EXAMINING STUDENT LEVEL VARIABLES AS PREDICTORS FOR ON-TIME HIGH SCHOOL COHORT GRADUATION

by

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This dissertation was prepared under the direction of the candidate's dissertation advisor, Dr. Sabrina Sembiante, Department of Curriculum, Culture, and Educational Inquiry, and has been approved by the members of his supervisory committee. It was submitted to the faculty of the College of Education and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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ABSTRACT

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Recent literature on high school graduation and drop out have shifted the focus from identifying causes of drop out to identifying students who are at risk of dropping out. The Early Warning Systems (EWS) used to identify students seek to use existing data to predict which students have a greater risk of dropping out of school so that schools can intervene early enough to reengage students. Despite widespread attention to individual indicators, there is no defined system of indicators proven to be generalizable across grade levels, specifically at the elementary grade levels. Drawing on the tenets of Bronfenbrenner's (1979) Ecological Systems Theory, the purpose of this quantitative research study was to determine to what extent the State of Florida's EWS model can predict on-time cohort graduation in grades 3-8.

Using a retrospective longitudinal sample, this study first established that Allensworth and Easton's (2005) grade 9 on-track indicator was predictive of dropout, finding that 92.2% of students who were on-track in grade 9 graduated on time. Using this grade 9 indicator as a proxy for graduation, this study then examined the

effectiveness of the Florida EWS at predicting on-track status. Through this a priori link to graduation, this study was able to shed light on predictive indicators in the elementary and middle school years without the temporal distance between the predictor grade levels and graduation typically associated with longitudinal studies of this nature. The findings that the Florida EWS successfully predicted 71.6% of future on- and off-track status confirms its use as a predictive indicator of students at risk of not graduating. The academic, behavioral, and engagement indicators found in both Allensworth & Easton's (2005) grade 9 on-track indicator and the Florida EWS were found to successfully capture the molar activities of students within the school ecological system and were successful at providing an indication of a student's development in terms of being on track to graduate on time from high school.

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CHAPTER ONE: INTRODUCTION

The detrimental effects of dropping out of school have been well documented ranging from an increased rate of unemployment (Bureau of Labor Statistics, 2016), a greater likelihood of being incarcerated (Stark & Noel, 2015), and an increased propensity for health problems (Pleis, Ward, & Lucas, 2010). Dropping out is defined as the act of withdrawing from school prior to graduating and, despite widespread and long-standing attention to the issue, school dropout persists. Specifically, some national estimates show 1 in 5 students dropping out prior to high school graduation (Stark & Noel, 2015). Further complicating the graduation process, the reauthorization of ESEA renamed to *No Child Left Behind Act of 2001*, radically changed how schools measure student progress. This shift also ushered in an era of increasing reliance on high stakes testing, all while calling on the nation's schools to increase graduation rates to 90% by 2014, (No Child Left Behind Act, 2011), a goal our nation found itself woefully short of reaching. While its subsequent replacement legislation, *Every Student Succeeds Act*, largely reduced federal requirements, the increased expectations associated with obtaining a high school diploma remained, providing a new reason for dropping out that did not exist before (Suh & Suh, 2011). This has placed schools in an interesting quandary: increase the rigor of education while simultaneously increasing the graduation rate. Despite a large body of research on graduation and despite some reported overall

positive trends in the national graduation rate (e.g., Kena et al., 2016), dropping out of school is still an ongoing issue associated with a variety of negative short- and long-term consequences for a student (Bloom, 2010).

Statement of the Problem

While dropping out of school is the act of withdrawing prior to graduating, it is important to view the contextual nature of what it means for a student to drop out of school. Rumberger (2011) suggests dropping out is not only an event, whether it is the formal act of withdrawing or an informal withdrawal through nonattendance, but also a status (i.e., students can re-enroll after dropping out) as well as a process. This latter descriptor, the final act in a long-term process, is widely confirmed throughout the literature (Bowers, 2010; Rumberger & Larson, 1998; Schoeneberger, 2012). Therefore, to better understand the issue of school dropout, researchers are increasing their focus on early identification of students who are “at risk” or “off-track” from graduation through Early Warning Systems (EWS; Barry & Reschly, 2012). EWS aggregate multiple, evidence-based Early Warning Indicators (EWI) to support identification of students at risk of not graduating. The success of an EWS is predicated on the premise that behaviors and actions exhibited early in an academic career may ultimately lead to the decision to drop out and that these behaviors and actions can be used to identify those students at risk. Students who drop out often experience crisis points earlier in their academic career (Neild, Stoner-Eby, & Furstenberg, 2008) forming negative developmental pathways and trajectories that begin well before grade 9 (Kieffer, Marinell, & Neugebauer, 2014) and which may ultimately cause a student to drop out of school. This premise holds drop out

to be the final, culminating act of educational disengagement that begins long before a student ultimately decides to drop out.

Multiple studies have shown that one's propensity to leave school can indeed be predicted through the identification of those risk factors exhibited in middle and high school (Allensworth & Easton, 2005; Allensworth & Easton, 2007; Balfanz, Herzog, & MacIver, 2007; Janosz, Le Blanc, Boulerice, Tremblay, 2000; MacIver, 2010; Rumberger, 1995) and, while far less prevalent in the literature, even as early as first grade (Ensminger & Slusarcick, 1992). The impetus of early identification is amplified considering that the majority of school-based interventions target students during high school, a time at which the effectiveness of such interventions is debatable (Lehr, Hansen, Sinclair, & Christenson, 2003). Further, many studies focus on students who drop out during high school, missing significant numbers of students who drop out in middle school (Balfanz et al., 2007; Rumberger, 2011). Despite ample evidence affirming the need for early identification, it has been recently suggested that a significant proportion of students who drop out are simply reacting to a more proximal event and the cause of their dropout may be unidentifiable through existing methods that use longitudinal predictors (Dupéré et al., 2015). While the decision to dropout is widely regarded to be related to multiple factors (Allensworth, 2013; Bowers 2010; Janosz, et al., 2000; Lan & Lanthier, 2003), it is vital to examine not only which factors can predict graduation, but also when in a student's academic career those factors can predict their decision to drop out, even if those indicators occur in the months immediately preceding the withdrawal.

Additionally, there is yet to be agreement as to the purpose of an EWS. Specifically, some believe EWS should merely predict those off track while others feel it should not only predict, but triage students based on the predictive indicators that inform intervention. Those who believe EWS should only predict assert that the system's ability to identify students before they decide to drop out should be the "single most important goal" of an EWS (Carl, Richardson, Cheng, Kim, & Meyer, 2013). In their work with the Consortium on Chicago School Research (CCSR), Allensworth and Easton (2005) highlighted this purpose using an on-track indicator that successfully predicted 80% of future graduation events. This binary indicator was derived solely from two academic measures, the credits earned and courses failed at the end of a student's 9th grade year. This foundational study prompted a shift in the field from exploring wide-ranging causes of drop out (e.g. Mehan, 1992; Rumberger, 1995) to soliciting a simple, more easily collected, data-based indicator that could predict students on track for graduating as well as those at risk of dropping out. While the CCSR indicator was highly predictive and replicable (e.g., Hartman, Wilkins, Gregory, Gould, & D'Souza, 2011; Norbury et al., 2012), criticism for the indicator highlighted the exclusive focus on identifying students at risk at the expense of attending to the underlying reasons for the academic failure that led to dropout (Balfanz & Byrnes, 2010). Allensworth and Easton (2007) emphasized these points in a subsequent study noting, "the on-track indicator does not provide information precise enough to allow specific students to be targeted for specific interventions" (p. 6). As such, there is the suggestion that an EWS should go beyond simply identifying those at risk to also inform educators on appropriate and effective intervention practices (Baltimore Education Research Consortium [BERC], 2011; Barry

& Reschly, 2012). This is not to say that work on EWS ought to focus on causes of drop out, but rather, on the use of indicators that might serve the dual purpose of robustly predicting on-time graduation as well as describing why those students are at risk. Faced with increasingly limited resources, schools are often forced to select limited interventions which target a specific cause of drop out and these interventions have shown not to be useful when applied to all students who are at risk of dropping out regardless of the cause for concern (Bowers & Sprott, 2012). Considering that schools monitoring and addressing student behaviors through an EWS saw improvements in those indicators in comparison to schools that did not have an EWS (Allensworth, 2013), EWS can potentially predict future graduation status and provide educators with specific avenues to intervene.

Definition of Terms

The following list of definitions provides clarification for terms that are used throughout this study.

Early Warning Indicators (EWI). EWI are specific, quantifiable attitudes, behaviors, or characteristics that are routinely collected at schools and which have been determined by research to be good predictors of whether a student is likely to drop out of school (Heppen & Therriault, 2008).

Early Warning Systems (EWS). "A system based on student data to identify students who exhibit behavior or academic performance that puts them at risk of dropping out of school" (United States Department of Education [USDOE], 2016).

Florida EWS On-track Status. While researchers, organizations, and educational systems define on- and off-track status differently, this study used the Florida Department

of Education's (FLDOE) definition as outlined in state statute (Fla. Stat. ch. 1001, § 42, 2017) which indicates a student to be off-track if any of the following four indicators are exhibited:

1. Attendance less than 90% (excused or unexcused),
2. One or more suspensions (in-school or out-of-school),
3. Course failure in mathematics or English language arts (ELA) in any marking period,
4. A level 1 on the mathematics or ELA statewide assessment (out of 5 where 3 is proficient) or, for those students in kindergarten through grade 3 who do not take the statewide assessment, a substantial reading deficiency (which currently has not been articulated as to how this is to be measured).

It follows that a student is considered on-track with an attendance rate at or above 90%, no suspensions, no course failures in mathematics or ELA, and an achievement level of 2-5 on the mathematics and ELA statewide assessment.

CCSR On-track Status. While researchers, organizations, and educational systems define off-track status differently, this study used the on-track status articulated by Allensworth and Easton (2005) which indicates a student to be on-track at the end of grade 9 if both of the following indicators are met:

1. Earned enough credits for promotion to grade 10 (currently, in the State of Florida, this is 6 credits),
2. Did not fail any courses during the grade 9 school year.

Therefore, off-track would indicate that a student either did not have enough credits to be promoted to grade 10 or failed at least one course in grade 9.

On-time Cohort Graduation. A student is considered to have graduated on time with their cohort when they earn a regular high school diploma within four years of the first time they start grade 9 (National Center for Education Statistics, 2017).

Non-Graduation. Any student who does not graduate with a regular high school diploma within four years of the first time they start ninth grade. This includes students who transfer to adult education programs or a Department of Juvenile Justice facility or who receive a special diploma certification of completion, or a General Educational Development (GED) diploma, (FLDOE, 2017a).

High School. In the context of the U.S. and for the purposes of this study, high school represents grades 9, 10, 11, and 12 in which a student is typically 15, 16, 17, and 18 years old respectively.

Middle School. In the context of the U.S. and for the purposes of this study, middle school represents grades 6, 7, and 8 in which a student is typically 12, 13, and 14 years old respectively.

Elementary School. In the context of the U.S. and for the purposes of this study, elementary school represents grades kindergarten, 1, 2, 3, 4, and 5 in which a student is typically 6, 7, 8, 9, 10, and 11 years old respectively.

Purpose of the Study

While recent research has shown that the propensity to drop out of school can successfully be predicted using 9th grade student-level data (Allensworth & Easton, 2005), several researchers have shifted their focus to identifying middle school predictors

noting the end of 9th grade may be too late to intervene successfully (Carl et al., 2013). Researchers in Philadelphia and Baltimore, among others, have identified student-level behaviors exhibited in middle school to be highly predictive through large-scale, longitudinal studies (Balfanz, et al., 2007; BERC, 2011). These largely positive findings have helped shape policy in U.S. education as some states are now requiring middle schools to use EWS to identify students who are off-track. For example, the State of Florida has required schools to implement an EWS to identify grade 6-8 students who are off-track and implement interventions to reengage them before they drop out. However, despite little research examining the predictive nature of elementary indicators, policymakers are increasingly expanding EWS requirements to these grade levels. In the spring of 2017, the Florida Legislature amended the state statutes expanding the EWS to include kindergarten through grade 8 students (Fla. Stat. ch. 1001, § 42, 2017). As mentioned before, this system uses four EWI (attendance, suspension, course failures, and low achievement on the statewide assessments) of which any indicator would signify off-track status. Because the State of Florida has not articulated how to apply the final indicator, a "substantial reading deficiency", to students in kindergarten through grade 2 who are not administered the statewide assessment, this study focused only on the intermediate elementary grades of 3 - 5 in addition to the middle grades. As such, the purpose of this quantitative research study was to determine to what extent the State of Florida's EWS model can predict on-time cohort graduation in grades 3-8.

Significance of the Study

Education remains an integral mainstay to any successful society (Dewey, 1916). Unfortunately, despite an enormous collective effort by researchers, educators, and

community members, students drop out of school at alarming rates. Work on EWI, while relatively new, has shown promise in its ability to systematically and accurately categorize student behaviors and attitudes related to disengagement that can be used to predict future dropout events. There is evidence that schools can easily identify, through existing data sources, student behaviors indicative of disengagement early enough for evidence-based interventions to effectively re-engage students prior to the decision to drop out. However, many questions still remain.

Allensworth and Easton's (2005) work on EWS marked a distinct change within the area of school dropout research. Using readily available data, their research showed that a significant percent of future graduation events could be predicted with an easy-to-use on-track indicator at the end of grade 9. This type of research using student-level variables to signal on- or off-track status successfully predicting future graduation has been replicated in other settings (e.g., Hartman et al., 2011) and expanded to middle school (e.g., Balfanz et al., 2007). Other researchers have examined those students who dropout after grade 9 and who are not typically identified by an EWS (e.g., Dupéré et al., 2015). However, there is a noticeable dearth of research on indicators that remain or become relevant at the elementary level. Despite this gap in the literature, and the relative infancy of EWS research at the middle school grades, the State of Florida has expanded their middle school EWS to the elementary levels. While there is a plethora of research affirming the use of attendance, behavior, and course performance (the ABCs) as EWI's (MacIver, Balfanz, & Byrnes, 2009), there is also ample research downplaying the added predictive benefit of using standardized assessments in an EWS (e.g., Alexander, Entwisle, & Horsey, 1997; Allensworth & Easton, 2005; Kieffer et al., 2014; Norbury et

al., 2012). However, Florida state statute has required the inclusion of performance on the statewide, standardized assessment as one of the four EWI. Additionally, Florida's EWS utilizes the same threshold for each indicator across all grade levels, kindergarten through grade 8. Whether or not the 90% attendance threshold proves predictive at the middle school levels, it would be assumed a different threshold would be needed at the elementary grade levels where the locus of control lies more so with the parents/guardians than at the middle school level.

Therefore, this study adds to the growing body of research on EWS by determining if the EWI established by the State of Florida are predictive of graduation status and providing much-needed research on whether intermediate elementary (grades 3 – 5) indicators are predictive of dropout. Moreover, by linking the CCSR on-track indicator to graduation, this study was able to longitudinally link elementary level student indicators to graduation without the temporal distance typically associated with this kind of longitudinal study. This study accomplished this by testing whether an a priori link to graduation from elementary school to the first year of high school using the CCSR on-track indicator in grade 9 is probable similar to the methodological deign used by Kieffer and colleagues (2014). Typically, the temporal distance involved in linking grade 4 to graduation is eight years. Considering the ever-changing landscape of education, this becomes problematic. For example, eight years ago, the State of Florida's statewide assessment was called FCAT. Since then, this assessment has twice been replaced. Therefore, by linking grade 4 to a grade 9 on-track status, this study will reduce the temporal distance between examined student data and current grade level by almost half.

Finally, this study will inform policymakers on the effectiveness of mandating EWI with the same thresholds across elementary and middle school grade levels.

Research Questions

The following research questions guided this study:

1. To what extent does the CCSR on-track indicator (Allensworth & Easton, 2005) at the end of grade 9 predict on-time cohort graduation?
2. To what extent does the State of Florida's Early Warning System on-track indicator for grades 3 – 8 predict on-track status in grade 9?
3. Of the four indicators that comprise State of Florida's Early Warning System on-track indicator, which indicator would represent the most statistically significant predictor of grade 9 on-track status?
4. To what extent do status indicators such as previous retention, low socioeconomic status (SES), Students with Disabilities (SWD) designation, English Language Learner (ELL) designation, and race/ethnicity affect the predictive nature of the State of Florida's Early Warning System?

Null Hypotheses

H_o1: There is no relationship between on-track status and graduation

H_o2: There is no relationship between grades 3 – 8 on-track status and 9th grade on-track status.

H_o3: There will be no statistically significant difference in the predictability of on-track status for grade 9 between any of the four indicators.

H_o4: There will be no statistically significant difference in the predictability of Florida's Early Warning System between each of the status indicators.

Delimitations

This study has a few delimitations controlled by the researcher. This study involved a single, mid-sized, suburban school district in Florida. Students at private schools were excluded due to the potential unavailability and non-conformity of data. Finally, only student-level indicators were included in this study. While there is existing research highlighting the potential predictive relationship of school-level indicators, this researcher chose to focus primarily on student-level indicators as the State of Florida's EWS focuses only on student-level indicators. Finally, because the setting for the research study is in Florida and is assessing the Florida EWS, this study will focus on the predictive nature of the indicators defined through Florida statute. For example, this study will not seek to find the most predictive attendance indicator, but rather assess the extent to which the attendance indicator as defined by the Florida EWS is predictive or not. This could limit the generalizability of any results to school systems outside of Florida.

Limitations

This study had several limitations outside of the control of the researcher. Because Florida considers on-time graduation to be within four years of first-time ninth grade enrollment, students who drop out prior to ninth grade are not included within this study. Additionally, the district included in this study did not include data from other districts for students transferring into their district. Therefore, any student who transferred into the district that did not have the requisite data for analysis were excluded from this study. Finally, the historical data included was collected retrospectively. In 2015, the district transitioned their Student Information System (SIS) and during this process uncovered several issues of data integrity relating to the conversion of historic

data within the old system into the new system. Due to the historic nature of the data involved, there may be some instances of reported missing data despite great efforts made to rectify these issues.

Theoretical Framework

Urie Bronfenbrenner's (1979) Ecological Systems Theory (EST) is a theoretical framework of human development which asserts that an individual is shaped by the contextual influences stemming from the primary settings (microsystems) within which the individual is an active participant (e.g., family, school, or peer group) as well as the interactions between those primary settings (mesosystem) such as how familial norms influence an individual's experiences in school. This influence expands to those settings within which the individual is not an active participant (exosystem), such as the media or state educational policies, and the over-encompassing cultural influences (macrosystem), such as societal value on obtaining an education. Challenging the views at the time in developmental psychology, EST asserts that, "environmental events and conditions outside any immediate setting containing the person can have a profound influence on behavior and development within that setting," (Bronfenbrenner, 1979, p. 18) prompting researchers to consider the influence of even the most remote setting on individual development. Self admittedly, Bronfenbrenner continued to revise, extend, and even challenge portions of his early work through a series of articles and chapters published throughout his lifetime (Bronfenbrenner, 1989). Despite the constant state of development, themes originally developed in his 1979 work, *The Ecology of Human Development*, and stressed throughout his later writings offer theoretical credence to some of the major premises on which EWS research is built, decades before EWS were

conceptualized. This includes the use of student-level indicators as predictors of future graduation status that reflect influences across multiple systems as predictors of future graduation status, early detection of students who are at risk of not graduating, and the importance and application of studying transitional periods in a student's academic career. In the following section, I provide an overview of EST and an in-depth examination of how EST informs research on EWS.

Overview of EST

EST is often described as a nesting of ecological systems surrounding the individual similar to a matryoshka doll. Figure 1 displays a simplified, visual example of the various ecological systems surrounding the individual in concentric circles.

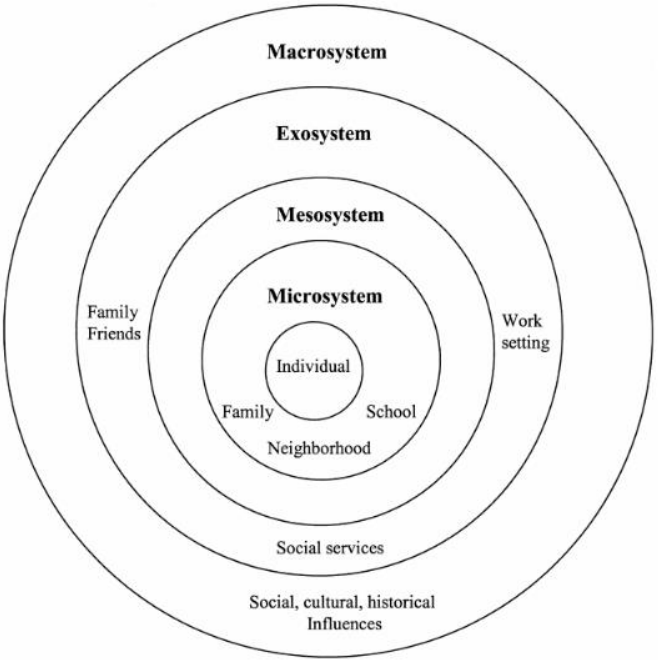

Figure 1: Ecological Systems Theory Model. Reprinted from "Psychosocial development in ethnically diverse youth: Conceptual and methodological challenges in the 21st century," (p. 753), by Swanson, D.P., Spencer, M.B., Harpalani, V., Dupree, D., Noll, E., 2003, *Development and Psychopathology, 15(3).* 743-771.

At the center of the model is the individual immediately surrounded by the microsystem, which are proximal settings within which an individual might find himself as an active participant such as the family, school, or peer group. The interrelations between these varying microsystems is defined through the next layer, the mesosystem. This system not only encompasses the transitions from one microsystem to the other, such as when a parent drops a child off at school, but also the underlying expectations, behaviors, and roles that an individual carries across each microsystem. For example, when a parent brings their child to the classroom on the first day of school (as opposed to the child entering alone), the positive relationship found in the family microsystem helps transition the child to the school microsystem benefiting the child developmentally. Surrounding the mesosystem is the exosystem which represents those settings in which the individual is not an active participant, but which influence the individual's development. Examples of exosystems include the media, the neighborhood the individual lives in, and the school system. It is important to highlight the differences between the microsystem and exosystem, particularly when similar settings are found within both. For example, the aspects of the school setting in which the student is an active participant would be labeled a microsystem when considering, for example, a student's relationships with teachers, interactions with the content, and the classroom culture and climate. However, when considering those influences where the individual is not primarily active, such as graduation requirements, overall school climate, or district rules, these aspects of the school system are characterized as an exosystem. The final layer surrounding the individual is the macrosystem which represents the larger cultural values and norms held

throughout the broader setting within which the individual lives such as the importance that U.S. culture places on obtaining a high school diploma.

Unfortunately, the simplified design illustrated in Figure 1 has the potential to limit the complexity of influence found within and across each of these systems on an individual's development. This model connotes a singularly focused influence for each of the systems found within the outer concentric circles on those found within. However, Bronfenbrenner stressed the importance of understanding the bidirectional influence of each system on individual development which is not particularly displayed in this model. For example, family dynamics have enormous influence on a child and should be considered when interpreting data. However, a child's development also influences those same family dynamics which simultaneously needs to be considered. Furthermore, each microsystem and exosystem might have widely different influences on an individual's development, both pushing and pulling in what may be, at times, opposite directions. For example, a school microsystem encouraging academic success through homework and projects completed outside of the school day may be in direct conflict with the family microsystem which may need the developing individual to watch younger siblings or obtain a part time job to help with family finances. Figure 2, on the other hand, offers the viewer a more complete display of the influences of each system on the individual.

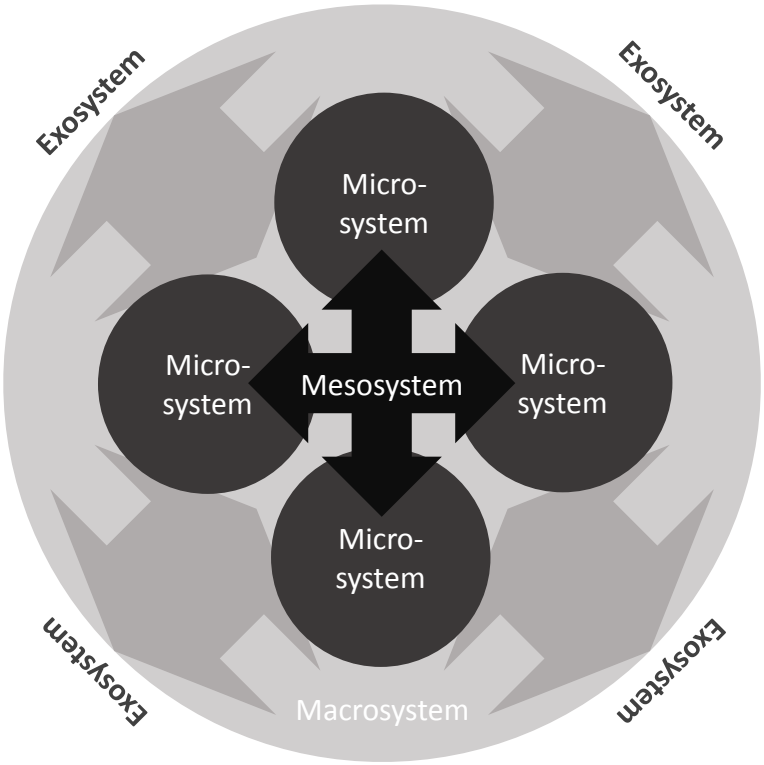

Figure 2: Bronfenbrenner's Ecological Systems Theory.

Molar Activities

One of the major facets of Bronfenbrenner's early work was a focus on what he termed, "molar activities", an intentional behavior or action exhibited within the microsystem. In terms of the school microsystem, molar activities could be exemplified in school attendance, positive relationships with peers and teachers, and the completion of homework and other academic tasks. He believed that an individual's development can be characterized by the breadth and depth of complexity of these molar activities stating, "the emerging structure and content of these relations and their developmental implications are thus of particular interest to us…" (Bronfenbrenner, 1979, p. 55). The more complex the molar activities within and across microsystems, the more developed the individual becomes. EST's use of molar activities as a gauge for development highlights the significance of focusing on student-level indicators when researching

EWS. For it is within these student-level indicators (molar activities) that EST suggests educators can gauge a student's risk of dropping out of school.

EST believes much of the complexity within molar activities can be attributed to dyadic relationships (individual plus one) in the primary microsystem, one of the most basic relational building blocks. In the school microsystem, this is best exemplified in research studies that show the relationship with the teacher to be one of the most important influences on a student's development (Burchinal, Peisner-Feinberg, Pianta, & Howes, 2002). However, the indirect influence of third parties, or what EST terms second-order effects, can also have profound influence on not only those dyadic relationships, but also on an individual's overall development (Bronfenbrenner, 1979). For example, a student being tutored might respond well to a teacher's individualized instruction. But when the presence of an overbearing parent is made known to the student, the same student who was previously relaxed and grasping content, may feel stressed and full of trepidation as he seeks the approval of the now-present parent. Even though the parent was not directly involved in the tutoring, they had an indirect influence on the dyadic relationship between the teacher and the student, inhibiting the student's development. Bronfenbrenner (1979) hypothesized that the developmental influence of a setting on an individual is directly related to the extent that positive relationships encourage that individual to engage in more complex, positive molar activities. Therefore, EST suggests it is vital that the student-level indicators used in an EWS represent those molar activities that most fully capture the entire sphere of influence.

Early Warning Indicators

The State of Florida requires schools to monitor student-level EWI in attendance, behavior (suspensions), and academic performance (course failures and performance on statewide assessments). These EWI represent molar activities that the student displays within the school microsystem and EST suggests the complexity (to what extent the student "performs" within each) is an indication of the student's development. However, as stated prior, it is vital these EWIs represent molar activities that encapsulates a wide variety of systemic influence to fully capture the students' propensity to persist with school until graduation. Below is an explanation of each EWI required by the State of Florida and the various influences from each system represented by each indicator.

Attendance. Attendance is defined by the molar activity of a student going to school. This EWI is expressed as a percent of days a student attends school and is triggered when a student does not attend at least 90% of the days enrolled. Examples of possible influences found at each system include:

- Microsystem: relationship(s) with teacher, engaging lessons and/or activities, instances of bullying, degree of success with academic tasks, health issues, school attendance initiatives,
- Mesosystem: familial value on the importance of regular attendance, parental involvement in transportation to and from school, peer pressure,
- Exosystem: impact of low SES, district attendance incentives, state disincentives to nonattendance such as an inability to apply for a driver's license,
- Macrosystem: societal values on school attendance, negative connotations for "skipping" or truancy.

Behavior. Behavior is defined by the molar activity of a student acting within the confines of the behavioral framework established or valued by the school culture. This EWI is triggered when a student acts in such a way that warrants an administrative punishment involving a suspension. Examples of influences found at each system include:

- Microsystem: degree of success with academic tasks (frustration and/or boredom leads to misbehavior), identifiable disabilities, engaging lessons and/or activities, available supports for behavioral and academic needs,
- Mesosystem: peer pressure, social standing within the peer group, parent teacher conferences, parental support and expectations,
- Exosystem: School discipline practices, positive behavior framework, state policy mandating suspension for certain behaviors (SESIR violations),
- Macrosystem: legal system, societal norms for behavior.

Academic performance. For the State of Florida, two measures define academic performance. The first measure captures the totality of molar activities a student engages in to earn a passing grade in mathematics and ELA. If a student fails either course, then the EWI is triggered. The second measure is defined by molar activity of a student's performance on the statewide assessment in mathematics and ELA. If a student does not demonstrate an understanding above an achievement level 1 through the assessment, the EWI is triggered. Examples of influences found at each system include:

- Microsystem: cognitive abilities, engaging lessons and/or activities, abilities of teacher to differentiate lessons to meet individual academic and behavioral needs, identifiable disabilities,

- Mesosystem: parental abilities and availability to tutor, community organizations providing academic after-school activities, school readiness, peer pressure,
- Exosystem: availability of school enrichment activities, school and district grading practices,
- Macrosystem: high stakes nature of test, use of assessments as evaluation tool for teachers, societal value on "working hard".

Early Detection

Central to the success of an EWS is the premise that students who are at-risk of not graduating can be identified through risk factors displayed earlier in their academic career. Since dropping out of school is the culminating event of a long period of disengagement, EWSs seek to identify the early stages of disengagement so that schools can effectively intervene well before that final act. Similarly, EST purports that an individual's development is expressed through the "substantive and structural complexity," (Bronfenbrenner, 1979, p. 55), of the actions and behaviors the individual displays within a microsystem. Further, those actions and behaviors that manifest within one microsystem will sustain over time throughout that microsystem and potentially other microsystems forming a developmental trajectory for the individual. This trajectory will increase in strength and scale over time across microsystems unless acted upon by a tempering influence found within one of the systems of influence on the individual. Figure 3 illustrates this principle in the context of an individual's disengagement from the microsystem of school. The y-axis represents the complexity of molar activities signaling disengagement from the educational system culminating in the act of dropping out of school. The initial placement on this scale of disengagement is largely dependent on the

influences of each setting on the student when entering school. Then, as the student develops over time, this initial level of disengagement within the school microsystem will increase in strength and scale to the point of potentially dropping out of school as influences found within and across systems solidify this developmental trajectory.

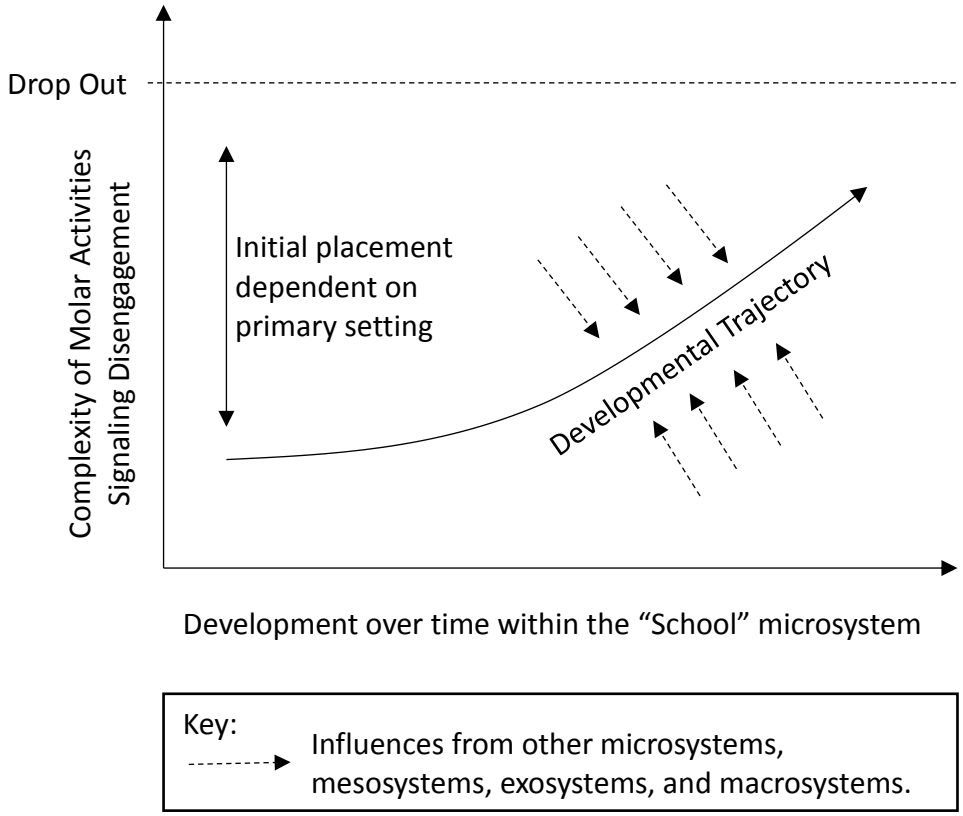

Figure 3: Developmental Trajectory

However, as Figure 4 illustrates, if schools can identify those students at-risk of dropping out early enough, interventions can be employed counteracting the negative trajectory decreasing the level of disengagement.

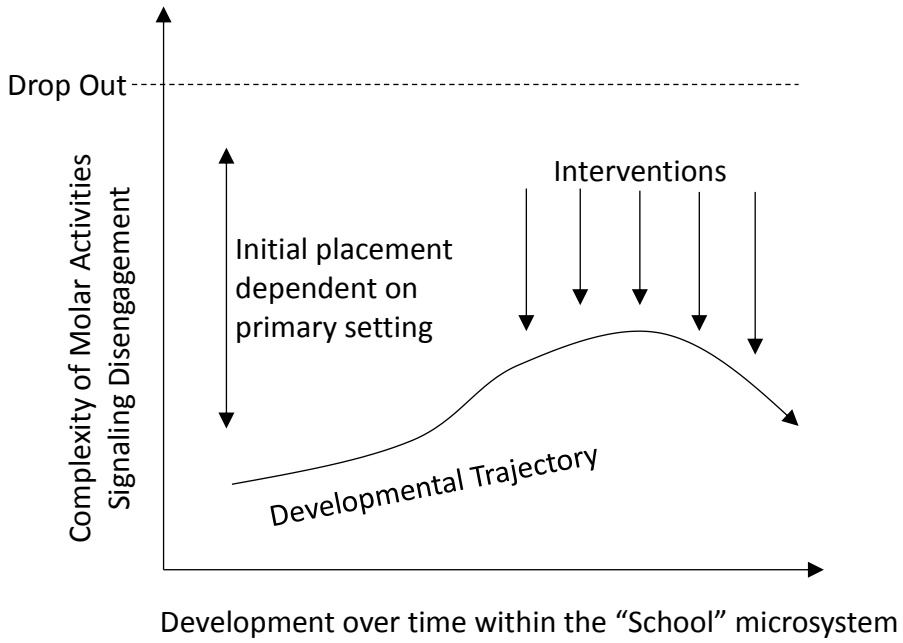

Figure 4: Developmental Trajectory with Interventions

EST suggests, therefore, the extent to which a school encourages positive molar activities that lead a student towards graduation (such as a culture that values regular school attendance and a clearly defined and articulated positive behavioral framework), the greater the influence that the second-order effect will have on positively impacting student graduation. Inversely, this facet of EST highlights the importance of examining educational practices that would negatively influence a student's development such as the unintended consequences of out-of-school suspension "pushing" a student out of school or interventions that punish noncompliance rather than reward positive compliance.

Transitions

In Bronfenbrenner's (1979) EST, he expressed his belief that patterns of behavior become distinct and varied when studied across different settings. Citing numerous research studies as evidence, he criticized the conclusions of studies performed solely in a laboratory setting and failed to interpret those conclusions through an ecological

perspective even when there was an attempt to control for the sterile environment. He believed this change in setting (i.e., laboratory instead of home, for example) had such a profound impact on behavior that could not be ignored when interpreting results. Thus, if EWS research is to fully capture the entire sphere of influence on a student, then it is important that the work be done in the contextual setting of the school. For example, research based on large administrative surveys may provide researchers with an easily accessible, nationally representative sample with longitudinal data. However, an ecological perspective on this sample would assume any conclusions drawn would not fully account for the influences that come from the surveys having been completed after the students has left the contextual influences of the school microsystem.

Furthermore, Bronfenbrenner purported that developmental changes are not likely to become obvious until the individual transitions from one setting to another as the individual adapts to the changing relationships, roles, and support structures in the new setting. The developmental changes evidenced through a transitional period are, perhaps, best exemplified in Allensworth's (2013) conclusion that academic difficulties in ninth grade were not a result of increased rigor, but from a decreased monitoring of student levels of engagement in high school. Students may have developed the desire to not complete homework (or other academic exercises) while in grade 8, but continued to engage in such activities due to the setting (smaller school size therefore increased relationships with staff). This desire, or change in development, did not manifest until the change of setting in grade 9 where, Allensworth concluded, high schools did not have the same level of relational control as the middle school exhibited. Moreover, middle school behaviors and attitudes may not be exhibited in the same manner or at the same threshold

as elementary. For example, considering attendance as a predictive indicator, as the locus of control moves from the parents to the child as the child progresses through school, underlying attitudes and beliefs about the importance of attending school may manifest. In other words, the child may not have wanted to go to school in third grade, but was brought to school by their parents. That same lack of desire, if still present in middle school, may manifest in measurable outcomes associated with non-attendance as the student exercises more control over his/her whereabouts. These outcomes associated with non-attendance will only increase in the high school years as access to transportation is more readily available and decreased parental oversight can be observed. Therefore, earlier detection of disengagement through attendance may not be able to be measured in the same manner or with the same thresholds as it is measured in high school Thus, EWS needs to capture the transition between grades, with more data on each transition point between grade levels (and data from earlier grades) providing more insight into the trajectory and its influences that may culminate in graduation or not. These transitional time periods and the accompanying developmental changes in an individual highlight the importance of early detection through EWS as disengagement becomes more evident.

Assumptions for This Study

It is important to note that while EST contains a large set of assumptions when seeking to explain the construct of human development, this study will not seek to address all of these assumptions. In focusing solely on the Florida EWS, this study will seek to understand how well this model can ascertain human development in terms of being on track to graduation. While EST proposes more influences than tested, this study

will seek to understand how well the indicators within the Florida EWS can capture the various ecological influences on a student within the school microsystem.

Overview of the Study

Chapter 2 provides a review of relevant literature related to EWIs including the composition of EWS, predictive student level indicators, transitional grade levels, the causes of dropout, and trends in methodological designs of similar studies. Chapter 3 details the methodology, research design, and procedures used within this study. Chapter 4 contains the findings and analyses of the data derived from the statistical methods used within this study. Finally, Chapter 5 presents a discussion of the findings and implications for further research.

CHAPTER 2: LITERATURE REVIEW

An extensive search of existing literature was performed to address the purposes of this study. Educational databases such as ERIC (EBSCO), JSTOR, and SAGE were used, as well as SearchWise, a meta-search database serviced by Florida Atlantic University. Search terms used in these databases included *early warning systems, early warning indicators, dropout, dropout prevention, high school graduation, on-time graduation, at risk, on-track status, off-track status*, as well as Boolean combinations of these terms. The following inclusion criteria were developed to determine which articles to include in this literature review. Articles were included if they: (a) Were peer reviewed and/or published by a relevant research organization and the article has been widely accepted by the research community (as evidenced by the study having been cited in other peer-reviewed articles); (b) Involved a quantitative, qualitative, or mixed methods research study; (c) Included a representative study sample of students in elementary, middle, or high school (non-compulsory school-aged student sample studies were excluded); and, (d) Sought to link student-level variables to high-school graduation or dropout prior to graduating.

Inclusion of non-peer reviewed articles occurred only after a detailed, discriminatory process to ensure the inclusion would add to the overall understanding of the research statement. Due to the relative infancy of EWS research, as well as the plethora of quality research produced by widely-cited authors working for organizations

such as the Baltimore Education Research Consortium (BERC), Consortium on Chicago School Research (CCSR), or the National Center for Education Evaluation and Regional Assistance, the exclusion of these articles would adversely impact the characterization of existing literature within this review. For example, Allensworth and Easton's (2005) work establishing a ninth grade on-track indicator, has been widely accepted by the research community as a seminal study in Early Warning Systems (EWS) and marked a distinct change in how the literature sought to tie individual-level characteristics to graduation and dropout. However, this article was published through the CCSR and not through a traditional, peer-reviewed journal. For the purposes of the current study, a relevant research organization is defined as one that engages in research germane to the understanding of high school graduation and/or early warning indicators (EWI).

The second criterion enlisted is the inclusion of those research studies employing quantitative, qualitative, or mixed methods which are aimed to create a body of primary-source, research-based studies. This criterion ensured the results of this literature review were based on data obtained through replicable means and added to the overall generalizability of this study.

The third criterion sought to include only those studies using samples of students in elementary, middle, and high school grades. The exclusion of pre-school aged and younger children was purposeful on three accounts:

1. The age of the child changes the construct of how that child interacts with authority and, at these ages, the child has little-to-no locus of control, adversely affecting the comparability to other studies involving students in elementary, middle, and high schools included within this review.

2. Schooling and/or educational programs at these ages are largely non-compulsory introducing a bias that may limit the comparison of results.
3. While this literature review openly sought to examine if any student-level variables could predict on-time cohort graduation, only those variables in which specifically elementary, middle, and high school educators (Kindergarten – 12th grade) had the potential to intervene were included.

The fourth and final criterion sought to include those studies that linked student-level variables to on-time cohort graduation and/or drop out status prior to on-time cohort graduation. This critical literature review only examines student-level variables that were predictive of on-time graduation. Therefore, studies that investigated the impact of a specific intervention were excluded due to the inability for schools to easily replicate that intervention. Additionally, studies that sought to describe school-level characteristics that led to higher gradation and/or dropout rates in isolation were excluded as they were outside of the focus of this review.

After performing the searches and applying the exclusion criteria detailed above, a textual population of 37 studies were identified. Boote and Beile's (2005) Literature Review Scoring Rubric, a foundational method for reviewing literature reviews, was used as a framework for examining this textual population. Using a constant comparative method for analysis, each study was examined for its contribution to the ten criteria identified by Boote and Beile. Areas specifically examined include how each study distinguished what has been done in the field and what needs to be done, explained the broader scholarly context, explained the field's historical context, defined relevant vocabulary, detailed relevant variables, identified central methodologies, related theories

to methodology, detailed the practical relevance of the research, detailed the scholarly relevance of the research, and described any results relevant to this literature review. After assembling each of the study's contributions within each criterion, broad themes and subthemes were developed for insight into which student-level indicators can predict graduation and potentially prevent drop out from occurring and are detailed below.

Synthesis of Literature Review

This section provides a thematic synthesis of the student-level variables that can be used to predict on-time cohort graduation as well as how those variables are most effectively utilized in an Early Warning System to aid educators in the prevention of dropout. First, the methodology of the examined studies is synthesized to provide a context from which the results are discussed. Next, I discuss the need for a systematic, data-based method for gathering relevant data, identifying students, and monitoring performance synthesized from the literature. While many indicators are predictive, and will be discussed in detail within the latter section, none of them fully capture or detail the reasons why students drop out and it is in the penultimate section this is discussed. Finally, I examine specific student-level indicators such as attendance, behavior, academic performance, and retention for their ability to predict graduation.

Trends in Methodological Design

Throughout the examined literature, methodology generally remained consistent. However, there were some variations in key definitions, data sources, and statistical analysis methods. These are detailed below.

Definitions found within the literature. Key definitions for graduation, drop out, and non-graduation varied slightly from study to study. On the surface, the decision

to stay in school until graduation or leave before graduation appears to be a binary decision. However, not every student who stays in school earns a standard diploma, with other options available such as a General Education Diploma (GED) earned through an adult education facility, a special diploma (a diploma option given to students with disabilities who are not able to meet the requirements for a standard diploma), or a vocational certification. Additionally, students who leave school prior to earning a diploma could be the result of a conscious decision to no longer attend school (i.e., drop out) or a move to a different school. The latter may appear as a negative result to researchers if the transfer is not recorded even if the student eventually earns a diploma in the new system. Mobility from school to school is particularly prevalent amongst students of low socioeconomic status, a subgroup particularly affected by drop out, and is therefore an important consideration in EWS research.

On-time graduation was generally defined as a student earning a standard diploma four years after they first enroll as a ninth grader (Allensworth & Easton, 2005; Hartman et al., 2011; Kieffer et al., 2014; Norbury et al., 2012). However, some variations on this definition existed. Balfanz and colleagues (2007) also considered students who graduated within one year as a positive outcome. Because of data constraints, Parr and Bonitz (2015) included students in their sample who were attending school four years after the initial ninth grade survey was administered as graduates.

Dropout definitions varied far more and are generally considered to be under contention (Bowers, 2010). The general definition of "dropout" centered around students who started high school but did not earn a diploma or GED (Barry & Reschly, 2012; Plunk, Tate, Bierut, & Grucza, 2014). Students who transferred to another school or

whose whereabouts were unknown were handled differently. Some researchers considered transfers as non-graduates (Balfanz et al., 2007; Parr & Bonitz. 2015) whereas others considered a student as having dropped out only upon their transferal from the district with no given reason (Neild et al., 2008). Still, others separated transfers altogether from dropouts (Bowers, 2010; MacIver & Messel, 2013). Regardless of these nuances, there is the potential of missing significant numbers of dropouts if an analysis starts with high school students as those who dropout before enrolling in ninth grade would never be included (Ensminger & Slusarcick, 1992).

While definitions varied (mostly due to constraints of available data), definitions for graduates and non-graduates were mostly uniform. Any adverse bias obtained by the inclusion of additional groups within either of these definitions was generally mitigated by the researchers' generalizing both as "good" or "bad" outcomes. For example, the labeling and inclusion of those students as dropouts for whom the graduation status is unknown most likely captures their actual outcome since the awarding of a diploma is generally tracked by the school system. Regardless, with the widely adopted Federal Graduation Rate and its definition of students who do and do not graduate or drop out, researchers would be wise to adopt these definitions to strengthen the bridge between research and practice.

Data sources. The data examined by researchers generally came from one of three sources and the statistical methods used to evaluate the data tended to align with how the data was obtained. Some researchers obtained data through existing district data systems (e.g., Allensworth & Easton, 2007; Balfanz, et al., 2007; BERC, 2011; MacIver, 2010) or through large, national administrative surveys (e.g., Bowers & Sprott, 2012;

Carpenter & Ramirez, 2007; Lan & Lanthier, 2003, Rumberger, 1995; Suh & Suh, 2007). Fewer studies obtained data through administering surveys to students (e.g., Neild, et al., 2008).

While the large, administrative surveys can provide more generalizable results due to the national sampling used, there are issues inherent with the surveys that limit the generalizability of its results. The information garnered from these surveys is not always transferable to local contexts. Schools cannot always replicate the survey questions easily or in a timely manner which minimizes the usefulness of the results in an EWS. Even when the findings do reveal a predictive indicator, the results do not always provide actionable data on malleable indicators (Schoeneberger, 2012) leaving districts with an interesting descriptor, but no specific plan to address the behavior. Furthermore, the use of generic surveys can potentially force a researcher to interpret results based on incomplete data if the survey questions do not capture the issues or characteristics pertinent to the context. For example, Parr and Bonitz (2015) defined students who were in school two years after the initial 10th grade survey as “completers”. This interpretation stemmed largely from the survey’s limitations and does not fully characterize those students as graduates. Finally, researchers who rely on these surveys must account for the significant numbers of students who leave the study prior to the concluding survey (Rumberger, 2011). While large national surveys can provide a nationally representative sample as well as ease the resources needed by researchers, results should be interpreted with an eye for indicators that are easily replicable for schools and which provide information that may inform effective interventions.

Moreover, in determining samples of students to evaluate, most studies examined a single cohort of students (e.g., a group of students who are educated at the same period of time (students who were first-time ninth graders during the 2015-16 school year) or compared a single year's performance to graduation (Carpenter & Ramirez, 2007; Lan & Lanthier, 2003; Neild et al., 2008; Rumberger & Larson, 1998). Only three studies' samples examined more than two cohorts (Kemple, Segeritz, & Stephenson, 2013; Kieffer et al., 2014; Schoeneberger, 2012). Limiting the sample to a single cohort of students reduces generalizability of results to that time period and also eliminates the possibility of evaluating the changes in variables over time.

Statistical methods. The statistical methods employed were generally consistent across the studies. Binary logistic regression was used predominantly throughout the literature (MacIver & Messel, 2013; Rumberger 1995; Suh & Suh, 2007). This quantitative method is used to explain the relationship between a binary dependent variable, such as whether or not a student graduates on time, and one or more independent variables, such as attendance rate, number of course failures, and/or socioeconomic status. The nature of examining the predictability of EWI lends itself towards this method as multiple indicators can be examined at once. However, completion status is not necessarily a dichotomous output, as aforementioned, which may introduce a bias to the results. Despite the reliance on logistic regression, there were significant alternatives within the literature (e.g., risk analysis, latent growth modeling, hierarchal regression analysis) to examine the relationships between student actions and behavior with graduation through a variety of statistical lenses. However, the prevalence of quantitative methods reveals a potential shortfall in the existing body of research

brought to question by a large number of the examined studies – why do students drop out? Qualitative approaches to addressing this question were noticeably missing from this area of research and, if included, may help inform further research on predictors of dropping out.

Drawing from the constructivist perspective, qualitative research focuses on how people find meaning in a phenomenon (Merriam, 2015). Researchers can uncover a broader picture of the disengagement process that leads to drop out by incorporating qualitative design methods into existing and future studies. In examining data through a qualitative research design, the how and why of drop out can be explored in-depth, leaving researchers with potentially qualified hypotheses that can then be tested empirically through quantitative methods. This is not to suggest literature on EWS should focus on causes of dropout, but rather, that formulating a greater understanding of why students drop out may aid researchers in selecting appropriate predictive indicators to include in an EWS. It is vital, however, for these qualitative findings to be paired with quantitative methods. As Dupréré and colleagues (2015) point out:

> Another major limitation of these [interview-based studies of dropouts] is the absence of credible comparison groups of students who do not drop out but are otherwise similar to students who do. The lack of a basis for comparison means that it is difficult to discern the events described by dropouts that are important from those that are not. For instance, many dropouts may report experiencing a family transition not long before dropping out but such transitions may be just as common among similar students who remain in school. Without an appropriate comparison group, these issues cannot be sorted out. (p. 601)

Therefore, the use of mixed-methods research designs in future studies provides an important, largely unexplored avenue for the field of predictive EWI while also enhancing the understanding of how those predictors link to the decision to drop out.

Composition of Early Warning Systems

Utilizing the stringent *What Works Clearinghouse* standards of evidence and effects, Dynarski and colleagues (2008) detailed six evidence-based recommendations on preventing students from dropping out in their seminal practice guide of policies and practices for dropout prevention. The first recommendation called on schools to utilize data systems to identify those students who might dropout as a critical first step in addressing this issue. While outside of the examined textual canon of this literature review, Dynarski and colleagues' (2008) recommendation supports the notion found throughout the examined studies that there is a need for a systematic method of identifying students who might drop out. Noting the individual significance of varying predictive indicators, Allensworth and Easton (2007) advised school systems to develop a data-based monitoring system, or EWS, that would track student- and school-level indicators throughout the school year. These indicators could then be used to cluster students with characteristics of high risk behavior (Schoeneberger, 2012), allowing for a predictive model to be developed and systematically monitored (Barry & Reschly, 2012). Therefore, only through the development and use of an EWS is existing data catalogued in such a way as to offer predictive indications of dropping out.

Indicators must provide timely data. An EWS must accurately identify those "at risk" or "off track" early enough for schools to intervene. The model's ability to identify students before they decide to drop out should be the "single most important

goal" of an EWS (Carl, et al., 2013) because if students can be identified early enough, effective and efficient intervention programs may be developed and implemented (Norbury, et al., 2012). While Allensworth and Easton's (2005) on-track indicator work through the CCSR has been proven to be predictive of later drop out, the criticism directed towards their work has focused on the timing of the indicator. As Carl and colleagues (2013) point out, waiting until the end of ninth grade, as the on-track indicator requires, may be too late to effectively intervene. Despite a lack of research on the persistence of "off-track" status among students as they progress through their school, there is an implied need among the literature to examine indicators early enough to alter the path to drop out. Therefore, schools must pay particular attention to actions and behaviors exhibited during the middle school grades, prior to the ninth-grade transition (Balfanz et al., 2007; Bowers, 2010; MacIver & Messel, 2013). Some researchers have even argued for an earlier examination of off-track status, such as when students are in 4th grade (Kieffer et al., 2014). Other researchers have even suggested examining predictors of student drop out even prior to when students exhibit one or no risk factors (Suh & Suh, 2007). Regardless of the exact timing of the indicators, for an EWS to be an effective tool to ameliorate dropout, it must not only accurately predict students at risk of dropping out but it must do so early enough for schools to intervene and re-engage students. The risk of not doing so could result in the creation of a novel tool that may offer no real use or practical benefit.

As aforementioned, recent research suggests that a large proportion of students who drop out of school do so as a reaction to proximal events and may not be identified through longitudinal studies that examine distal factors to predict dropout (Bowers &

Sprott, 2012; Dupéré et al., 2015). However, early detection of distal risk factors does not preclude the need for secondary prediction utilizing more proximal risk factors. Early detection through an EWS and monitoring of proximal events that cause drop out are not mutually exclusive and may actually be more directly related than previously thought. As Beekhoven & Dekkers (2005) suggest, a single event generally provides the impetus to drop out but the impact is largely dependent "on the background against which it occurs" (p. 211). That is to suggest that students who drop out as a result of a proximal event may have shown signs of disengagement prior to the event that may have been captured through an EWS. Furthermore, qualitative approaches can be used to collect ethnographic or phenomenological data to support and explain potential proximal causes of dropout. However, these studies suffer from the inability to compare those causes with those students who also experience the same "cause" but persist to graduation. As Dupéré and colleagues (2015) state, "many dropouts may report experiencing a family transition not long before dropping out but such transitions may be just as common among similar students who remain in school," (p. 601). Therefore, further research utilizing mixed methods is needed that examines the connection between proven distal risk factors and students who drop out as a result of proximal events to determine if existing EWS can predict larger proportions of students who drop out.

Contexts of data. There are a variety of data sources that schools can use within an EWS. In Rumberger's (2011) comprehensive work examining dropout, he classified the potentially predictive student-level indicators into four contexts: educational performance, behaviors, attitudes, and background. While indicators can be individually placed into these contexts, it is important for schools to explore and monitor multiple

contexts concurrently through an EWS to determine how students develop within and across each of these contexts (Alexander, et al., 1997). For example, educational performance is not only related to a student's cognitive ability, but also to their relationships with their family and teachers (Ensminger & Slusarcick, 1992). Students who drop out display heterogeneous characteristics (Bloom, 2010) and effective EWS should use indicators from multiple domains.

While the literature might show predictive indicators across multiple contexts, researchers are now showing a propensity to focus on those drop out indicators related to changeable or "malleable" attitudes and behaviors that can be influenced through interventions (Gaertner & McClarty, 2015; MacIver & Messel, 2013; Parr & Bonitz, 2015). While drop out prediction is vital for the success of an EWS, EWI relating to changeable attitudes and behaviors can lead educators to those behaviors that would be directly targeted for interventions. For example, Lee, Cornell, Gregory, and Fan (2011) examined 289 schools in Virginia and found that those schools that suspend a higher proportion of students have a higher rate of dropout. The results suggest that schools should monitor antecedent behaviors, such as bullying and aggression, that would lead a student to receive a suspension. By alerting school leaders to these behaviors, interventions can be effectively implemented prior to the event that causes a suspension, while allowing schools to proactively reduce out-of-school suspension, and in turn, the drop out problem. Additionally, course performance is directly related to how often a student is in class. When schools are alerted to student absence, an antecedent behavior to poor course performance, they can intervene to improve attendance, which is likely to

increase course performance and result in increased graduation rates (Gwynne, Lesnick, Hart, & Allensworth, 2009).

On-track indicator. The use of an on-track indicator as part of an EWS has been shown to predict dropout, both accurately and easily, using existing data sources that are readily available to schools. An "on-track indicator" is generally seen as a binary measure (i.e., on- and off-track) utilizing several measures to determine a student's status (i.e., whether a student is considered "on-track" or "off-track"). The CCSR introduced an on-track indicator in the early 2000s based on the number of course failures and credits earned in ninth grade, which successfully predicted 80% of future graduation events (Allensworth & Easton, 2005). The CCSR on-track indicator has been replicated with success in other school systems (Carl et al., 2013; Hartman, et al., 2011; Norbury et al., 2012), with English language learners (ELL; Gwynne, Pareja, Ehrilich, & Allensworth, 2012), and with students with disabilities (Gwynne et al., 2009). Using a similar on-track indicator based on credits earned in ninth grade and the successful passing of a New York Regents exam, Kemple and colleagues (2013) found significantly higher graduation rates among those students who were on-track as compared to those who were off-track in ninth grade. Furthermore, researchers have shown this kind of indicator can even predict dropout using data from as early as sixth grade. Using four indicators (i.e., attendance less than 80%, course failure in math, course failure in English, receiving an out-of-school suspension) to determine on-track status at the end of sixth grade, 60% of future dropouts were identified as being off-track (Balfanz et al., 2007). Similar findings showed 70.8% of dropouts were off-track in sixth grade based on four indicators: chronic absenteeism (missing more than 20 days of school), course failure in either math or

English, being one-year overage (indicator of an earlier retention), and out-of-school suspension for three or more days (BERC, 2011). While individual indicators might paint a broader picture of the student who drops out, utilizing multiple indicators to form a simple on-track indicator will provide schools with an easy-to-use alert of those needing further attention and intervention.

Predictive Student-Level Indicators

After examining the textual canon included for this study, several indicators were routinely proven or disproven as predictive of dropout. Attendance, behavior, and academic performance were largely found as predictive as well as malleable throughout the literature. Retention and socioeconomic status, while not malleable, was also seen as predictive. State test scores and a student's race and ethnicity were shown to either be not predictive, or mitigated by one of the previously mentioned indicators. Finally, student attitudes and perceptions were found to be predictive. However, specific measures varied greatly and were shown to be difficult for schools to replicate systematically. Below is a summary and synthesis of those indicators.

Attendance. Attendance is a statistically significant predictor of dropout (MacIver, 2010; Suh & Suh, 2007). Defined consistently throughout the literature as the number (or percent) of days present (or absent), thresholds for establishing a chronic absenteeism problem varied from as low as 90% present (e.g., Balfanz et al., 2007) to as high as 20 days absent (approximately 80%; e.g., MacIver, 2010). Some studies used student attendance as a continuous variable expressed as a percent of days present or number of days absent (e.g., Allensworth & Easton, 2007). While poor attendance does not specifically cause a student to dropout, it signals a symptom of larger issues that may

lead to dropout and should be monitored and intervened upon to help prevent subsequent dropout (Schoeneberger, 2012). Results from a study of student dropout in Baltimore, associated dropping out with a gradual process of disengagement from school. Nearly nine in ten of those students who dropped out were chronically absent (i.e., missed more than 20 days) in their final year of school and more than half (53.5%) of the students who dropped out missed more than 20 days in each of the three years prior to dropping out (MacIver, 2010). Similar findings tying later attendance problems to drop out were revealed in a study examining longitudinal student data, spanning first through twelfth grade, in a large urban school district (Schoenberger, 2012). This study grouped students into one of four categories depending on when in their academic career they exhibited poor attendance: constant attendees, early truants, developing truants, or chronic truants. Results showed that developing truants (i.e., those exhibiting poor attendance later in their academic career) had the highest dropout rate among the four groups, dropping out more than six times as much as the constant attendees. Further, chronic truants (i.e., those exhibiting poor attendance throughout their academic career) were more than five times as likely to drop out of school as constant attendees. However, one finding of particular interest was the relatively high dropout rate of the early truants. These students, despite improved attendance in late elementary and middle grades, still dropped out more often than constant attendees. These results suggest two conclusions. First, attendance at the early elementary grades is predictive of subsequent dropout. Second, even if interventions correct the attendance issue, those students should continue to be monitored for potential increased risk of dropout. These results substantiate the claim that dropping out is a long-term process and attendance is but one indicator of this disengagement.

Not only is attendance a predictor of dropping out, but the degree to which a student is truant matters. The lower the attendance rate, the greater the likelihood a student will drop out. In an examination of two ninth grade cohorts of first time ninth graders in Baltimore, MD totaling over 14,000 students, 82% of first-time ninth graders graduated with an attendance rate 95% or higher. However, only 26% of those students who were chronically absent (i.e., defined as missing 20 or more days) graduated (MacIver & Messel, 2013). However, even moderate levels of absences can be indicative of potential dropout (Allensworth & Easton, 2007). Examining a cohort of eighth grade students in Philadelphia during their high school years, Neild and colleagues (2008) found each additional week of school attended in ninth grade decreased the odds of dropout by 7%. While classifying students by patterns of attendance over multiple years is rare, these studies present sufficient evidence to indicate attendance at the high school level is predictive of dropping out.

In addition to the high school years, researchers also have shown that attendance in middle school can predict later dropout. Students with high absenteeism (i.e., 25% or more) in middle school were three to five times as likely to dropout (Rumberger & Larson, 1998). Similarly, sixth grade students whose attendance was less than 80% were highly likely to drop out (i.e., more than 85% did not graduate) and this particular indicator provided a high yield of dropouts that identified 23% of the cohort's future non-graduates (Balfanz et al., 2007). Considering a yield greater than 10% as significant, the ability of 6th grade attendance to identify almost a quarter of all future dropouts is substantial. Furthermore, attendance in late elementary and middle grades influence other potentially predictive indicators. Declines in attendance between fourth and eighth grades

have been found to uniquely predict students' ninth grade on-track indicator score (defined as a continuous measure composed of six separate indicators) even after controlling for academic achievement levels (Kieffer et al., 2014).

While existing literature is largely silent on the predictive nature of attendance during the early elementary years, Alexander and colleagues (1997) tracked a longitudinal sample of Baltimore students in the 1980s and early 1990s and found attendance as early as first grade to significantly predict dropout even after accounting for family context, background characteristics, personal resources, and school experiences. Despite occurring well before the prevalence of EWS research, their logistic regression mirrored the predictive nature of attendance in as early as the first grade to later graduation. Furthermore, each additional day of absence in grade one increased the likelihood of dropping out by about 5% (Alexander et al., 1997).

It is clear throughout the literature that attendance, regardless of grade level, is a significant predictor of dropping out. While a variety of factors influence the decision to attend or not attend school, when a student is not present, they miss valuable instructional time, experience interruptions to the educational process, and disengage from the school community. Student disengagement is exacerbated by the degree of truancy that a student experiences – the more a student is absent, the greater their likelihood of dropping out. Even in early elementary years, there still exists the suggestion that a student becomes disengaged through school non-attendance, even after considering that a student's agency around attendance is minimized at these early ages. Therefore, despite variance around the temporal threshold for chronic absenteeism throughout the literature, it is clear that

attendance is a strong predictor of later dropout and should be closely monitored through an EWS.

Student behavior. Student behavior has been shown to be a statistically significant predictor of dropout (Rumberger, 2011; Rumberger & Larson, 1998; Suh & Suh, 2007). While measured through a variety of indicators, out-of-school suspension is typically used as an indicator of aberrant behavior. Despite the obvious use of out-of-school suspension as a disciplinary measure for student behavior, there are unintended consequences to out-of-school suspension that push students out of school. Schools that have high out-of-school suspension rates tend to have high dropout rates, as students negatively perceive this disciplinary measure as a sign of not being wanted by the school, (Lee et al., 2011). Consequently, out-of-school suspension is predictive of dropping out as students who do drop out consistently have higher incidences of suspension when compared to those students who do not drop out (MacIver, 2010).

This correlation tends to hold true even for students in earlier levels of schooling. Being suspended in sixth grade was found to be a significant predictor of dropout (Balfanz et al., 2007). However, it is important to note that the duration of suspension did contribute to the significance level of these findings, with one study showing that a minimum of three days of out-of-school suspension was predictive of dropout, whereas a single suspension was not (BERC, 2011). Interestingly, research has demonstrated suspension in the first grade to be a significant predictor of dropout even after family context, background characteristics, and personal resources were accounted for (Alexander et al., 1997). However, this is not to suggest that a suspension in any grade directly relates to the decision to drop out, but rather, it is more indicative of a student's

social-emotional engagement and interaction with the school environment. In other words, suspension is a singular outward sign reflective of non-engagement with the educational environment and can be directly related to the early process of dropping out particularly for students in earlier grades. Furthermore, measures that capture a global judgment on a students' capacity to properly engage in the school community can be far more predictive. While not as prevalent in the research, receiving an unsatisfactory behavior mark from any teacher in sixth grade was found to be a significant predictor of drop out and had an enormous yield, identifying 50% of future cases of dropout (Balfanz et al., 2007).

A student's successful engagement within the behavioral framework established by schools is suggestive of their continued decisions to engage academically. When a student acts in a way that warrants a disciplinary measure as significant as an out-of-school suspension, this suggests an indication of the student's inability to continue academically to graduation. Further complicating a student's engagement is the unintended message schools send through suspensions, such as no longer wanting a student to participate for a time period in the school environment (Lee et al., 2011). These unintended messages can contribute to increased feelings of marginalization by a student who is already experiencing some challenges in the school setting. However, there is a suggestion that some behavioral indicators are stronger at earlier ages. Therefore, while behavior indicators should be closely monitored through an EWS, more research is needed that specifically examines the differential impacts across grade levels.

Academic performance. A student's academic performance, most often measured by course grades and/or credits earned, has been shown to be a statistically

significant predictor of drop out (BERC, 2011; Bowers, 2010; Rumberger & Larson, 1998). It has been suggested that poor academic achievement can be the earliest potential indicator of dropout in a student's academic career (Lan & Lanthier, 2003) and certainly is indicative of dropout in later years, as nearly all students who dropout fail at least one course the year prior to dropping out (MacIver, 2010). The CCSR's on-track indicator was based solely on academic performance, with a student being on-track if they accumulated enough credits at the end of ninth grade to be promoted to tenth, and if they had no more than one semester course failure in a core subject. This measure was highly predictive, even after controlling for eighth grade test scores, predicting 80% of future graduates (Allensworth & Easton, 2005). Similar findings highlight the predictive nature of academic performance, finding the number of credits earned at the end of ninth grade to be the most predictive of all variables (Kieffer et al., 2014). Furthermore, ninth graders who fail one or more courses, dropout five times as much as those students who pass all of their courses (MacIver & Messel, 2013).

Various studies have shown that academic indicators in middle school also can be predictive of dropping out. For every one-point increase in the student's noncumulative grade point average (GPA), a numeric indicator of grades across all courses, students were more than six times as likely to graduate (Bowers, 2010). Specifically, measuring GPA at the end of eighth grade also was determined to be a significant predictor of high school dropout (Suh & Suh, 2007) with a one-point higher GPA in eighth grade reducing the predicted dropout rate by more than 70% (Rumberger, 1995). While GPA is reflective of a student's performance across all courses, academic performance in individual, core courses, in particular math or English, have also been found to be predictive of dropping

out (Balfanz et al., 2007). Additionally, achievement in math courses were significantly correlated to dropping out (Neild et al. 2008; Parr & Bonitz, 2015) as early as first grade (Alexander et al., 1997; Ensminger & Slusarcick, 1992).

Interestingly, Suh & Suh (2011) chose not to include GPA in their longitudinal analysis of dropouts over two decades. Citing the overall decline in the dropout rate and relative stability of GPA over the studied time period, the authors felt GPA could not explain why students were not dropping out as much. However, this short-cited exclusion does not take into account the changing construct of grades as states adopted new, higher standards over that same time period. While GPA may have been stable during this time, the effort and engagement required to maintain the same GPA has increased, which may very well have explained the decreasing dropout rates. This critique is supported in their conclusion that the actual decrease in the dropout rate is due to a significant influence of omitted variables.

Because state graduation requirements include a minimum number of credits to be earned and a minimum GPA, academic performance is, at a minimum, a direct indicator of dropping out. However, because academic performance captures a wide variety of inputs such as effort, study habits, and cognitive abilities, all of which influence the ability to complete requirements for a high school diploma, academic performance as an indicator in an EWS more fully captures levels of disengagement associated with dropping out. Therefore, academic performance indicators, measured by credits earned and course failures, should be included in an EWS. Additionally, varying academic performance indicators may be warranted depending on state and local requirements. For example, the State of Florida requires students to take and pass a year-long Algebra 1

course as well as the statewide assessment in Algebra 1 for graduation (FLDOE, 2017c). Therefore, it would be prudent for schools in Florida to look at specific academic performance indicators in mathematics in years preceding student enrollment in an Algebra 1 course.

Retention. Grade retention is the practice of requiring a student to remain at a grade level for an additional year (Jackson, 1975). It should be noted that many data sources do not explicitly identify grade retention as a specific event in a student's educational career, so researchers often use the age of a child as a proxy for grade retention. Regardless of how grade retention is measured, students who were retained at some point in their educational career have much higher incidences of dropping out than those who were not retained (Bowers, 2010; Carpenter & Ramirez, 2007; Roderick, 1994; Rumberger, 1995; Suh & Suh, 2007). As such, grade retention can be used as a predictive indicator of dropping out in an EWS. Students who are over age for their grade are more than twice as likely to not graduate (MacIver & Messel, 2013). In fact, each additional year that a student is older at the start of high school more than doubles their odds of dropping out (Neild et al., 2008). Similarly, three out of every four students who were over age at sixth grade (a sign of elementary grade retention) did not graduate, making grade retention the single strongest predictor of drop out (BERC, 2011). Grade retention, even as early as the elementary grade levels, sets a student on a trajectory of dropping out of school.

Utilizing a discrete-time hazard model to examine survival analysis over the entire longitudinal grading histories from first grade through twelfth grade of a single graduating cohort, Bowers (2010) calculated not only the additional risk of dropping out

each EWI had on a student, but could pinpoint what year that indicator had the greatest influence of dropping out. Put another way, this methodology did not necessarily indicate *which* student is most at risk, but rather, examined *when* those students were most at risk of dropping out. One of the more interesting findings of this study, however, involved time-invariant results. One model used noncumulative GPA and retention regardless of the grade level while controlling for gender and ethnicity. This model explained well over 50% of the variance in the probability of dropping out, and specifically found that at any point after sixth grade, retained students were 10.2 times more likely to drop out than those who were not retained. These findings confirmed that at any grade level, the risk of dropping out can be predicted through retention and grades.

The inclusion of retention as a predictive indicator in an EWS may incite a shift in state and local retention policy and practice that would highlight the specialized needs of retained students. While a retained status cannot be changed through interventions after the fact, its strength as a predictor of future dropout certainly warrants inclusion in an EWS. At a minimum, this indicator will help schools identify those students most in need of intervention. Potentially though, the practice of retaining students could be avoided if an effective EWS was in place to warn schools of behaviors and actions that could help avoid a decision to retain a student.

Student attitudes. Students' perceptions and attitudes, measured through a variety of indicators, were highly predictive of dropping out and could certainly be altered through interventions. While these findings were derived mostly through surveys using a variety of questions, they all represented how a student views themselves, schools, and peers. For example, aggressive attitudes and belief in school rules

significantly predicted dropout rates (Lee et al., 2011). Related findings showed that students who drop out generally have lower self-esteem, approximately a quarter of a standard deviation below the national average (Lan & Lanthier, 2003). Conversely, students who graduate tend to have a higher locus of control and self-concept (Rumberger, 1995) with student expectations for attending school the following year especially predictive of drop out (Suh & Suh, 2007). That is, if a student did not expect to be in school the following year, they were more likely not to be in school.

Results from the review of the literature certainly indicate that a student's attitudes and perceptions can be predictive of dropping out, confirming the larger body of literature on social-emotional engagement. However, more work must be done in this area to warrant inclusion in an EWS, due not only to the variety of measures indicated but also to the difficulty in assessing, collecting, and aggregating student attitudes and perceptions. Researchers must narrow the focus on what attitude or perception is most predictive and determine how this might be captured systematically in order for schools to find this indicator useful in identifying students at risk for dropping out.

Race and ethnicity. Race and ethnicity have long been associated with increased rates of dropout (Ensminger & Slusarcick, 1992; Rumberger, 1995), however, other factors mitigate the impact race and ethnicity have on predicting dropout. For example, Black, Hispanic, and Native American students have been shown to have twice the rate of dropout when compared to White students. However, after controlling for socioeconomic status, race/ethnicity no longer predicted drop out (Carpenter & Ramirez, 2007; Rumberger 1995). Alternatively, the inclusion of academic course grades in the

predictive model also eliminated the predictability of race and ethnicity (Allensworth & Easton, 2005; Bowers, 2010).

Not only do other factors eliminate the predictive power of ethnicity, but they offer far more explanatory power to the variance in drop out and graduation. For example, attendance, course failure in math and English, and receiving an out-of-school suspension contributed 34 times more explanatory power in predicting graduation than race and ethnicity (Balfanz et al., 2007). Similarly, gender, race and ethnicity, and economic status together only explained 12% of the variation in graduation rates (Allensworth & Easton, 2007).

The disparities in educational outcomes for students of historically under-served populations have been well documented in the literature (e.g., David & Marchant, 2015). While there are suggestions that Black and Hispanic students are making larger gains than White students over the past 40 years (National Center for Education Statistics, 2013), the continued disparities between white students and minority students highlight the "educational debt" owed to minority students resulting from a much longer history of inequitable education (Ladson-Billings, 2006). Therefore, great caution must be taken when interpreting Early Warning research regarding the role of race and ethnicity as a predictor of on- and off-track status when paired with other explanatory factors such as low socioeconomic status and prior achievement levels. In these cases, race and ethnicity may not offer significantly greater explanatory power leading researchers to perhaps conclude to exclude this status indicator from a predictive EWS model. While this may be warranted quantitatively, it is vital that schools monitor EWIs by race and ethnicity

regularly to address the well-documented existing racial disparities in graduation as well as determine culturally relevant practices germane to the gaps observed.

State test scores. State test scores, the standardized achievement tests required to receive federal funding under the *No Child Left Behind Act of 2001*, generally were not found to be statistically predictive of dropping out (BERC, 2011). Rarely did a study show state test scores were predictive of drop out, and with those few that did, the predictive power was mitigated by other controlling factors (Alexander et al., 1997; Allensworth & Easton, 2005; Kieffer et al., 2014; Norbury et al., 2012) or were overshadowed by a more comprehensive measure of academic ability. For example, a standard deviation increase in test scores reduced the odds of dropping out by two thirds. However, course grades were far more powerful at predicting cases of drop out (Rumberger, 1995). Additionally, attendance was found to be eight times more predictive of course failures, an indicator of future dropout, than test scores (Allensworth & Easton, 2007). Even looking at the variance associated with dropping out, the inclusion of test scores added very little to the proportion of variance explained (MacIver & Messel, 2013).

While standardized test scores do give some evidence of academic achievement, they are generally seen as a momentary snapshot of a student's testing ability rather than a full temporal picture of the effort, resilience, and cognitive abilities required to achieve the requirements of a high school diploma. Furthermore, the high stakes associated with the state standardized tests further detract from the predictability as the contextual factors associated with the high stakes tests make it difficult to ascertain or discriminate a

student's learner characteristics from the reaction to those contextual factors. Therefore, state test scores are not predictive of graduation and should not be used in an EWS.

Socioeconomic status. Low socioeconomic status is indicative of a greater propensity for students to disengage from the educational process and has been shown to be predictive of dropping out (Alexander et al., 1997; Parr & Bonitz, 2015; Rumberger, 1995; Suh & Suh, 2007). When socioeconomic status was controlled for, race and ethnicity were no longer predictive of drop out (Carpenter & Ramirez, 2007; Rumberger 1995). Therefore, socioeconomic status, at a minimum, is more indicative as a predictor and potentially can point to a variety of related antecedents to dropping out. For example, the related familial and behavioral factors associated with low socioeconomic status contribute not only to the variation in covariate indicators such as attendance (Parr & Bonitz, 2015) but also to an increase in the probability of dropping out (Suh & Suh, 2011). Students of low socio-economic status are generally more mobile (movement between schools of enrollment) and this mobility is largely associated with poor student achievement (Rumberger & Larson, 1998). The detrimental effects may not be due to mobility itself, but to other poverty-related factors that contribute to both student mobility and student achievement. Unfortunately, despite consistently finding the power of poverty in predicting drop out, much research has been remiss in not identifying the underlying processes through which poverty influences the decision to persist through graduation (Rumberger, 1995; Suh & Suh, 2011).

The literature did point to several issues with the collection of socioeconomic status data that potentially could mitigate the predictability as an indicator:

- While low socioeconomic status is generally accepted as a predictor of dropping out, access to that data can be difficult to obtain for researchers due to statutory prohibitions (Schoeneberger, 2012),
- When studying only high school students, the measurement of socioeconomic status can be unreliable (MacIver & Messel, 2013)
- When a trait characterizes most of the cohort examined, it is not useful as a predictor (BERC, 2011).

If socioeconomic status can be obtained, and does not characterize most of the students under study, it can be predictive of dropping out. Additionally, there is evidence suggesting that negative correlations associated with low socioeconomic status can be overcome. When applying the CCSR on-track indicator to ELL, socioeconomic status did not improve the prediction rate when combined with the students' grade point average (Gwynne et al., 2012). Additionally, despite low socioeconomic status, students with high grades in first grade had far greater odds of graduating than those with low grades, (Ensminger & Slusarcick, 1992). These results suggest that for students of low socioeconomic status, the barriers to successfully passing core academic courses are the same barriers to graduation.

Like retained status, schools cannot control a student's socioeconomic status. However, this indicator has been proven useful as a predictor of future drop out as well as potentially directing schools to larger contextual issues related to poverty. Students of poverty face several issues that could potentially relate to academic achievement such as decreased access to proper nutrition and medical care, single parent households, lack of adequate supervision after school, and minimized assistance with educational

requirements outside of the school day such as homework and projects. These issues could highlight the potential lack of mechanisms available to students experiencing poverty to redirect disengagement as it occurs. However, it is suggested from the literature that not all students of low socioeconomic status face the same profile of issues. As such, while socioeconomic status has been proven useful as a predictor of drop out and should be included in an EWS, more work is needed in terms of how poverty leads to drop out, what characteristics of poverty influences the risk of drop out more, how those characteristics can be monitored through an EWS, and what interventions can be implemented to overcome the barriers associated with low socioeconomic status.

Multiple indicators. Factors such as attendance, behavior, academic performance, and retention have been shown to individually predict drop out. However, combining these factors have greatly enhanced the predictive power of EWS (Barry & Reschly, 2012). As the number of indicators increase, the percent of students who graduate decrease (BERC, 2011) and more students who dropout are identified (Balfanz et al., 2007). Specifically, students with three indicators were almost three times as likely to dropout as those with one (Suh & Suh, 2007). Similar findings showed a weighted average of six indicators were significantly more predictive than any individual or combination of five variables (Kieffer et al., 2014).

These findings point to the fact that the root cause of dropping out does not lie in individual indicators such as attendance, behavior, or academic performance. Rather, these are but symptoms of the antecedent of disengagement from the educational process. Therefore, it is vital that an EWS possess the ability to not only identify students exhibiting the aforementioned indicators, but also identify students exhibiting multiple

indicators as each individual student's disengagement will manifest itself through a variety of behaviors. It is through the identification of the multiple indicators that interventions can effectively be matched to individual student needs.

Elementary to Middle School and Middle to High School Transitional Grade Levels

While there has been relatively little work examining the timing of the decision to dropout (Neild et al., 2008), there is a general acceptance within the literature that transition years (i.e., grades 6 & 9 – those years transitioning from elementary to middle school and middle school to high school) prove to be the most difficult for students (Bowers, 2010; Lan & Lanthier, 2003). Of all grade levels, ninth grade indicators proved to be the most predictive (Kemple et al., 2013; MacIver, 2010). While academic and behavioral difficulties stem from experiences within these grades, they also find root in the habits formed in the preceding grades (Neild et al., 2008). Through a series of interviews and observations, Allensworth (2013) found that academic difficulties in ninth grade were not a result of increased rigor, but were largely due to a decrease in the high school's monitoring of students' levels of engagement. Specifically, students felt less academic pressure in ninth grade, were absent far more, and studied far less. This is evidenced by the finding that the CCSR on-track indicator held true even when eighth grade achievement tests were controlled. Students failed courses and did not earn enough credits (the two components of CCSR's on-track indicator) not because of academic ability (or inability) but because of a lack of engagement in the educational process.

Further, research confirms the monitoring of middle school EWIs and corresponding interventions are integral in increasing graduation rates. More than 75% of students with an eighth grade EWI exhibited at least one EWI in ninth grade and had the

lowest graduation rate. However, those who recovered from an eighth grade EWI had nearly as high a graduation rate as those who didn't exhibit an EWI either year (MacIver & Messel, 2013). Furthermore, declines in attendance during the middle school grades uniquely predicted students' ninth grade off-track status (Kieffer et al., 2014). Students with an EWI in sixth grade graduated at a rate of 36.4% compared to a graduation rate of 70.5% for those without an EWI. Perhaps more alarming is the finding that only 7.9% of the students with all four of the tracked indicators graduated (BERC, 2011). Similar findings showed that 60% of those students who eventually drop out can be identified by sixth grade indicators (Balfanz et al., 2007).

There is a general acceptance within the literature that the transition year to high school has been proven to be the most difficult for students. And while grade 9 performance has been shown to be the most predictive of eventual graduation or drop out status, the end of ninth grade might be too late to intervene when on-track indicators such as those developed by CCSR determine on- and off-track status (Allensworth, 2007). Furthermore, there is ample evidence that middle school indicators have use in predicting those who are at greater risk of being off-track and subsequently dropping out. Therefore, it is necessary for the success of an EWS to identify students exhibiting EWIs in middle school, as well as for interventions to be implemented during these middle school grades given that academic and behavioral problems do not self-correct (Balfanz et al., 2007). Despite this, the literature is severely lacking in determining what elementary indicators can influence middle school behaviors (even after Alexander and colleagues pointed this out in 1997). If ninth grade academic and behavioral performance is influenced by middle

school experiences, it may very well suggest that middle school academic and behavioral performance is influenced by elementary experiences.

What Causes a Student to Drop Out

EWIs such as attendance, behavior, and academic performance have been shown to be predictive of drop out. However, these indicators are simply descriptors of behaviors and do not identify the specific underlying causes of drop out. Studies consistently identify a wide variety of correlates to dropout, yet fail to explain why or how students drop out (Alexander et al., 1997). For example, even though research has shown retention to be a powerful predictor of drop out, there must be further examination as to whether retention causes a student to drop out, or if it is a symptom of another underlying cause (Carpenter & Ramirez, 2007; Gwynne et al., 2009). This is not to suggest research on EWS should shift to solely examine causes of drop out, but rather, researchers would be wise to consider predictors through the lens of what causes a student to drop out. This paradigm shift will allow for a greater understanding on why predictive EWI are linked to drop out in order to enhance and expand the predictive nature of EWS.

Theoretical foundation used in literature. Theory provides structures for understanding students' behavior and can potentially provide a framework for why those behaviors lead to the decision to drop out of school. As Suppes (1974) argues, "a powerful theory changes our perspective on what is important and what is superficial," (p. 4). Considering the multitude of seemingly contributing factors involved with a student who drops out of school, a theoretical framework would help guide researchers in designing their studies as well as potentially answering questions brought about by results

of those studies. Unfortunately, most studies were atheoretical (Parr & Bonitz, 2015) or evidenced implicit assumptions that were only discernable through the prior literature reviewed. This potentially leaves researchers without an explicit theoretical framework to guide their hypotheses and methods as well as to frame their conclusions. For example, it has been previously cited that school mobility is associated with poor student achievement. One researcher concluded that since mobility is more prevalent in students of poverty, the poor academic performance may be related to problems related to poverty rather than the actual changing of schools (Rumberger & Larson, 1998). However, if mobility and poverty were framed in student engagement theory, then mobility in of itself can be seen as a cause of disengagement regardless of socioeconomic status. Each move has the potential of detaching the student from the larger school community and force the student to adopt an outsider role with each school. Interventions designed to address poverty may help, but may also largely miss the associated need to reengage students to a new learning environment. With the aforementioned prevalence on quantitative methods in EWS research, there is a risk in identifying superficial correlations. However, a more complex understanding can arise when grounded within a theoretical framework (Suppes, 1974).

Student engagement. Student engagement has been central to most theoretical explanations surrounding dropout and school completion (Balfanz et al., 2007; Barry & Reschly, 2012) and while theory has largely been absent from the body of research studied, three engagement theories have been used to frame methodology and interpretations of results linking student-level indicators to dropout. Several studies have cited Finn's Frustration-Self Esteem Theory (Finn, 1989) to frame the understanding of

why students disengage from school systems (Lan & Lanthier, 2003; Plank, Deluca, & Estacion, 2008; Rumberger, 1995; Rumberger & Larson, 1998). In it, Finn theorizes early frustration with academics leads to low self-esteem which, in turn, leads to the indicators previously shown to result in dropout such as poor attendance, poor academic performance, and behavioral issues. These behaviors (skipping school, misbehaving, etc.) further exacerbate the academic struggles a student experiences which eventually results in a student dropping out of school. Finn's second theory, Participation-Identification Theory (Finn, 1989), is widely seen as the foundation for student engagement theory and is also cited by several studies (Balfanz et al., 2007; Barry & Reschly, 2012; Kiefer et al., 2014). In this second theory, Finn argues the lack of participation in school activities first leads to academic struggles which, in turn, leads to a lack of identification with the school causing a student's disengagement. Both of Finn's theories inform EWS research lending theoretical credence to the identification of risk factors as a sign of disengagement with possibly academic indicators providing the earliest indication. Finally, Tinto's (1987) interactionalist process of departure has also been cited by studies and explains and justifies underpinnings of EWS (Gaertner & McClarty, 2015; Rumberger & Larson, 1998). In this theory, Tinto argues that the decision to disengage is first influenced by personal attributes that predispose students to respond in particular ways. Through this process, the school influences the student's decision to persist with school or drop out through the extent in which the school integrates the student socially and academically. While developed to explain student's dropping out of postsecondary schools, Tinto's interactionalist process of departure theory has been used to explain secondary drop out. Using this theory, an EWS seeks to capture those personal attributes

and school influences as they manifest in student-level behaviors such as attendance, course failures, and behavioral issues well before they ultimately decide to drop out.

Much of the literature offered insight into the antecedents of dropping out, yet could not speak specifically to what causes a student to disengage and ultimately, to drop out. The utilization of student engagement theory to frame results will allow researchers to gain a better understanding of the engagement constructs that may influence dropping out. Data can then be collected to hold those variables to evidence the applicability of these theories to the work of EWS. With theory providing a framework to interpret results, it makes sense that future research would utilize student engagement theory to guide research design, methodologies, and interpretations.

Typologies. While most research has focused on what predicts dropout, a smaller segment of research has attempted to examine the differences among those who drop out. Few studies have sought to conceptualize those predictive factors into dropout typologies (Balfanz et al., 2007, Rumberger, 1995). That is, few studies have sought to categorize students who drop out and then identify predictive indicators that are common to each of these typologies (Janosz et al., 2000). Additionally, as Bowers and Sprott (2012) point out, much of the research on dropout typologies are from dated international samples that may lack generalizability to today's U.S. student population. Much like theory seeks to explain why predictive factors lead to drop out and allow for interventions to target antecedent behaviors, typologies could potentially help schools understand types of students that might drop out that may also lead to the development and implementation of targeted interventions or prevention efforts at earlier timeframes.

Bowers and Sprott (2012), using latent class analysis on a national sample of 1,470 dropouts, categorized dropouts in one of three types of students (jaded, quiet, and involved) each with its own set of predictive indicators and each requiring varying interventions. The jaded drop out group was presented as those students who were disinterested in school, cynical with how school rules were applied, and skeptical as to whether teachers were interested in them. These students tended to perform poorly in both academics and behavior and dropped out due to poor relationships with teachers and/or students, lack of belonging, or a perceived inability to complete graduation requirements. The second group of drop out students (quiet) had few discipline problems and did not participate in extracurricular activities. However, these students struggled academically and tended to drop out because they could not complete the academic requirements for school despite feeling as if they belonged to the school. The final group of dropouts (involved) had the highest levels of academic performance, were more involved in extracurricular activities, but had similar levels of behavioral problems as the jaded group. Involved students tended to dropout because of suspension or expulsion. These findings mirrored similar findings on typology studies (e.g., Janosz, Archambault, Morizot, & Pagani, 2008; Kronick & Hargis, 1998) and highlight the need for further research linking predictive indicators to the graduation status of each type of student who drops out of school.

There is potentially enormous benefit if students can be identified by typologies and predictive indicators assigned to each. Ultimately, researchers are seeking to reduce the rate of dropout and much of the work in EWS research has focused on evaluating predictive behavior prior to the actual drop out event. While each student and the

circumstances surrounding their decision to drop out is unique, research has shown promise in the ability to group students who dropout into typologies. Considering the limited resources available to schools, if typologies could present even a loose set of defining characteristics, interventions can be more effectively implemented to meet the individual needs of each typology. For example, if an intervention is designed to engage students in the larger school community through extracurricular activities, those students in the quiet typology would need individualized encouragement to engage, rather than leaving those students to volunteer. Furthermore, an additional intervention would need to be implemented to target involved students as they are most likely already engaged in extracurricular activities.

There is certainly precedent for this approach. The Response-to-Intervention (RTI) model found with a Multi-Tiered System of Supports (MTSS) parallels the idea of applying interventions to typologies of students who drop out. While not without criticism, the MTSS framework is widely supported in the literature and applies a series of evidence-based interventions through varying tiers of increasing supports. While every student receives the same level of instruction in the first tier, an evaluation of data will result in "groups" of students exhibiting common barriers. Interventions are then implemented in the second tier to target those common barriers. This approach ensures an effective and efficient use of limited resources. Likewise, if research could help define typologies of students with the common barriers associated with each, interventions could more effectively target those groups of students. However, considering the dearth of research on typologies, greater understanding is needed in this area of research.

Conclusion

Three major gaps were found within the examined literature. First, most studies were found to be atheoretical in both methodology and the interpretation of results. While results could speak to *when* and *if* a student would drop out, the lack of a theoretical framework to interpret results left researchers rarely able to answer *why* a student drops out. As stated before, the primary work on an EWS is to predict who will drop out regardless of the cause. However, as it is generally accepted that dropout is the final decision in a long process of disengagement, using student engagement theory to frame both methodology and the interpretation of results will help define constructs to further refine the predictive nature of EWS.

Secondly, the reliance on quantitative methods have built a significant base of understanding on what indicators predict drop out. However, similar to the lack of a theoretical framework, the lack of qualitative methods in mixed methods research designs have highlighted a glaring deficiency in results being able to identify the underlying reasons students drop out. A greater understanding towards these ends will enable interventions to be more specifically targeted to those reasons making them more effective and efficient in addressing student barriers to school completion. Additionally, greater understanding into the underlying reasons students drop out will inform future research into typologies of dropout.

Finally, more research is needed on the predictability of attitudes, behaviors, and actions exhibited prior to 9th grade, with a particular focus on indicators at the elementary years where there is a dearth of research. The CCSR's work in the early 2000s represented a shift in research on the issue of drop out. Instead of looking at

characteristics of students who drop out, this research sought to predict students who would eventually graduate or drop out. This use of a ninth grade on-track indicator proved to be able use a simple status indicator to predict quite accurately future graduation status. Further work extended this research, providing considerable evidence detailing how middle school indicators not only influence this on-track status but also directly predict graduation and dropout. However, there has been very little extension temporally within the examined literature. Specifically, how elementary indicators can predict graduation, on-track status, or even middle school indicators have not been examined extensively. The need for a deeper understanding of how these earlier behaviors predict graduation is amplified as policymakers are now requiring schools to monitor EWI at the elementary levels. Therefore, future research should focus on firming up the definition of the on-track construct not only at ninth grade, but also within middle school as well as determine whether elementary school attitudes, behaviors, and actions can be useful predictors of graduation.

Education remains an integral mainstay to any successful society. Unfortunately, despite an enormous collective effort by researchers, educators, and community members, students drop out of school at alarming rates. While there is a growing body of research exploring this very issue, many questions remain. Work on EWS is relatively new, but has shown promise in its ability to systematically and accurately categorize student behaviors and attitudes related to disengagement that can be used to predict future dropout events. The examined body of research has clearly shown that schools can easily identify, through existing data sources, student behavior indicative of disengagement. These indicators should include attendance, behavior, academic performance, retention,

SES, as well as the ability to measure for multiple risk factors. Race/Ethnicity as well as statewide, standardized tests did not add much predictability to an EWS and were overshadowed by other measures that more accurately predicted drop out. Collectively, it was clear through the examined literature that schools possess sufficient data on school level indicators to accurately predict future drop outs early enough to intervene. Now that we have shed light on which indicators can successfully predict on-time cohort graduation, the way forward needs to encompass not only a refinement of these indicators but also clarification on effective interventions that will reengage students before they drop out.

CHAPTER 3: METHODOLOGY

The purpose of this quantitative research study was to determine to what extent the State of Florida's EWS model can predict on-time cohort graduation in grades 3-8.

Research Questions

The following research questions guided this study:

1. To what extent does the CCSR on-track indicator (Allensworth & Easton, 2005) at the end of grade 9 predict on-time cohort graduation?
2. To what extent does the State of Florida's Early Warning System on-track indicator for grades 4 – 8 predict on-track status in grade 9?
3. Of the four indicators that comprise State of Florida's Early Warning System on-track indicator, which indicator would represent the most statistically significant predictor of grade 9 on-track status?
4. To what extent do status indicators such as previous retention, low socioeconomic status (SES), Students with Disabilities (SWD) designation, English Language Learner (ELL) designation, and race/ethnicity affect the predictive nature of the State of Florida's Early Warning System?

Null Hypotheses

H_o1: There is no relationship between on-track status and graduation

H_o2: There is no relationship between grades 4 – 8 on-track status and 9th grade on-track status.

H_o3: There will be no statistically significant difference in the predictability of on-track status for grade 9 between any of the four indicators.

H_o4: There will be no statistically significant difference in the predictability of Florida's Early Warning System between each of the status indicators.

Research Methods and Design

The study was designed using a retrospective longitudinal data set that was analyzed through statistical processes to understand the relationship between earlier student-level indicators and final graduation status. This study sought to establish a predictive link between the CCSR on-track status as determined after grade 9 to a final graduation status. The selected school district has used this on-track status as a part of their EWS work to some success. Using this link, this study will then establish an a priori link examining the Florida on-track status to the final graduation status through the CCSR on-track status. Below is a description of the school district, the sample, variables, and statistical analyses.

Demographic Information

The data for this study was drawn from a mid-sized school district in Florida, home to two main cities with approximately 18,000 students from a mix of suburban and rural communities. There are 21 schools in the school district: 13 elementary, 4 middle, 2 high, an Alternative school, and a special needs school. The alternative school is designed to provide a temporary placement for students as an alternative to expulsion while the special needs school serves students with significant disabilities. Additionally, there are five charter schools; 2 elementary, 1 middle, 1 high, and 1 combination school (kindergarten – grade 8). Three racial/ethnic groups comprise approximately 95% of the

student population during the school years studied (2010-11 through 2016-17) according to student enrollment records obtained through the FLDOE online reporting tool, *EdStats*. During this time period, the proportion of the district's minority population has increased from approximately 40% to 45%. Table 1 contains a more detailed summary of the racial/ethnic breakdown over the previous six years.

Table 1: *Six Year School District Racial/Ethnic Breakdown*

	White	Hispanic	Black	Two or More	Asian	American Indian	Pacific Islander
2010-11	59.8%	19.4%	15.9%	2.9%	1.5%	0.4%	0.1%
2011-12	59.3%	19.8%	16.1%	3.0%	1.4%	0.3%	0.1%
2012-13	57.9%	20.8%	16.4%	3.1%	1.4%	0.4%	0.1%
2013-14	57.2%	21.3%	16.5%	3.3%	1.4%	0.3%	0.1%
2014-15	56.2%	21.6%	16.8%	3.5%	1.4%	0.3%	0.1%
2015-16	55.6%	22.0%	17.0%	3.6%	1.5%	0.3%	0.1%
2016-17	54.8%	22.4%	17.2%	3.8%	1.5%	0.3%	0.1%

For the 2016-17 school year, the school district selected for study participation had 5.3% of its students designated as English Language Learners (ELL), a decline of 1% over the six years studied. Additionally, 14.4% received Exceptional Student Education (ESE) services, an increase of 1.4% over the studied period. Finally, the school district serves a large proportion of Economically Disadvantaged (ED) students as defined by the FLDOE with 56.3% of its population being designated during the 2016-17 school year. This represents a slight increase over the entire time period studied (0.7%), but does

represent an almost 3% decline from the year prior. Table 2 details the demographic data for the past five years.

Table 2: *Six Year School District Demographic Data*

	ELL	ESE	ED
2011-12	6.3%	13.0%	55.6%
2012-13	6.2%	12.8%	56.6%
2013-14	5.7%	13.1%	57.0%
2014-15	5.0%	13.5%	57.4%
2015-16	5.0%	14.1%	59.2%
2016-17	5.3%	14.4%	56.3%

The study's participating school district had above average graduation rates besting the State of Florida's graduation rates in each of the previous five years. Table 3 contains a summary of the graduation rates of the participating school district by racial/ethnic categories for the past five years.

Table 3: *Five Year School District Graduation Data by Race/Ethnicity*

	Asian	Black	Hispanic	Two or More	White	DISTRICT	STATE
2012-13	100.0%	65.9%	77.3%	95.8%	83.7%	80.9%	74.5%
2013-14	78.3%	66.7%	77.1%	76.0%	84.4%	80.1%	75.6%
2014-15	85.0%	59.7%	75.8%	85.4%	84.7%	79.1%	76.1%
2015-16	83.3%	64.6%	78.9%	73.7%	86.1%	81.2%	77.9%
2016-17	87.5%	74.2%	85.6%	86.2%	90.7%	87.2%	80.7%

Sample

The proposed study utilized a non-probability sampling approach. Specifically, the sampling approach is defined as a sample of convenience. The sample contained students enrolled in public schools within one middle sized school district located on the east coast of the State of Florida. To address RQ1 (To what extent does the CCSR on-track indicator [Allensworth & Easton, 2005] at the end of grade 9 predict on-time cohort graduation?), the sample contained all students who were first-time grade 9 students during the 2013-14 school year placing them in the graduating class of 2016-17, the most recent graduating cohort. The sample included the requisite data to determine the CCSR on-track status at the end of grade 9 (total number of credits earned and total course failures) as well as the final withdrawal code to determine graduation status. Students with a final withdrawal code signifying a transfer out of the district (W3A, W3B, W04, W24) or signifying a death (W12) prior to graduation will be removed from the sample as the final graduation status is unknown. Table 4 contains a summary of the overall essential demographic information for the first data sample.

Table 4: *RQ1 Descriptive Statistics: Essential Demographics*

Status Variable	N	%
White, non-Hispanic	609	61.6%
Black, non-Hispanic	144	14.6%
Hispanic	188	19.0%
Multiracial	31	3.1%
Asian or Pacific Islander	14	1.4%
American Indian or Alaskan Native	3	0.3%
ELL	12	1.2%
ESE	100	10.1%
ED	467	47.2%
Total Students	989	100%

To address RQ2 (To what extent does the State of Florida's Early Warning System on-track indicator for grades 3 – 8 predict on-track status in grade 9?), RQ3 (Of the four indicators that comprise State of Florida's Early Warning System on-track indicator, which indicator would represent the most statistically significant predictor of grade 9 on-track status?), and RQ4 (To what extent do status indicators such as previous retention, low SES, Students with Disabilities (SWD), English Language Learners (ELL), and race/ethnicity affect the predictive nature of the State of Florida's Early Warning System?), the sample contained all students who were first time grade 9 students during the 2016-17 school year. The sample included the requisite data to determine the CCSR on-track status at the end of the 2016-17 school year, including the total number of

credits earned and total course failures, and the requisite data to determine Florida's EWS on-track status at the end of each school year from 2010-11 (grade 3) through 2015-16 (grade 8) which includes the annual attendance rate, total number of days suspended, total course failures in mathematics or ELA, and the achievement level on the statewide, standardized assessment in mathematics and ELA. Table 5 contains a summary of the overall essential demographic information for the second data sample.

Table 5: *RQ2-4 Descriptive Statistics: Essential Demographics*

Status Variable	N	%
White, non-Hispanic	3852	55.0%
Black, non-Hispanic	1226	17.5%
Hispanic	1582	22.6%
Multiracial	230	3.3%
Asian or Pacific Islander	80	1.1%
American Indian or Alaskan Native	31	0.4%
ELL	343	4.9%
ESE	1043	14.9%
ED	4029	57.5%
Total Students	7001	100%

Prior to addressing the stated research questions in the proposed study, preliminary analyses were conducted. Specifically, analyses of essential demographics, missing data, and internal consistency of performance (reliability) were conducted. Regarding essential demographics, the primary statistical descriptive techniques to be

utilized were frequency counts and percentages. Missing data was evaluated through the use of both expectancy maximization (EM) and multiple imputations (MI). The frequency and percentage of missing data would be reported, along with an analysis of the randomness of missing data. The randomness of missing data was assessed through the use of Little's MCAR. MCAR values that are not statistically significant ($p > .05$) will be considered indicative of sufficient randomness of missing data.

Variables

The following section details the variables used within this study and are organized into two categories; outcome and predictor. The definitions for each are as follows:

Outcome Variables

The following outcome variables were used:

- Graduation Status (RQ1): Final withdrawal codes were used to determine the graduation status of the examined student population. This variable was coded using a binary code with 0 = non-graduation and 1= on-time adjusted cohort graduation. Based on the Florida Department of Education's (2017b) definition of on-time graduation, the following withdrawal codes are considered on-time graduation with all others defined as non-graduation: W06, W6A, W6B, W43, W52, WD1, WFW, WFT, WFA, WFB, WRW, WXL, WXT, WXW, W54, and W55.
- CCSR On-track Status (RQ2, 3, and 4): Based on Allensworth and Easton's (2005) research, grade 9 students were determined to be on-track if they earned by the end of the school year the requisite number of credits

for promotion to grade 10 (6 or more) and not failed any of their courses. All other grade 9 students were determined to be off-track. This variable was coded using a binary code (0 = on-track and 1 = off-track).

Predictor Variables

The following predictor variables were used in the analysis:

- CCSR On-track Status (RQ1): Based on Allensworth and Easton's (2005) research, grade 9 students were determined to be on-track if they earned the requisite number of credits for promotion to grade 10 (6 or more) and not failed any of their courses. All other grade 9 students were determined to be off-track. This variable was coded using a binary code (0 = on-track and 1 = off-track).

The following predictor variables were determined at the end of each grade level and reported separately by the school year.

- Florida On-track Status (RQ2, 3, and 4): Florida on-track status was determined through an examination of four EWI, any one of which would signify off-track status. The EWI utilized were:
    1. Annual attendance rate below 90%
    2. One or more suspensions (in- or out-of-school)
    3. Course failures in English Language Arts (ELA) or Mathematics
    4. An achievement level of 1 on the statewide, standardized state assessment in ELA or Mathematics (out of 5 achievement levels of which an achievement level of 3 is considered proficient).

This variable was coded using a binary code (0 = on-track and 1 = off-track).

- Attendance Rate: The annual attendance rate for each student was calculated by dividing the days present by the total days enrolled for that school year. Days in which the school system was closed (for example, due to inclement weather) were not counted in this rate. This variable was coded using a binary code (0 = Below 90%, 1 = 90% or above).
- Suspensions: The annual incidences of in- and out-of-school suspension. This variable was coded using a binary code (0 = no suspensions, 1 = one or more).
- Course Failures (ELA/Math): A course grade of F occurring in any marking period in either an ELA course or Mathematics course. This variable was coded using a binary code (0 = no course failures, 1 = course failure in 1 or more).
- Statewide, Standardized Assessment Achievement (ELA): While proficiency is determined as an achievement level of 3 or higher on a scale of 5 achievement levels, the State of Florida uses a level 1 as an indicator of being off-track. This variable was coded using a binary code (0 = level 2-5, 1 = level 1).
- Statewide, Standardized Assessment Proficiency (Math): While proficiency is determined as an achievement level of 3 or higher on a scale of 5 achievement levels, the State of Florida uses a level 1 as an indicator

of being off-track. This variable was coded using a binary code (0 = level 2-5, 1 = level 1).

Status Variables

The following status variables were used in the analysis:

- Retention Status: This variable indicated whether a student had been retained at some point in their academic career. The participating district automatically populates a data field when a student is retained alleviating the need to use the modal age as an indication of retained status. This was coded using a binary code (0 = never retained, 1 = retained one or more years).
- Race/Ethnicity: Each student was associated with a single race/ethnicity. This indicator was coded using the code: 1 = White, 2 = Black, 3 = Hispanic, 4 = Asian or Pacific Islander, 5 = American Indian or Alaskan Native, and 6 = Two or More.
- Low SES Status: This variable indicated whether a student was designated as low SES determined by their eligibility for free or reduced lunch. Students who were eligible were considered as being low-SES and coded using a binary code (0 = not low-SES, 1 = low SES).
- Student with Disability (SWD) Status: This variable indicated whether a student is designated as SWD determined by their eligibility for an Individual Education Plan (IEP) and access to special education services. This variable was coded using a binary code (0 = not designated as SWD, 1 = designated as SWD).

- English Language Learner (ELL) Status: This variable indicated whether a student is designated as an ELL and was coded using a binary code (0 = not designated as an ELL, 1 = designated as an ELL).

Grouping Variables

The following grouping variable was used in the analysis.

- Grade Level: This variable will indicate the grade level the student is in during that school year and will be entered as the numeric grade (i.e. grade 3 = 3, grade 4 = 4, etc.)

Statistical Analyses

To address RQ 1, a binary logistic regression was used to analyze the predictability of the independent variable of CCSR on-track status on the dependent variable of graduation status. Binary logistic regression allows for both categorical and continuous EWI to predict a dichotomous outcome variable (graduation or non-graduation; King, 2008). The predictive model of fitness was evaluated using the omnibus chi-square model summary. Model summary values of $p < 0.05$ were considered indicative of a robust model. The predictive effect of the CCSR on-track status was addressed through the Nagelkereke pseudo R^2 value and the predictive efficacy of the model was evaluated through the comparison of Block 0 and Block 1 values. The odds ratios, or $\mathrm{Exp}(B)$, represents the interpretation of likelihood in evaluating the dependent variable with $\mathrm{Exp}(B)$ values of 1.0 to be considered even odds. The statistical significance of the findings was ascertained utilizing the $p < 0.05$ alpha level as the threshold for statistical significance.

To address RQ 2, a binary logistic regression was used to analyze the predictability of the independent variable of Florida on-track status at each grade level (grade 3 through grade 8) on the dependent variable of CCSR on-track status. The predictive model of fitness was evaluated using the omnibus chi-square model summary. Model summary values of $p < 0.05$ were considered indicative of a robust model. The predictive effect of the Florida on-track status was addressed through the Nagelkereke pseudo R^2 value and the predictive efficacy of the model was evaluated through the comparison of Block 0 and Block 1 values. The odds ratios, or $\mathrm{Exp}(B)$, represented the interpretation of likelihood in evaluating the dependent variable with $\mathrm{Exp}(B)$ values of 1.0 considered even odds. The statistical significance of the findings were ascertained utilizing the $p < 0.05$ alpha level as the threshold for statistical significance.

To address RQ 3, a binary logistic regression was used to analyze the predictability of the independent variables that comprise Florida on-track status (attendance rate; suspensions; course failures; and statewide, standardized assessment proficiency) at each grade level (grade 3 through grade 8) on the dependent variable of CCSR on-track status. The initial analysis evaluated the independent predictor variables using the correlation matrix to test for multi-collinearity. Values where $r > 0.70$ were considered an indicator of the violation of multi-collinearity. In such instances, one of the two variables under examination was omitted from further analysis. The predictive model of fitness was evaluated using the omnibus chi-square model summary. Overall model summary values of $p < 0.05$ were considered indicative of a robust model. The predictive effect of the CCSR on-track status was addressed through the Nagelkereke pseudo R^2 value and the predictive efficacy of the model was evaluated through the

comparison of Block 0 and Block 1 values. The odds ratios, or $\mathrm{Exp}(B)$, represented the interpretation of likelihood in evaluating the dependent variable with $\mathrm{Exp}(B)$ values of 1.0 considered even odds. The statistical significance of the findings was ascertained utilizing the $p < 0.05$ alpha level as the threshold for statistical significance.

To address RQ 4, a two-stage analysis using binary logistic regression was used. The first stage analyzed the predictability of the independent variables Florida on-track status and all five status indicators (retention, race/ethnicity, low SES, SWD, and ELL) at each grade level (grade 3 through grade 8) on the dependent variable of CCSR on-track status. The initial analysis evaluated the independent predictor variables using the correlation matrix to test for multi-collinearity. Values where $r > 0.70$ were considered an indicator of the violation of multi-collinearity. In such instances, one of the two variables under examination was omitted from further analysis. The initial binary logistic regression utilized the forced entry method of inputting each of the independent variables to generate an overall predictive model. The predictive model of fitness was evaluated using the omnibus chi-square model summary. Model summary values of $p < 0.05$ were considered indicative of a robust model. The predictive effect of the Florida on-track status with all five status indicators was addressed through the Nagelkereke pseudo R^2 value and the predictive efficacy of the model was evaluated through the comparison of Block 0 and Block 1 values. The odds ratios, or $\mathrm{Exp}(B)$, represented the interpretation of likelihood in evaluating the dependent variable with $\mathrm{Exp}(B)$ values of 1.0 considered even odds. The statistical significance of the findings was ascertained utilizing the $p < 0.05$ alpha level as the threshold for statistical significance.

The second stage of analysis further assessed the extent in which each of the status indicators have on the predictability of the Florida on-track status on the CCSR on-track status. This stage utilized a hierarchal binary logistic regression to assess the potential moderating or mediating effects of each of the status indicators upon the predictability of the Florida on-track status. Status indicators were entered using a hierarchal method based on review of the literature. The predictive model of fitness was evaluated using the omnibus chi-square model summary. Model summary values of $p < 0.05$ was considered indicative of a robust model. The predictive effect of the Florida on-track status with each individual status indicators was assessed through a comparison of the Nagelkereke pseudo R^2 values and the overall percentage predicted correct at each hierarchal level (block). The odds ratios, or $\mathrm{Exp}(B)$, represented the interpretation of likelihood in evaluating the dependent variable with $\mathrm{Exp}(B)$ values of 1.0 to be considered even odds. The statistical significance of the findings was ascertained utilizing the $p < 0.05$ alpha level as the threshold for statistical significance.

CHAPTER 4: DATA ANALYSIS AND RESULTS

The purpose of the study was to determine to what extent the State of Florida's EWS model can predict on-time cohort graduation in grades 3-8. The following research questions guided this study:

1. To what extent does the CCSR on-track indicator (Allensworth & Easton, 2005) at the end of grade 9 predict on-time cohort graduation?
2. To what extent does the State of Florida's Early Warning System on-track indicator calculated at the end of grades 3 – 8 predict on-track status in grade 9?
3. Of the four indicators that comprise State of Florida's Early Warning System on-track indicator, which indicator would represent the most statistically significant predictor of grade 9 on-track status?
4. To what extent do status indicators such as previous retention, low socioeconomic status (SES), Students with Disabilities (SWD) designation, English Language Learner (ELL) designation, and race/ethnicity affect the predictive nature of the State of Florida's Early Warning System?

The corresponding null hypotheses that were tested in this study are:

H_o1: There is no relationship between on-track status and graduation

H_o2: There is no relationship between grades 3 – 8 on-track status and 9th grade on-track status.

H_o3: There will be no statistically significant difference in the predictability of on-track status for grade 9 between any of the four indicators.

H_o4: There will be no statistically significant difference in the predictability of Florida's Early Warning System between each of the status indicators.

Below is a description of the preliminary analyses, essential demographics, and data analysis for the data set used to answer RQ1 followed by the preliminary analyses, essential demographics, and data analysis for the data set used to answer RQ 2-4. SPSS version 22.0 was used to analyze the data in order to answer the research questions.

Preliminary Analyses: Research Question 1

To address RQ1 (To what extent does the CCSR on-track indicator [Allensworth & Easton, 2005] at the end of grade 9 predict on-time cohort graduation?), the examined data set contained all students who were first-time grade 9 students during the 2013-14 school year which placed them in the graduating class of 2016-17, the most recent graduating cohort. The sample included the requisite data to determine the CCSR on-track status at the end of grade 9 (total number of credits earned and total course failures) as well as the final withdrawal code to determine graduation status. Prior to addressing the research question and hypotheses, preliminary analyses were conducted including missing data and comparative data relative to participant CCSR on-track status.

Missing Data

The data set used to answer RQ1 was found to be 100% intact prior to analytics. As such, imputation of missing data and subsequent analytics related to missing data were unnecessary.

Comparative Data by Component Indicators

This data set was further analyzed by comparing graduates and non-graduates relative to the component indicators of the CCSR on-track status indicator, the total number of credits earned and total number of course failures during the grade 9 year. This analysis was conducted using a *t* test of independent means and the results highlight statistically significant differences ($p < .001$) between graduates and non-graduates in terms of the number of credits earned at the end of grade 9 and the number of course failures during grade 9. Students who graduated on-time earned a mean of 6.722 credits at the end of grade 9 compared to a mean of 4.701 for students who did not graduate on-time (6 credits are needed to matriculate to grade 10). Additionally, students who graduated on-time only failed a mean of 0.2 courses compared to a mean of 1.44 courses for students who did not graduate on-time. This means that students who graduated on-time were more likely to have earned more credits and failed fewer courses in grade 9 than those who did not graduate. Therefore, these results revealed the distinct academic differences between students identified as on-track and those identified as off-track as well as highlight the fact that academic indicators such as credits earned and course failures are important indicators in differentiating the two groups. The results for this analysis are displayed in Table 6.

Table 6: *Graduation Status Comparisons of Credits Earned and Course Failures*

Achievement Area	N	Mean	SD	*t*
Credits Earned (Graduate)	820	6.722	0.9189	10.747***
Credits Earned (non-Graduate)	169	4.701	2.4086	
Course Failures (Graduate)	820	.20	0.593	7.323***
Course Failures (non-Graduate)	169	1.44	2.179	

*** $p < .001$

Analysis of Research Question 1 and Null Hypothesis 1

In order to address RQ1 (To what extent does the CCSR on-track indicator [Allensworth & Easton, 2005] at the end of grade 9 predict on-time cohort graduation?) and H_o1 (There is no relationship between on-track status and graduation), a binary logistic regression test was used. Results of this analysis show that the CCSR on-track indicator at the end of grade 9 represented a robust, statistically significant predictor of on-time cohort graduation successfully predicting 80.2% of final graduation statuses. Specifically, 92.2% of the students who were on-track at the end of grade 9 went on to graduate on-time whereas 44.6% of those off-track at the end of grade 9 did not graduate. Table 7 contains a summary of the crosstabulation analysis between CCSR on-track status and final graduation status.

Table 7: *Crosstabulation of CCSR On-Track Status and Graduation Status*

CCSR Status	On-Time Graduate	Non-Graduate	Percent Predicted Correct
On-Track	682	58	92.2%
Off-Track	138	111	44.6%

Students who were identified as on-track through the CCSR on-track indicator were approximately 9.5 times more likely to earn on-time cohort graduation than students who were identified as off-track through the CCSR on-track indicator. Table 8 contains a summary of the binary logistic regression findings with regards to RQ1.

Table 8: *Predicting On-time Cohort Graduation Status by CCSR On-Track Status*

Model	$\beta(SE)$	95% Lower CI Odds Ratio	Odds Ratio Exp(β)	95% Upper CI Odds Ratio
Intercept	0.22 (0.19)			
CCSR	2.25*** (0.13)	6.56	9.46	13.65

Note $R^2 = .24$ (Nagelkerke). Model $X^2(1) = 155.55, p < .001$. *** $p < .001$

A ROC Curve analysis was conducted as a post hoc test to maximize specificity and sensitivity of the prediction. A ROC curve plots the true positive rate (sensitivity) against the false positive rate (1 – specificity) at various thresholds. The area under the ROC curve is, therefore, a useful measure of how well a parameter (in this case, the CCSR on-track status) can distinguish between a binary dependent variable (in this case, graduation status). The robust, predictive nature of the CCSR on-track indicator was validated through this analysis with the AUC $= .684;\ p < .001$. Table 9 contains a summary of findings with regards to the ROC curve analysis.

Table 9: *Post Hoc ROC Curve Analysis*

Model	AUC	SE	95% CI Lower Bound	95% CI Upper Bound
CCSR	.684***	0.02	0.641	0.726

*** $p < .001$

In light of the statistically significant results from this analysis, the null hypothesis is rejected concluding that there is a relationship between CCSR on-track status and graduation.

Preliminary Analyses: Research Questions 2-4

The second examined data set contained all students who were first time grade 9 students during the 2016-17 school year and was used to address RQ2 (To what extent does the State of Florida's Early Warning System on-track indicator calculated at the end of grades 3 – 8 predict on-track status in grade 9?), RQ3 (Of the four indicators that comprise State of Florida's Early Warning System on-track indicator, which indicator would represent the most statistically significant predictor of grade 9 on-track status?), and RQ4 (To what extent do status indicators such as previous retention, low SES, Students with Disabilities [SWD], English Language Learners [ELL], and race/ethnicity affect the predictive nature of the State of Florida's Early Warning System?). The sample included the requisite data to determine the CCSR on-track status at the end of the 2016-17 school year, (total number of credits earned and total course failures), as well as Florida's EWS on-track status at the end of each school year from 2010-11 (grade 3) through 2015-16 (grade 8), (annual attendance rate, total number of days suspended, total course failures in mathematics or ELA, and the achievement level on the statewide, standardized assessment in mathematics and ELA). Prior to addressing the research questions and hypotheses, preliminary analyses were conducted including missing data, internal reliability of major indicators of the Florida EWS on-track status, and comparative data relative to participant CCSR on-track status.

Missing Data

The data set used to answer RQ2-4 was found to be 100% intact prior to analytics. As such, imputation of missing data and subsequent analytics related to missing data were unnecessary.

Internal Reliability

An analysis of the internal reliability by CCSR on-track status was conducted using the four independent variables that comprise Florida EWS on-track status (Attendance below 90%; one or more suspensions; one or more course failures; and a level 1 on the standardized, statewide assessment in mathematics or ELA). This analysis assessed the consistency of the independent variables that comprise the FL EWS on-track status within each of the CCSR on-track statuses, that is, the degree to which the four component variables agree within the CCSR on-track status construct. Cronbach's Alpha (a) revealed a moderate and statistically significant internal reliability within both CCSR on- and off-track status. Considering the distinct constructs being measured within the four component indicators of the Florida EWS on-track status, values of $\alpha = .57$ and $.56$ suggest the component indicators reliably reflect CCSR on- and off-track status. That is to say, the component indicators of attendance, suspensions, course failures, and achievement levels on the state assessments are all constructs that are important indicators of future on- and off-track status. When these indicators are tracked together through the Florida EWS, there is a degree of confidence in its ability to provide reliable insight into the potential success or failure for each student. Table 10 contains a summary of findings related to the internal reliability.

Table 10: *Internal Reliability of FL EWS On-Track Status Component Indicators*

CCSR On-Track Status	*a*
On-Track	.57***
Off-Track	.56***

*** $p < .001$

Comparative Data Relative to CCSR Status

Comparisons of essential independent variables were conducted relative to the student CCSR on-track status. The purpose of this analysis is to compare the differences between the two independent groups, on- and off-track status, in terms of the evaluated independent variables that comprise the Florida EWS on-track status indicator.

Initially, students identified as on- and off-track by the CCSR on-track status indicator were compared through the four binary independent variables that comprise the Florida EWS on-track status indicator (Attendance below 90% vs. above 90%; one or more suspensions vs. no suspensions; one or more course failures in mathematics or ELA vs. no course failures; and a level 1 on the standardized, statewide assessment in mathematics or ELA vs. a level 2-5 on both mathematics and ELA standardized, statewide assessments). Due to the non-parametric nature of these variables, a Mann-Whitney U-test was used to determine the statistical significance between the two groups. For each of the four indicators, a statistically significant difference favoring the students who were identified as on-track by the CCSR on-track status indicator was evident. Similar to the results in RQ1, these results highlight the distinct academic and behavioral differences between students who are identified as on- and off-track in grades 3-8. Specifically, students who were identified as on-track by the CCSR on-track status

indicator were more likely to have attendance above 90%, not be suspended, have no course failures in ELA or Mathematics, and not earn a level 1 on the statewide, standardized assessment in ELA or Mathematics when compared to those students who are identified as off-track. Table 11 contains a summary of findings with regard to the comparison of the CCSR on- and off-track status with regards to the four component variables of the Florida EWS on-track status indicator.

Table 11: *CCSR On-track Status Comparison by Florida EWS Component Indicators*

Component Indicator	N	Mean Ranks	*z*
Attendance (On-Track)	4756	3314.61	19.49***
Attendance (Off-Track)	2245	3895.87	
Suspension (On-Track)	4756	3282.14	23.38***
Suspension (Off-Track)	2245	3964.65	
Course Failure (On-Track)	4756	3295.02	23.90***
Course Failure (Off-Track)	2245	3937.36	
Level 1 Flag (On-Track)	4756	3139.93	28.56***
Level 1 Flag (Off-Track)	2245	4265.92	

*** $p < .001$

Further analysis reflected more specific data that comprises the component indicators of the Florida EWS on-track status indicator. Specifically, students identified as on- and off-track by the CCSR on-track status indicator were compared with regard to the specific achievement level (1-5) on the standardized, statewide assessments in mathematics and ELA; the number of course failures in Mathematics and ELA; the specific annual attendance rate (expressed as a percentage of days attended school); the

total number of days suspended out-of-school each year; and the total number of days suspended in-school each year. The comparisons were conducted using a *t* test of Independent Means. For each of these variables, the results show a statistically significant difference favoring the students who were identified as on-track by the CCSR on-track status indicator. Students who were identified as on-track by the CCSR on-track status indicator had a mean achievement level of 2.96 in math and 3.12 in ELA (3 is considered proficient) compared to a mean achievement level of 2.01 in math and 2.13 in ELA for those identified as off-track. Mean achievement levels in both the Algebra I End-of-Course (EOC) and Geometry EOC assessments revealed a similar disparate level between students identified as on- and off-track. Further, students who were identified on-track failed 0.5 fewer courses on average than those off-track. Finally, students who were identified as on-track were present 3% more and suspended out-of-school more than a full day less and in-school a little more than a half day less on average than students who were identified as off-track. Table 12 contains a summary of findings with regards to the comparison of the aforementioned variables.

Table 12: *CCSR On-track Status Comparison by Specific Component Data*

Component Data	N	Mean	SD	*t*
Achievement Level Math (On-Track)	4082	2.96	1.186	31.369***
Achievement Level Math (Off-Track)	1986	2.01	1.072	
Achievement Level ELA (On-Track)	4593	3.12	1.147	32.727***
Achievement Level ELA (Off-Track)	2070	2.13	1.103	
Achievement Level Algebra 1 (On-Track)	357	3.74	1.087	6.594***
Achievement Level Algebra 1 (Off-Track)	47	2.64	0.987	
Achievement Level Geometry (On-Track)	113	4.46	0.756	1.804*
Achievement Level Geometry (Off-Track)	4	3.75	1.258	
Course Failures (On-Track)	4684	0.07	0.42	15.83***
Course Failures (Off-Track)	2245	0.57	1.48	
Attendance Rate (On-Track)	4732	95.87	4.16	18.10***
Attendance Rate (Off-Track)	2197	92.72	7.66	
Out-of-school Suspension (On-Track)	4758	0.21	1.77	11.94***
Out-of-school Suspension (Off-Track)	2245	1.37	4.43	
In-school Suspension (On-Track)	4758	0.13	0.97	10.53***
In-school Suspension (Off-Track)	2245	0.77	2.82	

* $p < .1$. ** $p < .05$. *** $p < .001$

Analysis of Research Question 2 and Null Hypothesis 2

To address RQ2 (To what extent does the State of Florida's Early Warning System on-track indicator calculated at the end of grades 3 – 8 predict on-track status in grade 9?) and H_o2 (There is no relationship between grades 3 – 8 on-track status and 9th

grade on-track status), a binary logistic regression test was used. Results of this analysis show that the Florida EWS on-track indicator at the end of grades 3-8 represented a robust, statistically significant predictor of CCSR on-track status successfully predicting at the end of each grade level 3-8 a significant number of future CCSR on-track statuses at the end of grade 9. Overall, the Florida EWS on-track indicator successfully predicted 71.6% of future CCSR on-track statuses. Specifically, at each grade level, 71.9% at the end of grade 3, 71.5% at the end of grade 4, 71.4% at the end of grade 5, 72.6% at the end of grade 6, 70.6% at the end of grade 7, and 71.7% at the end of grade 8. Similar to the model used in RQ1, students who were identified as on-track with the Florida EWS on-track status indicator were identified as on-track through the CCSR on-track status indicator at far higher frequencies than the students identified as off-track through the Florida EWS on-track status indicator were identified as off-track through the CCSR on-track status indicator, For example, 77.1% of students who were on-track at the end of grade 3 were on-track at the end of grade 9 compared to 48.3% of students identified as off-track at the end of grade 3 that were off-track at the end of grade 9. Of interest to note, the success of the Florida EWS on-track status predicting CCSR on-track status rose sharply between grade 5 and 6 rising from 78% to 86%. This suggests that the construct of on-track as measured by the Florida EWS is a more reliable indicator of future success when measured in the middle school grade levels (grade 6-8) when compared to the elementary grade levels. Related, the success of the Florida EWS off-track status predicting CCSR off-track status rose sharply between grade 3 and grade 4, then remained relatively level through grade 8. This suggests that the construct of off-track

status is not as successful at predicting future off-track status in grade 3 when compared with grades 4-8. Table 13 below illustrates these trends in detail.

Table 13: *Crosstabulation of FL EWS On-Track Status with CCSR On-Track Status*

FL EWS Status	Count of CCSR On-Track	Count of CCSR Off-Track	Percent Predicted Correct
Grade 3 On-Track	599	178	77.1%
Grade 3 Off-Track	89	83	48.3%
Grade 4 On-Track	608	182	77.0%
Grade 4 Off-Track	126	163	56.4%
Grade 5 On-Track	625	176	78.0%
Grade 5 Off-Track	153	195	56.0%
Grade 6 On-Track	573	93	86.0%
Grade 6 Off-Track	236	297	55.7%
Grade 7 On-Track	559	88	86.4%
Grade 7 Off-Track	285	338	54.3%
Grade 8 On-Track	588	69	89.5%
Grade 8 Off-Track	315	383	54.9%

Overall, students who were identified as on-track through the Florida EWS on-track indicator were considerably more likely to be identified as on-track at grade 9 than those students identified as off-track through the Florida EWS on-track indicator. This ranged anywhere from 3.12 times as likely at the end of grade 3 to 10 times as likely at the end of grade 8. Table 14 contains a summary of findings with regards to RQ2.

Table 14: *Predicting Grade 9 CCSR On-track Status using FL EWS On-Track in Grades 3-8*

Model	$\beta(SE)$	95% Lower CI Odds Ratio	Odds Ratio Exp(β)	95% Upper CI Odds Ratio
Grade 3	-1.14*** (0.18)	0.23	0.32	0.45
Grade 4	-1.46*** (0.15)	0.17	0.23	0.31
Grade 5	-1.51*** (0.11)	0.17	0.22	0.29
Grade 6	-2.05*** (0.14)	0.10	0.13	0.17
Grade 7	-2.10*** (0.14)	0.10	0.14	0.18
Grade 8	-2.34*** (0.15)	0.07	0.10	0.13

Note R^2 range $= .13 - .29$ (Nagelkerke). Model $X^2(1) = 41.84 - 322.94$, $p < .001$. *** $p < .001$.

A ROC Curve analysis was conducted as a post hoc test to maximize specificity and sensitivity of the prediction. As stated prior, a ROC curve plots the true positive rate (sensitivity) against the false positive rate (1 – specificity) at various thresholds. In this analysis therefore, the area under the ROC curve is a useful measure of how well the FL EWS on-track status indicator at the end of grades 3-8 can distinguish between on- and off-track status as indicated through the CCSR on-track status indicator. The robust, predictive nature of the FL EWS on-track indicator was validated through this analysis with statistically significant AUCs at each grade level (AUC $= .594 - .722$; $p < .001$). Table 15 contains a summary of findings with regards to the ROC curve analysis.

Table 15: *RQ2 Post Hoc ROC Curve Analysis*

Model	AUC	SE	95% CI Lower Bound	95% CI Upper Bound
Grade 3	.594***	0.02	.552	.637
Grade 4	.667***	0.02	.629	.705
Grade 5	.670***	0.02	.635	.706
Grade 6	.709***	0.02	.687	.739
Grade 7	.703***	0.02	.674	.732
Grade 8	.722***	0.01	.694	.749

*** $p < .001$

In light of the statistically significant results from this analysis, the null hypothesis is rejected concluding that there is a relationship between the Florida EWS on-track status calculated at the end of grades 3-8 and the grade 9 CCSR on-track status.

Analysis of Research Question 3 and Null Hypothesis 3

To address RQ3 (Of the four indicators that comprise State of Florida's Early Warning System on-track indicator, which indicator would represent the most statistically significant predictor of grade 9 on-track status?) and H_o3 (There will be no statistically significant difference in the predictability of on-track status for grade 9 between any of the four indicators), a binary logistic regression test was used. Prior to the regression being run, issues of multi-collinearity were addressed through an evaluation of the correlation matrix. This initial analysis revealed no significant levels between the independent predictor variables leading to the conclusion that there were no issues of multi-collinearity. Results of the subsequent binary logistic regression analysis show that all four component indicators represent robust, statistically significant predictors of

CCSR on-track status. Furthermore, the indicator signifying a level 1 on the standardized, statewide assessment in Mathematics or ELA represents the most robust predictor of the CCSR on-track status by virtue of its slightly superior weight (β) and Odds Ratio $(\text{Exp}\beta)$. The remaining three indicators, attendance, suspension, and course failure were nearly identical in their weight $(\beta,\ 0.89, 0.89, 0.92$ respectively$)$ and Odds Ratio $(\text{Exp}\beta, 0.35, 0.34, 0.33$ respectively$)$ and were only slightly less robust of a predictive indicator when compared to the level 1 indicator. Table 16 contains a summary of findings with regards to RQ3.

Table 16: *Predicting Grade 9 CCSR On-track Status using FL EWS Component Indicators*

Model	$\beta(SE)$	95% Lower CI Odds Ratio	Odds Ratio Exp(β)	95% Upper CI Odds Ratio
Intercept	2.48***(0.12)			
Attendance	-0.89*** (0.09)	0.35	0.41	0.49
Suspension	-0.89*** (0.09)	0.34	0.41	0.49
Course Failure	-0.92*** (0.14)	0.33	0.40	0.49
Level 1	-1.25*** (0.06)	0.25	0.29	0.32

Note $R^2 = .23$ (Nagelkerke). Model $X^2(4) = 1266.48, p < .001$. *** $p < .001$.

A ROC Curve analysis was conducted as a post hoc test to maximize specificity and sensitivity of the prediction. The robust, predictive nature of the component indicators was validated through this analysis with the AUC $= .663 - .722;\ p < .001$. However, given the added sensitivity and specificity of prediction inherent in the post hoc ROC curve analysis, the indicator signifying a course failure in mathematics or ELA exerts the most predictive effect on the CCSR on-track status considering the larger AUC value of .722 rather than the flag representing a level 1 on the standardized, statewide

assessment in Mathematics or ELA ($AUC = .681; p < .001$). Table 17 contains a summary of findings with regards to the ROC curve analysis.

Table 17: *RQ3 Post Hoc ROC Curve Analysis*

Model	AUC	SE	95% CI Lower Bound	95% CI Upper Bound
Attendance	.663***	0.01	.644	.683
Suspension	.700***	0.01	.681	.720
Course Failure	.722***	0.01	.702	.743
Level 1	.681***	0.01	.666	.696

*** $p < .001$

In light of the statistically significant results from this analysis, the null hypothesis is rejected concluding that there is a statistically significant difference in the predictability of on-track status for grade 9 between any of the four indicators.

Analysis of Research Question 4 and Null Hypothesis 4

To address RQ4 (To what extent do status indicators such as previous retention, low socioeconomic status [SES], Students with Disabilities [SWD] designation, English Language Learner [ELL] designation, and race/ethnicity affect the predictive nature of the State of Florida's Early Warning System?) and H_o4 (There will be no statistically significant difference in the predictability of Florida's Early Warning System between each of the status indicators), a hierarchical multiple binary logistic regression test was used. Prior to the regression being run, issues of multi-collinearity were addressed through an evaluation of the correlation matrix. This initial analysis revealed no significant levels between the independent predictor variables leading to the conclusion that there were no issues of multi-collinearity.

Prior to the hierarchical analysis, a forced method of entry for each of the status indicators was used as a means for establishing the predictability of the overall model as well as the statistical significance of each status indicator as a part of the model. This analysis revealed low SES status, retention status, ELL status, and ESE status as statistically significant predictors. Students who were retained and students of low SES were individually about 2.5 times as likely to be identified as off-track in grade 9 as indicated on the CCSR on-track status indicator. Students identified as SWD were 1.5 times as likely to be identified as off-track in grade 9 as indicated on the CCSR on-track status indicator while students identified as ELL were 1.2 times as likely to be identified as off-track in grade 9 as indicated on the CCSR on-track status indicator. Table 18 contains a summary of findings with regards to the forced entry binary logistic regression.

Table 18: *Predicting CCSR On-Track Status with FL EWS Status and Status Indicators in Grades 3-8 Using Forced Entry*

Model	$\beta(SE)$	95% Lower CI Odds Ratio	Odds Ratio Exp(β)	95% Upper CI Odds Ratio
Intercept	1.62***(0.41)			
FL EWS	-1.26***(0.06)	0.25	0.28	0.32
Retention	-0.86***(0.08)	0.36	0.42	0.49
Low SES	-0.92***(0.07)	0.35	0.40	0.46
SWD	-0.42***(0.08)	0.56	0.66	0.77
ELL	-0.20 (0.14)	0.63	0.82	1.07
Ethnicity	-0.08**(0.03)	0.88	0.93	0.98

Note $R^2 = .28$ (Nagelkerke). Model $X^2(4) = 1384.8, p < .001$. ** $p < .05$. *** $p < .001$.

The statistically significant status indicators (FL EWS, retention, low SES, and SWD) were then entered using a hierarchical entry method in a hierarchical multiple binary logistic regression test. The FL EWS on-track status indicator represented the primary and base predictor in each of the five predictive "blocks". The addition of predictor status variables at each block of the predictive model exerted a "moderating" effect upon the predictive abilities (β) of the FL EWS on-track status indicator. However, minimal to no change in predictive effect was manifested with the addition of the identified predictor status variables at each stage of the predictive process. For example, adding low SES as a predictor only resulted in additional 0.04 added to the overall model R^2. Retention, ELL, and SWS added negligible amounts (0.03, 0005, and

0.002, respectively) to the overall model R^2. Table 19 contains a summary of the hierarchical multiple binary logistic regression model findings.

Table 19: *Hierarchical Multiple Binary Logistical Regression Findings*

	β	*SE*	Exp(β)	R^2 Change
Block 1				
Intercept	0.27	0.04		
EWS	-1.71	0.06	0.18	.19
Block 2				
Intercept	0.51	0.05		
EWS	-1.53	0.06	0.22	
Low SES	-0.98	0.07	0.38	+.04
Block 3				
Intercept	1.11	0.07		
EWS	-1.31	0.06	0.27	
Low SES	-0.88	0.07	0.41	
Retention	-0.96	0.07	0.38	+.03
Block 4				
Intercept	1.18	0.13		
EWS	-1.31	0.06	0.27	
Low SES	-0.88	0.07	0.42	
Retention	-0.96	0.07	0.38	
SWD	-0.43	0.08	0.65	+0.005
Block 5				
Intercept	1.45	0.14		
EWS	-1.26	0.06	0.28	
Low SES	-0.88	0.07	0.42	
Retention	-0.85	0.08	0.43	
SWD	-0.43	0.08	0.65	
Ethnicity	-0.08	0.10	0.93	+.002

In light of the statistically significant results from this analysis, the null hypothesis is rejected concluding that there is a statistically significant difference in the predictability of Florida's EWS on-track status indicator between each of the status indicators. However, the difference the status indicators add to the predictability of the Florida EWS on-track status indicator is mitigated by the minimal addition to the explained variation as measured by the Nagelkerke R^2.

CHAPTER 5: FINDINGS

The primary goal of this study was to examine the extent to which the Florida EWS in grades 3-8 predicts future graduation status. EWS research often utilizes longitudinal data linking early student-level indicators directly with an eventual graduation. Unfortunately, longitudinal data has the potential of limiting the generalizability of any findings due to the temporal distance between the current graduation year and the earlier grade levels used as predictors. This study uniquely addresses this issue by establishing an a priori link to graduation using the CCSR on-track status as a proxy for graduation. The CCSR on-track status indicator is determined through evaluating the number of credits and course failures a student earns during grade 9. The intent of this study was to first show the CCSR on-track status indicator is an effective predictor for graduation. Then, the effectiveness of Florida's EWS in grades 3-8 could be evaluated through its ability to predict the CCSR on-track status at the end of grade 9. This study adds to the Early Warning field by not only providing a necessary analysis of Florida's EWS at the intermediate elementary and middle school grade levels, but doing so using more recent and relevant student-level indicators. Through a synthesis of results from this study, I provide a discussion of the four critical findings below.

Finding One

Results from this study suggest the CCSR on-track status at the end of Grade 9 can predict future graduation status. I had hypothesized that the CCSR on-track status

indicator would predict future graduation and, therefore, could be used as a proxy for graduation. A student is on track if the student earns enough credits for promotion to grade 10 (in the studied Florida district, this equates to 6 credits) and does not have a course failure during grade 9. Not only has this been shown to be predictive in a variety of contexts through other research studies (e.g., Allensworth & Easton, 2005; Carl et al., 2013; Hartman, et al., 2011), the studied district has used this indicator in prior years as a predictor of graduation. Therefore, I felt this study would show the CCSR on-track status indicator to be predictive of graduation and, in turn, could be used for the evaluation of the Florida EWS model's ability to successfully predict future graduation events. My findings that 92.2% of on-track students went on to graduate exceeded the findings of Allensworth and Easton (2005), seminal authors on Early Warning research and developers of the CCSR on-track indicator, who found that 80% of on-track students went on to graduate with their cohort. Not only did the model significantly predict future graduation, but analysis of the results showcased the disparity between those students who were on-track and those who were off-track. On-track students earned far more credits (more than two full credits on average) and failed far fewer classes (more than a full credit on average). These findings highlight the difficulties students experience as they transition from middle to high school consistent with previous research (Bowers, 2010; Lan & Lanthier, 2003) as well as the Ecological Systems Theory (EST) theoretical framework (Bronfenbrenner, 1979). EST suggests that the complexity of molar activities, or daily actions and behaviors, is indicative of the extent to which a child has developed. The academic measures used within the CCSR on-track status indicator represent a variety of molar activities influenced through several ecological systems evidenced by a

student's effort, cognitive abilities, persistence, ability to adapt to a variety of demands academically, and ability deal with increased freedom and responsibility associated with the matriculation from grade 8 to grade 9. The fact that the CCSR on-track indicator predicts graduation so well provides evidence supporting the theoretical belief that the complexity of molar activities can be used as evidence of human development. Furthermore, prior research has shown this indicator to be predictive of graduation in large urban settings such as Chicago (Allensworth & Easton, 2005) and Milwaukee (Carl et al., 2013), suburban districts in Texas (Hartman, et al., 2011), as well as with English language learners (ELL; Gwynne, et al., 2012), and with students with disabilities (SWD; Gwynne et al., 2009) in a variety of contexts. Considering that the CCSR on-track status indicator has been shown to be predictive across so many contexts highlights the importance of successful academic performance as a prerequisite to graduate. Furthermore, it is incumbent upon schools to strengthen academic interventions to ensure students have the requisite skills to pass courses. The strength of this indicator despite the absence of the other "typical" engagement indicators such as attendance and behavior suggest the successful completion of academic offerings is the primary vehicle to graduation.

While students who met both academic measures (indicated as on-track by the CCSR on-track status indicator) went on to graduate in large numbers, it is interesting to note the disparity between on-track status which successfully predicted graduation (92.2%) compared with off-track status which successfully predicted non-graduation (44.6%). While non-graduates will never be predicted as successfully as graduates considering schools' deliberate and purposeful efforts at intervening with those students

who are designated as off-track, adding additional student-level indicators from other performance domains (such as attendance and discipline) might add to the overall predictability of the CCSR model by improving the model's ability to predict non-graduation from a student's off-track status. For these students who are designated as off-track through the CCSR on-track status indicator, the academic difficulties flagged by the off-track status are simply not enough to capture the full extent of the ecological influences steering these students to non-graduation.

It is important to draw attention to the exclusion of what could be significant numbers of students who drop out when evaluating the predictive nature of the CCSR on-track status indicator. Because this indicator utilizes data from grade 9 academic performance, students who dropped out prior to enrollment in grade 9 did not populate the sample examined in this study. Therefore, there exists the potential to exclude from analysis students who drop out of school and who may or may not have been off-track in grade 9. While it is difficult to ascertain the exact number of students excluded, anecdotal evidence supports the notion that this issue occurs frequently enough to be of concern.

Furthermore, students who drop out of school can potentially be excluded from analysis based on the manner in which graduation rates are calculated, and specifically with regard to how school transfers are handled. As explained in Chapter 2, the Federal Adjusted Cohort Graduation Rate calculation methodology excludes students from the examined school who transfer to another school. This is due to the assumption that the eventual graduation status will be credited to the final school of enrollment. This study, informed by this methodology as well as the practical inability of determining the final graduation status, also excluded from analysis students who transferred out of the studied

school district. However, when a student withdraws from a school citing a desire to transfer to another school, the original school does not need proof of enrollment in the new school to withdraw the student. Therefore, if a student withdraws and never enrolls at the new school, he/she effectively has dropped out of school, but will be coded as a transfer and excluded from analysis. Like students who drop out prior to grade 9 enrollment, it is difficult to ascertain how many students with which this may be occurring, but future research should be directed at examining this issue in detail.

Due to the overall usefulness of student-level indicators in the academic performance domain, as measured by the CCSR on-track status indicator, in demonstrating the likelihood of graduation, these indicators can successfully represent a student's molar activities within the school system indicating the extent of their development. Therefore, the CCSR on-track status indicator can be used as a proxy for future graduation status when evaluating students' on-track status at lower grade levels.

Finding Two

The second major finding of this study is that the Florida EWS at grades 3-8 successfully predicted the CCSR on-track indicator at grade 9. The Florida EWS is comprised of attendance, behavioral, and academic indicators which have been widely documented as predictive indicators in previous research. Given this relationship, I hypothesized that the Florida EWS would not only predict students' future CCSR on-track status, but the indicator would become increasingly predictive of students on-track status as their grade levels increased. This was hypothesized for two reasons: First, as a student matriculates to each grade level, the locus of control for student behaviors which are monitored by these indicators generally shift from the parent/guardian to the student.

Because of this, the thresholds for determining off-track status are not as effective at capturing the underlying intent or attitude of the student at the earlier grades. For example, while a grade 3 student may not want to go to school, they are largely dependent on their parents and/or guardians to take them to school, leaving little student choice. This means that the attendance rate at these grade levels does not necessarily fully reflect the student's desired attendance and engagement. As the student progresses to middle grades, however, they have greater control of their attendance (or non-attendance) resulting in an increased ability for the attendance indicator to signal actual student dis/engagement. Therefore, monitoring attendance at the same threshold from grade 3 through grade 8 will not fully capture the students' underlying disengagement from school. Furthermore, the Florida EWS utilizes a different threshold (90% for chronic absenteeism) as compared to previous research such as 80% used by Balfanz et al. (2007) or 20 or more days (88.9% considering a traditional 180-day school year) used by BERC (2011) and MacIver and Messel (2013). Not only is Florida's threshold inconsistent with the above research but the higher threshold will potentially result in a greater number of false indications that students are off-track due to chronic absenteeism. Second, I had hypothesized the Florida EWS would become increasingly predictive with each grade level because the longer a student is on-track, the more a student may assimilate to the concept of "schooling" as indicated through the adherence to rules surrounding attendance, behavior, and academic success. As the student increasingly adjusts and becomes accustomed to "schooling", the greater the likelihood that the student will persist within these academic and behavioral frameworks until graduation. Therefore, I hypothesized that with each increasing grade level, the Florida EWS would more

accurately indicate on-track students who remain on-track as well as off-track students who remain off-track.

The findings of this study were somewhat consistent with my hypothesis as the Florida EWS, at all grade levels, successfully predicted 71.6% of the CCSR on-track statuses at the end of grade 9. However, the predictability of the Florida EWS remained relatively static as the grade levels increased (all grade levels successfully predicted between 70.6-72.6% of future CCSR on-track statuses) rather than becoming increasingly predictive with each grade level as I had hypothesized. This was due primarily to the Florida EWS' difficulty in identifying off-track students the further removed from grade 9 the student becomes. In grade 8, for example, the Florida EWS identifies 698 students as off track (51.5% of all grade 8 students). This number decreases with each grade level ending with only 172 students identified as off-track in grade 3 (18.1% of all grade 3 students). While off-track status at each grade level 3-8 successfully predicted off-track status in grade 9 at consistent levels (all grade levels are between 54.3 – 56.4% except grade 3 which is at 48.3%), the Florida EWS' ability for on-track status to successfully predict CCSR on-track decreased with each lower grade (from 89.5% in grade 8 to 77.1% in grade 3). These two factors result mathematically in a relatively static overall prediction rate for each grade level.

The Florida EWS' inability to designate significant numbers of off-track students at the earlier grade levels highlights its inability to account for the shifting locus of control in student-level indicators. To increase the effectiveness, the Florida EWS must successfully identify more students at the earlier grade levels who are showing signs of being off-track. This can be done by either adjusting the thresholds that determine off-

track status or altering the data that comprises each indicator to obtain the most statistically significant value. These adjustments will strengthen the Florida EWS' ability to accurately indicate on- and off-track status, particularly at the earlier grade levels and can be done for the attendance, behavior, and course failures indicators. In terms of attendance, the average annual attendance for grade 3-8 students who went on to earn CCSR on-track status in grade 9 was nearly 96% compared to 92.7% for those earning off-track status, a little over 3% difference. One option for increasing the number of students identified as off-track would be to lower the threshold for chronic absenteeism, from 90% attendance to 80% as suggested by the literature. This could potentially more clearly differentiate students showing more drastic attendance issues through the Florida EWS. However, this would be counter to recent calls for a standardizing the definition of chronic absenteeism across the nation as missing 10% or more of school (Jordan & Miller, 2017). High rates of absenteeism have been shown to be correlated not only to increased rates of non-graduation, but also to predictors of non-graduation such as lower academic achievement, increased rates of retention, and lower achievement on standardized assessments. Therefore, while lowering the threshold for chronic absenteeism from 90% attendance to 80% could potentially more clearly differentiate drastic attendance, it is crucial that the threshold for chronic absenteeism used in the Florida EWS be consistent with definitions used in other educational research domains at 90% attendance. It follows then, that further research should be directed at better understanding how attendance at the elementary ages can be used as a predictor of non-graduation.

Regarding the behavioral indicator, the Florida EWS uses one or more suspensions as an indicator and includes both out-of-school and in-school suspension to populate this indicator. The use of both types of suspension is not consistent with existing research which generally found only out-of-school suspension to be the most predictive (e.g., Balfanz et al., 2007). Due to the inclusion of in-school suspension, more students may be designated off-track with little-to-no evidence supporting the predictive nature of this discipline measure. Furthermore, at the elementary grade levels, both types of suspension are generally only used as a discipline measure in the most extreme cases and may not be sensitive enough at those grade levels to fully indicate disengagement at the molar activity level within the behavioral domain. Therefore, subsequent research should examine which alternative behavioral indicators more fully capture a student's capacity to engage within the school's behavioral expectations, such as unsatisfactory behavior marks assigned by teachers suggested by Balfanz et al. (2007), and how these indicators could increase the effectiveness of the Florida EWS at the elementary levels to predict future off-track status.

Finally, regarding the course failures indicator, the Florida EWS only uses course failures in mathematics and ELA, potentially ignoring indications of a student's academic struggles through course failures in other subject areas. By removing this subject restriction and utilizing one or more course failures in any subject area, the ecological influences on academic achievement will be more fully captured, potentially increasing the ability of the Florida EWS to successfully predict on- and off-track status. It is vital for the success of an EWS that the component indicators effectively identify disengagement within the attendance, behavioral, and academic domains. Considering

our understanding of the developmental trajectories of a student as he/she matures, the thresholds used within these component indicators contained in the Florida EWS must adapt at earlier grade levels to reflect the varying ways in which a student expresses disengagement at younger ages.

The theoretical notion that ecological influences have dynamic relationships across systems supports the ability of the Florida EWS to predict future on- and off-track status. Over time, these dynamic relationships positively (or negatively) impact students' development. By including indicators from a variety of engagement domains (attendance, behavior, and academic), the Florida EWS more fully captures the influences from these ecological systems as they manifest through the student's molar activities exhibited within the school microsystem. The success of the Florida EWS model at predicting future on- and off-track status confirms our understanding that a student's development can be characterized by the complexity of the exhibited molar activities. Whether a student drops out of school or persists to graduation, his/her time in school is characterized by a process of learned skills and behaviors. Mastery of these skills and behaviors fosters success within the educational system and the complexity of a student's molar activities which are indicative of his/her being on-track to graduate are effectively captured by the student-level indicators of the Florida EWS model. As such, this finding and the guiding EST theory supports the use of the Florida EWS at intermediate elementary and middle grade levels as a means to predict future graduation status. Students who are on-track at earlier grade levels will continue to stay on-track and students who are identified as off-track in grades 3-8 represent an accurate target group on which a school can intervene.

Finding Three

Analysis of the study's results revealed that all four indicators comprising the Florida EWS were statistically significant, with the indicator for a level 1 on the standardized, statewide assessment being the strongest predictor. This rejected my hypothesis that, as has been shown in previous research in this area (e.g., Allensworth & Easton, 2005; Kieffer et al., 2014; Norbury et al., 2012), the test for multi-collinearity would reveal a statistically significant correlation between the indicator for course failures in mathematics or ELA and the indicator for a level 1 on the standardized, statewide assessment. Course performance is generally seen as a more complete picture of a student's effort, resilience, and cognitive abilities as opposed to achievement on a state assessment which can be perceived as a snapshot in time of those same measured characteristics. Both are measures of academic performance that I hypothesized would be correlative. Furthermore, of the remaining three indicators under study (attendance below 90%, one or more suspensions, and course failures), I hypothesized that the indicator signifying a course failure would be the strongest predictor of future CCSR on-track statuses for three reasons:

1. As previously stated, the locus of control for attendance at the elementary grade levels and, to a lesser degree, at the middle school grade levels resides primarily with the parents and/or guardians. Therefore, while students may desire to disengage through nonattendance, they do not necessarily have the power to decide not to attend as evidenced by the mean attendance rate for off-track students of 92.72% (which is well above the 90% threshold that signals chronic absenteeism). The hypothesized inability of the attendance indicator to accurately

capture the underlying attitudes and engagement contributed to my belief that another indicator would be a better predictor.

2. The district under examination in the study was cited in 2013-14 and later sanctioned by the Florida Department of Education for disproportionate classroom removals for Black students receiving Exceptional Student Education (ESE) services (SWD). In subsequent years, the district employed a number of alternate discipline practices, significantly reducing classroom removals. In some schools, the use of in-school suspension was eliminated entirely. The drastic reduction in the use of suspension as a discipline measure contributed to what I had hypothesized to be a reduction in the indicator's ability to fully capture behavioral disengagement.
3. In 2006, the Florida Legislature amended state statutes creating the requirement, beginning with students starting middles school in 2006-07, that students must successfully complete core courses in grades 6, 7, and 8 (mathematics and ELA inclusive) in order to matriculate to high school (Fla. Stat. ch. 1003, § 4156, 2017). From personal anecdotal experience, this resulted in reductions in course failures as middle schools strengthened academic supports and passed students in order to create more space to accommodate the increasing student enrollment. This reduction in overall course failures would lead to, what I thought to be, an increased ability of the course failure predictor to differentiate those students truly showing academic difficulties. That is, the indicator would more clearly identify students showing signs of academic disengagement considering these students

failed a mathematics or ELA courses even after the policy change resulted in a decrease in overall course failures.

For these reasons, I had hypothesized the course failures indicator would be the strongest predictor of off-track status.

Not only did this finding reject my hypothesis of linear correlation between the level 1 and course failure indicators, the level 1 indicator was the strongest predictor of future off-track status with the other three component indicators (i.e., attendance below 90%, one or more suspensions, and course failure in mathematics or ELA) generally equal in their strength of prediction. My hypothesis that the course failure indicator would be the strongest predictor was also rejected in response to this finding. While the predictive power of state assessments is confirmed in research, this power generally diminishes when paired with other academic measures (Rumberger, 2011). State assessment results reflect a snapshot of student academic achievement while course grades reflect not only a more comprehensive summary of academic inputs (such as effort, persistence, work product) but also across a wider temporal sample. However, findings from this study suggest that low test scores play a larger role in predicting future academic struggles as students with a level 1 on the statewide assessment are 3.44 times more likely to be off track in grade 9. Even though this finding linked state test scores to academic indicators as measured by the CCSR on-track status indicator in grade 9, the larger policy influences from the state educational macrosystem must be considered in the interpretation of these results. Specifically, grade 3 students in Florida must earn a level 2 or higher (out of 5 where a level 3 is satisfactory) on the state assessment in ELA to be promoted to grade 4 and high school students must earn a level 3 on the state

assessment in ELA and Algebra 1 to graduate with a standard diploma. While neither of these requirements specifically apply to grade 9, when the CCSR on-track status is determined, the high stakes nature of state assessment in Florida have cultivated an assessment-driven climate within the educational system contributing to the relationship between poor performance on the state assessment and overall disengagement. Although there have been multiple studies mentioned above that have examined state assessment performance as an EWI, none of these studies have examined the results through the lens of state graduation requirements. Therefore, it is difficult to generalize those findings to FL without knowing specifically how those states integrate performance on state assessments within promotional requirements, especially in light of the contrasting findings in this study showcasing the predictive power of state assessment achievement.

There is a particular concern with the potential use of this study's finding elevating performance on state assessments as a predictor of graduation in justifying current policy decisions related to the use of state assessments in graduation requirements. Current policies have resulted in teachers and administrators shifting their focus to increasing test scores despite what some have described at best as "sparse" research suggesting high stakes testing positively increases student learning, (Nichols, 2007). While current high-stakes testing requirements and teacher accountability may owe its existence to the noble purpose of increasing student achievement, some observers have suggested that the use of testing has shifted from a somewhat flawed mechanism of individual accountability, to a mechanism of institutional accountability that may be even more flawed (Nichols & Berliner, 2007). Instead of providing teachers and administrators with useful data to positively impact graduation, the judgment and negativity associated

with assessment policies have undermined effective instructional techniques. Therefore, this finding should not be celebrated, but rather, used as a caution to reconsider the unintended consequences of placing such a pronounced emphasis on high stakes testing in graduation requirements.

Furthermore, this finding highlights the necessity for future Early Warning research to interpret findings in light of the varying policy influences on local schools. As mentioned in Chapter Two, the indicators used within an EWS are not directly causing a student to drop out from school, but are rather, measurable symptoms of a student disengaging from the educational process. The success of an EWS lies in its ability to accurately capture these signs of disengagement early enough for schools to intervene. To this end, researchers must consider the specific federal, state, and local policy influences (macrosystem) on a student's molar activities within the school microsystem to ensure EWS more effectively identify students at risk of not graduating.

Apart from the level one indicator proving to be the most predictive, all four indicators were statistically significant and generally similar in strength. This finding confirms our understanding for the need of indicators from various domains within an EWS. As stated in Chapter One and further explored in Chapter Two, dropping out of school is the culminating act in a long-term process of disengagement. This disengagement manifests through a student's behaviors and actions and can then be captured through the EWS, identifying students who are on- and off-track from graduation. Despite the suggestion that specific indicators can identify typologies of students who drop out (Bowers & Sprott, 2012), it is vital for the overall success of an EWS to use indicators from various domains to ensure the successful identification of

student disengagement. Even though no two indicators demonstrated significant levels of correlation with one another, the fact that all four component indicators were statistically significant and generally similar in strength lends support to the notion that they are all indicators of a larger issue of disengagement. To the extent we understand bidirectional influence between ecological systems, this finding confirms the relationship between the indicators as they signify disengagement. That is, students who struggle academically may act out behaviorally, resulting in suspensions or simply the choice not to attend school. Conversely, students who are absent or suspended may struggle academically as they miss instructional time.

It is interesting to note the results from the post hoc ROC Curve Analysis suggesting that the course failure indicator may have a more pronounced strength in the predictive power of the Florida EWS model than indicated through the binary logistic regression. The ROC Curve Analysis functions to increase the degree of specificity and sensitivity to the analysis, highlighting each indicator's ability to correctly link success and failure on the indicator with on- and off-track status respectively. This post hoc analysis suggests a student's course performance in mathematics and ELA more clearly identifies future on-track status than the other three indicators. While this analysis does not change the previously discussed finding detailing the power of student performance on state assessments as a predictor, it does shed light on how this finding may fit in with the seemingly contrasting body of literature which denotes a diminishing power of prediction for state assessment when paired with other, more comprehensive, academic measures (e.g., Allensworth & Easton, 2005; Kieffer et al., 2014; Norbury et al., 2012). Perhaps the student's effort, persistence, and cognitive abilities captured over an

extended period as indicated by course performance may more clearly indicate future academic performance than previously detailed.

Regardless of individual strengths, this finding confirms all four of the Florida EWS' component indicators (attendance below 90%, one or more suspensions, course failures in mathematics or ELA, and a level 1 on the standardized, the statewide assessment system in mathematics or ELA) capture inputs from a variety of ecological systems and can successfully be used in an EWS to predict future on-track status. However, inputs from the macrosystem (i.e. policies surrounding graduation requirements in Florida) may have a potentially greater influence on the predictive nature of these indicators which must be considered in interpreting these findings to school systems outside of the state of Florida.

Finding Four

The final major finding of this study is that status indicators identifying prior retention, low SES, SWD, and race/ethnicity added to the overall predictive nature of the Florida EWS but not to the extent to warrant inclusion in the model. Moreover, the status indicator identifying ELL status was not found to be statistically significant. I had hypothesized that all of the status indicators would add to the overall predictive nature of the model as they each uniquely represent inputs from varying ecological systems not directly indicated through the existing Florida EWS model. The results of this study highlighted low SES as the strongest predictive indicator followed by the statistically significant predictive indicators of retention, SWD status, and, lastly, race/ethnicity. However, the findings rejected my hypothesis denoting that all status indicators were statistically significant predictors since the status indicator signifying whether a student

was identified as ELL was found not to be statistically significant. With regards to the prior retention, low SES, SWD, and race/ethnicity status indicators, this finding was in line with prior research that determined these status indicators to be predictive (e.g., Rumberger, 1995; and Suh & Suh, 2007). Furthermore, the low β weight associated with the race/ethnicity of each student aligned with existing research that suggests a diminishing predictive power when paired with other status indicators such as low SES (Carpenter & Ramirez, 2007) and course grades (Bowers, 2010).

One of the strengths of the Florida EWS is its ability to easily differentiate students who may be on- or off-track and those who need additional supports. Therefore, I had hypothesized that any additionally derived predictability within the Florida EWS from the inclusion of these status indicators would need to be weighed against the subsequent complication of having to interpret additional status indicators to the model alongside the existing on-track status indicator to identify students needing additional supports. That is, educators would no longer look to a single indicator signifying on- or off- track status, but need to interpret that indicator in light of five additional status indicators. The results of this study suggest that the Florida EWS would be better off without these status indicators. While they are statistically significant, the minor addition to the Nagelkerke R^2 at each step of the Binary Logistic Regression highlights the fact that the four statistically significant status indicators do not add enough predictability to the Florida EWS model to warrant inclusion given the increased difficulty this would add to the process of identifying on- and off- track status.

This finding confirms our understanding of how ecological influences affect human development across and within systems. My hypothesis that all status indicators

(i.e., low SES, retention, SWD status, and, race/ethnicity) would be predictive due to their unique input not specifically addressed within the component indicators of the Florida EWS discounted the existing influence these status indicators have on the student-level indicators of attendance, behavior, and academic performance. The fact that the addition of the status indicators added very little to the explained variance attributed to the Florida EWS confirms the influences of each status indicator on the component indicators of the Florida EWS. For example, we know students of poverty face decreased access to proper nutrition and medical care, single parent households, lack of adequate supervision after school, and minimized assistance with educational requirements outside of the school day such as homework and projects. Taken alone, the low SES status indicator would be indicative of a greater propensity to drop out. However, when paired with the Florida EWS, the influences of poverty are exerted across ecological systems and manifest within a student's attendance, behavior, and course performance, decreasing the added predictability that would be expected when SES is added as a predictor. Hence, the addition of this status indicator will not add significant amounts to the explanatory power of the Florida EWS to warrant inclusion.

As stated in Chapter 1, there is some disagreement to the purpose of an EWS. Some believe the system should exclusively predict students who are off-track while others point to the need for an EWS to also signal to educators the reason why a student might be off-track. For those arguing the former, this finding would point to the exclusion of status indicators in the areas of retention, SES, SWD, and race/ethnicity as a result of the small amount of additional variance explained. However, this study seeks to link prediction with a larger purpose of establishing the beginnings of intervention for

educators. In this new role, not only would the Florida EWS predict students showing signs of disengagement, but it would help signal a need for a specific intervention early enough to effectively reengage the student. Therefore, while there is not enough evidence to support that these status indicators be included in the Florida EWS, the subsequent problem solving that is necessary once students are identified as off-track demands the inclusion of these status indicators which can inform as interventions specific to students' needs. For example, race/ethnicity may not add to the identification of students who are off-track within the Florida EWS. However, there are several evidence-based, culturally-relevant interventions that could be employed by educators based on the racial and ethnic breakdown of those students identified by the model.

Implications for Research and Practice

This study showed that linking EWI exhibited in early grade levels to a later status indicator (such as the CCSR on-track status indicator at the end of grade 9) is a useful and effective way to test the predictive nature of those EWI of future graduation events. An unfortunate byproduct of using longitudinal data for evaluating the predictability of elementary age behaviors to graduation is the length of time that separates the two. Behaviors in elementary years may be found to be predictive, but may not be relevant in today's elementary system. For example, as stated in Chapter One, the statewide, standardized assessment in Florida has undergone two major replacements (from Florida Comprehensive Assessment Test [FCAT] to FCAT 2.0 in 2011-12 and from FCAT 2.0 to Florida Standards Assessment [FSA] in 2014-15) since the latest graduation cohort of 2017 took them as grade 3 students. Determining how predictive this assessment is of graduation would add to the body of EWS research, but the

generalizability of any findings to the current state assessment practices would be impacted due to this fact. Therefore, similar to the methodology of this study, researchers should consider using an on-track indicator in earlier grade levels as a proxy for graduation when testing EWI exhibited in earlier grade levels.

Additionally, this study shows that the Florida EWS is predictive of future off-track status and, in turn, of future graduation status. This included a necessary examination of early warning research at the elementary grade levels. Not only is there scant evidence in the existing body of research linking elementary indicators to graduation, but no study has yet to test the predictability of the Florida EWS at the elementary levels. Despite this, the Florida legislature recently expanded the statutorily required EWS to elementary grade levels leaving educators scrambling to understand the effectiveness and usefulness of an EWS at those grade levels. This study provides necessary evidence that the Florida EWS is useful at predicting future graduation status, urging educators to look more closely at behaviors exhibited in earlier grade levels to increase graduation rates.

As researchers continue to add to the body of literature on EWI at the elementary levels, educators must consider how an EWS at these grade levels can inform interventions. This study confirms that the Florida EWS is predictive at intermediate elementary grade levels. However, more research is needed to ensure the most effective indicators are implemented within the Florida EWS. Until then, educators must begin to adopt interventions designed to address behaviors exhibited at these early grade levels that address the myriad of ecological influences on a child's development at this time in their lives. By understanding how influences from various ecological systems manifest in

a student's molar activities (such as the policy influences [macrosystem] of statewide assessment practices in Florida on the predictive nature of achievement levels in earlier grade levels), educators can effectively intervene with the root causes for disengagement. For example, while some behaviors are not as prevalent at the earlier grade levels (such as chronic absenteeism or course failures), addressing the intent or attitudes that contribute to those behaviors may aid in preventing them from coming to fruition as the locus of control shifts from the parent/guardian to the student. Specifically, addressing the need for daily attendance at school and utilizing evidence-based, engaging instructional practices will address root causes for disengagement by encouraging students to want to come to school and will eventually lead to higher attendance rates when those students have more control over their attendance.

This study highlighted the need for educational leaders to consider policies that unintentionally lead to disengagement. In the interest of maintaining a student's engagement in school, educators should, for example, consider alternative discipline measures to suspension. Removal from the classroom results in a disengagement from the community of the classroom, places them behind academically, and, as suggested by prior research, gives the message to students that they are not wanted by the school (Lee et al., 2011). This is not to suggest schools should eliminate suspension, but just consider alternative discipline practices where warranted. Schools must balance the safety of all students and, certainly, some behaviors warrant removal from the school community. However, this should only be done in the most extreme cases as suspension has been shown to influence a student's disengagement from the educational system and leading, in some cases, to a decreased likelihood to graduate.

Considering the lack of research evaluating the predictive nature of Florida's EWS, especially at the elementary ages, it was vital to limit the scope of this study to the student-level indicators used within the Florida EWS. Now that these student-level indicators have been shown to be predictive of graduation, an additional commentary is warranted on the specific influences of the school exosystem on the predictive nature of the Florida EWS. Prior research has demonstrated the impact of school-level indicators on student-level achievement (e.g., Rumberger & Thomas, 2010). This is to suggest, that based on the systemic inequities pervasive throughout our schools, some of the blame on high levels of non-graduation lie with the system itself and warrants study on how systemic and school-level variables affect the predictive nature of the Florida EWS. While it is difficult to establish the exact relationship between graduation and school-level variables, studies show that between 20-25% of the variability within graduation and non-graduation can be tied to school-level characteristics (Rumberger, 2011). For example, schools with lower attendance rates have been found to have lower graduation rates (Rumberger & Thomas, 2010). Particularly concerning however, is that the schools with lower attendance rates tend to be concentrated in our poorer communities (Balfanz & Byrnes, 2012). Furthermore, exclusionary discipline practices that remove students from the educational process, such as suspension, lead to higher rates of non-graduation (Christie, Jolivette, & Nelson, 2007), and are often disproportionately applied to minority students (Gregory, Skiba, & Noguera, 2010). With the continued segregation of our schools along not only race/ethnic lines, but also socioeconomic lines, it is vital for Florida policymakers and educators to understand the specific influence derived from the school system on student achievement.

Finally, it is important to understand the role of theoretical foundations in research, especially those studies relying on quantitative methods prevalent in Early Warning research. If the purpose of research is to understand a problem (Creswell, 2012), then it is imperative for Early Warning researchers to craft studies that allow findings to explain aspects of the problem previously unknown. Theory helps explain the studied phenomenon and can provide researchers with a framework to guide their methodology, assumptions, and constructs within the study as well as to interpret the subsequent results. Considering the multitude of contributing reasons to students dropping out from school (e.g.. Rumberger, 2011; Suh & Suh, 2007), Early Warning researchers are confronted with a massive number of variables that can potentially shed light on the issue of school dropout. Theoretical foundations such as EST allow researchers to be more strategic in explaining the results, particularly those derived from quantitative methods. For example, without EST as a theoretical foundation to this study, I might have been inclined to suggest low SES status is not an effective predictor of graduation considering the results showing a minor addition to the explained variation to the Florida EWS model detailed in Chapter Four. However, drawing on our understanding of how molar activities within a microsystem are influenced by other ecological systems, I can be more confident in the finding that low SES does in fact influence a student's disengagement but its influence is adequately captured in the attendance, behavior, and academic indicators already found within the Florida EWS model. The complexity inherent within the phenomenon of school dropout is more fully understood when researchers affix hypotheses, methods, and interpretations to theoretical frameworks that explain how students develop in and out of the school system.

Recommendations for Future Research

The following are recommendations for future research based on the findings from this study:

1. Future research should balance the need for the ease of use of a model with improving the predictive nature of the model. For example, for studies examining the most predictive attendance indicator and/or threshold, there is an inherent loss in predictability when using a binary threshold (similar to the 90% threshold used by the Florida EWS) as compared to a continuous measure of a student's actual attendance rate. While this latter measure might increase the overall predictive nature of the model, educators would lose insight into the potential of a student's chronic absenteeism.
2. Considering the changing locus of control in student-level behaviors in elementary grade levels, future research should determine if varying thresholds for each indicator at subsequent grade levels would lead to a more predictive model and what these thresholds should reflect. Investigation into this area should also examine variations across educational contexts since differences in policy or interpretations of policy have the potential to shift findings.
3. In terms of suspension, the Florida EWS uses both in-school and out-of-school suspension. While in-school suspension still removes the student from the community of the classroom, it may not carry the same stigma as an out-of-school suspension and may not "push" the student to drop out. Therefore,

future research should separate these suspensions or include only the out-of-school suspensions to determine if this would lead to a more predictive model.

4. In light of the statutory requirement for successful completion of all core courses in middle school grades and the anecdotal evidence highlighting the reduction of course failures, future researchers should examine if the inclusion of a grade of D along with course failures in mathematics or ELA will increase the predictive nature of the Florida EWS.
5. Additional research should be directed at exploring the finding of this study that highlights the strength of a student's performance on state assessment at predicting future on-track status. Considering that this finding is counter to many related studies, understanding this phenomenon in greater detail will help refine EWS and help direct educators in designing interventions.
6. The state assessment indicator in the Florida EWS uses an achievement level in either mathematics or ELA. Future research should explore the strength of each indicator separately to determine if perhaps the strength of the indicator lies in underlining the ability (or, rather, inability) of schools to successfully intervene with students who are below grade level in reading or mathematics.
7. Considering the potential influence of policy decisions requiring minimum achievement levels on state assessments, future research could examine the impact that persistent under-achievement on state assessments has on graduation.
8. By establishing an a priori link to graduation through the grade 9 CCSR on-track status indicator, this study reduced the temporal distance from the

studied predictive grade levels to the current graduation cohort year. However, by requiring grade 9 completion in this study to determine the CCSR on-track status, students who dropped out prior to the end of grade 9 were excluded. Therefore, future research might benefit from establishing a similar on-track status at the end of grade 8.

Conclusion

Despite an enormous amount of research on graduation and drop out, students continue to drop out of school at alarming rates (Stark & Noel, 2015). In the past 10 years, a growing body of research has sought to link behaviors exhibited early on in students' academic career to latter graduation status with the aims of creating a system to identify those students who are showing early signs of being off-track. The State of Florida has used this research as a foundation for its policy changes, requiring schools to identify and monitor students in grades K – 8 who are showing signs of disengagement. By examining the predictive nature of elementary behaviors to graduation, this study fills an enormous gap in existing research and is the first to specifically examine the Florida EWS at the elementary grade levels. This study established an important benchmark in early warning research from which future researchers can further examine and refine the predictive nature of Florida's EWS.

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