiles of sixth graders based upon attendance, core academics, and sociodemographic factors. Third, and most important, these profiles were associated with on-time promotion to the tenth grade.

A student’s decision to dropout is the culmination of a long-term process; no single factor and no single event fully accounts for the choice to leave school. In addition, students show signs of dropout long before they actually drop out. These signs are evident in their school data; metaphorically, their data is raising a hand to ask for help. Early identification allows more time for effective intervention and is the main value of this study. Accordingly, three research-based prevention and intervention programs are presented. The results of this study suggest it is possible to use these indicators and profiles to identify children at risk, to determine the real issues facing students based upon their feedback, and to develop an appropriate intervention for each child.
Dedicated to my first teacher, my mother,

Eunice Lucille Boyd,

September 21, 1927 – December 21, 2006
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Fields of Study

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Specialization: Child Development in a K-12 Environment, Dropout
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Chapter 1: Introduction

The No Child Left Behind (NCLB) legislation enacted in 2001 was based on the principle that establishing measurable goals with high standards would improve every child’s individual outcomes in education (U.S. Department of Education, 2001). Although the national drop-out rate has declined since the enactment of NCLB, from 10.7% in 2001 to 7% in 2011 (National Center for Education Statistics, 2011), each year hundreds of thousands of young adults continue to join the ranks of those without a high school diploma. The National Center for Education Statistics (2011) reported that in 2010 there were 3.2 million young adults between the ages of 16 and 24 without a high school diploma or its equivalent. In 2012, the White House Council for Community Solutions determined there were 6.7 million young people between the ages of 16 and 24 who were out of school and out of work, at a cost of $93 billion in direct and indirect social costs in 2011 (The White House Council for Community Solutions, 2012). Ultimately, what is at stake is the welfare of these young adults, since studies have demonstrated that individuals without a high school diploma are more likely to require government assistance, live in poverty, have lower wage earnings, and experience higher unemployment rates (Community Research Partners, 2013; Neild, Stoner-Eby, & Furstenberg, 2008). The wage differences among high school dropouts, high school graduates, and college graduates are significant, as shown by the information in the 2010 U.S. Census. Mean earnings for a high school dropout were $20,241, for a high school
graduate $30,617, and for a college graduate $56,665 (U.S. Department of Commerce, 2011). The national unemployment rates are 12% for high school dropouts, 8.1% for high school graduates and 4.1% for college graduates (U.S. Census Bureau, 2012). Without doubt, the unused potential of this population comes at a high cost to both the individual and to our nation.

Due to the serious consequences of not completing high school, many studies have investigated the determinants of high school dropout, which has proven to be a difficult and complex problem. High school dropout is influenced by many factors related to the student, school, family, and community (Alexander, Entwisle, & Horsey, 1997; Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Edmunds, et al., 2012; Gottfried, Marcoulides, Gottfried, & Oliver, 2013; Noguera, 2012; Rumberger R., 1983). A recent study sought to identify the strongest predictive factors of dropout, with results showing that attendance, behavior, and course passing / performance (often called the “ABCs”) were stronger predictors of high school graduation than student test scores or demographics (Bruce, Bridgeland, Fox, & Balfanz, 2011). Some researchers (e.g., Rumberger & Lim, 2008) have called for conceptualizing dropout as a process, one which some claim begins as early as elementary school (Finn, 1989). To this end, Rumberger and Lim conducted a meta-analysis of 25 years of research and identified 203 studies (containing 389 different analyses) that predicted school dropout from variables measured in high school, middle school, elementary school, and preschool. These researchers found many individual characteristics of students were predictive of high school dropout: student background (e.g., demographics, health, prior performance, past experiences), attitudes (e.g., goals, values, self-perceptions), behaviors (e.g., engagement,
coursework, deviance, peers, employment), and performance (e.g., achievement, persistence, attainment). Rumberger and Lim also found institutional characteristics of students’ communities, schools, and families could predict whether students drop out of high school. The institutional characteristics of a school enable researchers to understand between school differences in drop-out rates (Rumberger & Lim, 2008). This study also found less than 17 percent of the variability in student drop-out rates can be attributed to the characteristics of the high schools that students attend. Rumberger and Palardy found drop-out rates varying by high schools “from a low of 2% to a high of 22%” which suggested to them that where students attend does matter (2005, p. 15). Furthermore, Borman and Dowling’s research found that schools do influence student achievement to the extent that “fully 40% of the differences in achievement can be found between schools” (Borman & Dowling, 2010, p. 1201). However, others argue the possibility that school effects are a function of the student composition and not the organizational characteristics of the school (Bryk & Thum, 1989), in that a school with fewer dropouts attracts those who intend to complete school.

A commonality among the cited research studies is that each has examined the extent to which students’ attendance, behavior, core academic performance, and other variables are related to their likelihood of dropout, which represents a variable-centered approach to addressing this question. An alternative approach is the person-centered approach which “allows an examination of the impact of multiple factors on probability of group membership” (Nagin, 1999, p. 140). The purpose of a person-centered approach is to answer research questions regarding group differences in developmental patterns, as it explains how variables are different between groups and similar within groups (Laursen
& Hoff, 2006; Muthen & Muthen, 2000; Rindskopf, 1987). Specifically, groups are identified in an effort to maximize the differences between groups and minimize the difference within groups (Laursen & Hoff, 2006). There are few studies on dropout that employ the person-centered approach. Research on this approach found only one peer-reviewed article (Janosz, Le Blanc, Boulerice, & Tremblay, 2000). Other studies merely categorize students based upon the cause of dropout, a variable-centered approach (Doll, Eslami, & Walters, 2013; Kronick & Hargis, 1998; Legters & Balfanz, 2010).

The research on high school dropout frequently uses data gathering mechanisms, which are outside of the routine of a school, such as surveys of students, teachers, principals, and parents. The meta-analysis completed by Rumberger and Lim (2008), for instance, found 166 studies out of 208 in which researchers gathered data that required surveys or additional data beyond that which is normally collected by the school. Data such as family structure, drug usage, parent education, and parent involvement were often used in such studies. Bruce and colleagues’ study is a recent exception, in that data used within a school was studied to determine predictors of dropout such as attendance, behavior, and course performance (Bruce, Bridgeland, Fox, & Balfanz, 2011). The impact of school on dropout was also examined in the Rumberger and Lim (2008) meta-analysis. There were 45 studies using school-level variables, of those only 23 used data that is readily available, such as student composition, type of school, and teacher/student ratio. The other 22 relied on data obtained through surveys such as academic climate, disciplinary climate, teaching quality, and social environment.

Numerous studies have shown that while dropout is the culmination of factors and events that occur over time, ninth grade is a crucial year, a transitional year for a child
moving from middle school to high school and facing, often for the first time, academic performance requirements for promotion to the next grade (Balfanz, Herzog, & Mac Iver, 2007; Cairns, Cairns, & Neckerman, 1989; Neild & Balfanz, 2006; Neild, Stoner-Eby, & Furstenberg, 2008; Roderick & Camburn, 1999). Academic performance requirements vary by state, however, many states require students to attain four to five credits within their ninth grade year with at least two credits from core courses such as English, and math (Dounay, 2006).

Studies have shown experiences in the ninth grade contribute significantly to the probability of dropout, even controlling for contextual factors (Allensworth E., 2013; Allensworth & Easton, 2005; Neild, Stoner-Eby, & Furstenberg, 2008). One report showed first-time freshmen not promoted to the tenth grade on time had a drop-out rate between 60% and 80% (Allensworth & Easton, 2005). While two other reports stated approximately 30% to 33% of the students who drop out did not make the transition to tenth grade (Editorial Projects in Education, 2006; Neild R., 2009). The Editorial Projects in Education report also showed students in high-poverty schools have a higher loss of students in the ninth grade, 40%, than low-poverty schools, only 27% (Editorial Projects in Education, 2006).

**Definition of Key Concepts**

On-time promotion to the tenth grade for the purposes of this analysis is defined as promotion to the tenth grade at the end of the ninth grade year. If a child is retained in grade at the end of the ninth grade year, this is not promoted on time.

Readily available data is data that is collected and monitored by a school during the school year. This data is often collected daily as in the case of attendance and
behavior, or is collected periodically such as demographic information which is collected annually or at the time of enrollment, or core academic performance which is collected approximately every four to five weeks. Most of this data is typically stored in the student information system.

Variable-centered approaches are the foundation of analyses for human development scholars and include descriptive statistics, correlation and regression analyses, analyses of variance, and structural equation modeling (Laursen & Hoff, 2006). These variables include individual characteristics such as demographics, attendance, behavior, and core academic performance.

Profile-centered approach is to identify whether underlying groups of students exist. In this study, Latent Profile Analysis (LPA) will be used to address this research question. LPA has been used in medical diagnosis to enable an estimate of accurate diagnosis and in alcoholism research to find groups of individuals who are susceptible to alcohol dependence (Bucholz, et al., 1996; Rindskopf & Rindskopf, 1986; Uebersax & Grove, 1990). Latent Profile Analysis offers a way to use several indicators at once and combines this information into groupings (Rindskopf & Rindskopf, 1986). LPA can be used to classify participants into groups based on their responses on the observed variables and is best used for predictors or outcomes that are categorical (Samuelsen & Raczynski, 2013). Latent Profile Analysis determines whether distinct groups exist, what distinguishes the groups from one another, and assigns each participant to a group based on their observed data. In Latent Profile Analysis, researchers typically specify the number of groups that the analysis should try to fit to the data (but not how those groups
are defined). In this study, the data will determine the best fitting number of groups, and therefore an exploratory approach will be employed.

**Research Purpose and Aims**

The purpose of this research is to describe the extent to which there are characteristics of sixth grade students and their sixth grade schools that are predictive of whether students are promoted on time to the tenth grade, as an early-warning indication of dropout. Complexity of dropout will be examined using readily available information on students and their schools from the end of sixth grade to determine their on-time arrival to the tenth grade using a variable-centered approach. In addition, this study will determine the extent to which there is a typology of those who are or are not promoted on time, a person-centered approach. While Janosz et al. (2000) provided evidence that profiles of students who drop out exist; their study used data that were gathered through interviews from a sample of 825 students. This study will determine the extent to which there may be reliable, identifiable groups based upon information a school district already has available for a much larger sample.

*Research question 1:* To what extent is on-time promotion to tenth grade predicted by students’ attendance, behavior, core academic performance, selected demographic characteristics, and selected school characteristics at the end of sixth grade?

*Research question 2:* To what extent are there reliable profiles of students at the end of sixth grade with respect to students’ attendance, behavior, core academic performance, and selected demographic characteristics that are associated with on-time promotion to the tenth grade?
Limitations and Delimitations

Taking advantage of the vast amount of data collected about students, this study will use data that is gathered and stored within a school district to determine the likelihood of drop out. This purposely limits the study in order to provide a practical application of this analysis. However, this presents a limitation: school-based information shows just one view of the child, and does not include contextual factors in and out of school. The data selected for this study will only be one urban school district, however, it is the largest in the state of Ohio. This choice therefore excludes charter schools, suburban and rural schools.
Chapter 2: Literature Review

High school graduation increases a students’ chance for a positive life course, therefore, understanding why students drop out is critical. Dropout is a difficult and complex problem influenced by many factors related to the student, school, family, and community (Alexander, Entwisle, & Horsey, 1997; Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Edmunds, et al., 2012; Gottfried, Marcoulides, Gottfried, & Oliver, 2013; Noguera, 2012; Rumberger R., 1983). Further, dropout is best conceptualized as a process, one that may begin as early as elementary school (Finn & Rock, 1997). Positive developmental processes are likely to lead to graduation and a productive life, however, negative developmental processes can be detrimental to an individual. For example, when a child is exposed to negative interactions within the family, with society, or across the life span, there is a negative effect on developmental outcomes (America's Promise Alliance, 2014; Bruce, Bridgeland, Fox, & Balfanz, 2011; Neild R., 2009; Perry, 2002; Rumberger & Lim, 2008). A review of the literature suggests there is much known about the common risks to dropout and dropout is best placed within a framework that conceptualizes the cumulative development of a child.

Theoretical Framework

Dropout, the focus of this investigation, can be understood within the context of bioecological theory, which describes human development as a process of increasingly complex systematic interactions between humans and their environment
(Bronfenbrenner, 1989; Bronfenbrenner & Ceci, 1994; Bronfenbrenner & Morris, 1998; Bronfenbrenner & Morris, 2006). This theory proposes that humans are influenced by reciprocal interactions within the family, within society, within the contexts of the historic times, and across entire lifespans. In short, human beings are a product of their interactions with others, their environment, and their times. The bioecological theory also explains the importance of the reciprocal action between nature (the person) and nurture (the environment) within a context. The bioecological theory posits that human beings start with biological raw material, which interacts with the environment as they develop.

Bronfenbrenner and Morris (1998) emphasize within the bioecological theory the idea of Process-Person-Context-Time concepts and their interactions. Dropout draws from all four concepts, as dropout is influenced by interactions (Process) over a long period of years (Time) that impact students’ developmental outcomes and is the result of interactions among individual characteristics and known risk factors (Person), within the school environment (Context) (America's Promise Alliance, 2014; Bronfenbrenner & Morris, 2006; Tudge, Mokrova, Hatfield, & Karnik, 2009).

The first of these, Process, also referred to as proximal process, is the foundation of development and is based upon systemic interactions between humans and their environment. The bioecological theory indicates that individuals do not act in a vacuum; instead, they act within an environment that shapes their realities and their interactions. Human development occurs through the process of complex interactions between the individual and other people, objects, and symbols in the immediate environment (Bronfenbrenner & Morris, 2006). Research studies show that dropout is not a singular event but rather the culmination of factors and events (America's Promise Alliance, 2014;

For instance, students who drop out are often trying to cope with complex issues at home and school (America's Promise Alliance, 2014). Process, as described by Bronfenbrenner, should include activities and interactions necessary to achieve the developmental outcomes being studied (Bronfenbrenner & Morris, 1998; Tudge, Mokrova, Hatfield, & Karnik, 2009). The activities and interactions necessary to graduate can be observed through typical activities of a school that are relevant to graduating.

Individual characteristics of the Person also contribute to the course of development, including dropout. Individuals make choices and take actions over their lifetime within a historical and social context that includes life transitions and events. These interactions enable an individual to be both a product and a producer of their own development. Students who drop out are best conceptualized as products of their environments, which may contain exposure to violence, unsupportive school climates, and parental health issues (America's Promise Alliance, 2014). They are also producers of their own development, including their choice to suspend education.

Bronfenbrenner (1998) defined three types of Person characteristics: demand, resource, and force, two of which are relevant to this study. Demand characteristics are those characteristics that affect development based upon a person’s ability to “invite or discourage reactions from the social environment that can disrupt or foster processes of psychological growth” (Bronfenbrenner & Morris, 2006, p. 810). Demand characteristics include demographic attributes such as gender, race, age, and appearance. The bioecological model proposes that these Person characteristics need to be included in any
study in order to understand the way in which these characteristics impact the outcome (Tudge, Mokrova, Hatfield, & Karnik, 2009). Resource characteristics are “biopsychological liabilities and assets that influence the capacity of the organisms to engage effectively” (Bronfenbrenner & Morris, 2006, p. 810). Resource characteristics include skills, past experiences, and material resources; inclusion of these in studies of human development can provide insights into how these characteristics influenced the way in which the person developed (Tudge, Mokrova, Hatfield, & Karnik, 2009). Finally, force characteristics are “active behavioral dispositions that can set proximal processes in motion and sustain their operation, or – conversely – actively interfere with, retard, or even prevent their occurrence” (Bronfenbrenner & Morris, 2006, p. 810). Force characteristics include such factors as motivation, persistence, and temperament and the impact these have on the outcome (Tudge, Mokrova, Hatfield, & Karnik, 2009). Of the three types of characteristics, the present study focuses specifically on student demand and resource characteristics as these represent information about students commonly collected by schools that can help to understand dropout. Demand characteristics include demographic information such as race, gender, and age while resource characteristics include past experience such as prior grades and material resources signified by socioeconomic status. Force characteristics are internal to the child and difficult to capture, if at all, by data systems, therefore it is not included in this study.

Context as represented in Bronfenbrenner’s bioecological model (Bronfenbrenner, 1979) is proposed to contain four nested, interactive, and overlapping systems, which influence an individual’s development. The system closest to the individual is the microsystem, which recognizes the context of a child’s development including his or her
family, school, peers, and neighborhood. The mesosystem is the interaction with two or more Microsystems such as interactions between the teachers and parents and the impact this has on the student. The exosystem includes factors that have an indirect impact on development such as parental work obligations. The macrosystem is a cultural perspective where there are shared beliefs and values. To date, much research on drop out typically focuses on the microsystem, concentrating on the child, school, family, peers, and neighborhood. Consistent with that lens, this study too is situated in understanding the context of school as a factor within children’s microsystem that is important to dropout.

Time is the fourth concept in the bioecological model, and includes proximal processes that happen in specific occurrences, over weeks and years, over lifespans, or across generations (Bronfenbrenner & Morris, 2006). The notion of Time is highly relevant to studies of dropout, as this is a process that occurs over time and is not a single event. The decision to drop out can be also influenced by prior generations including a child’s parents and grandparents. Therefore, it is best to have a longitudinal study to understand the influence of Process, Person, and Context on the outcome over Time (Tudge, Mokrova, Hatfield, & Karnik, 2009). This view of outcome over Time has also been described as life-course, life trajectory, or developmental pathway to explain individual Processes of development and change over Time (Cairns & Cairns, 1994; Elder, 1992). Laursen and Hoff (2006) theorized that developmental trajectories could be assumed to differ across individuals and when that assumption is enacted, a person-centered approach should be invoked. The person-centered approach assumes individual differences in patterns of change over time and describes differences among individuals
in how variables are related to each other over time (Laursen & Hoff, 2006). Therefore it is important to have a longitudinal analysis to understand individual processes of development and change over time (Cairns & Cairns, 1994).

In this section, the bioecological model was described to provide a theoretical framework for this study of early-warning indicator of dropout. As this model proposes, human development is highly complex, and is the product of numerous interactions among Person, Process, Context, and Time. This study will incorporate student history and experiences including individual characteristics of the Person such as demographics, socioeconomic status, and prior academic performance, the developmental interactions or Process such as attendance, behavior, and core academic performance, within the Context of school, and over Time.

### 2.1 Student Characteristics Related to Dropout

Prior studies indicate there are numerous characteristics of students that are associated with dropout that are readily measured well in advance of the child’s departure from school (Alexander, Entwisle, & Horsey, 1997; Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Edmunds, et al., 2012; Finn & Rock, 1997; Gottfried, Marcoulides, Gottfried, & Oliver, 2013; Noguera, 2012). Of interest in this investigation is the importance of those characteristics of children that are readily available to schools, as these are regularly recorded and monitored. For instance, schools, for a variety of reasons, very carefully record children’s attendance, and other characteristics. The rationale for selecting these characteristics for their predictive value is that research results can be readily translated into efforts to improve student outcomes, in that these can serve as early-warning indicators. The measures of interest in this study include
students’ attendance, behavior, core academic performance, and sociodemographic factors.

**Attendance**

Attendance can be simply defined as how frequently students attend school as planned. Absences include not only sick days or skipped days, but also days that a student is tardy. A number of studies have found that attendance is a strong predictor of dropout, even when measured several years prior to leaving school (Balfanz, Herzog, & Mac Iver, 2007; Balfanz & Legters, 2004; Barrington & Hendricks, 2001; Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Edmunds, et al., 2012; Finn & Rock, 1997). A recent meta-analysis examined 45 studies and found that 64 percent indicated attendance was significant and negatively predictive of dropout (Rumberger & Lim, 2008). The authors inferred that attendance is an indicator of student engagement. In addition, two studies found large effect sizes when attendance of dropouts was compared to attendance of graduates (Finn & Rock, 1997; Worrell & Hale, 2001).

Attendance provides a sense of the student’s engagement in school. A student who is not satisfied with the interest from their teachers and feels alienated from the school environment is not likely to come to school or class on time (Finn & Rock, 1997; Worrell & Hale, 2001). While attendance does not indicate if a child was on task in the classroom, it does provide a sense of engagement with the adults and peers in the school.
Behavior

Behavior problems also serve to predict dropout. Students who have behavior problems, specifically deviant behaviors such as drug use, fighting, thefts and vandalism, are also likely to drop out, even independent of academic problems (Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Janosz, Le Blanc, Boulerice, & Tremblay, 2000). Behavior has been inconsistently operationalized in the research, some use surveys to gather behavior information either self-reported (Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Janosz, Le Blanc, Boulerice, & Tremblay, 2000) or as reported by principals and teachers (Cairns, Cairns, & Neckerman, 1989). Another operational definition is school misbehavior, which Rumberger and Lim’s meta-analysis (2008) found to be the most common indicator of deviant behavior. School misbehavior as reported in middle school was a predictor of later high school drop out in 94% of the 17 studies using school misbehavior. Another study narrowed the measurement of behavior to suspension from school and found suspensions to be positively correlated to dropout (Edmunds, et al., 2012).

Similar to attendance, behavior is also an indicator of student engagement in school. In addition, behavior can be the manifestation of the inability to perform academically, as academic achievement has been shown to mediate deviant behavior (Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000). Furthermore, Cairns and colleagues found students who drop out tended to affiliate with others who also dropped out (Cairns, Cairns, & Neckerman, 1989). Students who are not able to keep up with the class or associate with a deviant peer group may resort to acting out in order to leave the classroom or impress their peers.
Core Academic Performance

A student characteristic that is associated with dropout in addition to those referenced thus far is academic performance, specifically children’s experience with course failure. Course failure is defined as performing poorly in school as reflected on report cards and on tests, specifically for math and reading, and has been shown to be a strong predictor of later dropout (Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Cairns, Cairns, & Neckerman, 1989). For example, one study found that dropouts could be identified with 85% accuracy at the end of ninth grade, based simply upon whether a child has experienced two failing grades by ninth grade (Barrington & Hendricks, 2001). Alexander et al. (2001) determined there was a large effect (d= -1.23) when middle school grades of dropouts were compared to middle school grades of graduates. Test scores on state achievement tests, while similar to course performance in that both measure academic achievement, were less frequently available for review by Rumberger and Lim (in only 51 different analyses), but were found to be a significant predictor of graduation or drop-out rate in more than half of them (59%). Alexander et al. (2001) found a large effect (d= -.74) when performance on middle school state achievement tests of dropouts was compared to the same for graduates.

Academic achievement below that of a student’s classmates increases the likelihood of dropout. When a student falls behind academically, it is difficult to catch up, as there are few structures in place for a student to learn previously taught content. One such structure is grade retention. While grade retention can be a way to learn previously missed content, students who are retained are often derailed and ultimately drop out (Alexander, Entwisle, & Kabbani, 2001; Roderick & Camburn, 1999;
Another structure is accelerated learning. Once students have fallen behind, it takes more than one school year of learning in order to catch up (Alexander, Entwisle, & Kabbani, 2001). To obtain more than one year's growth in learning within one school year is difficult for the teacher and a poorer performing student. Thus, students with low academic achievement are more likely to drop out.

**Sociodemographic Factors**

Demographic factors that characterize students’ background also figure prominently in prediction of dropout; these characteristics are referred to within the bioecological model as demand characteristics. Demand characteristics most often included in research on dropout include gender, race, and age, although the relations between these factors and dropout is somewhat mixed. In Rumberger and Lim’s (2008) meta-analysis, they found that gender was one of the most commonly tested potential predictors (102 studies), yet less than half (46%) of these studies showed a significant relation between gender and graduation or drop-out rates. Supplementary research found conflicting effects of gender where Battin-Pearson et al. (2000) found females to be at greater risk while Alexander et al. (1997) found males were at greater risk and Alexander, Entwisle, and Kabbani (2001) found that in their graduating sample the proportion of female students was higher than in their drop-out sample, but the differences were small ($d = .09$).

Race and ethnicity has also figured in this work. Race has commonly been studied with respect to its association with drop-out rates, with about half of the studies in one meta-analysis showing race to relate significantly to drop-out rates or graduation rates between Blacks and Whites (Rumberger & Lim, 2008). Other studies have shown that
Black males are lagging behind in graduation as compared to their White male counterparts (Noguera, 2012). Alexander et al. (2001) reported that the proportion of Black students in their drop-out sample was higher than the proportion of Black students in their graduating sample, but the differences were very small (d=.02).

Socioeconomic status and past academic experiences, referred to as resource characteristics in the bioecological model, have also been studied to predict dropout. Socioeconomic status (SES) was another common variable found in 86 studies of student drop out (Rumberger & Lim, 2008); 70% of the studies included in this meta-analysis found low socioeconomic status to be predictive of dropout. Low SES is often cited as a predictor of dropout and in earlier analyses Rumberger (1983; 1987) noted that socioeconomic status is one of the most important factors associated with dropout. Battin-Pearson, et al. (2000) affirmed that regardless of academic achievement, low socioeconomic status increased the likelihood of drop out. In addition, Goldschmidt and Wang (1999) also found low socioeconomic status significantly increased the odds of a student dropout. Alexander et al. (2001) found a large effect size (d=−.95) when socioeconomic status of dropouts was compared to the socioeconomic status of graduates. Past academic experience such as grade retention before the ninth grade has also been found to be predictive of dropout. The Rumberger and Lim meta-analysis found that grade retention before ninth grade (71% of 55 analyses) was an indicator of dropout. Alexander, Entwisle, & Horsey (1997) discovered a large effect (d=.56) when retention of dropouts was compared to the same for graduates. While Alexander, Entwisle, & Kabbani (2001) added to the prior research when they found a very large effect (d=.94)
Student characteristics related to drop out: attendance, behavior, core academic performance, and sociodemographics factors are applicable to the understanding of child development within the bioecological model. As noted, the interactions among Person, Process, Context, and Time shape the development of a child and should be included in research about dropout. Even though demand and resource characteristics for the most part are not malleable, they will be included as they can be predictive of dropout. Bronfenbrenner and Morris (2006) conceptualized demand characteristics as influencing the way others interact with an individual, thus impacting the development of the individual. In fact, most drop-out research includes demand characteristics even though the relationship to dropout is mixed. Resource characteristics, such as low socioeconomic status and grade retention, more consistently predict dropout and are often included in drop-out research. Both demand and resource characteristics will be included in this study.

2.2 Schools and Dropout

The context in which a student interacts also influences proximal processes. The context of interest for this study is school, which provides a source of readily available data. As noted earlier, Rumberger and Lim (2008) found less than 17 percent of the variability in student drop-out rates can be attributed to the characteristics of the high schools that students attend. Rumberger and Palardy found drop-out rates varying by schools from 2 to 22 percent, which suggested to them that where students attend does matter (2005). Borman and Dowling’s research found that schools do influence student
achievement to the extent that “fully 40% of the differences in achievement can be found between schools” (Borman & Dowling, 2010, p. 1201). Lee and Burkam (2003) also found that schools, beyond individual backgrounds and behaviors, influence students’ decision to drop out. In fact, they argue when only the individual characteristics are considered, it allows the institutions to dismiss responsibility. Others argue the possibility that school effects are a function of the student composition and not the organizational characteristics of the school (Bryk & Thum, 1989) and that a high school with fewer dropouts attracts those who intend to complete school. In their meta-analysis and framework development Rumberger and Lim (2008) determined there were four distinct attributes of schools that have an impact on student drop out rates: (a) student composition, (b) school processes and practices, (c) structural characteristics, and (d) school resources. These attributes are explored further below.

**Student Composition**

Student composition of a school is easiest to determine based upon the data that is used for the individual student. Student composition indicators include: (a) mean socioeconomic status (Bryk & Raudenbush, 1988; Bryk & Thum, 1989; Meyers, 1986; Rumberger & Lim, 2008; Rumberger & Palardy, 2005); (b) proportion of students at risk due to poor grades, lack of attendance, or problems with behavior (Lee & Burkam, 2003; Rumberger & Lim, 2008; Rumberger & Palardy, 2005); (c) proportion of retained students (Rumberger R., 1995; Rumberger & Palardy, 2005; Rumberger & Thomas, 2000); (d) proportion of linguistic or racial minorities (Finn & Voelkl, 1993; Goldschmidt & Wang, 1999; Lee & Burkam, 2003; Rumberger & Lim, 2008; Rumberger & Palardy, 2005); (e) proportion of students with mobility (Rumberger & Lim, 2008);
Student composition may influence a student’s decision to drop out in two ways: it may have a direct impact or it may represent other characteristics of a school that impact dropout. Student composition may influence students directly through their peers in school including motivation, learning, and behavior. Or indirectly as students are more likely to stay in a school where they feel safe (fewer students at risk in behavior), where teachers set fair academic expectations (fewer students at risk academically), and where they see themselves as similar to others in the school (less differentiation) (Bryk & Thum, 1989; Rumberger & Lim, 2008).

**School Processes and Practices**

School processes and practices are difficult to determine based upon data that is readily available. While schools have limited influence over school inputs such as student characteristics, they do have some control over the processes and practices they create (Rumberger & Palardy, 2005). Rumberger and Lim (2008) conceptualized school processes and practices as a composite indicator from student-level data, namely behavior and attendance. However, research often defines school processes and practices as curriculum selected and taught, students’ opportunity to learn, teachers’ influence over school climate, and the structure for dealing with behavior (Rumberger & Palardy, 2005; Spillane & Louis, 2002). Information on curriculum, opportunity to learn, and school climate are usually gathered by surveys or focus groups which is not readily available data. While behavior information is readily available, the policies and practices leading to
suspension or expulsion are not. As a result, school processes and practices will not be included in this study as it is information that is not readily available.

**Structural Characteristics**

Structural characteristics include school size, grade organization, private/public, and urban/rural/suburban (Rumberger R., 1995; Rumberger & Lim, 2008). One study found the most optimal school size for a high school was between 600 and 900 students (Lee & Smith, 1997), while others found school size was not consistently related to school performance (Bryk & Thum, 1989; Finn & Voelkl, 1993; Lee & Burkam, 2003; Rumberger R., 1995; Rumberger & Palardy, 2005). Rumberger and Lim’s meta-analysis (2008) found 12 analyses studying whether drop-out rates were lower for students attending suburban or rural schools in contrast to urban schools. The results of these analyses were mixed: seven found no significant effects, two found drop-out rates were lower in an urban environment, and three found an urban environment increased the odds of dropout. In the analysis of public versus private schools, attending a Catholic high school increased the odds of graduating (Rumberger & Lim, 2008). Rumberger and Lim (2008) concluded the mixed results were due to the difficulty of finding a causal connection between student outcomes and structure due to the high correlation with student composition.

While a school cannot change student composition, there are a few structural characteristics within a school or district’s control that could impact the development of a child. Smaller schools, grade configurations with fewer transitions, and school choice are a few of these characteristics and will be considered in this study.
School Resources

School resources, as defined by Rumberger and Lim (2008) include student-teacher ratio, teacher salaries, average expenditures per pupil, the percentage of teachers with advanced degrees, and measures of teacher quality. Out of the six analyses studied by Rumberger and Lim, only two found significant effects based upon these school resources. Likewise, Finn and Voelkl (1993) found that student-teacher ratio was not a factor in predicting engagement, which they linked to graduation. While there is debate in the education research community about the degree school resources impact student outcomes (Rumberger & Lim, 2008), an initial analysis of Columbus City Schools found there is little variability across schools in student-teacher ratio, teacher salaries, average expenditure, and percentage of teachers with advanced degrees. Due to this analysis, school resources will not be included in this study.

The addition of school-level variables provides another perspective on dropout and offers an explanation of between-school differences in predicting dropout. The majority of studies referenced analyzed the extent to which dropout is predicted by high school characteristics. This study is unusual in that it analyzes the extent to which on-time promotion to the tenth grade is predicted by sixth grade school characteristics.

2.3 Profiles of Students who Dropout

The research reviewed thus far shares a common theme, in that they each sought to identify the predictive relations between school dropout and variables related to students’ attendance, behavior, core academic performance, and sociodemographic characteristics (e.g., gender, race). Such “variable-centered work” has been important for identifying those variables that relate to drop out. A variable-centered approach “views
the individual as a summation of variables over time” (Bergman & Trost, 2006, p. 604) and is used to determine which variables most consistently predict dropout.

In the present study, an alternative to the variable-centered approach is also used to examine predictors of dropout, namely, a person-centered approach. A person-centered approach takes a “holistic and dynamic view of the individual as an integrated totality over time,” it is an examination of “patterns of interwoven components” (Bergman & Trost, 2006, p. 604). The value of using this approach to learn more about dropout is suggested in part by the bioecological model. The bioecological model proposes that the interaction among various factors may produce different outcomes in children over Time (Bronfenbrenner & Morris, 1998) and thereby create groups of students with similar factors and outcomes. Tesseneer and Tesseneer (1958) found the same factors may influence different students in different ways, whereas Janosz et al. noted it is highly unlikely that “all dropouts have the same personal attributes and family, school, and social experiences and follow the same developmental pathway” (Janosz, Le Blanc, Boulerice, & Tremblay, 2000, p. 171).

Few studies of dropouts have employed a person-centered approach. An exception to this is work by Janosz and colleagues (2000) who used this approach to identify groups of students who drop out. They built off of the variable-centered approach to determine whether different profiles of students could be identified, to distinguish potential dropouts from students who will graduate, using a sample in the French-speaking Island of Montreal. There were 825 white, French-speaking students in grades 7 through 11 included in the study and the sample represented the student population on the Island. This study identified four profiles of dropouts: (a) Quiet (38% to 41%), those who
behave and show moderate to high commitment to education, (b) Disengaged (7% to 11%), those with average level of misbehavior, average performance but low commitment, (c) Low-Achiever (8% to 13%), those with weak commitment to education, average level of misbehavior and very poor school performance, and (d) Maladjusted (39% to 44%), those with high levels of misbehavior. Interestingly, they found that the Quiet and Maladjusted profiles accounted for 77% to 85% of the eventual dropouts. They assert that it is not enough to understand which variables are predictive of dropout, as students are not one group. On the contrary, it is critical to know the groups of students likely to drop out in order to provide appropriate intervention.

Much research has been conducted on the topic of dropout and the bioecological model concepts of Process, Person, Context, and Time have the greatest potential to explain the culminating event of suspending education or school dropout. Proximal processes and reciprocal interactions impact a student’s developmental trajectory and ultimately, their decision to stay in school. Examining a student’s individual characteristics and risk factors within the context of school and over time can indicate the student’s likelihood of staying in school or not. It is also of value to know if there are groups of students with similar characteristics that may end up with a similar outcome as little research has been conducted using this method.

Research often employs the use of many variables that are not easily gathered during a school year. These variables could include student engagement in school, deviant behavior out of school, and parental expectations for the child’s educational attainment. These variables are usually obtained through surveys of students, principals, teachers, counselors, parents, and/or peers, through focus groups, or end of year data.
Once this data is analyzed, it is often past the time anything can be done to intervene on the student’s behalf. However, using data that is readily available to a school such as data that is collected for state compliance reporting such as attendance, in-school behavior, and academic performance provides variables that are feasible to collect and actionable in the school setting (Glasgow, 2013). Therefore, this study will delimit the variables to those that can be readily obtained during the school year.

Understanding why student’s dropout before the final act of leaving school is critical. Accordingly, the developmental outcome of interest in this study is on-time promotion to the tenth grade, which represents an early proxy for graduation (the inverse of drop out). On-time promotion to the tenth grade is the most salient time point because students who make it on time to the tenth grade have a greater chance of graduating than students who do not make it on time. In fact, studies have shown students not promoted on time to the tenth grade have a drop-out rate between 30% and 80% (Editorial Projects in Education, 2006; Neild, Stoner-Eby, & Furstenberg, 2008). Ninth grade is often a retention grade for students who have not completed the required coursework. This is visible in the enrollment of the ninth grade compared to the tenth grade. Neild found “half of the districts in the United States had a tenth-grade enrollment that was no greater than 95 percent of ninth-grade enrollment. In one-quarter of the districts, tenth-grade enrollment was no greater than 90 percent of that ninth grade” (Neild R., 2009, p. 56). For these reasons, the present study investigates predictors of on-time promotion to the tenth grade from the prior history and experiences of students during the earlier years of schooling, measured at the end of sixth grade. The end of sixth grade was selected in order to understand dropout as early as possible. Most dropout research is focused on
high school grades when it is almost too late to intervene effectively. More attention needs to be drawn to the middle school grades to understand dropout as early as possible to make a difference in these students’ lives.

As noted, attendance, behavior, core academic performance, and sociodemographic factors as predictors of dropout are well researched and found to be important variables. However, these variables have not been used to predict on-time promotion to the tenth grade using data from the end of sixth grade as an early-warning indicator of dropout, a variable-centered approach. Furthermore, development of students is impacted by their Context, therefore, students will be analyzed within schools to reduce the likelihood of a false positive, or Type I error.

There are studies that appear to employ a person-centered approach, but are simply categorizing students based upon a risk factor of dropout, which is a variable-centered approach. One study by Doll et al. (2013) using data from the Educational Longitudinal Study: 2002, classified students into three groups based upon the student identified cause of dropout: (a) Pushed Out (49%), due to poor attendance and behavior, (b) Pulled Out (37%), for those who feel compelled to leave school to work or to fulfill other family obligations, and (c) Falling Out (14%), due to insufficient academic progress. Pushed Out (48.7%) and Pulled Out (36.9%) accounted for 85.6% of the reasons these students drop out. In a brief by Legters and Balfanz (2010) they identified four categories of dropouts, which were not empirically derived: (a) Fall Out due to a disruptive life event, (b) Pushed Out through multiple suspensions, (c) Fade Out for those who do well in school but see little reason to continue, and (d) Fail Out for those who experience course failure and are well behind academically. While this categorization of
students based upon their reason for leaving school is informative and provides terminology that may be useful, these studies did not employ a person-centered approach, which is used in this study.
Chapter 3: Research Methods

3.1 Setting and Participants

The setting for this analysis is Columbus City Schools (CCS), the largest school district in Ohio. It will include only the middle schools and high schools from school year 2009-2010 and school year 2013-2014. This district had a total enrollment of approximately 50,000 students in school year 2013-2014 for grades K – 12 and is in an urban setting. The four-year graduation rate in CCS was 77% in school year 2012-2013 (Ohio Department of Education, 2015), meaning that approximately 701 children did not graduate within four years. This graduation rate is somewhat lower than the average four-year graduation rate for the state of Ohio, which was 82.2% in school year 2012-2013 (Ohio Department of Education, 2015). (Note: Graduation rates are always reported a year in arrears to allow summer graduations to count in the total). The district is majority African American, at 56.5% and majority socioeconomically disadvantaged, at 78.5%, with a mobility rate of 21.5% and a chronic absenteeism rate of 29.3% (Ohio Department of Education, 2015).

All participants will be derived from the Columbus City School District. To qualify for this participant set, students need to have data from the end of sixth grade and the beginning of the tenth grade. This sample included 3512 sixth graders collected from the end of school year 2009-2010, 1350 (38%) were students inactive or not enrolled in Columbus City Schools in the fall of 2013. Of these 1350 students there were 932
students not enrolled, implying they left before the fall of 2013, and 418 students that were inactive or transferred out of Columbus City Schools. Of the 418 inactive or transferred students, 346 transferred to a known district, 30 were coded as blank or asterisk, 20 were expelled, 18 moved but not known to be continuing, three were coded in a program and not a school, two withdrew due to truancy or non attendance, one was overage, and one was coded as completing the course requirements. The remaining 2162 students had an average rate for on-time promotion of 81.5% (SD=.39) meaning 18.5% of the students or 400 children in this sample were not promoted to the tenth grade on time.

3.2 Procedures

The primary procedures of relevance are identifying the variables of interest, then accessing and preparing the data for analysis. Measures of interest, based upon the research, include student-level variables: attendance, behavior, core academic performance, as well as sociodemographic factors; and school-level variables: student composition and structural characteristics.

Operating Variables (Measures)

Student-level data. Data gathered for this study are readily available and often collected on a daily basis within a school district including attendance, behavior, core academic performance (ABCs), and sociodemographic factors.

Attendance. Attendance is taken each day by the homeroom teacher and recorded by administrative staff in the student information system. A student is assumed to be present unless marked absent. The measure used for attendance is a percentage of days attended. This is calculated on a daily basis within the student information system as days
attended divided by the days enrolled. This variable is indicative of attendance percentage for the entire sixth grade year.

**Behavior.** Behavior is defined as misconduct or disruptive action of one or more students that cause an adult to take action. If an adult witnesses a disruptive action on school grounds or school bus, they record the incident and provide their account to the principal or assistant principal who then determines the consequence of the infraction. Both the incident and the consequence of the incident are entered into the student information system by administrative staff on a daily basis. Columbus City Schools utilizes the Positive Behavior Intervention Support (PBIS) system, which is supported by the Ohio Department of Education to maximize and promote academic achievement (Columbus City Schools, 2014). PBIS categorizes discipline offenses to reflect the actions of students: (a) Level I, minor offenses, (b) Level II, repeated Level I offenses or serious misconduct, and (c) Level III, repeated Level I or II offenses, illegal and/or serious misconduct, or life or health threatening offenses. A complete description of the offenses is included in the Appendix. Suspension days are number of days a student receives a consequence of Out of School suspension. This is established by the school administrator and entered into the system by the school secretary. The student measures used in this analysis are the numbers of Level I, II, or III incidents and days of suspension from the student information system.

**Core academic performance.** Academic information will include grades assigned by the teacher, which are input into the student information system about every four to five weeks. The grades at the end of the sixth grade are included in this analysis. The scaled score from the Ohio Achievement Assessment for math and reading at the end of
sixth grade will also be included as academic performance indicators. The outcome variable of on-time promotion to the tenth grade will be determined by grade level in the year after the first freshman year.

**Sociodemographic information.** Demographic information will include gender, race, date of birth, socioeconomic status, limited English proficiency, special education status, and retention at any grade prior to sixth grade. Gender, race, and date of birth are collected from the parents at the time a student is enrolled in the district and entered into the student information system (SIS) by district personnel. Gender is set to male or female when entered into the SIS. Race is entered into the SIS using one of the following categories established by the Ohio Department of Education: Multiracial, Asian/Pacific Islander, Hispanic, African American, White, American Indian/Alaskan Native. The date of birth of the student is also entered into the SIS at the time of enrollment. The district establishes socioeconomic status each year based upon each family’s situation. Parents provide income information to the school in order for the student to obtain a free or reduced price lunch. The income eligibility guidelines to determine need are established by the United States Department of Commerce. Students whose families are within 130% of poverty are eligible for a free lunch; those within 185% of poverty are eligible for a reduced price lunch (U.S. Department of Commerce, 2014). If the determination of need is satisfied, the administrative staff within the school set the free or reduced priced lunch flag to yes in the SIS. The free or reduced price lunch qualification is established each year based upon family need. The free or reduced price lunch flag collected for each student at the end of sixth grade will be used for the analysis.
Students who were born outside the United States, or whose parents were born outside the United States, or students who speak a language other than English at home are assessed each year to determine their English proficiency. The assessment used is Language Assessment Scale (LAS) (McGraw Hill Education, 2015) which has moderate prediction (canonical correlation=.76) of scores on reading/language arts tests (Abedi, 2008). The assessment measures listening, reading, speaking, and writing in English at the appropriate age and grade level. Based upon this assessment students are placed in an English as a Second Language (ESL) service from beginner through to advanced.

Beginner level students rarely use English for communication and have limited or no understanding of English. They tend to gather meaning from pictures and tables instead of text. The intermediate level students understand more complex speech but repetition may be required. They have difficulty expressing all of their thoughts and speak in simple sentences. They have some proficiency in reading especially if the context is familiar. The advanced level students are able to communicate in English for most day-to-day routines. However some figures of speech or other idioms are not yet mastered. They may be able to read with fluency but may not totally comprehend (Columbus City Schools, 2014). Once the assessment is completed, school personnel enter the ESL level and the Limited English Proficiency flag is set to yes in the student information system. The student is reassessed each year and the ESL level is adjusted based upon the students performance. The end of sixth grade ESL flag will be used for the analysis.

Public schools are required by the U.S Department of Education through the Individuals with Disability Education Act (U.S. Department of Education, Office of Special Education Programs, 2004) to educate all children regardless of disability. A
student is referred either by the parent or teacher to district personnel, if there is a suspected disability. Once the parental consent for testing is obtained, a comprehensive multidimensional assessment is tailored to the individual needs of the child starting with information that exists such as evaluations by the parent, teacher, or physician. Based upon the preliminary information, additional assessments may be performed. Upon completion of the evaluations a group of qualified professionals and the parent(s) of the child determines whether the child has a disability as defined by the Ohio Administrative Code in rule 3301-51-01 paragraph (B)(10) (Ohio Department of Education, 2013). If the child is not able to perform adequately for the child’s age in one or more of the following areas, then the child is deemed to have a disability: (a) oral expression, (b) listening comprehension, (c) written comprehension, (d) grade-level appropriate reading or math skills, and (e) not able to make sufficient progress in grade-level standards. Disabilities could include, but are not limited to deafness, emotional disorders, orthopedic, acute or chronic health problems, and learning disabilities such as dyslexia and cognitive delay. Children who are identified as having a disability are eligible for services such as special education. An Individualized Education Plan (IEP) is then developed with input from the parents, teachers, and various district representatives. The IEP identifies the services the child will receive and the planned outcomes of those services (Columbus City Schools, 2014). An Individualized Education Plan is reviewed annually to ensure compliance with the plan and/or to determine if the student no longer needs to be on an IEP. If a student is on an IEP school personnel set the IEP flag to yes if there is an IEP in place and include the type disability in the SIS. The Individual Education Plan is reviewed annually by
school personnel, the student, and the parents and is adjusted accordingly. The end of sixth grade IEP flag will be utilized for this analysis.

Graduation cohort denotes on-time graduation, to signify completing high school in four years. Graduation cohort is established when a student enters the ninth grade for the first time and is set at four years from the student’s entry into high school. The graduation cohort is entered into the student information system by the administrative staff at the high school. The graduation cohort year for this sample is 2016. Retention at any grade prior to ninth grade is hard to determine based upon readily available data. However, overage is an indicator of retention and will be used as a substitution.

**School-level data.** The school-level variables selected will follow two of the four items from the framework of Rumberger and Lim (2008): student composition and structural characteristics. School processes and practices were not included as this information is not readily available during a school year. School resources were not included, as this variable was found to not be significant in the research and this sample.

**Student composition.** Student composition will be calculated from the population of the students attending the school at the end of the year of the sixth grade year and will be gathered from the CCS student information system. It will include mean socioeconomic status, the proportion of students at risk in academics (specifically reading and math), the mean number of behavior incidents and the mean number of days suspended, the proportion of retained students as derived by overage, the proportion of racial minorities, the proportion of students in Limited English Proficiency programs, and the proportion of students with an Individualized Education Plan.
**Structural characteristics.** The structural characteristics of the school will include the number of students attending a school, the grade organization, and whether the school is a lottery or neighborhood school. This data will be collected at the end of the school year. Grade organization within Columbus City Schools has many forms. There are schools that contain grades K through 5, grades K through 6, grades 6 through 8, grades 7 through 12, grades 9 through 12 or grades K through 12. The focus of this study is on sixth grade, which includes three types of grade organization: schools that contain grades K through 6, grades 6 through 8 and grades K through 12. While this study will only focus on urban public schools, an analysis will be performed to determine if there are differences in schools that obtain their population via a lottery versus those that obtain their population from the neighborhood. The identification of lottery school is based upon the district accepting applications to enroll in a lottery school, which is not required for a neighborhood school (Columbus City Schools, 2014).

**Outcome measure.** The outcome measure for this analysis is on-time promotion to the tenth grade. This variable is established by analyzing grade level for the cohort’s tenth grade school year. If grade level for the tenth grade school year is ten then the student was promoted on time. If not, the student was not promoted on time. This outcome measure serves as an early-warning indicator of dropout.

**Accessing and Preparing Data**

Student level data will be collected from Columbus City Schools (CCS) after the students have been deidentified by Columbus City Schools. The request of data from Columbus City Schools has been approved by CCS based upon the approval of the exemption review from the Ohio State University Institutional Review Board.
level data will also be collected from the Ohio Department of Education for the appropriate years.

The raw, deidentified student level data from CCS will be recoded in order for the analysis tool to perform. The following are the procedures for the recoding of specific fields. The attendance rate was calculated as the percentage of days attended for a student’s entire sixth grade year. This analysis centered attendance on 94.3%, (the sample mean) and divided by 5 to put attendance in units of 5 percentage points. The number of Level I, II, or III incidents and days of class missed due to being suspended measure behavior. The risk indicator for reading and math, which is set to 1 when the classroom grade for reading or math is a D or F, measures core academics. The cut-off for proficiency on the Ohio Achievement Assessment (OAA), using the scaled score, is 400. Each student’s score on the reading and math OAA at the end of sixth grade will be centered on proficiency and divided by 50 in order to make the changes in the OAA scaled score more meaningful in the results ([OAA score – 400]/50 = Centered OAA score). The sociodemographic variables require the most preparation. Gender is set to male or female when entered into the SIS and will be recoded to 1 for male and 0 for female. Race will be recoded to 1 for African American and 0 for all other due to the large percentage of African American students in this data set (65.5%). Only 24.7% of the student population is White, with 5.2% Hispanic, 2.5% Multiracial, 1.8% Asian, and 0.3% American Indian or Alaska Native. The socioeconomic status for this analysis will be recoded to 1 when the free or reduced price lunch flag is set to yes. When Limited English Proficiency flag is set to yes it will be recoded to 1 for this analysis. School personnel set the IEP flag to yes if there is an IEP, which will be recoded to 1 if yes. Age
is calculated from date of birth using the Date and Time wizard within SPSS. Any student two years overage for the cohort, or 14 years old or older, will be coded as 1 for retained prior to the sixth grade year. The outcome variable of on-time promotion to the tenth grade will be determined by grade level in the year after the first freshman year. If this grade level is less than ten, it will be coded to 1 indicating the student was not promoted on time to the tenth grade. The data will be collected from the data warehouse for all sixth graders in school year 2009-2010 (graduation cohort of 2016).

School-level information will originate from three sources: student-level information, Ohio Department of Education, and Columbus City Schools. Student composition will be calculated from the aggregate of student-level information. Means for each school will be calculated for socioeconomic status, number of behavior incidents by level, and number of days suspended. Proportions for each school will be calculated for students at risk in academics (specifically reading and math), retained students as derived by overage, racial minorities, students in Limited English Proficiency programs, and students with an Individualized Education Plan (e.g. students at risk in math/total number of students). Structural characteristics including enrollment and grade organization will be gathered from the Ohio Department of Education’s local report card. The designation of lottery school will come from Columbus City Schools.

3.3 Analysis

The study is designed to determine the extent to which there are characteristics of sixth grade students or schools that are predictive of whether students are promoted on time to the tenth grade.
Research question 1: To what extent is on-time promotion to tenth grade predicted by students’ attendance, behavior, core academic performance, selected demographic characteristics, and selected school characteristics at the end of sixth grade? Hierarchical generalized linear modeling (HGLM) will be used for this analysis. HGLM allows for the prediction of the outcome of a categorical variable, in this case on-time promotion, based upon one or more predictors within a context. Bivariate Pearson correlation and regression coefficients will be examined to ensure HGLM is a worthwhile pursuit. If so, an HGLM empty model using one-way random effects ANOVA model will be executed and the ICC analyzed to determine within school variability. Following the ICC analysis, Level 1 and Level 2 HGLM models will be completed. Level 1 analysis from hierarchical generalized linear modeling (HGLM) will examine student-level variables to predict on-time promotion to the tenth grade. Level 2 will add school-level variables including student composition and structural characteristics to predict on-time promotion to the tenth grade. The hierarchical generalized linear modeling will be performed in HLM version 7 (Scientific Software International, 2015).

Research question 2: To what extent are there reliable profiles of students at sixth grade with respect to students’ attendance, behavior, core academic performance, and selected demographic characteristics that are associated with on-time promotion to the tenth grade? This is an exploratory analysis, however, it is expected there are two or more reliable profiles similar to the profiles found by Janosz et al. (Janosz, Le Blanc, Boulerice, & Tremblay, 2000). The method for this analysis is latent profile analysis (LPA). LPA uses similarities in the patterns of scores or responses among participants to assign each person to a group that includes other people who responded similarly. LPA
determines whether distinct groups exist, what distinguishes the groups from one another, and assigns each participant to a group based on their observed data. More information will be provided in the results, using Samuelsen and Raczynski (2013) to describe the technique. Exploratory analysis will be used to determine the best fitting model using Bayesian information criterion (Kaplan, 1989). Once the number of groups is established, descriptive statistics will be used to define the groups. MPlus version 7 will be used to conduct the LPA (Muthen & Muthen, 1998). The descriptive analyses will be conducted with SPSS version 22.0 (SPSS, 2011).
Chapter 4: Results

4.1 Sample Characteristics

The participants in this sample were sixth graders enrolled in Columbus City Schools at the end of school year 2009-2010. Data collected were readily available data on students within sixth grade schools including attendance, behavior, core academic performance (ABCs), and sociodemographic factors (Table 1). The sample contained 2162 students with some variables missing values. Missing data was handled using listwise deletion within HLM and using Full Information Likelihood (FIML) estimation in Mplus. FIML is preferred because it offers less biased estimators over other traditional approaches (Acock, 2005) and it allows for the preservation of all available data rather than estimating missing data. Of the 2162 students (Table 2), three children (.1%) did not have attendance data; 55 did not have reading Ohio Achievement Assessment (2.5%), 53 did not have math Ohio Achievement Assessment (2.5%), 213 were missing reading risk indicator (9.9%), and 369 were missing math risk indicator (17.1%). There were no sociodemographic data missing. A test of the random distribution of the missing data was performed and found to be missing completely at random, $\chi^2(19) = 3.19$, $p = 1.00$ indicating that listwise deletion was also appropriate.

This samples average attendance was 94.3%, with average of one Level I and II behavior infractions with very few average Level III behavior infractions (.06). The average days of suspension for this sample was 4.92 days. Within this sample only 17.0%
had a reading risk indicator and 24.5% had a math risk indicator. This sample, on average, was proficient on the Ohio Achievement Assessment in reading and math. The cut-off for proficiency using the scaled score is 400 and the data was centered on proficiency and divided by 50 in order to make the changes in the OAA scaled score more meaningful. As a result the sample, on average, had an OAA reading score of 408.4 \[408.4 = (.1678 \times 50) + 400\] and a math score of 405.7 \[405.7 = (.1147 \times 50) + 400\]. The sociodemographic indicators of this sample are similar to the district average for school year 2009-2010 when there were 51,351 students in Columbus City Schools (Ohio Department of Education, 2015). The sample was evenly split between males (49.3%) and females (50.7%), which was the similar as the district average (males 50.9%, females 49.1%) at that time. The majority of the sample was African American (65.5%) whereas the district average for school year 2009-2010 was 60.1%. This sample has a larger percentage of children in poverty (84.9%) than the district average (81.9%). This sample has 8.0% of the students flagged as Limited English Proficient in contrast to the district with 9.8% of the students who are LEP. This sample has an average of 17.5% of the students on an Individual Education Plan while the district had only 15.1% of the population on an IEP. The percentage of retained students was only .6% or 13 students. In this sample, 400 students were not promoted to the tenth grade after one year in ninth grade (18.5%) whereas 1762 (81.5%) were promoted on time.
Table 1.

*Descriptive statistics of 6th grade students in sample*

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Overall</th>
<th>N = 2162</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n %</td>
<td>or M</td>
</tr>
<tr>
<td>Attendance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>94.3</td>
<td>(5.44)</td>
</tr>
<tr>
<td>Centered</td>
<td>-.01</td>
<td>(1.09)</td>
</tr>
<tr>
<td>Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level I</td>
<td>1.01</td>
<td>(2.65)</td>
</tr>
<tr>
<td>Level II</td>
<td>1.11</td>
<td>(2.28)</td>
</tr>
<tr>
<td>Level III</td>
<td>.06</td>
<td>(.31)</td>
</tr>
<tr>
<td>Suspensions</td>
<td>4.92</td>
<td>(8.22)</td>
</tr>
<tr>
<td>Core Academics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading RI</td>
<td>329</td>
<td>(16.9%)</td>
</tr>
<tr>
<td>Reading OAA</td>
<td>.17</td>
<td>(.56)</td>
</tr>
<tr>
<td>Math RI</td>
<td>439</td>
<td>(24.5%)</td>
</tr>
<tr>
<td>Math OAA</td>
<td>.11</td>
<td>(.80)</td>
</tr>
<tr>
<td>Sociodemographic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1066</td>
<td>(49.3%)</td>
</tr>
<tr>
<td>Female</td>
<td>1096</td>
<td>(50.7%)</td>
</tr>
<tr>
<td>African American</td>
<td>1416</td>
<td>(65.5%)</td>
</tr>
<tr>
<td>Other Race</td>
<td>746</td>
<td>(34.5%)</td>
</tr>
<tr>
<td>SES</td>
<td>1836</td>
<td>(84.9%)</td>
</tr>
<tr>
<td>LEP</td>
<td>173</td>
<td>(8.0%)</td>
</tr>
<tr>
<td>IEP</td>
<td>378</td>
<td>(17.5%)</td>
</tr>
<tr>
<td>Retained</td>
<td>13</td>
<td>(0.6%)</td>
</tr>
<tr>
<td>On-time promotion</td>
<td>1762</td>
<td>(81.5%)</td>
</tr>
</tbody>
</table>

*Note.* Level I, II, and III = behavior offenses in 6th grade, see narrative for definition. RI = Risk Indicator for course grades D or F. OAA = Ohio Achievement Assessment in 6th grade. SES = Socio Economic Status. LEP = Limited English Proficient. IEP = Students with an Individual Education Plan. On-time promotion is coded as 0.
Table 2.

Comparisons of missing and non-missing data of 6th grade students

<table>
<thead>
<tr>
<th>Variables</th>
<th>Missing n % or M (SD)</th>
<th>Non-missing n % or M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>94.31 (5.50)</td>
<td>94.36 (5.44)</td>
</tr>
<tr>
<td>Centered</td>
<td>-.05 (1.12)</td>
<td>-.01 (1.09)</td>
</tr>
<tr>
<td>Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level I</td>
<td>1.11 (2.79)</td>
<td>1.01 (2.65)</td>
</tr>
<tr>
<td>Level II</td>
<td>1.12 (2.32)</td>
<td>1.11 (2.28)</td>
</tr>
<tr>
<td>Level III</td>
<td>.07 (.32)</td>
<td>.06 (.31)</td>
</tr>
<tr>
<td>Suspensions</td>
<td>2.38 (6.16)</td>
<td>2.31 (6.14)</td>
</tr>
<tr>
<td>Core Academics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading RI</td>
<td>213 (9.9%)</td>
<td>1949 (90.1%)</td>
</tr>
<tr>
<td>Reading OAA</td>
<td>.16 (.56)</td>
<td>.17 (.56)</td>
</tr>
<tr>
<td>Math RI</td>
<td>369 (17.1%)</td>
<td>1793 (82.9%)</td>
</tr>
<tr>
<td>Math OAA</td>
<td>.10 (.78)</td>
<td>.11 (.80)</td>
</tr>
</tbody>
</table>

Note. MCAR test: Chi-Square = 3.194, DF = 19, p = 1.00. Level I, II, and III = behavior offenses in 6th grade, see narrative for definition. RI = Risk Indicator for course grades D or F. OAA = Ohio Achievement Assessment in 6th grade. No missing sociodemographic data.

Descriptive statistics were conducted on the sample of 2162 students comparing those who made it on time to the tenth grade and those that did not using each of the 16 predictors. An analysis of variance was done comparing the differences between the population means of these two groups, which is presented in Table 3. The t-test determines the significance of the difference between on-time and not on-time promotion for each continuous variable. A chi square analysis was conducted for each dichotomous variable in relationship to the dichotomous outcome variable of on-time promotion to...
indicate the relationship among the four categories. The Bonferroni correction was applied to the p values associated with each individual test in order to maintain the $\alpha = .05$. With 16 individual tests the Bonferroni correction equals $.003 (.05/16)$. Using the Bonferroni correction, all of the variables are statistically significant except for race ($\chi^2(1) = 2.67, p = .102$), Limited English Proficient ($\chi^2(1) = 6.01, p = .014$), Individual Education Plan ($\chi^2(1) = 6.10, p = .014$), and retained ($\chi^2(1) = 2.67, p = .085$). The mean attendance rate for those students who did go to the tenth grade on time was statistically different from those who did not ($t = 9.18, df = 2157, p < .001$) and on average, those who were promoted on time had a higher attendance rate. The mean for Levels I, II and III behavior infractions, and days missed due to suspension for those students who were promoted on time was statistically different from those who were not ($p < .001$) and on average, those who made it to tenth grade on time had fewer behavior incidences and fewer days missed due to suspension. The number of students with reading ($\chi^2(1) = 112.36, p < .001$) or math ($\chi^2(1) = 133.25, p < .001$) risk indicators who were promoted on time was statistically different from those who were not. On average, 39.5% of the students with a risk indicator in reading and 38.5% with a risk indicator in math were not promoted on time to the tenth grade as compared to 18.5% of the population who were not promoted on time. The mean for reading ($t = 10.70, df = 2157, p < .001$) and math ($t = 9.77, df = 2157, p < .001$) Ohio Achievement Assessments for those students who were not promoted on time was statistically different from those who were promoted on time. The average OAA reading score for those who were promoted on time was 411.5 [411.5 = ($0.23 \times 50) + 400$], above the proficiency score of 400, whereas those who were not
promoted on time had an average score of 395.0 \([395.0 = (-1 \times 50) + 400]\). The average OAA math score for those who were promoted on time was 409.5 \([409.5 = (0.19 \times 50) + 400]\), above the proficiency score of 400; however, those who were not promoted on time had an average score of 388.5 \([388.5 = (-0.23 \times 50) + 400]\). The percentage of students not being promoted on time to the tenth grade was higher for males than females \((t = 24.6, df = 2157, p < .001)\). The mean of socioeconomic status for those students who were not promoted on time was statistically different from those who were \((t = 51.39, df = 2157, p < .001)\) and 96.5% of those not being promoted on time were in poverty, above the sample mean of 84.9%.
Table 3.

**Descriptive statistics of 6th grade students who were promoted on time and who were not promoted on time**

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Promoted On Time</th>
<th>Not Promoted On Time</th>
<th>t / χ²</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 1762</td>
<td>N = 400</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n % or M (SD)</td>
<td>n % or M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Attendance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>94.9 (5.05)</td>
<td>92.15 (6.43)</td>
<td>9.18</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Centered</td>
<td>.09 (1.01)</td>
<td>-.45 (1.29)</td>
<td>9.18</td>
<td>&lt; .001</td>
</tr>
<tr>
<td><strong>Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level I</td>
<td>.73 (2.06)</td>
<td>2.26 (4.16)</td>
<td>-10.67</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Level II</td>
<td>.82 (1.78)</td>
<td>2.39 (3.51)</td>
<td>-12.91</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Level III</td>
<td>.05 (.29)</td>
<td>.11 (.39)</td>
<td>-3.43</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Suspensions</td>
<td>3.78 (6.28)</td>
<td>7.85 (11.29)</td>
<td>-7.28</td>
<td>&lt; .001</td>
</tr>
<tr>
<td><strong>Core Academics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading RI</td>
<td>199 (60.5%)</td>
<td>130 (39.5%)</td>
<td>112.36</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Reading OAA</td>
<td>.23 (.56)</td>
<td>-.10 (.46)</td>
<td>10.70</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Math RI</td>
<td>270 (61.5%)</td>
<td>169 (38.5%)</td>
<td>133.25</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Math OAA</td>
<td>.19 (.81)</td>
<td>-.23 (.61)</td>
<td>9.77</td>
<td>&lt; .001</td>
</tr>
<tr>
<td><strong>Sociodemographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>24.6</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Male</td>
<td>824 (77.3%)</td>
<td>242 (22.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>938 (85.6%)</td>
<td>158 (14.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td>2.67</td>
<td>.102</td>
</tr>
<tr>
<td>African American</td>
<td>1140 (80.5%)</td>
<td>276 (19.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Race</td>
<td>622 (83.4%)</td>
<td>124 (16.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>1450 (79.0%)</td>
<td>386 (21.0%)</td>
<td>51.39</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>LEP</td>
<td>153 (88.4%)</td>
<td>20 (11.6%)</td>
<td>6.01</td>
<td>.014</td>
</tr>
<tr>
<td>IEP</td>
<td>325 (86.0%)</td>
<td>53 (14.0%)</td>
<td>6.10</td>
<td>.014</td>
</tr>
<tr>
<td>Retained</td>
<td>13 (100%)</td>
<td>0 (0%)</td>
<td>2.67</td>
<td>.085</td>
</tr>
</tbody>
</table>

*Note.* Level I, II, and III = behavior offenses in 6th grade, see narrative for definition. RI = Risk Indicator for course grades D or F. OAA = Ohio Achievement Assessment in 6th grade. SES = Socio Economic Status. LEP = Limited English Proficient. IEP = Students with an Individual Education Plan. On-time promotion coded as 0. Significance from ANOVA comparing students who were promoted on time to those who were not.
One purpose of this study was to determine the extent to which tenth grade on-time promotion was associated with sixth grade schools in order to implement school-level interventions as early as sixth grade. However, the children in this sample were measured over time and as a result there are multiple memberships in schools. At time point one, these children were in sixth grade (School Year 2009-2010) at time point two, they were at the beginning of what should be their tenth grade year (School Year 2013-2014). Multi-level models, used in this analysis, assume children remain in the same group over time, which is not the case with this data (Cafri, Hedeker, & Aarons, 2015).

The independent variables about the child are nested within sixth grade schools and the dependent variable of on-time promotion has the children renested in high schools. The method used to analyze the impact of differing group effects over time is cross-classified random-effects model (Cafri, Hedeker, & Aarons, 2015). This approach to the analysis is outside the scope of this dissertation, however, given the fact that the group changes over time, an exploratory analysis of the impact of the high schools upon on-time promotion to the tenth grade is included.

The sixth grade school buildings in this sample were any schools within Columbus City Schools with a sixth grade population of students in 2009-2010, which were 34 schools with some variables missing values. The school-level variables included student composition and structural characteristics. The student composition for each school reflects only the sixth grade class in each school and is the same as the overall sample depicted in Table 1. The structural characteristics included enrollment, lottery indicator, and grade configuration. The average enrollment is 432 students per school and reflects the enrollment of the entire school, not just the sixth grade class. A school is
defined as a lottery school if students have to apply to attend the school. There were
seven lottery schools, which is 20.5% of the total number of schools. The grade
configuration with the highest percentage is grade 6-8 with 61.7%, or 21 schools. Of the
34 buildings, one did not have reading Ohio Achievement Assessment proportion (2.9%),
one did not have math Ohio Achievement Assessment proportion (2.9%), two did not
have reading risk indicator proportion (5.9%) and two did not have math risk indicator
proportion (5.9%).

The tenth grade school buildings in this sample were any schools within
Columbus City Schools with a tenth grade population of students in 2013-2014, which
were 21 schools. The school-level variables included student composition and structural
characteristics. The student composition for each school reflects the student composition
in this sample (Table 1) nested in the high schools. The structural characteristics included
enrollment and lottery indicator. The average enrollment is 641 students per school and
reflects the enrollment of the entire school, not just the tenth grade class. There were five
lottery schools, which is 23.8% of the total number of high schools. Grade configuration
was not included as there is only one high school that is configured other than ninth
through twelfth grades.

4.2 Outcome of Research Question One

The first research question is: To what extent is on-time promotion to tenth grade
predicted by students’ attendance, behavior, core academic performance, selected
demographic characteristics, and selected school characteristics at the end of sixth grade?
While a standard regression method could have been used to answer this research
question, standard regression assumes the data is statistically independent and this sample
has data that is nested within schools (O'Connell & Reed, 2012). A method that recognizes clustered data and reduces the tendency for Type I errors is hierarchical generalized linear modeling (HGLM) and was the method selected for this analysis.

This analysis has a dichotomous outcome of on-time or not on-time promotion to the tenth grade. There are unique steps required to utilize a dichotomous outcome within HGLM using HLM version 7 (Scientific Software International, 2015). The Bernoulli distribution and Laplace transformation settings were used in order to produce a reliable deviance statistic for this binary response model (O'Connell, Goldstein, Rogers, & Peng, 2008). The Bernoulli distribution allows for dichotomous probability of distribution such as not on time or on time to tenth grade. This produces an odds of success or failure; if the odds are greater than 1.0 then the probability of success is greater than the odds of failure; if the odds are 1.0 then both outcomes are equally likely; and if the odds are less than 1.0 the probability of success is less than the odds of failure (O'Connell & Gray, 2011). In this analysis, in order to have a meaningful intercept description, success refers to a child not making it on time to the tenth grade (not on time = 1, on time = 0). Thus in this analysis, if the odds are greater than 1.0 the probability of not making it on time to the tenth grade is greater than making it on time. The odds ratio (OR) measures the association between the “binary outcome and an explanatory variable that provides an indication of how odds for the outcome changes as the explanatory variable increases or decreases” (O'Connell, Goldstein, Rogers, & Peng, 2008, p. 226). The Laplace transformation setting was selected due to its computational efficiency, good quality, and is one of the most often-used estimation algorithms for HGLM (Snijders & Bosker, 2012).
The strategy developed for this method is to perform the following steps:

1. Logistic empty model to determine how much clustering exists in the data. This analysis is performed with no predictors at level 1 or level 2.

2. Logistic random intercept only model to obtain a general impression of the data. Variables will be removed from the model if they are not significant.

3. Logistic reduced model after the non-significant variables were removed.

4. Logistic random coefficients model to include random effects of each variable and allow them to vary randomly across schools. Variables will be removed from the model if they are not significant.

5. Logistic contextual model using the reduced random intercept and random coefficients model with the addition of predictors of the intercepts including school composition and school structural characteristics. These will be allowed to vary at random in the model.

**Logistic Empty Model and ICC Analysis**

An empty model with no predictors at the child level or school level provides an overall estimate of the likelihood of not being promoted on time (coded as 1) to the tenth grade for this sample and provides an understanding of how much clustering exists in this data within sixth grade schools. The empty model estimates the probability of not being promoted on time for a school with a value of zero or for a “typical” school (O'Connell, Goldstein, Rogers, & Peng, 2008). The estimated odds of not obtaining on-time promotion over the odds of obtaining on-time promotion for students in a sixth grade school are .246400 (Table 4). The estimated probability of not obtaining on-time promotion for these students is $\gamma_{00}/(1 + \gamma_{00}) = .246400 / (1 + .246400) = .19768$. This
estimate is higher than the overall proportion of children, ignoring school variability, who do not obtain on-time promotion to the tenth grade for this sample (Number of students not on time/Total number of students in sample = \(400/2162 = .185\)). In order to determine how strongly sixth grade schools contribute to dependency in the data, an Intra-Class Correlation is performed as a measure of the proportion of total variance that can be attributed to schools (O'Connell & Reed, 2012). The Intra-Class Correlation (ICC) is 3.4%; meaning 3.4% of the variability of not obtaining on-time promotion to the tenth grade is between sixth grade schools. Thus the variability is larger than zero, signifying that a multilevel analysis is appropriate due to some clustering effect. Table 4 displays the outcome of the empty model with the following Level-1 model, Level-2 model and mixed model equations:

\[
\text{ICC} = \frac{\tau_{oo}}{\tau_{oo} + 3.29} = \frac{.11683}{(.11683 + 3.29)} = .034292
\]

Level-1 model
\[
\text{Prob(ON\_TIME}_{ij}=1| \beta_j) = \phi_{ij}
\]
\[
\log[\phi_{ij}/(1 - \phi_{ij})] = \eta_{ij}
\]
\[
\eta_{ij} = \beta_{0j}
\]

Level-2 model
\[
\beta_{0j} = \gamma_{00} + \mu_{0j}
\]
\[
\text{Level-1 variance} = \frac{1}{\phi_{ij}/(1 - \phi_{ij})}
\]

Mixed model: \(\eta = \gamma_{0} + \mu_{c}\).
An exploratory analysis was performed to determine the extent to which high schools have an impact upon on-time promotion to the tenth grade. An Intra-Class Correlation was performed to determine the proportion of variance that can be attributed to high schools. The Intra-Class Correlation (ICC) is 16.7%; meaning 16.7% of the variability of not obtaining on-time promotion to the tenth grade is between high schools. While the ICC for high schools is higher than for sixth grade schools, it is still possible to get an accurate prediction using sixth grade schools. Since one purpose of this study was to determine the association of sixth grade schools upon on-time promotion to the tenth grade, nesting within sixth grade schools will be used for the remainder of this analysis.

\[ \text{ICC} = \frac{\tau_{oo}}{\tau_{oo} + 3.29} = 0.66295/(0.66295+3.29) = 0.166771 \]

**Logistic Random Intercept Only Model**

The following fields were specified as child-level predictors of not on-time promotion to the tenth grade: attendance; behavior - Level I, Level II, Level III behavior infractions, and days missed due to suspension; core academics – reading risk indicator,
reading Ohio Achievement Assessment (OAA) score centered, math risk indicator, math OAA centered; and Sociodemographics – male, African American, socioeconomic status, Limited English Proficient, Individual Education Plan, and retained. The random intercept model 1 “analysis completed with errors” and further noted it was “unable to continue” and did not produce the results for Unit-Specific Model, EM Laplace-2 Estimation (Scientific Software International, 2015). Since the EM Laplace model was not produced the significance of the slope for each field was analyzed from the logit link function output, which did complete successfully. From the logit link function output it was determined that Level I offenses \((p = .651)\), Level III offenses \((p = .113)\), African American \((p = .242)\), and retained \((p = 1.00)\) were not significantly different from zero. Thus random intercept model 2 was created removing these fields. Model 2 ran successfully in HGLM, however, there were still two fields whose slopes were not significantly different from zero: male \((p = .143)\) and math Ohio Achievement Assessment \((p = .169)\). These fields were removed and the random intercept model 3 was created without Level I and Level III behavior infractions, math OAA, male, African American, and retained and was executed again. Table 5 displays the outcome of random intercept model 3 with the following Level-1 model, Level-2 model and mixed model equations:

**Level-1 model**

\[
\text{Prob}(\text{ON\_TIME}_{ij}=1|\beta_j) = \phi_{ij} \\
\log\left[\frac{\phi_{ij}}{1 - \phi_{ij}}\right] = \eta_{ij} \\
\eta_{ij} = \beta_{0j} + \beta_{1j} \cdot \text{ATTD} + \beta_{2j} \cdot \text{LVL II} + \beta_{3j} \cdot \text{SUSP} + \beta_{4j} \cdot \text{RD OAA} + \beta_{5j} \cdot \text{RD RI} + \beta_{6j} \cdot \text{MA RI} + \beta_{7j} \cdot \text{SES} + \beta_{8j} \cdot \text{IEP} + \beta_{9j} \cdot \text{LEP}
\]

**Level-2 model**

\[
\begin{align*}
\beta_{0j} &= \gamma_{00} + \mu_{0j} \\
\beta_{1j} &= \gamma_{10}
\end{align*}
\]
\[ \beta_{2j} = \gamma_{20} \]
\[ \beta_{3j} = \gamma_{30} \]
\[ \beta_{4j} = \gamma_{40} \]
\[ \beta_{5j} = \gamma_{50} \]
\[ \beta_{6j} = \gamma_{60} \]
\[ \beta_{7j} = \gamma_{70} \]
\[ \beta_{8j} = \gamma_{80} \]
\[ \beta_{9j} = \gamma_{90} \]

Level-1 variance = \[1/[\phi_{ij}/(1 - \phi_{ij})]\]

Mixed model
\[ \eta_{ij} = \gamma_{00} + \gamma_{10} \times \text{ATTD}_{ij} + \gamma_{20} \times \text{LVL II}_{ij} + \gamma_{30} \times \text{SUSP}_{ij} + \gamma_{40} \times \text{RD OAA}_{ij} + \gamma_{50} \times \text{RD RI}_{ij} + \gamma_{60} \times \text{MA RI}_{ij} + \gamma_{70} \times \text{SES}_{ij} + \gamma_{80} \times \text{IEP}_{ij} + \gamma_{90} \times \text{LEP}_{ij} + \mu_{0j}. \]

Where ATTD represents attendance centered, LVL II indicates Level II behavior offenses, SUSP is days missed due to suspensions, RD OAA represents reading OAA scores, RD RI is reading risk indicator, MA RI indicates math risk indicator, SES is socioeconomic status, IEP is Individual Education Plan, and LEP represents Limited English Proficient.
Table 5.

Reduced random intercept analysis EM Laplace-2 estimation

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Coefficient (SE)</th>
<th>Odds Ratio</th>
<th>\textit{t} (df)</th>
<th>\textit{p}</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model for on-time ((\beta_0))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.174</td>
</tr>
<tr>
<td>Intercept ((\gamma_{00}))</td>
<td>-3.07(.33)</td>
<td>.046</td>
<td>-9.20 (28)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Model for ATTD slope((\beta_1))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ((\gamma_{10}))</td>
<td>-.27(.07)</td>
<td>.762</td>
<td>-3.70 (1707)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Model for LVL II slope((\beta_2))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ((\gamma_{20}))</td>
<td>.12(.05)</td>
<td>1.13</td>
<td>2.18 (1707)</td>
<td>.030</td>
<td></td>
</tr>
<tr>
<td>Model for SUSP slope((\beta_3))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ((\gamma_{30}))</td>
<td>.03(.02)</td>
<td>1.03</td>
<td>1.99 (1707)</td>
<td>.047</td>
<td></td>
</tr>
<tr>
<td>Model for RD OAA slope((\beta_4))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ((\gamma_{40}))</td>
<td>-.90(.21)</td>
<td>.41</td>
<td>-4.23 (1707)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Model for RD RI slope((\beta_5))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ((\gamma_{50}))</td>
<td>.24(.19)</td>
<td>1.27</td>
<td>1.22 (1707)</td>
<td>.223</td>
<td></td>
</tr>
<tr>
<td>Model for MA RI slope((\beta_6))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ((\gamma_{60}))</td>
<td>.66(.16)</td>
<td>1.93</td>
<td>3.98 (1707)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Model for SES slope((\beta_7))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ((\gamma_{70}))</td>
<td>1.43(.36)</td>
<td>4.19</td>
<td>4.01 (1707)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Model for IEP slope((\beta_8))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ((\gamma_{80}))</td>
<td>-1.15(.28)</td>
<td>.32</td>
<td>-4.18 (1707)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Model for LEP slope((\beta_9))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ((\gamma_{90}))</td>
<td>-.63(.29)</td>
<td>.53</td>
<td>-2.19 (1707)</td>
<td>.029</td>
<td></td>
</tr>
</tbody>
</table>

Random Effects (Var. Components) | Variance | df | Chi-square |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Var. in not on-time promotion (u_0)</td>
<td>.03</td>
<td>28</td>
<td>38.64 ((p = .087))</td>
</tr>
</tbody>
</table>

\textit{Note.} Deviance (FEML) = 4621.796372 11 estimated parameters. ATTD = attendance centered on sample mean. LVL II = Level II behavior incidents. SUSP = days missed due to suspension. RD OAA = reading Ohio Achievement Assessment centered on proficient and divided by 50. RD RI = reading risk indicator. MA RI = math risk indicator. SES = Socioeconomic status. IEP = Individual Education Plan. LEP = Limited English Proficient.
Logistic Random Coefficients Model

The next set of analyses allowed the fields included in random intercept model 3 to vary randomly across schools. The outcome of this random coefficients model produced two variables that were not significant, those were Limited English Proficient ($p = .16$) and reading risk indicator ($p = .58$). In addition, the reading risk indicator was highly correlated with the math risk indicator (-.530). Table 6 provides the outcome of the reduced random intercept and random coefficients model with the following Level-1 model, Level-2 model and mixed model equations:

Level-1 model

$$\Pr(ON\_TIME_{ij} = 1 | \beta_j) = \phi_{ij}$$

$$\log\left(\frac{\phi_{ij}}{1 - \phi_{ij}}\right) = \eta_{ij}$$

$$\eta_{ij} = \beta_0 + \beta_1 \ast \text{ATTD} + \beta_2 \ast \text{LVL II} + \beta_3 \ast \text{SUSP} + \beta_4 \ast \text{RD OAA} + \beta_5 \ast \text{MA RI} + \beta_6 \ast \text{SES} + \beta_7 \ast \text{IEP}$$

Level-2 model

$$\beta_0 = \gamma_{00} + \mu_{0j}$$

$$\beta_1 = \gamma_{10} + \mu_{1j}$$

$$\beta_2 = \gamma_{20} + \mu_{2j}$$

$$\beta_3 = \gamma_{30} + \mu_{3j}$$

$$\beta_4 = \gamma_{40} + \mu_{4j}$$

$$\beta_5 = \gamma_{50} + \mu_{5j}$$

$$\beta_6 = \gamma_{60} + \mu_{6j}$$

$$\beta_7 = \gamma_{70} + \mu_{7j}$$

Level-1 variance = $1/\left[\phi_{ij}(1 - \phi_{ij})\right]$

Mixed model

$$\eta_{ij} = \gamma_{00} + \gamma_{10} \ast \text{ATTD}_{ij} + \gamma_{20} \ast \text{LVL II}_{ij} + \gamma_{30} \ast \text{SUSP}_{ij} + \gamma_{40} \ast \text{RD OAA}_{ij} + \gamma_{50} \ast \text{MA RI}_{ij} + \gamma_{60} \ast \text{SES}_{ij} + \gamma_{70} \ast \text{IEP}_{ij} + \mu_{0j} + \mu_{1j} \ast \text{ATTD}_{ij} + \mu_{2j} \ast \text{LVL II}_{ij} + \mu_{3j} \ast \text{SUSP}_{ij} + \mu_{4j} \ast \text{RD OAA}_{ij} + \mu_{5j} \ast \text{MA RI}_{ij} + \mu_{6j} \ast \text{SES}_{ij} + \mu_{7j} \ast \text{IEP}_{ij}$.

Where ATTD represents attendance centered, LVL II indicates Level II behavior offenses, SUSP is days missed due to suspensions, RD OAA represents reading OAA scores, MA RI indicates math risk indicator, SES is socioeconomic status, and IEP is Individual Education Plan.
Table 6.  
Reduced random intercept and coefficients analysis EM Laplace-2 estimation under FEML

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Coefficient (SE)</th>
<th>Odds Ratio</th>
<th>t (df)</th>
<th>p</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model for on-time ($\beta_0$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.288</td>
</tr>
<tr>
<td>Intercept ($\gamma_{00}$)</td>
<td>-3.74 (.65)</td>
<td>.024</td>
<td>-5.75 (28)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Model for ATTD slope($\beta_1$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{10}$)</td>
<td>-.33 (.08)</td>
<td>.72</td>
<td>-4.02 (28)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Model for LVL II slope($\beta_2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{20}$)</td>
<td>.06 (.05)</td>
<td>1.14</td>
<td>2.31 (28)</td>
<td>.028</td>
<td></td>
</tr>
<tr>
<td>Model for SUSP slope($\beta_3$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{30}$)</td>
<td>.04 (.02)</td>
<td>1.04</td>
<td>2.02 (28)</td>
<td>.053</td>
<td></td>
</tr>
<tr>
<td>Model for RD OAA slope($\beta_4$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{40}$)</td>
<td>-.90 (.21)</td>
<td>.41</td>
<td>-4.25 (28)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Model for MA RI slope($\beta_5$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{50}$)</td>
<td>.71 (.23)</td>
<td>2.04</td>
<td>3.30 (28)</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>Model for SES slope($\beta_6$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{60}$)</td>
<td>2.03 (.65)</td>
<td>7.62</td>
<td>3.12 (28)</td>
<td>.004</td>
<td></td>
</tr>
<tr>
<td>Model for IEP slope($\beta_7$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{70}$)</td>
<td>-1.20 (.28)</td>
<td>.30</td>
<td>-4.27 (28)</td>
<td>&lt;.001</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Random Effects (Var. Components)</th>
<th>Variance</th>
<th>df</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Var. in not on-time promotion ($u_0$)</td>
<td>1.15</td>
<td>19</td>
<td>18.83 ($p &gt; .500$)</td>
</tr>
<tr>
<td>Var. in ATTD ($u_1$)</td>
<td>.01</td>
<td>19</td>
<td>13.95 ($p &gt; .500$)</td>
</tr>
<tr>
<td>Var. in LVL II ($u_2$)</td>
<td>.003</td>
<td>19</td>
<td>17.10 ($p &gt; .500$)</td>
</tr>
<tr>
<td>Var. in SUSP ($u_3$)</td>
<td>.001</td>
<td>19</td>
<td>18.37 ($p &gt; .500$)</td>
</tr>
<tr>
<td>Var. in RD OAA ($u_4$)</td>
<td>.13</td>
<td>19</td>
<td>23.39 ($p = .220$)</td>
</tr>
<tr>
<td>Var. in MA RI ($u_5$)</td>
<td>.27</td>
<td>19</td>
<td>19.70 ($p = .413$)</td>
</tr>
<tr>
<td>Var. in SES ($u_6$)</td>
<td>.91</td>
<td>19</td>
<td>16.54 ($p &gt; .500$)</td>
</tr>
<tr>
<td>Var. in IEP ($u_7$)</td>
<td>.20</td>
<td>19</td>
<td>19.44 ($p = .429$)</td>
</tr>
</tbody>
</table>

Note. Deviance (FEML) = 4616.786545, 44 estimated parameters. ATTD = attendance centered on sample mean. LVL II = Level II behavior incidents. SUSP = days missed due to suspension. RD OAA = reading Ohio Achievement Assessment centered on proficient and divided by 50. MA RI = math risk indicator. SES = Socioeconomic status. IEP = Individual Education Plan.
**Reduced random intercepts and coefficients model description.** Two variables were selected to describe in more detail the impact upon not on-time promotion to the tenth grade. Attendance and math risk indicator were selected to represent a continuous variable and a categorical variable respectively. As noted earlier, attending school is critical to learning even though attendance does not guarantee learning will occur. Math risk indicator reflects the grade in math at the end of the sixth grade and research has shown that feedback from teachers is often more reliable than state assessments and should provide insights into the trajectory to tenth grade.

**Attendance.** The estimated logit for a child who has attendance at the mean of 94.3%, has no Level II behavior infractions, with no class days missed due to suspension, with 400 on reading OAA, with no math risk indicator, is not receiving free or reduced price lunch, and does not have an Individual Education Plan within a school is $\gamma_0 = -3.74$ (s.e. = .65) and is statistically different from zero, $t(28) = -5.75$, $p < .001$. This suggests that for a child with all of the child-level descriptions above within a school, the estimated probability of not obtaining on-time promotion is $\text{Odds ratio}/1+\text{Odds ratio} = .023687/(1 + .023687) = .023$ which is lower than the actual mean of .185 indicating that a child with all the above factors has a better chance of making it on time to the tenth grade. The effect for attendance $\gamma_{10} = -.329208$ (s.e. = .08), indicates as the number of days of attendance increases by one (94.3 + 1 = 95.3), the estimated logit decreases by .329208 units which is statistically different from zero $t(28) = -4.02$, $p < .001$. The exponentiation of this slope ($\gamma_{10}$) is .7194, which represents the effect of attendance on the odds of not being promoted on time to the tenth grade; when attendance increases by one, the odds of not on-time promotion decreases by about a quarter compared to when
attendance is at the mean. A child with attendance of one more day than the mean has a predicted logit of $\gamma_{00} + (\gamma_{10})*1 - 3.742850 + (-.329208)*1 = -4.072058$, exponential $(-4.072058) = .01704228$. For a child with one day more in attendance rate, or 95.3 percent, the odds of not attaining on-time promotion is decreased by 28.1% than if attendance rate for a child were the mean of 94.3% \[ \text{Odds (attendance days = 95.3)} / \text{Odds (attendance days = 94.3)} = (.01704228/.023687) = .719 \text{ then 100%*(OR-1) = -28.1%}. \]

**Math risk indicator.** The effect for math risk indicator $\gamma_{50} = .71$ (s.e. = .23), indicates as the math risk indicator increases by one, the estimated logit increases by .71 units which is statistically different from zero $t(28) = 3.30, p = .003$. The exponentiation of this slope is 2.04, which represents the effect of math risk indicator on the odds of not being promoted on time to the tenth grade; when there is a math risk indicator, the odds of not being promoted on-time increase by 2.04 times compared to when there is no math risk indicator. A child with math risk indicator has predicted logit = $-3.74 + (.71) * 1 = -3.03$, exponential $-3.03 = .048$. The odds ratio (math risk indicator = 1)/ odds (math risk indicator = 0) = $.048/.024 = 2.04$. For a child with a math risk indicator the odds of not attaining on-time promotion is more than attaining on-time promotion and is more than if the math risk indicator was zero (comparing .048 to .025).

**Remaining variables.** Level II behavior is not significant based upon the Bonferroni correction ($p = .028$) and the odds ratio is greater than one indicating the odds of not being promoted on time increases as the Level II behavior infractions increase. Days missed due to suspension is also not significant based upon the Bonferroni correction ($p = .023$) and the odds ratio is greater than one indicating that the odds of not
being promoted on time increases as days missed due to suspension increase. A student who had 50 points more than proficient, or 450, on the Ohio Achievement Assessment in reading were .41 times more likely to not be promoted on time as compared to a student who had 50 fewer points (OR=.41, \( p < .001 \)). The socioeconomic flag is not significant based upon the Bonferroni correction (\( p = .004 \)) and the odds ratio is greater than one indicating that the odds of not being promoted on time increases as poverty increases.

Students with an Individual Education Plan were .30 times more likely to not be promoted on time as compared to those students without an Individual Education Plan controlling for all the other variables (OR=.30, \( p < .001 \)). Table 7 displays the odds ratios for the seven variables and distinguishes them between more likely to not be promoted on time and less likely to not be promoted on time.

Table 7.

*Reduced random intercept and coefficients analysis EM Laplace-2 estimation comparisons of odds ratios*

<table>
<thead>
<tr>
<th>More likely to not be promoted on time</th>
<th>Odds Ratio</th>
<th>( p )-value</th>
<th>Less likely to not be promoted on time</th>
<th>Odds Ratio</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level II</td>
<td>1.14</td>
<td>.028</td>
<td>Attendance</td>
<td>.72</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Suspension</td>
<td>1.04</td>
<td>.053</td>
<td>Reading OAA</td>
<td>.41</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Math Risk Indicator</td>
<td>2.04</td>
<td>.003*</td>
<td>IEP</td>
<td>.30</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>SES</td>
<td>7.62</td>
<td>.004</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Attendance = centered on sample mean. Level II = Level II behavior incidents. Suspension = days missed due to suspension. Reading OAA = reading Ohio Achievement Assessment centered on proficient and divided by 50. SES = Socioeconomic status. IEP = Individual Education Plan.

* Significant using Bonferroni correction
Logistic Contextual Model

The prior model helped explain the role of child-level attendance, behavior, core academics, and sociodemographics on the likelihood of not being promoted on time to the tenth grade nested within a sixth grade school. Based upon this sample, it indicated there were a few variables such as Level I and Level III behavior, math Ohio Achievement Assessment, reading risk indicator, male, African American, Limited English Proficient, and retained that were not significant factors in on-time promotion for this sample. The results of the reduced random intercept and random coefficient model (Table 6) showed no significant residual variability in the intercepts across sixth grade schools after adjusting for the variables that were included $\tau_{00} = 1.15$, $\chi^2(19) = 18.83$, $p > .500$. Even though there was no variation remaining, the next step to add the contextual effects was still performed.

In this model, a child who has 94.3% attendance, with no Level II behavior infractions, has no class days missed due to suspension, with 400 on reading OAA, with no math risk indicator, is not receiving free or reduced price lunch, and does not have an Individual Education Plan while in a sixth-grade school with a sixth-grade population that has 94.3% attendance proportion, no Level II behavior infractions, zero suspension days missed, with 400 on reading OAA, with no students with a math risk indicator, no one receiving free or reduced price lunch, and no one with an Individual Education Plan, with enrollment of 432 students in the building, is not a lottery school, is not a grade K-6 school has expected log-odds of -3.64, $t(18) = -.772$, $p = .045$ (Table 8). The estimated odds for a child with these individual and sixth grade school characteristics, exponential (-3.64), is .026, corresponding to a predicted probability of not being promoted on-time.
of .026 which is lower than the actual mean of .185. Therefore it is more likely for a child
with all of these characteristics within a sixth grade school with all of the above
characteristics to be promoted on time to tenth grade than not.

The analysis provided the following explanation “the reliability estimates reported
above are based on only 20 of 29 units that had sufficient data for computation. Fixed
effects and variance components are based on all the data” (Scientific Software
International, 2015). The following information is provided as evidence regarding the
contextual model. Due to the lack of variation being explained, no descriptions are
provided. The outcome of the contextual model is shown in Table 8 with the following
Level-1 model, Level-2 model and mixed model equations:

Level-1 model
\[ \text{Prob(ON\_TIME}_{ij}=1| \beta_j) = \phi_{ij} \]
\[ \log\left(\frac{\phi_{ij}}{1 - \phi_{ij}}\right) = \eta_{ij} \]
\[ \eta_{ij} = \beta_{0j} + \beta_{1j} \ast \text{(ATTD)} + \beta_{2j} \ast \text{(LVL II)} + \beta_{3j} \ast \text{(SUSP)} + \beta_{4j} \ast \text{(RD OAA)} + \beta_{5j} \ast \text{(MA RI)} + \beta_{6j} \ast \text{(SES)} + \beta_{7j} \ast \text{(IEP)} \]

Level-2 model
\[ \beta_{0j} = \gamma_{00} + \gamma_{01} \ast \text{(ATTD)} + \gamma_{02} \ast \text{(LVL II)} + \gamma_{03} \ast \text{(SUSP)} + \gamma_{04} \ast \text{(RD OAA)} + \gamma_{05} \ast \text{(MA RI)} + \gamma_{06} \ast \text{(SES)} + \gamma_{07} \ast \text{(IEP)} + \gamma_{08} \ast \text{(ENROLLMENT)} + \gamma_{09} \ast \text{(LOTTERY)} + \gamma_{10} \ast \text{(GRADE K6)} + \mu_{0j} \]
\[ \beta_{1j} = \gamma_{10} + \mu_{1j} \]
\[ \beta_{2j} = \gamma_{20} + \mu_{2j} \]
\[ \beta_{3j} = \gamma_{30} + \mu_{3j} \]
\[ \beta_{4j} = \gamma_{40} + \mu_{4j} \]
\[ \beta_{5j} = \gamma_{50} + \mu_{5j} \]
\[ \beta_{6j} = \gamma_{60} + \mu_{6j} \]
\[ \beta_{7j} = \gamma_{70} + \mu_{7j} \]

ENROLLMENT was centered around the grand mean.
Level-1 variance = \[1/\phi_{ij}(1 - \phi_{ij})\]

Mixed model
\[ \eta_{ij} = \gamma_{00} + \gamma_{01} \ast \text{ATTD}_{ij} + \gamma_{02} \ast \text{LVL II}_{ij} + \gamma_{03} \ast \text{SUSP}_{ij} + \gamma_{04} \ast \text{RD OAA}_{ij} + \gamma_{05} \ast \text{MA RI}_{ij} + \gamma_{06} \ast \text{SES}_{ij} + \gamma_{07} \ast \text{IEP}_{ij} + \gamma_{08} \ast \text{ENROLLMENT}_{ij} + \gamma_{09} \ast \text{LOTTERY}_{ij} + \gamma_{10} \ast \text{GRADEK6}_{ij} \]

64
\[ + \gamma_{10} \cdot \text{ATTD}_{ij} + \gamma_{20} \cdot \text{LVL II}_{ij} + \gamma_{30} \cdot \text{SUSP}_{ij} + \gamma_{40} \cdot \text{RD OAA}_{ij} + \gamma_{50} \cdot \text{MA RI}_{ij} + \gamma_{60} \cdot \text{SES}_{ij} + \gamma_{70} \cdot \text{IEP}_{ij} + \mu_{0j} + \mu_{1j} \cdot \text{ATTD}_{ij} + \mu_{2j} \cdot \text{LVL II}_{ij} + \mu_{3j} \cdot \text{SUSP}_{ij} + \mu_{4j} \cdot \text{RD OAA}_{ij} + \mu_{5j} \cdot \text{MA RI}_{ij} + \mu_{6j} \cdot \text{SES}_{ij} + \mu_{7j} \cdot \text{IEP}_{ij}. \]

Where ATTD represents attendance centered, LVL II indicates Level II behavior offenses, SUSP is days missed due to suspensions, RD OAA represents reading OAA scores, MA RI indicates math risk indicator, SES is socioeconomic status, and IEP is Individual Education Plan. ENROLLMENT represents the total enrollment in the school for all grades, LOTTERY is a school that takes applications for enrollment, GRADEK6 represents the K through 6th grade configuration of the schools as a comparison group.
Table 8.

*Logistic contextual model - analysis EM Laplace-2 Estimation under FEML*

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Coefficient (SE)</th>
<th>Odds Ratio</th>
<th>t (df)</th>
<th>p</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model for on-time ($\beta_0$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{00}$)</td>
<td>-3.64(4.72)</td>
<td>.03</td>
<td>-.77 (18)</td>
<td>.450</td>
<td></td>
</tr>
<tr>
<td>ATTD proportion ($\gamma_{01}$)</td>
<td>-.01 (1.56)</td>
<td>.99</td>
<td>.01 (18)</td>
<td>.993</td>
<td></td>
</tr>
<tr>
<td>LVL II proportion ($\gamma_{02}$)</td>
<td>-.18(.70)</td>
<td>.83</td>
<td>-.26 (18)</td>
<td>.797</td>
<td></td>
</tr>
<tr>
<td>SUSP proportion ($\gamma_{03}$)</td>
<td>.04(.21)</td>
<td>1.04</td>
<td>.17 (18)</td>
<td>.866</td>
<td></td>
</tr>
<tr>
<td>RD OAA proportion ($\gamma_{04}$)</td>
<td>-.06(1.35)</td>
<td>.94</td>
<td>-.05 (18)</td>
<td>.963</td>
<td></td>
</tr>
<tr>
<td>MA RI proportion ($\gamma_{05}$)</td>
<td>-1.41(2.27)</td>
<td>.24</td>
<td>-.62 (18)</td>
<td>.540</td>
<td></td>
</tr>
<tr>
<td>SES proportion ($\gamma_{06}$)</td>
<td>.07(5.75)</td>
<td>1.07</td>
<td>.01 (18)</td>
<td>.991</td>
<td></td>
</tr>
<tr>
<td>IEP proportion ($\gamma_{07}$)</td>
<td>1.60(2.77)</td>
<td>4.98</td>
<td>.58 (18)</td>
<td>.570</td>
<td></td>
</tr>
<tr>
<td>Enrollment ($\gamma_{08}$)</td>
<td>.00(.00)</td>
<td>1.0</td>
<td>.02 (18)</td>
<td>.892</td>
<td></td>
</tr>
<tr>
<td>Lottery ($\gamma_{09}$)</td>
<td>-.10(.55)</td>
<td>.90</td>
<td>-.19 (18)</td>
<td>.853</td>
<td></td>
</tr>
<tr>
<td>Grade K-6 ($\gamma_{10}$)</td>
<td>-.07(.54)</td>
<td>1.08</td>
<td>.14 (18)</td>
<td>.893</td>
<td></td>
</tr>
<tr>
<td>Model for ATTD slope($\beta_1$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{10}$)</td>
<td>-.33(.11)</td>
<td>.72</td>
<td>-2.98 (28)</td>
<td>.006</td>
<td></td>
</tr>
<tr>
<td>Model for LVL II slope($\beta_2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{20}$)</td>
<td>.14(.09)</td>
<td>1.15</td>
<td>1.57 (28)</td>
<td>.128</td>
<td></td>
</tr>
<tr>
<td>Model for SUSP slope($\beta_3$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{30}$)</td>
<td>.03(.03)</td>
<td>1.03</td>
<td>1.21 (28)</td>
<td>.236</td>
<td></td>
</tr>
<tr>
<td>Model for RD OAA slope($\beta_4$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{40}$)</td>
<td>-.87(.28)</td>
<td>.42</td>
<td>-3.09 (28)</td>
<td>.004</td>
<td></td>
</tr>
<tr>
<td>Model for MA RI slope($\beta_5$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{50}$)</td>
<td>.83(.52)</td>
<td>2.29</td>
<td>1.60 (28)</td>
<td>.122</td>
<td></td>
</tr>
<tr>
<td>Model for SES slope($\beta_6$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ($\gamma_{60}$)</td>
<td>2.03(1.07)</td>
<td>7.62</td>
<td>1.90 (28)</td>
<td>.067</td>
<td></td>
</tr>
</tbody>
</table>

Continued
Table 8 continued

Model for IEP slope ($\beta_7$)

| Intercept ($\gamma_{70}$) | -1.22 (.38) | .30 | -3.24 (28) | .003 |

Random Effects (Var. Components) | Variance | df | Chi-square |
--- | --- | --- | --- |
Var. in not on-time promotion ($u_0$) | 1.40 | 9 | 22.41 ($p = .008$) |
Var. in ATTD ($u_1$) | .01 | 19 | 13.99 ($p > .500$) |
Var. in LVL II ($u_2$) | .003 | 19 | 16.37 ($p > .500$) |
Var. in SUSP ($u_3$) | .001 | 19 | 17.60 ($p > .500$) |
Var. in RD OAA ($u_4$) | .13 | 19 | 22.95 ($p = .239$) |
Var. in MA RI ($u_5$) | .25 | 19 | 18.35 ($p > .500$) |
Var. in SES ($u_6$) | .90 | 19 | 17.18 ($p > .500$) |
Var. in IEP ($u_7$) | .22 | 19 | 18.88 ($p > .500$) |

Note. Deviance (FEML) = 4610.427003; 54 estimated parameters. All proportions are school level proportions of each variable for the 6th grade class. ATTD = attendance centered on sample mean. LVL II = Level II behavior incidents. SUSP = days missed due to suspension. RD OAA = Reading Ohio Achievement Assessment centered and divided by 50. MA RI = math risk indicator. SES = Socioeconomic status. IEP = Individual Education Plan. Enrollment = grand mean centered at 426. Lottery = school is attended via lottery. Grade K-6 = configuration of school is grades K through 6.

4.3 Outcome of Research Question Two

The second research question is: To what extent are there reliable profiles of students at sixth grade with respect to students’ attendance, behavior, core academic performance, and selected demographic characteristics that are associated with on-time promotion to the tenth grade? This is an exploratory analysis with the expectation there will be two or more reliable profiles associated with on-time promotion.

A Latent Profile Analysis (LPA) was conducted using the entire sample of 2162 students. Missing data was handled using Full Information Likelihood (FIML) estimation as it was in the HLM analysis. LPA is a type of Latent Class Analysis that is used to empirically classify individuals into groups based on their responses on several indicators or variables. The variables selected for inclusion in the person-centered approach were
the ones used in the reduced random intercepts and random coefficients model from the prior analysis. The variables included: attendance, Level II behavior infractions, days missed due to suspension, reading Ohio Achievement Assessment, math risk indicator, whether the student was flagged as receiving free or reduced price lunch (SES), and whether the student had an Individual Education Plan (IEP).

The LPA method allows the data to determine group membership and define the group characteristics based on each student’s responses to the observed variables. In terms of procedure, an LPA identifies first whether latent profiles exist within the observed data, how many profiles exist, characterizes those profiles, and identifies which persons belong to which group. LPA uses the scores of each person on each observed variable as well as the co-variation between observed variables to determine possible group membership for each person included in the data. In other words, LPA uses similarities in the patterns of scores or responses among participants to assign each person to a group that includes other people who responded in similar ways.

The researcher sets the number of groups identified by the LPA, and as the number of profiles represented in the data is unknown, an exploratory analysis was conducted (Muthen & Muthen, 1998). To do so, six different models were fit to the data, representing two through seven groups. The guidelines set forth by Nylund, Asparouhov and Muthén (2007) were used for continuous LPA analysis to determine the best fitting model. The model fits of each of the six models was compared using Bayesian information criterion (BIC; Kaplan, 1989), the Vuong-Lo-Mendell-Rubin (VLMR) likelihood ratio test for 1 (H0) versus 2 classes, and the bootstrap likelihood ratio test (BLRT). The model with the lowest BIC, significant VLMR, and significant BLRT was
considered the potential best fitting model. Next, consideration was given to the separation and uniqueness of the profile identifications: a high entropy value (greater than .8, or closest to 1.0; Ramaswamy, DeSarbo, Reibstein, & Robinson, 1993) and no less than 1% of the total count in a given class. Model fit indices are presented in Table 9, and the comparison of all fit indices suggests that the four-class model was the best fit to the data as it has the lowest VLMR, a low BLRT, with a high entropy value, and a low BIC, and no class with less than 1% of the total count. Figure 1 illustrates that the slope of the curve decreases substantially after the four-class model, which also suggests the four-class model should be utilized.

Table 9.

Model fit indices for Latent Profile Analysis

<table>
<thead>
<tr>
<th>Classes</th>
<th>-2LL</th>
<th>df</th>
<th>AIC</th>
<th>BIC</th>
<th>Entropy</th>
<th>VLMR</th>
<th>BLRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>-14942.5</td>
<td>17</td>
<td>29918.98</td>
<td>30015.52</td>
<td>0.958</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>-13671.9</td>
<td>25</td>
<td>27393.73</td>
<td>27535.70</td>
<td>0.948</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>-13294.4</td>
<td>33</td>
<td>26654.89</td>
<td>26842.29</td>
<td>0.917</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>-13089.3</td>
<td>41</td>
<td>26260.57</td>
<td>26493.40</td>
<td>0.914</td>
<td>0.0221</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>-12944.8</td>
<td>49</td>
<td>25987.70</td>
<td>26265.96</td>
<td>0.814</td>
<td>0.0001</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>-12849.1</td>
<td>57</td>
<td>25812.16</td>
<td>26135.86</td>
<td>0.824</td>
<td>0.0921</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note.* -2LL = bootstrap likelihood. Df = degrees of freedom. AIC = Akaike information criteria. BIC = Bayesian information criteria. VLMR = Vuong-Lo-Mendell-Rubin likelihood ratio test *p*-value. BLRT = bootstrap likelihood ratio and represents the *p*-value.
Latent profile analysis was executed using the four-class model and included the distal categorical variable of on-time promotion to create four profiles and determine the relationship between each profile and the probability of on-time promotion to the tenth grade. The DCAT process was used in Mplus to handle on-time promotion, which is the preferred method for categorical distal outcomes (Lanza, Tan, & Bray, 2013). The results of this analysis are presented in Table 10 and descriptive statistics were used to describe the groups. Labels were given to each group based upon their defining characteristics across the seven indicator variables. The four groups were categorized as (a) Successful, (b) On Edge, (c) Fail out, and (d) Pushed out. These groups have some characteristics in common with profiles identified by Janosz et al. (2000) even though Janosz et al. used
additional data in their profile development including school engagement, peer relationships, and family processes. Successful is similar to the Graduates profile, On Edge has characteristics in common with Disengaged and Quiet, Fail Out is similar to Low Achievers, and Maladjusted is like Pushed Out. In addition, Figures 2 and 3 provide graphical representation of the characteristics of the identified four classes.

Table 10.

Summary of latent profile analysis for the four groups including the distal variable not on time

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Successful</td>
<td>On Edge</td>
<td>Fail Out</td>
<td>Pushed Out</td>
</tr>
<tr>
<td>n=1404 M(SD)</td>
<td>n=469 M(SD)</td>
<td>n=242 M(SD)</td>
<td>n=47 M(SD)</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>64.9</td>
<td>21.7</td>
<td>11.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Continuous observed means</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attendance</td>
<td>.29 (1.6)</td>
<td>.15 (1.64)</td>
<td>-.03 (1.59)</td>
<td>-.45 (1.28)</td>
</tr>
<tr>
<td>Level II</td>
<td>.08 (.29)</td>
<td>1.57 (1.21)</td>
<td>4.72 (3.14)</td>
<td>8.6 (3.97)</td>
</tr>
<tr>
<td>Suspension</td>
<td>.01 (.08)</td>
<td>2.21 (1.54)</td>
<td>9.65 (4.22)</td>
<td>34.5 (12.40)</td>
</tr>
<tr>
<td>Reading OAA</td>
<td>.28 (.56)</td>
<td>.03 (.51)</td>
<td>-.13 (.47)</td>
<td>-.23 (.40)</td>
</tr>
<tr>
<td>Categorical observed percentages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>.79 (.41)</td>
<td>.95 (.21)</td>
<td>.98 (.13)</td>
<td>.96 (.20)</td>
</tr>
<tr>
<td>IEP</td>
<td>.15 (.36)</td>
<td>.21 (.41)</td>
<td>.24 (.43)</td>
<td>.19 (.40)</td>
</tr>
<tr>
<td>Math risk</td>
<td>.17 (.38)</td>
<td>.29 (.45)</td>
<td>.47 (.50)</td>
<td>.76 (.44)</td>
</tr>
</tbody>
</table>

Note. IEP = Individual Education Plan. Attendance = centered on 94.3% (sample mean). Suspension Days of 0 = no days suspended. OAA = Ohio Achievement Assessment in 6th grade centered on proficiency (400) and divided by 50. Not on time = 0. Successful = learning and coming to school. On Edge = close in many categories to succeeding. Fail Out = low attendance, low academics along with behavior issues. Pushed Out = behavior issues and high number of days missed due to suspension. Not on time mean is for descriptive purposes only.
Succeeding

This group’s (n=1404, 64.9%) attendance was the most of any group at 94.6% (94.59 = .29 + 94.3) and they had almost no Level II behavior infractions or days missed due to suspension. They had the highest reading OAA score with a group mean of 414 [414 = (.28*50)+400], above the proficiency score of 400 and very few with a math risk indicator (17%). This group has the smallest proportion of children in poverty (79%) and very few had an Individual Education Plan (15%). They were also the most likely to make it on time to the tenth grade at 89.0% meaning approximately 154 students in this group did not make it to the tenth grade on time. This group is succeeding in every category.

On Edge

This group (n=469, 21.7% of the sample) attended slightly more than the sample mean (94.5%), they had more Level II behavior infractions, and had 2.21 days missed due to suspension. The group barely passed the reading OAA with a score of 401.5 [401.5 = (.03*50)+400], just above the proficiency scaled score of 400. Almost a third of this group had a math risk indicator (29%). There is nothing distinct about this group other than they were close to the mean of the sample and close to being successful. All indicators for this group are in the moderate range; therefore On Edge was selected to represent the precarious position of these students. A few changes to the positive or the negative can have an impact on the outcome for these children. Only 25.3%, or 117 students, did not make it on time to the tenth grade.
Fail Out

This group’s (n=242, 11.2%) attendance is slightly lower than the sample mean at 94.27%, with more Level II behavior infractions (4.72) than all classes other than the Pushed Out class. They also had numerous days missing due to suspension (9.65), but less than the Pushed Out class. They are struggling academically with a reading OAA score below proficient at 393.5 \[393.5 = (-.13*50)+400\], and almost half of the class has a math risk indicator (47%). This group has the largest proportion of students with an Individual Education Plan (24%). Close to half of this group does not make it on time to the tenth grade (41% or approximately 99 students). The classification of Fail Out was selected due to academic concerns as the behavior infractions and days missed due to suspensions were less than the Pushed Out group.

Pushed Out

This group’s (n=47, 2.2%) attendance was below the sample mean at 93.85% and had the most Level II behavior infractions (8.6) as well as the most days missed due to suspensions (34.5). They were not learning as the reading OAA (388.5) was less than proficient and the majority of this group had a math risk indicator (76%). They were also the group most likely to not make it on time to the tenth grade (57%) or approximately 27 students. This group is distinguished by their behavior incidents and days missed due to suspension; it appears they were being pushed out of school.
Figure 2. Means of the defining characteristics for continuous variables

Figure 3. Observed percentage of yeses for the defining characteristics of categorical variables
Group Association with On Time

The final part of research question two is to determine if reliable profiles are associated with on-time promotion to the tenth grade. To test the association of the profiles with on-time promotion, the auxiliary option in Mplus was used to “identify a variable that is not used in the analysis but is saved for use in a subsequent analysis” (Muthen & Muthen, 1998, p. 556). In this case, the subsequent analysis was the equality test of means across latent classes, which provided probabilities of on-time promotion across the classes as shown in Table 11 (Muthen & Muthen, 1998). The categories of on-time and not on-time promotion within class are different from each other based upon the confidence intervals. While there is a slight overlap within the Pushed Out class, the remaining confidence intervals do not overlap one another signifying they are different from each other.

Table 11.

<table>
<thead>
<tr>
<th>Probabilities of on-time promotion by class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful</td>
</tr>
<tr>
<td>n=1404</td>
</tr>
<tr>
<td>Probability</td>
</tr>
<tr>
<td>On-time promotion</td>
</tr>
<tr>
<td>Confidence Interval</td>
</tr>
<tr>
<td>Not on-time</td>
</tr>
<tr>
<td>Confidence Interval</td>
</tr>
</tbody>
</table>

Note. Not on time = 0. Confidence Interval = 1.98*se +/- probability

The Successful and On Edge groups have the highest probability of being promoted on time to the tenth grade at 89.5% and 75.0% respectively. The Fail Out and Pushed Out groups have lower probability of being promoted on time at 57.4% and
41.9% respectively. The group differences on the likelihood of on-time promotion also provides comparisons of the profiles to each other (Table 12). All groups were initially compared to the Successful profile, as this was the largest group and represented those most likely to be promoted on time to the tenth grade. Then additional pairwise comparisons were made among the other three profiles. All of the comparisons of the groups were significant ($p < .001$) except Fail Out versus Pushed Out ($p = .053$). Based upon this analysis using this sample, there are reliable profiles associated with on-time promotion to the tenth grade.

Table 12.

<table>
<thead>
<tr>
<th>Group differences on the likelihood of promotion</th>
<th>$\chi^2$</th>
<th>p-value</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall test</td>
<td>153.51</td>
<td>.000</td>
<td>3</td>
</tr>
<tr>
<td>Successful</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On Edge</td>
<td>34.02</td>
<td>.000</td>
<td>1</td>
</tr>
<tr>
<td>Fail Out</td>
<td>85.50</td>
<td>.000</td>
<td>1</td>
</tr>
<tr>
<td>Pushed Out</td>
<td>42.61</td>
<td>.000</td>
<td>1</td>
</tr>
<tr>
<td>On Edge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail Out</td>
<td>17.50</td>
<td>.000</td>
<td>1</td>
</tr>
<tr>
<td>Pushed Out</td>
<td>19.18</td>
<td>.000</td>
<td>1</td>
</tr>
<tr>
<td>Fail Out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pushed Out</td>
<td>3.74</td>
<td>.053</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note.* Not on time = 1. Group definitions in Table 10.
Chapter 5: Discussion

Preventing students from dropout should be a national concern, both for the welfare of the individuals who do not have a high school diploma and therefore have reduced likelihood of success, and the societal costs of supporting young adults who are out of work and not in school. It is well-documented that young adults who do not graduate from high school are more likely to have lower wage earnings and experience higher unemployment rates (Community Research Partners, 2013; Neild, Stoner-Eby, & Furstenberg, 2008; Swanson, 2009). As more jobs require educational achievement through and even beyond high school, not having a high school diploma is a “human tragedy for the children and families” of dropouts (Milliken, 2007, p. xxiii).

As noted in Chapter 1, the national unemployment rates for a high school dropout are 150% of those for high school graduates and triple those of college graduates (U.S. Census Bureau, 2012). In addition, businesses are not able to recruit an adequate workforce since they cannot employ nearly one-third of the potential workforce due to insufficient educational attainment. “The bottom line is that this nation cannot rightfully expect to lead the 21st century’s information- and technology-driven global economy when we have upwards of 30 percent of our young people not even graduating from high school,” said Thomas Donohue, president and CEO of U.S. Chamber of Commerce (Milliken, 2007, p. xxiii). In fact, the United States is falling behind other nations in preparing our youth for employment and successful lives. The Program for International
Student Assessment (PISA), tests 15-year-old students in mathematics, science, and reading periodically in more than 70 countries. The results from the PISA indicate the United States outcomes have remained flat while other countries education systems have passed the United States. In 2009, only six countries had higher scores in reading literacy than the United States. In the 2012 PISA test, eighteen countries or education systems had higher average scores in all three subjects than the United States (Institute of Education Sciences, 2014). These include, in alphabetic order, Australia, Canada, Chinese Taipei, Estonia, Finland, Germany, Hong Kong-China, Ireland, Japan, Liechtenstein, Macao-China, Netherlands, New Zealand, Poland, Republic of Korea, Shanghai-China, Singapore, and Switzerland. If the United States wants to maintain its current relative position in the world, it is imperative that children receive an education that can prepare them to compete in a global economy.

5.1 Purpose and Major Findings

Many studies have examined the reasons students drop out and determined it to be a multifaceted and challenging problem with no single reason for students’ to dropout. However, many students cite as their reason to drop out is due to poor preparation prior to high school, making it difficult to keep up academically. This study sought to identify early-warning indicators of drop out based upon on-time promotion to the tenth grade using characteristics of sixth grade students and their sixth grade schools. There are several important findings of note. First, there were several student-level variables at sixth grade used to predict who would and would not be promoted on time to the tenth grade. Second, there were four reliable profiles of sixth graders based upon attendance,
core academics, and sociodemographics. Third, and most important, these profiles were associated with on-time promotion to the tenth grade.

**Predicting On-time Promotion – Variable-Centered**

The first major finding of this study is that there were five student-level variables at sixth grade which predicted on-time promotion to the tenth grade. Attendance, two core academic variables, and two sociodemographic variables were significant in predicting failure to achieve on-time promotion to the tenth grade and were consistent with the literature on drop out.

This study showed that as attendance increased, the odds of being promoted on time increased, as compared to students who attended less. It seems intuitive that the more a student attends, the more likely they will be in class learning the material and have a better foundation upon which to succeed in high school and be promoted on time to the tenth grade. Research shows that children who miss approximately 18 days in a school year are more likely to struggle academically and drop out (U.S. Department of Education, 2015). Attendance also provides a sense of a student’s engagement in school. As noted in Chapter 2, a student who does not have a strong relationship with his or her teachers and feels removed from the school environment is not likely to come to school or class on time (Finn & Rock, 1997; Worrell & Hale, 2001).

The two variables that were significant in predicting on-time promotion within core academics were reading scores on the Ohio Achievement Assessment and math risk indicator. A student with a higher score on the reading Ohio Achievement Assessment had increased odds of being promoted to the tenth grade on time, as compared to a student who had a lower score. The importance of successfully passing the Ohio
Achievement Assessment for reading at the end of sixth grade reinforces the notion that reading is fundamental to learning in grades above fourth. With a good foundation in reading, the possibilities for success increase and on-time promotion to the tenth grade increases. Test scores on state achievement tests have been found to be a significant predictor of graduation; in particular, a large effect was found when performance on middle school state achievement tests of dropouts was compared to the same for graduates as noted in Chapter 2 (Alexander, Entwisle, & Kabbani, 2001).

In addition, a student with a math risk indicator, meaning they received a grade of a D or F from their sixth grade teacher, had decreased odds of on-time promotion to the tenth grade as compared to a student without a math risk indicator. It has been shown that course failure in math and reading is a strong predictor of later dropout and that dropouts could be identified based simply upon whether a child has failed two courses before ninth grade (Barrington & Hendricks, 2001; Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Cairns, Cairns, & Neckerman, 1989). The math risk indicator is the teacher’s perspective of a student’s knowledge of math. Proficiency in math is a foundational skill that will be needed for success in high school. In the ninth grade, math instruction turns to algebra and without the proper foundation in math from middle school, the more difficult topic of algebra can leave a child behind in math, preventing them from advancing to the tenth grade on time, if ever.

The two sociodemographic variables that significantly predicted on-time promotion were student’s disability status and socioeconomic status. A student with an Individual Education Plan (IEP) had increased odds of being promoted on time as compared to students without an IEP. This was an unexpected result and is discussed in
Many studies find low socioeconomic status to be predictive of dropout and this study found a similar outcome. A student with low socioeconomic status had decreased odds of making it on time to tenth grade as compared to a student with higher socioeconomic status. Many studies include socioeconomic status to predict dropout. Low socioeconomic status has been found to be a predictor of dropout and is often described as being one of the most important factors associated with dropout (Alexander, Entwisle, & Kabbani, 2001; Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Goldschmidt & Wang, 1999; Rumberger R., 1983; 1987; Rumberger & Lim, 2008).

Also based upon prior research, it was expected that gender and race might not significantly predict on-time promotion, which proved to be the case with this sample. In Rumberger and Lim’s (2008) meta-analysis they found less than half (46%) of the studies showed a significant relation between gender and dropout rates. Race has often been studied in relation to graduation, specifically comparing dropout rates between Blacks and Whites. In one meta-analysis (Rumberger & Lim, 2008) half of the studies show race had a significant relation to dropout rates between Blacks and Whites. Another study reported the proportion of Black students in the graduation sample was smaller than the Black students in their dropout sample, however the differences were very small (Chapter 2).

In addition, the literature is mixed on the impact of English language proficiency on dropout. The meta-analysis performed by Rumberger and Lim (2008) found five studies that analyzed the effect of English language proficiency on dropout. One of these studies determined that there was no significant effect (Driscoll A., 1999), one found
bilingual Hispanics had lower dropout rates than non-Hispanic whites (Lutz, 1999), and three studies found students with more English language proficiency had lower dropout rates (Griffin & Heidorn, 1996; Perreira, Harris, & Lee, 2006; Zsembik & Llanes, 1996). Based upon this research, Limited English Proficiency was not expected to significantly predict on time promotion to the tenth grade, which it did not significantly predict.

**Predicting On-time Promotion – Person-Centered**

The second major finding is that four reliable profiles of sixth graders were produced based upon attendance, behavior, core academics, and sociodemographics. The groups were labeled as Successful (64.9%), On Edge (21.7%), Fail Out (11.2%), and Pushed Out (2.2%). Unlike other studies, this analysis used all students in the sample, not just those who were not promoted on time to the tenth grade. Therefore, the profiles and percentages of population in each profile do not completely align with the study by Janosz and colleagues (2000). In addition, Janosz et al. used survey data to understand engagement of the students and included that information in the development of the profiles of students who dropout.

The Janosz study separated out those who graduated, which is similar to the Successful group from this analysis. As noted in Chapter 4, the On Edge group has characteristics in common with Janosz’s Disengaged and Quiet profiles, while Fail Out is similar to Janosz’s Low Achievers, and Pushed Out is akin to Janosz’s Maladjusted. The profiles from this sample are also similar to the categories created by Legters and Balfanz (Legters & Balfanz, 2010) based upon the student identified cause of dropout. Legters and Balfanz’s categories of Fail Out, due to course performance, and Pushed Out, due to multiple suspensions, are similar to the Fail Out and Pushed Out groups in this study.
Fade Out, from Legters and Balfanz, has some similarities to On Edge as both groups are doing reasonably well in school. There was no connection from this sample to Legters and Balfanz’s Fall Out category. The profiles from this sample are also similar to the categories identified in the study by Doll. Doll’s study classified students into three groups based upon the student-identified cause of drop out. Pushed Out, due to poor attendance and behavior, and Failing Out, due to lack of academic progress, are comparable to Pushed Out and Fail Out in this sample. Doll’s study also categorized students as being Pulled Out, which the current study did not produce.

Based upon this analysis, a person-centered approach provided insights that can be acted upon. As noted earlier, only one study of dropouts have employed a person-centered approach. The other studies that produce groups do so by categorizing the reasons for drop out. The person-centered approach provides an understanding of the holistic view of a student and creates groups of students with similar factors and outcomes. This view enables interventions to be targeted to a group of students. More often, administrators target a school that needs an intervention based upon a variable-centered approach. However, as seen in this study, school-level variables were not significant and, therefore, it suggests that this is not the most effective way to intervene. In order to provide the appropriate intervention, it is critical to know the groups of students likely to drop out requiring a person-centered approach. Applying the person-centered approach is more straightforward as you can target the children in need of intervention regardless of the school. Therefore, interventions can be easier to implement and monitor.
Profiles Associated with On-time Promotion

The third, and most important finding, is that the identified profiles were associated with on-time promotion to the tenth grade, which is a unique attribute of this study. Two of the studies cited earlier categorized students based upon their reason for drop out and did not include students who graduated (Doll, Eslami, & Walters, 2013; Legters & Balfanz, 2010). The person-centered study by Janosz, et al. (2001) also did not include students who graduated. This study included all students in an effort to determine to what extent a profile was associated with on-time promotion to the tenth grade.

The profiles enable identification of the potential for not on-time promotion as early as the end of sixth grade. Based upon this sample, the Fail Out and Pushed Out groups were more likely to not be promoted on time in comparison to the Successful and On Edge groups. If all the students within the Fail Out and Pushed Out groups received an intervention, that would be a total of 289 students or 13.4% of the population based upon this sample. However, 159 more children would receive an intervention than needed it, based upon this analysis. Conversely, none of the students within the Successful and On Edge group would be served, leaving 264 without an intervention, which could have prevented them from not making it on time to the tenth grade. This is an important finding as this information enables educators to locate and intervene on behalf of those that are likely to not be promoted on time. As noted earlier, intervening at the school level may not be productive based upon the analysis of this sample, therefore, having the information to know which students need an intervention is critical.
5.2 Unexpected Results

There were five unexpected results in this analysis. It was expected that all the ABCs – attendance, behavior, and core academic variables would significantly predict students’ on-time promotion to the tenth grade. However, only attendance, reading scores on the Ohio Achievement Assessment, and math risk indicator were significant predictors. It was also expected that between schools variance would be larger and that school structural characteristics would be significant.

The first unexpected finding was that behavior variables for any level of incidents and days missed due to suspension were not significant predictors of on-time promotion. This finding does not align with the literature on dropouts, which suggests that the more a student has behavior problems the more likely they are to dropout (Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Cairns, Cairns, & Neckerman, 1989; Janosz, Le Blanc, Boulerice, & Tremblay, 2000). As noted in Chapter 2, the operational definition of student behavior in these studies varies. Some use surveys to gather behavior information from principals and teachers (Cairns, Cairns, & Neckerman, 1989) or as self-reported (Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Janosz, Le Blanc, Boulerice, & Tremblay, 2000). Yet another operational definition is school misbehavior (Rumberger & Lim, 2008), which is the operational definition used in this study. In the meta-analysis by Rumberger and Lim (2008) they found misbehavior in middle school to be a predictor of high school dropout. The research also found suspensions to be positively correlated to dropout (Edmunds, et al., 2012). Similar to the inconsistent operational definition of behavior in the literature, these results could imply that behavior incidences and days of suspension are inconsistently
applied even though there is a district-wide guide to behavior identification and consequence (see the Appendix).

The second unexpected finding was that the reading risk indicator did not significantly predict on-time promotion, however, it was highly correlated with the math risk indicator. The expectation was that the risk indicators for math and reading would be inversely predictive of on-time promotion based upon the literature regarding course failure (Battin-Pearson, Newcomb, Abbott, Hill, Catalano, & Hawkins, 2000; Cairns, Cairns, & Neckerman, 1989). The risk indicators are based on the teachers’ grade and knowledge of the child thus making it a more accurate predictor of student outcome than the state assessment, which reflects how a student performed on one test on one day. It was anticipated that neither Ohio Achievement Assessment would be predictive, however, the reading Ohio Achievement Assessment was significant.

The third unexpected finding regarded two of the sociodemographic variables, retention and disability. While retention has been shown in the literature to be predictive of dropout (Alexander, Entwistle, & Horsey, 1997; Alexander, Entwisle, & Kabbani, 2001), it did not significantly predict on-time promotion. It is possible the method used to identify a student as retained was not refined enough to be predictive. Overage was used as the identifier for retention and to ensure retention was not over identified, any student two years overage for the cohort was flagged as retained. Thus only 13 students were identified as being retained which may have been understated for this sample and possibly too small, as it did not significantly predict on-time promotion.

For students with disabilities, it is counterintuitive that a student with a disability requiring an Individual Education Plan (IEP) would be more likely to get to the tenth
grade on time compared to students who do not have an IEP. The research of Reschly and Christenson (2006) found higher dropout rates for students with behavioral disorders and for students with learning disabilities as compared to students without disabilities. These students were identified by the parent and received one or more disability related service, which usually requires and Individual Education Plan. While another study found test scores and grades in high school mediated the effects of the disabilities (Powell & Steelman, 1993). It is possible that, for this sample, the IEP process worked; students were able to get the attention and intervention they needed in order to make it on time to the tenth grade.

The fourth unexpected finding was that there was not more variability between schools based upon dropout research. As noted earlier, the independent variables about the child are nested within sixth grade schools and the dependent variable of on-time promotion has the children renested in high schools (Chapter 4). Much of the research on dropout uses high school as the context, not middle school (Bryk & Thum, 1989; Rumberger & Lim, 2008; Rumberger & Palardy, 2005). For example, Rumberger and Palardy found drop-out rates varying by school from 2 to 22 percent in high schools (2005). The variance explained by this study actually fell between that range: the analysis using sixth grade schools found 3.4% of the variance could be explained between schools and the analysis using high schools found 16.8% of the variance could be explained between schools. A larger variance was expected between sixth grade schools because the range of means for not on-time promotion at was as low as 0% and as high as 42%. Based upon this range, it appeared there would be significant variation between these schools.
The fifth and final unexpected finding was that the effect of school structural characteristics such as enrollment, lottery, and grade configuration did not significantly predict on-time promotion. Some research on the impact of enrollment size on dropout has been performed at the high school level and determined the optimum size for a high school was between 600 and 900 students (Lee & Smith, 1997). However, other studies did not find school size related to school performance (Bryk & Thum, 1989; Finn & Voelkl, 1993; Lee & Burkam, 2003; Rumberger R., 1995; Rumberger & Palardy, 2005). The range enrollment for schools containing a sixth grade was 67 to 848 students in the building, not just sixth grade enrollment. The sample size of schools may have been too small to provide significance, with only 34 schools in this sample.

It was surprising that the effect of the school-level variable of lottery did not significantly predict on-time promotion as compared to neighborhood schools. Parents who send their children to lottery schools believe that their child will have higher academic outcomes, although there was no research found to confirm that belief. Parents have to take the initiative to apply for the lottery thus demonstrating their value of education. There are only seven lottery schools in this sample or 20.6%, making it possible there were too few.

It was also surprising that the effect of school-level variable of grade configuration did not significantly predict on-time promotion. Even though the literature is sparse regarding the impact of grade configuration, it was expected that the schools with fewer transitions would be significantly predict on-time promotion. Again, there may not have been enough variation in the sample to make a difference, as 61.7% of the
schools were configured as sixth through eighth grades, which produces the most transition points.

The research also indicates that effect school-level proportions of the ABCs and sociodemographic variables would significantly predict on-time promotion (Bryk & Raudenbush, 1988; Bryk & Thum, 1989; Finn & Voelkl, 1993; Goldschmidt & Wang, 1999; Lee & Burkam, 2003; Meyers, 1986; Rumberger R., 1995; Rumberger & Lim, 2008; Rumberger & Palardy, 2005; Rumberger & Thomas, 2000). However, none of the proportions significantly predicted on-time promotion including the student composition variable of socioeconomic status even though the proportion of children in poverty by school ranged from as low as 33% to 100% for this sample. This may be due to the fact there was only one school with less than 50% poverty concentration implying that the schools were more alike than different.

There are at least three explanations of why there was not more variance between schools: sample size, sample variation, and student mobility. The sample contained only 34 schools and some had missing data, as described earlier. The sample was taken entirely from one urban district, which could have reduced the school level variation. The impact of student mobility could also influence school variance. Students who change schools more often are less likely to have better educational outcomes and school change is often an indicator of other family issues such as homelessness or an unstable home environment. For children already at risk, school change only worsens their ability to learn (Community Research Partners, 2013; Rumberger & Lim, 2008).
5.3 Implications of Results

This study shows that identification of at-risk students is possible as early as sixth grade, providing an early-warning indicator of dropout. This offers an opportunity to spot students at risk and provide interventions well before they enter high school. By providing them with additional support it is possible that a portion of them can achieve on-time promotion to the tenth grade. Once students are identified, it is also important to use effective intervention strategies in an operationally efficient manner. Educators and social service agencies need to be able to employ intervention strategies that have been demonstrated to work and are cost effective. It is the activation of the interventions based upon the early-warning indicators that will make a difference in students’ lives. The outcome of this study is that interventions can happen early, using effective intervention strategies, in an operationally efficient manner.

Three established dropout prevention and intervention programs align well with the use of early-warning indicators. These programs tackle the needs of children based upon the child’s data, they keep students in school, help students’ progress in school, and raise graduation rates. The three programs have common elements and procedures: they use a diagnostic process to determine which students are at risk of dropout, they assign an adult advocate who targets interventions for the students at risk, they usually include the school, family, and community in the intervention, and they monitor the success of the student during and after the intervention. This multifaceted approach seems to be a successful model because it allows the child’s needs to dictate the intervention and does not rely on a “silver bullet”. Instead, this approach uses the talents from the school, family, and community-based organizations to help address children’s needs.
The prevention and intervention programs studied were drawn largely from the What Works Clearinghouse, a part of the Institute of Education Sciences within the U.S. Department of Education. The intent of the What Works Clearinghouse (WWC) is to provide “critical assessments of scientific evidence on the effectiveness of education programs, policies, and practices (referred to as ‘interventions’)” (What Works Clearinghouse, 2014, p. 1). This source was selected because the What Works Clearinghouse is a comprehensive and trusted source of programs that work in education and their standards for inclusion are rigorous and stringent. Check & Connect, ALAS, and Chicago Public Schools On-Track program all identify students for intervention based upon attendance, behavior, and core academics. These approaches focus on indicators that have the possibility of being improved and protect the child from unnecessary embarrassment of being selected because of their socioeconomic status.

Check & Connect (What Works Clearinghouse, 2006) is a dropout prevention program, which depends upon continually assessing a student’s performance in school and invokes support such as mentoring, case management, and others based on the observations of the assessments. The name is as it implies, the Check component is close monitoring of student progress indicators for attendance, behavior and academic success. The Connect component engages the staff to provide individualized interventions in conjunction with school personnel, community service providers, and family members as appropriate. The What Works Clearinghouse analysis found that Check & Connect had positive effects on students staying in school and had potentially positive effects on progressing in school. However, there were no discernible effects on completing school
within four years of entering the program and no indication of on-time promotion to the tenth grade.

ALAS, which is Spanish for wings, is a program providing intervention for middle and high school students specifically developed to tackle student, family, school, and community factors that affect dropout (What Works Clearinghouse, 2006). Every student has a counselor who watches attendance, behavior, and academic achievement. This counselor gives feedback to the student and manages interventions and provides resources to the students, teachers, and families. The What Works Clearinghouse analysis found ALAS had potentially positive effects on staying in school and potentially positive effects on progressing in school at the end of the intervention, which was ninth grade.

Chicago Public Schools implemented a prevention and intervention program, named On Track, to increase high school graduation (Allensworth E., 2013). It identified students who struggled in eighth grade with course performance and attendance and supported them in the summer prior to their freshman year to ease their transition to high school. After school started, administrators identified students who were at risk of failing a course in ninth grade and intervened to get them the resources needed to get back on track. Students who did fail a course in the first semester of their freshman year were provided the opportunity to recover their lost credit through other means. This prevention (in the summer) and intervention (during the school year) showed improvements in the on-track rate for freshmen in Chicago Public Schools from a baseline of 56 to 59% in 2004 to 2007 to 82% in 2013 (Bruce, Bridgeland, Fox, & Balfanz, 2011; Roderick, Kelley-Kemple, Johnson, & Beechum, 2014). The increase seen in the ninth grade held
through to graduation, with the first cohort having increased graduation rates by 13 percentage points (Roderick, Kelley-Kemple, Johnson, & Beechum, 2014).

Intervening in an operationally efficient manner is another important part of a successful graduation support effort. Prevention and intervention programs are costly and need to be affordable in order to be taken to scale. It is common to consider a tiered approach: whole school (universal intervention), individuals with risk factors which place them at higher than average likelihood of dropping out (selective interventions), and high-risk individuals (indicated interventions). Often a tiered approach uses school wide reforms to tackle 75% of the problems, then individually target 15 to 20% of the students who need additional supports, with five to 10% of the students receiving intensive support such as counseling (Balfanz, Herzog, & Mac Iver, 2007). Based upon the analysis from this study, an investment in school-based initiatives to improve attendance, academic achievement, and on-time promotion rates may be less effective than a person-centered approach.

The person-centered approached employed in this study enables the identification of groups of children for possible intervention. It is important to remember that early-warning indicators should be used as a screening device, the results of which would identify where to get more information. This approach also reduces the costs of prevention and intervention as they are targeted to those who need the services. As an example, from this study the Fail Out and Pushed Out groups should receive an intervention based upon their likelihood of not being promoted on time to the tenth grade. However, only 130 students from these two groups actually required the intervention. Meaning 159 students would receive an intervention that they did not really need.
Conversely, there are 147 students in the Successful group and 117 in the On Edge group that could benefit from an intervention that they would not receive. To address this, the profile should be used as a screening device and all 758 students from the On Edge, Fail Out, and Pushed Out groups should be interviewed and more information obtained to ensure the proper intervention is implemented for each child. This leaves 147 students from the Successful group that would not receive services who could have benefited from them. The good news is that the 147 students will likely display signs of coming off track to on-time promotion prior to the ninth grade leaving more time to catch these children.

5.4 Limitations

This study has limitations including the lack of contextual factors, the analysis of only one urban school district, and the cross-classified nature of the longitudinal data. The first limitation is that while this study has the benefit of using existing data collected about students in an education setting, it does not include contextual factors about the child both in school and out of school. There are many individual and institutional influences on a child’s development that were not included in this study. The individual characteristics that were not included in this analysis were: (a) student engagement; (b) delinquent behavior outside of school; (c) peer relationships; (d) students’ beliefs, values, and attitudes; and (e) mental and physical health (Rumberger & Lim, 2008). The institutional characteristics not included were related to family influences such as: (a) family structure, (b) family resources, and (c) family practices (Rumberger & Lim, 2008).

The second limitation is that this study included only one cohort in one school year in one urban district. Even though the selection of one urban district provided strengths, it did limit the perspective. It limited the differences between schools as this
study shows the schools in this district are more alike than not. While this sample could represent a typical cohort from Columbus City Schools, one cannot be certain until additional cohorts in other school years are analyzed. This analysis did not include any moderators or mediators for programs or changes in curriculum that occurred in the district at this time that could have affected the sixth grade class or these children’s experiences in ninth grade. Thus, these results cannot be generalized to other populations within Ohio or across the nation. The inclusion of charters, suburban, and rural school districts from across Ohio and other states might have provided more differentiation at the school level and should be studied.

The third limitation was the cross-classified nature of the longitudinal data and the difficulty to deal with it statistically. It is important that group membership within a school is accurately reflected in the analysis. If sixth grade schools’ variance is over or underestimated due to the wrong classification then the effect of school could be incorrectly attributed (Cafri, Hedeker, & Aarons, 2015). New models have been developed to handle this type of data such as cross-classified random-effects models (CCREM). The cumulative-effects model within CCREM would analyze the influence of the sixth grade school as well as the high school and should be the model considered for future analysis.

5.5 Conclusion

A students’ decision to dropout is the culmination of a long-term process; no single factor and no single event fully accounts for a student’s choice to leave school. In addition, students show signs of dropout long before they actually drop out. These signs are evident in their data; metaphorically, their data is raising a hand to ask for help. This
study attempted to find early-warning indicators of dropout by using sixth grade data to predict on-time promotion to the tenth grade. Predictive factors were found using a variable-centered approach and profiles associated with on-time promotion were also found using a person-centered approach. The variable-centered findings of this study support the research that attendance and core academics were significant. The person-centered approach is unique; in fact, almost all of the research on dropout categorizes students’ reasons for leaving school instead of performing latent profile analysis. The person-centered findings of this study found reliable profiles that can be acted upon as early as sixth grade to ensure on-time promotion to the tenth grade. This finding is critical to the implementation of early interventions and should be used as a screening device to further identify students’ specific needs and tailor appropriate interventions.

This study found that it is possible to identify risks early enough to intervene in order to get students on track to graduation. Earlier identification allows more time for effective intervention and is the main value of this study. It will be important to use these indicators and profiles in the manner in which they are intended – to identify children at risk, to determine the real issues facing the student based upon feedback from the student, then to develop an appropriate intervention for each child. There are early-warning indicators to dropout; the education community and those serving children need to recognize them and take action based upon them to ensure on-time promotion to the tenth grade.

Disclosure

It should be noted that Columbus City Schools was found guilty of excluding state test scores for students in the state report card for school years 2011, 2012, and 2013
This will not impact data collected for any of the school years, as the state test data was not changed in the data warehouse, where this data was collected. However, the Auditor of the State of Ohio found evidence of grade changing, which would affect data in the data warehouse. The Auditor of the State of Ohio found that “school building administrators engaged in improper change of grades that were given to students by the teachers. These changes were made to the quarterly grades and to the final grades of CCS students” (Auditor of State of Ohio, 2014, p. 29). Specifically, administrators were found to have “changed the student’s grade from an F to a passing grade” (Auditor of State of Ohio, 2014, p. 29). The auditor found “letter grade changes for all CCS high schools during school year 2010-2011 made by someone other than the students’ teachers” (Auditor of State of Ohio, 2014, pp. 29-30). This study does not use grades from the students’ high school experience; the only high school data used was tenth grade on-time promotion.
References


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Appendix: Behavior Descriptions

Excerpts from the Guide to Positive Student Behavior from Columbus City Schools

(Columbus City Schools, 2014)
## Level I Behaviors & Intervention Strategies

Multiple options for correcting student behavior may be selected depending on individual student needs including the age and grade level of the student, history of misbehavior, and seriousness of any specific offense.

<table>
<thead>
<tr>
<th>Expected Behavior</th>
<th>Violation of Expected Behavior</th>
<th>Definition of Violation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obey laws regarding smoking for minors</td>
<td>Use, Possession, Sale or Distribution of Tobacco Products</td>
<td>Using or possessing any tobacco product such as cigarettes, &quot; dipping tobacco&quot;, or electronic cigarettes.</td>
</tr>
<tr>
<td>Follow Distict Dress Code Policy</td>
<td>Dress Code Violation</td>
<td>Any style of dress that contradicts the District Dress Code Policy. (See pages 6-7) The Dress Code Policy is intended to prevent disruption of the classroom atmosphere, enhance classroom decorum, eliminate disturbances and minimize distractions of other students so as not to interfere with the educational process.</td>
</tr>
<tr>
<td>Consider the feelings of others</td>
<td>Disruptive Behavior</td>
<td>Conduct such as talking out of turn, making noises, throwing objects, play fighting, horseplay, inappropriate displays of affection or otherwise distracting one or more classmates in the school environment will be considered disruptive.</td>
</tr>
<tr>
<td>Obey classroom rules</td>
<td>Profanity</td>
<td>Swearing, cursing, or making obscene gestures.</td>
</tr>
<tr>
<td>Demonstrate positive social skills</td>
<td>Tardiness, Absenteeism, Truancy</td>
<td>Arrival to school after the school day has begun or absence from school or the classroom without a parent's and school authorities' knowledge. Truancy is defined as any unexcused absence.</td>
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<tr>
<td>Be at school on time and attend regularly</td>
<td>Gambling</td>
<td>Playing any games of chance or skill for money or items of value.</td>
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<tr>
<td>Tell the truth</td>
<td>Electronic Communication Devices</td>
<td>The misuse by students of pagers, beepers, cellular telephones, and other electronic devices such as iPods, MP3 players, tablets and including &quot;look alike&quot; devices for receiving and/or transmitting messages during school time. (The district shall not assume responsibility for devices that are damaged, lost or stolen when brought to school or after being confiscated or violation of this Board policy). Students may be permitted to use electronic devices for instructional purposes.</td>
</tr>
<tr>
<td>Follow school rules</td>
<td>Forgery/Fraud/False Identification</td>
<td>Withholding the name of another person or changing times, dates, grades, passes, or permits giving false information to school district personnel or a school resource officer.</td>
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</tbody>
</table>

### Menu of Strategies to Correct Behavior**

- **Positive practice of desired behavior**
- **Conference with student/parent**
- **Re-teach the behavioral expectations**
- **Create a behavioral contract with the student/parent that includes 3-5 behavioral goals for demonstrating expected behavior that will be monitored and revisited**
- **Student participates in a reflective activity and applies new learning**
- **Refer student to the Intervention Assistance Team for repeated behavior**
- **Out of School Suspension (OSS) is not permitted for TRUANCY or other ATTENDANCE related infractions.**
- **Detention during which student participates in behavioral intervention**
- **PEAK (elementary only)**
- **Time out outside of instructional time**
- **In-school suspension time during which student participates in behavioral intervention**
- **FALS**
- **Criminal charges may be filed**
- **Expulsion**
## Level II Behaviors & Intervention Strategies

Multiple options for correcting student behavior may be selected depending on individual student needs including the age and grade level of the student, history of misbehavior, and seriousness of any specific offense.

<table>
<thead>
<tr>
<th>Expected Behavior</th>
<th>Violation of Expected Behavior</th>
<th>Definition of Violation</th>
<th>Menu of Strategies to Correct Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be Safe</td>
<td>Fighting</td>
<td>Mutual participation in an incident involving physical conflict.</td>
<td>Conference with student/parent</td>
</tr>
<tr>
<td></td>
<td>Improper operation of a vehicle</td>
<td>Any action that violates state driving codes and traffic rules of student conduct within a public or in a private vehicle.</td>
<td>Create a behavior contract with the student/parent that includes 2-3 behavioral goals for demonstrating expected behaviors that will be monitored and revisited</td>
</tr>
<tr>
<td></td>
<td>School bus/School vehicle disruption</td>
<td>Conduct not specifically listed that obstructs the orderly and safe operation of buses/vehicles.</td>
<td>Restitution</td>
</tr>
<tr>
<td>Be Respectful</td>
<td>Sexual Misconduct</td>
<td>Any action or behavior that includes unacceptable touching or making references to their private body parts or those of another person verbally, pictorially or in writing, included in sexual misconduct are actions involving touching of a sexual nature, with or without consent of the other party and possession of inappropriate sexual materials. This includes &quot;sexting&quot; which is defined as sending, sharing, viewing or possessing pictures, text messages, e-mails or other material of a sexual nature in electronic or any form on a cell phone or other electronic device.</td>
<td>Require daily check-ins with designated staff or administration</td>
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<td></td>
<td>Bullying</td>
<td>Any act written or verbal, gestures, photographs, drawings or any other form of communication used to intimidate, harass or threaten harm to another person based on race, gender, sexual orientation, religion, disability, sexual orientation, violence within a dating relationship, or any other reason.</td>
<td>Refer student to the Intervention Assistance Team for repeated behaviors.</td>
</tr>
<tr>
<td></td>
<td>Harassment/Coercion</td>
<td>Any act of verbal or threat of physical harm to another person or of a person's property.</td>
<td>Detention during which student participates in behavioral intervention</td>
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<td></td>
<td>Insubordination</td>
<td>Behavior that substantially disrupts the orderly learning environment.</td>
<td>Link student with community agency</td>
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<td></td>
<td>Extortion</td>
<td>Getting money or a promise by using threat or force. Students must not make a promise to anything he or she does not want to do by using threat or force.</td>
<td>FALS or PEAK (Elementary Schools only)</td>
</tr>
<tr>
<td></td>
<td>Firearms Look-Alive</td>
<td>Possessing, transmitting, or using any item that resembles a firearm but does not have the explosive characteristics of a firearm but may use a spring loaded device or an air pressure by which to propel an object or substance (i.e., toy guns, cap guns, BB guns and pellet guns).</td>
<td>In-School Suspension time during which student participates in behavioral intervention</td>
</tr>
<tr>
<td>Be Responsible</td>
<td>Theft</td>
<td>Taking or stealing in taking another person's property without his/her permission.</td>
<td>Out of School Suspension with class work</td>
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<td></td>
<td>Vandalism</td>
<td>The intentional destruction or damage of property without permission.</td>
<td>Criminal charges may be filed</td>
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<td>Trespassing</td>
<td>The act of being on school property without permission or refusing to leave the premises or property.</td>
<td>Expulsion</td>
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<td></td>
<td>Cheating/Plagiarism</td>
<td>Using, submitting or attempting to obtain information or answers dishonestly. Taking ideas or writings of others and presenting them as if they were yours.</td>
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<td></td>
<td>Unauthorized or inappropriate use of internet, computers or computer software</td>
<td>Any action that violates local, state or federal law or CCS Acceptable Use Policy. This includes using the Internet for non-educational purposes, sending or receiving personal information about yourself or others without permission, using inappropriate language and using the network to personally attack or harass another person.</td>
<td></td>
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</tbody>
</table>
Level III Behaviors & Intervention Strategies

Multiple options for correcting student behavior may be selected depending on individual student needs including the age and grade level of the student, history of misbehavior, and seriousness of any specific offense.

<table>
<thead>
<tr>
<th>Expected Behavior</th>
<th>Violation of Expected Behavior</th>
<th>Definition of Violation (includes any repeated Level I or II Violation)</th>
<th>Menu of Strategies to Correct Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be Safe</td>
<td>Pay attention to health, nutrition and exercise</td>
<td>Possession, being under the influence of, buying, selling alcohol or illegal drugs. This also applies to any substance made to look like, or represented to be, illegal drugs or alcohol and any related paraphernalia. Students are permitted to bring prescription or over-the-counter medication to school with the written permission from a parent/guardian and with authorization and supervision of their doctor and school administrator or administrator's designee. A student may neither sell nor give prescribed OR over-the-counter medication to another student at school or during school activities.</td>
<td>Conference with student/parent, Loss of privilege.</td>
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<td></td>
<td>Resist negative pressure and avoid dangerous situations</td>
<td>Physically attacking another person. Unprovoked hitting, kicking, shoving or otherwise causing physical pain or harm to another outside the context of a mutual conflict is considered assault.</td>
<td>Participation in substance abuse counseling program.</td>
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<td></td>
<td>Place high importance on getting to know people of other cultural/ethnic groups</td>
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<td>Refer student to the Intervention Assistance Team.</td>
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<tr>
<td>Be Respectful</td>
<td>Practice conflict resolution and anger management skills</td>
<td>Possessing, transmitting or using any kind of firearm, knife, razor, needles, nunchaku, pepper gas or like substances; dangerous clubs, chain or other look-alike object; or any item that can be considered a weapon or used as a weapon or ammunition for any such weapon. This includes hiding such items at one’s desk, or in a locker or a hiding place on school property including district school buses/vehicles.</td>
<td>In-School Suspension time during which student participates in behavioral intervention.</td>
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<td></td>
<td>Use impulse control</td>
<td>Creating, setting off, attempting to set off or possessing any type of explosive device,</td>
<td>Out of School Suspension with class work.</td>
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<td>Be Responsible</td>
<td>Practice personal responsibility</td>
<td>Violent Act</td>
<td>Reinstatement.</td>
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<td>Arson</td>
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<td>False Fire Alarms/Bomb Threats/Tampering with Automated External Defibrillator (AED)</td>
<td>Expulsion.</td>
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<td>Sexual Offense</td>
<td>Criminal charges may be filed.</td>
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<td>Serious Bodily Injury</td>
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</table>
## Summary Menu of Strategies & Consequences

<table>
<thead>
<tr>
<th>OFFENSE</th>
<th>Parent Contact/Conference</th>
<th>School-Based Behavioral Intervention</th>
<th>Referral to Student Support Program Personnel</th>
<th>Time-Out PEAK (Elementary Only)</th>
<th>PALES</th>
<th>Detention</th>
<th>In-School Suspension</th>
<th>Out-of-School Suspension</th>
<th>IPASS</th>
<th>Expulsion</th>
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<td>Use, Possession, Sale or Distribution of Drugs other than Tobacco or Alcohol</td>
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<td>Use, Possession, Sale or Distribution of a Firearm</td>
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<tr>
<td>Use, Possession, Sale or Distribution of a Dangerous Weapon other than a Firearm, Explosive, Incendiary Device or Poison</td>
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<td>Use, Possession, Sale or Distribution of Explosive, Incendiary Device or Poison</td>
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