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The Efficacy of an Early Warning System and a Response to Intervention Decision-Making Model for Students Transitioning in Secondary Education

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THE EFFICACY OF AN EARLY WARNING SYSTEM AND A RESPONSE TO INTERVENTION DECISION-MAKING MODEL FOR STUDENTS TRANSITIONING IN SECONDARY EDUCATION

by

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ABSTRACT

The purpose of this study was to test the validity of using an early warning systems as a mean for identifying students at-risk of academic disengagement. Additionally, student outcome gains when participating in a Response to Intervention (RtI) decision-making model were compared to those who did not participate. Separate methods of data analysis were used to examine. The study used 7,579 student records to conduct the study of students in sixth and ninth grade in the 2014-2015 academic year.

The Pearson correlation coefficient was used to determine the strength of the relationship between the early warning risk score, grade point average (GPA), and credits earned. Overall, the results suggest that the higher the students' risk scores, the lower the GPAs were, while those with lower risk scores tended to have higher GPAs. The results of the correlation analysis proved the existence of the relationship between students' risk scores, and their academic achievement based upon grade point average and earned credits. The results for both grade six and grade nine showed statistical significance, suggesting a strong relationship between students' GPAs and early warning risk scores. When GPAs were examined two years later, those students with lower risk scores two years prior tended to have higher GPAs and more credits earned two years later.

For Research Question Three, caliper matching was used to match students who participated in the RtI process with another single variable from a student who did not participate in the RtI process (Painter, 2004; Stuart, 2010; Clark, 2015). A related samples *t*-test (matched subjects design) was used to test the observed differences in student outcomes for students who were in the RtI process compared to those who were not in the RtI process. In summarizing, students in grade six and nine generally had greater increases in risk indicators

(as measured by change in risk score) and less increase in academic outcomes when participating in the RtI process compared to those who did not participate in the process.

For my mom, Joyce. No words could ever do justice the love, encouragement, and support you have given me, especially in the past 10 years.

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THE PROBLEM AND CLARIFYING COMPONENTS

Introduction

Academic disengagement produces a long lasting cycle of inequity and disparity over time. In addition to jeopardizing graduation status on the short term, school disengagement has lasting effects into adulthood, including behavior trajectories that lead to increased crime and drug use (Henry, Knight, & Thornberry, 2012). Therefore, ensuring early identification of students who are academically disengaged is not only an educational interest, but also an interest related to national public health, the judicial system, and the economy at large. To address this concern, identifying at what point student disengagement trends can be measured and the risk indicators attributed to disengagement can help concentrate educational efforts in ensuring on time graduation for students. Critical transitions occur for students as they move from elementary school to middle school, and middle school to high school (Allensworth & Easton, 2007; Lucas, 1997). The process of disengagement starts early, but increases overtime and can be recognized through increased patterns in risk indicators (Alexander, Entwisle, & Kabbani, 2001). Therefore, it is important to identify student patterns in critical transition years and employ interventions when necessary (Henry et al., 2012).

Once students are identified as exhibiting risk factors, a systems approach is needed to analyze barriers on a systematic level (Curtis, Castillo, & Cohen, 2008). In order to provide systematic support for all students through a multi-tiered approach that addresses both academic and behavioral domains, school-wide data and grade-level data can be used to identify trends and patterns (Eagle, Dowd-Eagle, Synder, & Gibbons, 2015).

Early warning systems (EWS) may be utilized as an avenue for identifying academically disengaged students who are at high-risk of dropping out of school, especially in transitional years. As defined by Heppen and Therriault (2008), EWS identify students who are academically disengaged and are at high-risk of dropping out by recognizing student patterns related to drop out rates. By identifying students at high-risk of dropping out as early as possible, educators can ensure interventions are in place. EWS identify academically disengaged students by aggregating student indicators that are linked to educational outcomes and graduation. Risk indicators are used to identify students so that the educator can investigate the educational barriers present, including risk indicator types, and the degree of severity. Risk indicators may include data in the areas of academic achievement, misconduct, attendance, retention, mobility, and other tertiary factors (Gleason & Dynarski, 2002; Heppen & Therriault, 2008). EWS allows for a more timely awareness of specific student risk indicators and that may facilitate more efficient responses by educators providing interventions and supports to ultimately remediate and help students get back on track.

Once students are identified with risk indicators, an approach can be used to address the needs of students through both academic and behavioral intervention decision-making processes. MTSS (Multi-Tiered System of Supports) is utilized by examining school-wide data of student performance to identify risk factors and trends in order to provide systematic support. This unified approach can accelerate the efforts of school-wide improvement for all students, as educators within schools systematically address the needs of interventions through a continuum of support based upon their academic or behavioral needs (Sugai & Horner, 2006; Eagle, Dowd-Eagle, Synder, & Gibbons, 2015). Within this continuum to address the needs of all learners, a

Response to Intervention (RtI) framework is used to ensure the needs of all students through a tiered approach.

Response to Intervention is a data driven multi-tiered approach to the identification and support of students with learning and/or behavioral needs. Within the context of making educational decisions for students not meeting standards, two approaches are typically used by school personnel: either a four step problem solving process or a standard intervention protocol. A standard intervention protocol involves prescribing systematic interventions offered to students who have been identified as not meeting specified levels of performance who demonstrate a need for remediation. Interventions are typically predetermined, based upon available school resources and are implemented after having proven effective for other students in need of remediation (Christ, Burns, & Ysseldyke, 2005; Johnson et al, 2006). The marked difference when using a standard protocol approach is the lack of individualization that occurs throughout the selection and monitoring of the student's response to intervention.

The Response to Intervention decision-making model includes a four step problem solving process that promotes a planned set of supplemental or intensive procedures to address specific skill deficits for students not meeting standards with the universal curriculum taught to all students. The four step problem solving process includes (a) charted data to drive root cause analysis in problem identification; (b) incremental goals established by a problem solving team; (c) assessment driven interventions and instruction; and (d) deliberate monitoring of the impact on student learning (Batsche et al., 2007; Gresham, 2004; Hattie, 2012). In instructional practice, RtI is not an intervention program, but a process. It serves as a framework to identify students at risk and develop a plan for addressing identified student needs. The long term goal is to reduce risk indicators that lead to negative outcomes by responding quickly to the student's

need for intervention and developing a plan for follow up based upon student need (Batsche et al., 2007; Gresham, 2004). Whether in the classroom or school-wide, in an RtI decision-making model, a four step problem solving process is utilized as an approach of addressing the needs of all learners. The differentiation within the four step problem solving process varies based upon the needs of learners. In some cases needs of students are adequately met through standard protocol interventions and decision-making (Christ, Burns, & Ysseldyke, 2005; Johnson et al, 2006), in other cases, the four step problem solving process calls for a greater intensity and a team of educators with specific knowledge to aid in decision-making.

Research and procedures focused on effective implementation of RtI are most often at the elementary level (Duffey, 2007). To ensure effective interventions, it is essential that the design of an RtI decision-making model address the structure and organization that exists in secondary schools. The design and implementation of effective academic and behavioral intervention processes through support structures in secondary schools are essential to ensure intervention decision-making processes effectively meet the needs of academically disengaged students in secondary school settings, as well (Duffey, 2007). The use of EWS can help address student's need for interventions in a manner that aligns with the organizational structures available at the secondary level (Johnson & Semmelroth, 2010).

Statement of the Problem

A systems perspective is needed to solve barriers in the identification of students who are academically disengaged (Curtis et al., 2008). There is a need for research that examines the effectiveness of recognizing early school disengagement in transitional years as students move from elementary to middle school and middle school to high school. In addition, there is a need to examine the efficacy of an RtI decision-making model in secondary schools. The problem

studied was the relationship between academic achievement and an early warning system in addressing school disengagement in secondary students. In addition, the problem to be studied was the academic gains among students in an intensive RtI decision-making model for disengaged students.

Purpose of the Study

With an early warning system and an intensive RtI decision-making process, a model is possible that can address the needs of academically disengaged students while meeting the unique organizational structures of the secondary school level (Johnson & Semmelroth, 2010). The purpose of the proposed research was to address the gap in the extant literature by examining the use of an early warning system to aide recognition of early school disengagement. An additional purpose was to examine an intensive response to intervention decision-making process and the difference interventions have on secondary school student's academic achievement.

This study contributed to the extant literature focused on the implementation of an electronic, district-wide early warning system (EWS) to inform educators during the problem-solving processes within the multi-tiered system of supports approach to address the needs of students in secondary schools. Specifically, as students transition to larger schools, achievement gaps are susceptible to expanding for students; therefore, there is a need to ensure identification and interventions for students who are prone to disengagement (Balfanz, 2009). To address this need, policies enacted through Florida legislation through Senate Bill 850 in July of 2014 require middle school personnel to identify students showing signs of academic disengagement and intervene based upon specific risk indicators (Fla. Stat. §1001.42). These early warning risk indicators include the following: (a) attendance below 90 percent, regardless of whether it is

excused or a result of out-of-school suspension; (b) one or more suspensions, whether in school or out of school; (c) course failure in English/language arts or mathematics; and (d) a Level 1 score on the statewide assessment in English/language arts or mathematics. For any student in Florida possessing two or more early warning risk indicators, school personnel must convene a team for the purposes of examining what interventions need to be in place for the student (Fla. Stat. §1001.42). As this legislation calls for increased identification of students who are academically disengaged, the research findings in this study could provide school districts greater validation that the use of an early warning system could serve as a predictor of off track for graduation status. In addition, it could provide school districts a systematic approach to identifying students in need of interventions.

In the MTSS process identifying risk factors, trends and patterns of academically disengaged students are necessary to provide systematic support through a tiered approach. Minimal research has been conducted examining the effectiveness of intervention decision-making models in secondary schools. The findings of this study aid school districts in gaining greater understanding of the academic gains of students when in a Response to Intervention Decision-Making Model. Especially as middle schools are required to form a problem solving team to meet on students exhibiting two or more risk indicators, findings should inform school district personnel in examining the effectiveness of the RtI Decision-Making Model, especially with the provisions of parental involvement in this process (Fla. Stat. §1001.42). The combination of examining an early warning system and the RtI decision-making model might aid in the development of most effective methods to build capacity and streamline interventions for secondary schools. The study's findings provide new insight into effective methods of

identifying academically disengaged students and insight as to the improvements students made when in the intervention decision-making process.

Definition of Terms

To avoid ambiguity in definitions and terms used to distinguish between interventions, and a Response to Intervention decision-making process, the following definitions are provided. This is in order to provide clarification on common terminology used in this research study.

Academically Disengaged Students: Students who are less likely to graduate from high school, as measured by failed course benchmarks, grade point average, and course failure (Heppen & Therriault, 2008).

Aggregate Covariate: The combination of certain variables in order to develop one variable used for predictability in the outcome of a study (Stuart, 2010).

Below Proficiency: Students identified as being below proficiency based upon the 2013-14 FCAT 2.0. Reading assessment, addressing reading skills in the areas of vocabulary, reading application, literary analysis, informational text, and research process.

Caliper Matching: A statistical method of matching, where by a variable of interest in the treatment group is matched to a variable in the control group in order to correspond with the closest point search. Matching based on the closest point of estimate increases the likelihood that variable will be matched based on the parameter of interest.

Credits Earned: A numeric summarization approach to assessment course completion based upon work completed. Credits are awarded based upon a student having successfully passed a course and are accumulated to measure on track for promotion status to the next grade level (International Affairs Office, 2008).

English/language Arts (ELA) assessment: A series of assessments in English/Language Arts developed to measure student performance based upon an absolute model that examines specific skills related to Florida standards in English/Language Arts. The assessment is administered three times per year, in September through April (Discovery Education Assessment, 2008).

Early Warning Systems (EWS) An approach utilized in school districts where available data are aggregated to identify student risk patterns and predict the likelihood that students are at high-risk of dropping out. By recognizing student patterns related to drop out rates, predictive analytics are designed to identify potential dropouts early on (Heppen & Therriault, 2008).

English for Speakers of Other Languages (ESOL): Program for students who are identified as having difficulty listening, speaking, reading, or writing in the English language in order to receive free and appropriate instruction and accommodations in order to meet academic benchmarks (LULAC vs. State Board of Education, 1990).

Free and Reduced Lunch Program: Student of low socioeconomic status who are eligible for the free and reduced lunch program when meeting certain income and household eligibility requirements (United States Department of Agriculture, 2014).

Grade Point Average (GPA): A measure of a student's academic achievement representing the average value of total quality points earned derived by total quality points attempted during a specific time period. An A equals 4.0, B equals 3.0, C equals 2.0, D equals 1.0, and F equals a 0.0.

Mobility: Changing of multiple schools has been linked to an increased likelihood in students dropping out of high school, specifically those students who attended five or more schools throughout their academic course (Gleason & Dyrnaski, 2002). For the purposes of this

study, the school district defined mobility as any student that had moved three or more schools in the past two years (0=less than 3 moves in the past 2 years; 20=3 or more moves in the past 2 years).

Multi-Tiered System of Supports (MTSS): An integrated approach of implementing Response to Intervention on a school-wide level; by using school-wide data to identify trends and patterns in students in order to provide systematic support through a tiered approach. This unified approach promotes collaborative teaming cross-departmentally, to accelerate the efforts of school-wide improvement for all students. Within a multi-tiered system to address needs of all students through both a behavioral and academic framework, schools can most efficiency allocate resources through systematic identification and interventions based upon student needs (Sugai & Horner, 2006; Problem Solving & Response to Intervention Project, 2013)

On-Time Graduation: Students enrolled in the public school that obtain a standard diploma, graduating from high school in a four year period from their initial grad base year to graduation date (Digest of Education Statistics, 2013).

Off-Track Indicators: Measures of student performance outcome data that is linked to specific risk thresholds that are used to indicate whether a student has a greater likelihood of not meeting on-time graduation (Allensworth & Easton, 2012).

Over Age: Students who are significantly over their expected age for their grade level has been found to be a significant predictor of off-track for graduation status (Gleason & Dyrnaski, 2002; Hammond, Linton, Smink, & Drew, 2007). For the purposes of this study, the school district defined over age is being twenty-one months or older than one's expected age for their grade level (0=student is not over age; 20=over age).

Response to Intervention (RtI): A prevention framework focused on individual students making minimal learning gains, by monitoring student's performance, and adjusting the intensity and frequency of interventions based upon the students response to intervention. In addition, it is utilized to identify students with certain disabilities in schools (Fuchs & Fuchs, 2006; National Center on Response to Intervention, 2010).

Response to Intervention Decision-Making Model (Four Step Problem Solving Process): A planned set of supplemental or intensive procedures to address specific skill deficits for students not meeting standards with the universal curriculum taught to all students. The four-step problem solving process includes deliberate parent communication with (a) charted data to drive root cause analysis in problem identification; (b) incremental goals established by a problem solving team; (c) assessment driven interventions and instruction; and (d) deliberate monitoring of the impact on student learning (Batsche et al., 2007; Gresham, 2004; Hattie, 2012).

Retention: A student's failure to be promoted to the next grade level, based upon lack of credits or a team based decision based upon data that reflects a student is unlikely to be successful if promoted. Retention is one of the most salient predictors of a student not graduating from high school (Alexander & Entwisle, & Kabbani, 2001; Gleason & Dyrnaski, 2002). For the purposes of this study, as determined by the school district, students who are retained inherit twenty points for their risk score (0=has not been retained or retention data were unavailable; 20=retained).

Risk Factors: Include alterable or unalterable characteristics that attribute to whether or not a student is more likely to drop out of high school (Alexander, Entwisle, & Kabbani, 2001).

Factors can include characteristics within the family, community, institutionally, or at school and create a displacement that inhibits a student from being successful in school.

Risk Score Indicator: A aggregate score based upon risk factors that characterize a student as on or off track for graduation (Allensworth & Easton, 2005) including patterns of course failure, attendance, poor behavior, and other indicators used to predict whether students will graduate from high school (Balfanz, 2008).

Special Education Program: Free and appropriate public education programs, services, and instruction necessary for a students with a disability to meet academic benchmarks (Florida Statutes (F.S.) Section 1003.01(3)(b)).

Standard Protocol Interventions: Systematic interventions offered to students who have been identified as not meeting specified levels of performance who demonstrate a need for remediation. Interventions may be predetermined, based upon available school resources and are implemented after having proven effective for other students in need of remediation (Christ, Burns, & Ysseldyke, 2005; Johnson et al, 2006).

Treatment Integrity: Collection of data use to ensure fidelity of interventions and ensure interventions and instruction offered to students actually address the needs of students based upon skill deficits (Lane et al., 2004).

Conceptual Framework

There are two bodies of knowledge that frame this study. The first is emerging research on early warning systems that can be used to predict student academic disengagement and lack of persistence in school to graduation. Second is the effectiveness of academic and behavioral intervention decision-making processes in secondary schools. The areas of study are organized

into interrelated concepts that examine students in transitional years, from elementary school to middle school, and middle school to high school.

Academic disengagement has a lasting impact, not only on individual students but society at large. Studies indicate that underachievement outcomes produce a long lasting cycle of inequity and disparity over time, thus becoming an issue not only for educational stakeholders but a national public health concern (Woolf, 2007). Critical transitions occur for students as they move from elementary to middle school, and middle school to high school (Lucas, 1997, Allensworth & Easton, 2007). Specifically when students transition from fifth to sixth grade and eighth to ninth grade, changes exacerbate academic disengagement, such as an increased student to teacher ratio, larger campus, and decreasing communication between classroom teachers (Neild, Stoner-Eby, & Furstenburg, 2008). Thus it becomes more critical that systematic monitoring of student progress is in place. As students often transition to larger schools, achievement gaps are susceptible to expanding for students (Balfanz, 2009). Studies show that academic disengagement is not a process that starts suddenly, but is rather a gradual process of disengagement occurs over several years (Alexander et al., 2001). Even while there is ongoing debate whether schools can compensate for what may come down to societal issues (Gallagher, Goodyear, Brewer, & Rueda, 2012), it is important to identify students' trajectories throughout critical transitions and employ interventions.

In student identification and interventions, a systems approach is needed to analyze barriers on a systematic level (Curtis et al., 2008). In order to provide systematic support for all students, school-wide data and grade-level data should be used to identify trends and patterns (Eagle, Dowd-Eagle, Synder, & Gibbons, 2015). Once student needs are identified, an approach can be used to address the needs of students through both academic and behavioral intervention

decision-making processes. MTSS (Multi-Tiered System of Supports) is utilized by examining school-wide data to identify trends and patterns in students in order to provide systematic support through a tiered approach. This unified approach can accelerate the efforts of school-wide improvement for all students, while schools systematically address the needs of interventions through a continuum of support based upon their academic or behavioral needs (Sugai & Horner, 2006; Eagle, Dowd-Eagle, Synder, & Gibbons, 2015). Tier 1 represents the universal instruction delivered to all students. Tier 2 represents the supplemental intervention instruction provided to students who are not mastering the grade level expectations taught universally to all students. Tier 3 represents the most intensive mode of instruction or intervention, delivered to students who have not mastered grade level expectations with universal instruction (Tier 1 instruction), and with supplemental instruction (Tier 2 intervention). Whether through standard protocol interventions, or through a Response to Intervention decision-making model (Four Step Problem Solving Process), the multi-tiered system of supports framework seeks to ensure systematic interventions are in place to safeguard success for all students (Problem Solving & Response to Intervention Project, 2013).

With increasing technological advances, early warning systems (EWS) are utilized as an avenue for identifying students in need through a Multi-tiered system of supports approach. First digitized in 2007, research examining the effectiveness of early warning systems is still emerging. As defined by Heppen and Therriault (2008), early warning systems identify students who are academically disengaged and high-risk of dropping out, by recognizing student patterns related to drop out rates, thus identifying potential dropouts early on. By identifying students at high-risk of drop out as early as possible, school personnel can, in turn, ensure interventions are provided to mitigate academic disengagement. Early warning systems identify academically

disengaged students by aggregating student indicators that are linked to academic outcomes and graduation. Risk indicators are used to flag students so that educators can see what type of educational barriers are present for a student, including risk indicator types, and to what degree of severity. Risk indicators may include data in the areas of academic achievement, misconduct, attendance, retention, mobility, and other tertiary factors (Gleason & Dynarski, 2002). Efficient, continuous, and accurate use of early warning systems provide educators with sources of educational data about educational risk factors that may lead to more efficient awareness to specific student risk factors. This method could allow for analysis of all students in a schoolto drive school improvement within the systems and structures implemented on a school-wide level.

Prior to the development of early warning systems, Gleason and Dynarski (2002) examined relationships of multiple risk indicators when compared to student dropout rates. . They analyzed combination indicators including truancy, over age, course failure, and other alterable and unalterable indicators. Twenty-five percent of students with two or more indicators dropped out of school, and thirty-four percent of student with three indicators dropped out of school. Additional studies by Ingels, Curtin, Kaufman, Alt, and Chen (2002) also yielded findings that the more risk indicators a student has the more likely the student is to drop out. Henry et al. (2012) intended to address the longitudinal research gaps in examining the utilization of a school disengagement warning index in order to predict dropout and problem behaviors for students during adolescence and into young adulthood. The study examined whether there was a relationship between an early warning disengagement index and early dropout, delinquency, and problem substance abuse in early adulthood years. Findings concluded that the warning disengagement index was a valid predictor of high school dropout

and school disengagement had a significant impact on problem behaviors post high school (b= .47, SE=.04, $p < .05$).

Through an MTSS approach, early warning systems are not only utilized school-wide, but also by teachers within the classroom. There is a higher emphasis on content standards and course rigor within secondary schools (Fuchs, Fuchs, & Compton, 2010). Emerging research suggested that the use of early warning systems aided in generating meaningful collaboration among teachers to meet the needs of at risk students (Soland, 2013). Early warning systems also aided with the broader goal of providing interventions to at risk students who may not otherwise be recognized as at risk (Allensworth, 2013). According to Allensworth (2013), placing emphasis on risk indicators helps educators focus efforts on a problem solving process that includes actionable follow-up with interventions. Slander (2013) examined teacher intuition in conjunction with the use of early warning systems. He concluded that teacher predictions and early warning systems were strongly accurate (in 70-80% predictions). When teacher intuition proved wrong, the early warning system recovered accuracy 55% of the time. These findings suggest that a predictive analytic model such as an early warning system could be useful to balance teacher subjectivity in judgment error.

Researchers continue to place emphasis on using risk indicators to aid educators in focusing efforts on a problem solving process that include root cause analysis and implementation of interventions based upon student's areas of need (Allensworth, 2013; Johnson & Semmelroth, 2010; Slander, 2013). Emerging research validates the use of EWS as a reliable predictor of academic disengagement (Balfanz, Herzog, Mac Iver, 2007; Henry et al., 2012; Soland, 2013) but the ultimate goal is to reduce risk score indicators and improve student's trajectory towards academic achievement. Authors suggest there is a need to go beyond student

identification and ensure systematic interventions are in place (Johnson & Semmelroth, 2010). Specifically, a Response to Intervention framework is suggested as a potential avenue for reducing risk indicators, as related to academic disengagement (Fuchs, Fuchs, & Compton, 2010; Johnson & Semmelroth, 2010; National Center for Intensive Intervention, 2010). Whether in the classroom or school-wide, the long term goal is to reduce risk that lead to negative outcomes by responding quickly to the student's need for intervention.

The Response to Intervention decision-making model is a planned set of supplemental or intensive procedures that address specific skill deficits for students not meeting standards. Within the decision-making model, a four-step problem solving process includes (a) charted data to drive root cause analysis in problem identification; (b) incremental goals established by a problem solving team; (c) assessment driven interventions and instruction; and (d) deliberate monitoring of the impact on student learning (Batsche et al., 2007; Gresham, 2004; Hattie, 2012). MTSS (Multi-Tiered System of Supports) offers a foundation for how RtI decision-making mitigates academic disengagement on a school wide level. A unified approach of integrating MTSS and RtI promotes collaborative teaming cross-departmentally to accelerate the efforts of school-wide improvement for all students. Within a multi-tiered system to address needs of all students through both a behavioral and academic framework within schools, school personnel efficiently allocate resources through systematic identification and interventions (Sugai & Horner, 2006; Problem Solving & Response to Intervention Project, 2013).

Within classrooms, implementation of the RtI decision-making process is focused on high impact instructional practices and strategies that impact student performance. Teachers differentiate their instruction by using assessments to drive the core instruction, in turn influencing their teaching and maximize student learning. As students are unsuccessful with

core instruction, the teacher undergoes the deeper four step problem solving process, in order to meet each student's need for intervention within the instruction. In some cases, the teacher revisits the approach being used with the core instruction. In other cases with a provision of an effective core instruction already in place, the teacher provides more intensive instruction and intervention to students not mastering standards. With an effect size of 1.07, Hattie (2012) listed response to intervention as the number three highest influence on student achievement. One component of the response to intervention model referenced by Hattie (p. 61) is the testing effect. A major component of this principle is frequent assessment, making instructional decisions based upon student performance, and monitoring the impact on student learning. In addition to instructional decisions made based upon assessments, students become more engaged because the most deliberate and immediate feedback within the RtI helps to guide their learning.

The concept of Response to Intervention as a decision-making model focuses on school improvement efforts in ensuring intervention related initiatives are systematic in their alignment to close the achievement gap (Johnson & Semmelroth, 2010). When students are unsuccessful with core instruction (Tier 1), a four step problem solving process is put into place to address the needs of students. Often times this problem solving results in a student receiving supplemental intervention or instruction (Tier 2). Student needs may be addressed at the Tier 2 level through standard protocol interventions where interventions are offered for students who have been identified as not meeting specified levels of performance who demonstrate a need for remediation. Interventions may be predetermined, based upon available school resources and are implemented after having proven effective for other students in need of remediation (Johnson et al, 2006). In other cases a student may receive Tier 2 level interventions based upon more individualized needs, as determined through the RtI four step problem solving process. The most

intensive mode of instruction or intervention, delivered to students who have not mastered grade level expectations with universal instruction (Tier 1), and with supplemental instruction (Tier 2) is Tier 3. Students receiving RtI interventions at a Tier 3 level require an even higher level of intensity and frequency in order to master benchmarks. Within a multi-tiered system of supports, often times Tier 3 interventions can be included in standard protocol interventions offered to students. But within a Tier 3 level of support, it is critical to continue to intensify interventions needed for those students who are still looking for a solution in academic disengagement. Just as interventions offered to students are intensified, the problem solving process itself must also be intensified. The RtI Four Step Problem Solving Process (Decision-Making Model) includes deliberate parent communication with a planned set of procedures that will be put into place to address the specific skills of the student. Just as was conducted school wide, on an individual level (a) charted data were used to drive the root cause issue in identifying the problem; (b) incremental goals are established by a problem solving team; (c) assessments are used to drive interventions and instructions; and (d) deliberate monitoring of the impact on learning, to include parental involvement (Batsche et al., 2007; Gresham, 2004; Hattie, 2012). A problem solving team might consist of educational experts with deepened knowledge on pedagogical or student service needs. In some cases, the RtI Four Step Problem Solving Process can result in a need for an evaluation and sometimes eligibility for special education services under IDEIA (2004). Regardless, RtI is a continuous process that based upon the individualized needs of all students, therefore it should not be initiated or stop simply on the basis of a referral to special education or special education eligibility (Council for Exceptional Children, 2008).

While studies suggest that systematic interventions are effective, there has been reluctance to implement an RtI decision-making process in secondary schools (Canter, Klotz, &

Cowan, 2008). A common misconception among secondary staff is that educational outcomes are less alterable when students reach middle and high school and that it may be too late to intervene (Ehren, 2009). Where interventions under the framework of RtI are perceived as an elementary focus, secondary school staff emphasize content level expertise, an increase in rigor and higher level critical thinking skills (Fuchs, Fuchs, & Compton, 2010).

To ensure fidelity of interventions, the design of systematic interventions through an RtI framework must be customized to the needs at the secondary level. Translation of the RtI framework and structures is essential to ensure effective practice in secondary schools. Most RtI literature assumes implementation at the secondary level mirrors the components of RtI implementation at the elementary level, however due to the structure and organization of secondary schools, RtI program implementation should be implemented differently (Duffey, 2007).

In conclusion, critical transitions have been identified for students as they move from elementary to middle school and middle school to high school. Through the combined use of a multi-tiered systems approach and an early warning system, it is possible to identify early school disengagement and increase the likelihood of students being on track for graduation. An RtI Four Step Problem Solving Process might be used to regain on track for graduation status.

Research Questions

The following questions were answered by data provided by the target school district and a performance data management system used within the target school district. Data included an early warning risk score, comprised of indicators that flag a student at risk of graduation (attendance, misconduct, course failure, grade point average (GPA), mobility, grade point average, over age, and retention). Other variables were also examined as outlined below.

1. To what extent was there a relationship between the early warning identification risk score and academic achievement for students in grades six and nine, as determined by their grade point average (GPA)?
2. To what extent was there a relationship between the early warning risk score for students in grade four and grade six (end of 2012-2013 school year) and their academic achievement two years later in grade six and nine (end of 2014-2015) respectively, as determined by their grade point average (GPA) and credits earned?
3. Based on participation or lack of participation in an intensive RtI decision-making process, how did students in grade six and nine compare in achievement (risk score, GPA, and an English/language arts assessment)?

Research Question One (To what extent was there a relationship between the early warning identification risk score and academic achievement for students in grades six and nine, as determined by their grade point average?) was designed to examine if there was a relationship between students' risk scores in the 2014-2015 school year and their 2014-2015 end of year GPAs.

Research Question Two (To what extent was there a relationship between the early warning risk score for students in grade four and grade seven (end of 2012-2013 school year) and their academic achievement two years later in grade six and nine (end of 2014-2015) respectively, as determined by their combined GPA?) was designed to examine whether a relationship existed between the risk score and students' on track for graduation status two years following the assigned risk indicator. Therefore, the researcher examined if there was a relationship between students' risk scores two years prior (in the 2012-2013 school year) and their end of year GPAs (in the 2014-2015 school year). In addition, for students who were in

sixth grade during the 2012-2013 school year, credits earned at the end of their ninth grade year in the 2014-2015 school year was examined.

The purpose of Question Three (Based on participation or lack of participation in an intensive RtI decision-making process, how did students in grade six and nine compare in achievement (risk score, GPA, and an English/language arts assessment?) was to examine the efficacy of Response to Intervention when used in the scope of an intensive four step problem solving process (Batsche et al., 2007; Gresham, 2004; Hattie, 2012). Therefore students were compared in two groups, one in which they participated in the RtI decision-making model, the other group, they did not participate in the RtI decision-making model. Student improvement in their GPA, risk score, and English Language Arts assessment were used to determine whether there was a difference between students who participated in the intervention decision-making model and those that did not participate.

Table 1

Research Questions and Data Sources

Questions	Data Sources
To what extent was there a relationship between the early warning identification risk score and academic achievement for students in grades six and nine, as determined by their grade point average (GPA)?	Sample of all students Grade six (2014-2015 school year) 2014-2015 risk score data 2014-2015 year to date GPA Grades nine (2014-2015 school year) 2014-2015 risk score data 2014-2015 cumulative GPA
To what extent was there a relationship between the early warning risk score for students in grade four and grade seven (end of 2012-2013 school year) and their academic achievement two years later in grade six and nine (end of 2014-2015) respectively, as determined by their GPA?	Sample of all students Grade four (2012-2013 school year) 2012-2013 risk score 2014-2015 year to date GPA Grade seven (2012-2013 school year) 2012-2013 risk score 2014-2015 cumulative GPA 2014-2015 credits earned
Based on participation or lack of participation in the RtI process, how did students in grade six and nine compare in achievement (risk score, GPA, and English/language arts assessment)?	Grades six and nine RtI process Changes in GPA from quarter one to quarter four Changes in risk score from quarter one to quarter four Changes in English/Language Arts assessment from quarter one to quarter four

Methodology

Research Design

The primary goal of this study was to examine the validity of using an early warning system as a mean for identifying students at-risk of academic disengagement. Additionally the

questions tested student outcome gains when students participated in a Response to Intervention (RtI) decision-making model compared to those that did not participate. Separate methods of data analysis were used to test the research questions. The research design for this study used existing, quantitative data, collected through a student performance data management system in the school district. The research design used was correlational. Data collection was completed upholding student privacy in accordance with Family Educational Rights and Privacy Act (FERPA). Data were linked to subjects identifying information through a randomized number which was assigned to participant variables in place of student identifying information (names, student numbers). Once all identifying information was removed, data were downloaded into SPSS. Data were analyzed with appropriate tests. For Research Question One and Research Question Two, a Pearson correlation coefficient was used to test the strength of the relationship between the early warning system and students' grade point average (Steinberg, 2008). For Research Question Three caliper matching was used to match students who participated in the RtI process with students who did not participate in the RtI process. Since the risk score was an aggregate covariate, it could be used to best ensure subjects were matched to other subjects with like characteristics. An aggregate covariate is the combination of certain variables in order to develop one variable used for predictability in the outcome of a study (Stuart, 2010). The aggregate covariate used for this study was the risk score used in the school district. Variables combined to create this aggregate covariate included a continuous point system based upon measurable risk factors. A predetermined weighting of points was assigned to students when meeting any of the below risk thresholds (described in greater detail in Appendix A).

- 2 or more absence in the first 25 days of school
- 5 absences in a grading period

- Course failure in each grading period
- Course failures from the prior school year
- Cumulative Grade Point Average
- Total out of school suspensions per year
- Over expected age for grade level
- Prior Retention
- Mobility

Once students were matched to another student with the same risk score, a related samples *t*-test (matched subjects design) was used to determine if there was a relationship between students' achievement and their participation in the RtI process (Steinberg, 2008).

Participants

As a means to investigate students in transitional years during the 2014-2015 school year, the population for this study consisted of sixth and ninth grade students in one mid-size local school district. Existing data were examined for this selection of this study. For Research Question One and Research Question Two, the population included all students (identified as EL, Special Education, and those that were eligible for free or reduced lunch). For Research Question One, the population included 7,579 students in grades six or nine in the 2014-2015 school year. Research Question Two, included a population of 4,861 students who were enrolled in the school district in both 2012-2013 and 2014-2015. For Research Question Three, purposive sampling (Neuman, 1997) was used to include students who participated in the RtI process. Criteria that were used to determine whether students participated in the RtI process were identified from a data performance system where RtI details for students were stored. In order for students to meet criteria for participation in this study, he had to be in the RtI process for at

least one month in duration, and had to have the essential components of an intervention plan reported as being implemented. Treatment integrity or fidelity of the implementation of the intervention plan was not reported and the study did not necessarily include those in standard protocol interventions. The sample included 417 general education students who participated in the RtI process that were matched to 417 students who did not participate in the RtI process. Caliper matching (Stuart, 2010) was used by matching students who were in the RtI process to students who were not in the RtI process by their risk score. Since the risk score was an aggregate covariate that included several risk factors, this allowed for examination of students where inferences could be generalizable to the population of interest.

Instrumentation

The key variables in this study were measured by student outcome data. The risk score was as a variable in all three research questions. This aggregate covariate was developed in a local mid-size school district by a team of data analysts and district level administrators as a means of identifying students who are less likely to graduate from high school. In the development of the risk score, the team examined research on what factors that are available and most alterable in a school district that correlate to on track graduation (Balfanz, Bridgeland, Moore, & Hornig Fox, 2010; Hammond et al., 2007). Two years prior to this research being conducted, the following measurable factors were assigned a point value by the school district (Appendix A) based upon the team's evaluation of risk associated with each factor: (a) 2 or more absence in the first 25 days of school; (b) 5 absences in a grading period; (c) course failure in each grading period; (d) course failures from the prior school year; (e) cumulative Grade Point Average; (f) total out of school suspensions per year; (g) over expected age for grade level; (h) prior retention; and (i) mobility. Additional variables were also used in the analysis. Credits

earned assessed successful completion of a course to measure ono track for graduation (International Affairs Office, 2008). Improvements in the English/language arts assessment (Discovery Education Reading Assessments) was a universal assessment that examined student performance growth on specific Florida standards (Discovery Education Assessment, 2008). The reading reliability across the state of Florida was .83 with a sample size of 3,266 in grade 9 and .86 with a sample size of 3,872 in grade 6. To ensure content validity assessments are aligned to the standards being taught across the state's grade level using the Webb Alignment Tool (WAT). Grade Point Average (GPA) was used to measure of students' academic achievement representing the average value of total quality points earned derived by total quality points attempted during a specific time period. Overall research studies confirm that the GPA and earned credits are a valid and reliable indicator of student achievement (Bacon & Bean, 2006).

Data were obtained from the school district student performance data management system. SPSS Version 21 was used to analyze data. Quantitative measures will be used to provide an indication as to whether a relationship exists between the risk score and academic achievement.

Procedures

Approval to conduct this research was obtained from the University of Central Florida's Institutional Review Board (IRB). In addition, written permission was secured from the school district for approval to access this data for the purposes of the research. Student data used was not identified or linked to identifiable student information.

Students were removed from the study under certain conditions. For Research Questions One and Two, students were removed from the study if having withdrawn during the school

district between 2012 and 2014. For Research Questions Three, students who participated in the RtI process were eliminated from the study under certain conditions. If students were identified as in the RtI process for less than one month in duration, they were removed from the study because the Response to Intervention Decision-Making Model could not be properly implemented in this short of time (Batsche et al., 2007; Gresham, 2004; Hattie, 2012). In the 2014-2015 school year, some schools staff reported students in the RtI process due to students being in after school or before school tutorial, however it could not be confirmed that such students were in RtI as defined by the Response to Intervention Four Step Problem Solving Process (Batsche et al., 2007; Gresham, 2004; Hattie, 2012). Therefore if students were reported in the RtI process for tutorial only, they were removed from the study. Lastly, students were removed from the study if eligible for a disability (IDEIA, 2008). The child study team or problem solving team process for students with a disability was documented in a different software that was not examined in this study. In addition the purpose of this study was to identify students who may not otherwise be identified as needing interventions. Lastly, if a student had a risk score of a zero during the first quarter, they were removed from the study. This helped to control for variability in circumstances where students transferred from other school districts resulting in lacking data to contribute to the risk score.

Data Analysis

Existing data were analyzed using SPSS version 21. For Research Question One and Research Question Two, a Pearson correlation coefficient was used to test the strength of the relationship between the early warning system and students' grade point average (Steinberg, 2008). For Research Question Three caliper matching was used to match students who participated in the RtI process with students who did not participate in the RtI process. Since the

risk score was an aggregate covariate, it could be used to best ensure subjects were matched to other subjects with like characteristics. An aggregate covariate is the combination of certain variables in order to develop one variable used for predictability in the outcome of a study (Stuart, 2010). The aggregate covariate used for this study was the risk score used in the school district. Variables combined to create this aggregate covariate included a continuous point system based upon measurable risk factors. A predetermined weighting of points was assigned to students when meeting any of the below risk thresholds (described in greater detail in Appendix A). Once students were matched to another student with the same risk score, a related samples *t*-test (matched subjects design) was used to determine if there was a relationship between students' achievement and their participation in the RtI process (Steinberg, 2008). For Research Questions One through Three, the data were examined for correlations and differences, to lead to findings of the research study.

Limitations

The study had the following limitations:

1. The study did not examine the frequency or intensity of the interventions, therefore it could not be concluded which interventions are most successful within the RtI problem solving process.
2. The data were used from a mid-sized public school district in Central Florida examining grades six and nine. Therefore the results of the study may not be generalizable to other school districts or grade levels.
3. The school district examined had a digitized early warning identification system and Response to Intervention (RtI) process; therefore results may not be generalizable to

districts that do not have this capability through a student performance data management systems.

4. The school district's early warning identification system and digitized RtI process was first implemented at the start of school year 2013-14. Therefore research findings may be premature based upon the beginning stages of the implementation.
5. Several students were removed from the ninth grade population because of missing a GPA (n=2,727). This occurred because when a student transferred from one school to another, or withdrew, the data warehouse system did not automatically carry their GPA over from one school to the next

Delimitations

The study had the following delimitations:

1. For Research Question Three, the sample in the treatment group included students who participated in the RtI process for a minimum of two data collection periods in the 2014-2015 school year (data collection occurred in November, 2014, February, 2015, and May, 2015). Any participants that were in the RtI process for less than two data collection periods were excluded from the study.
2. For Research Question Three, the sample used for the treatment group was selected after having met criteria at their school to warrant the RtI decision-making process. Therefore, students identified in RtI for other purposes were excluded from the study (i.e. tutorial reporting).
3. For Research Question Three, the sample excluded students who were in a special education program. The child study team or problem solving team process for students with a disability was documented in a different software that was not

examined in this study. In addition the purpose of this study was to identify students who may not otherwise be identified as needing interventions.

Assumptions

The study operated under the following assumptions:

1. All data used in the risk score configuration was accurate and complete (attendance, grades, discipline, and retention coding).
2. The sample selected for Research Question Three were in the RtI process because of a need for an intervention decision-making process.
3. The sample identified as in the RtI process received the reported interventions with treatment integrity and in an RtI decision-making process (four step) that included deliberate communication with the parent/guardian.

Organization of the Study

This research study is presented in five chapters. Chapter I of this study has introduced the statement of the problem, purpose of the study, significance of the study, definition of terms, conceptual framework, research questions, limitations, delimitations, and assumptions of the study.

Chapter 2 presented a literature review with relevant research associated with the statement of the problem. This review includes research on early warning systems that recognize early school disengagement during transitional years and the impact of interventions in secondary schools to address early school disengagement.

Chapter 3 presents the methodology and procedures used for data collection and analysis used for the study. It contains an introduction to the early warning system (EWS) and RtI

process utilized in the Central Florida school district. It also includes the population and how the sample was selected, instrumentation, procedures, and data analysis.

Chapter 4 contains an analysis of the data and the findings of the study for each research question.

Chapter 5 presents a summary of the study and discussion based upon the findings, implications for practice, and recommendations for further research.

CHAPTER TWO
LITERATURE REVIEW

Introduction

According to the Digest for Education Statistics (2013), only 81% of public school standard diploma students met on time graduation in the 2011-12 school year. Over the years, trends have shown gradual increases in the graduation rate, but the percentage solicits questions regarding the 19% of students who never graduated. Within the process of academic disengagement, it is important to identify students' trajectories towards on-track graduation, identify students who are potentially becoming academically disengaged, and employ interventions (Balfanz, Herzog, & Mac Iver, 2007). Combination risk factors, such as course failure, truancy, and retention have proven that students meeting certain thresholds of risk are less likely to graduation from high school (Alexander, Entwisle, & Kabbani, 2001; Balfanz et al., 2007; Gleason & Dynarski, 2002). With increasing technological advances, early warning systems (EWS) are utilized as an avenue for identifying students at high-risk of dropping out, especially in transitional years. The use of EWS aid in the broader goal of providing interventions to academically disengaged students who may not otherwise be recognized as at-risk (Allensworth, 2013; Henry, Knight, & Thornberry, 2012). The long-term goal is to reduce risk factors that lead to negative outcomes by responding quickly to the student's need for academic or behavioral intervention (National Center for Intensive Intervention, 2013). If implemented properly, the design of interventions through a systematic decision-making framework might further aid in increasing graduation rates. Therefore there are two bodies of knowledge that frame this review. The first is emerging research on analytics that can be used to predict student academic disengagement and lack of persistence in school to graduation. Second

is the use of a response to intervention decision-making process in secondary schools. The areas of study are organized into interrelated concepts that examine students in transitional years, from elementary school to middle school, and middle school to high school. The review is framed by first examining trends in academic disengagement, and how risk indicators can be used to identify students with a greater likelihood of academic disengagement. Next, research on the use of early warning systems, and the validity in their ability to predict academic disengagement are presented. Lastly, the response to intervention decision making model is examined as a means for systematic intervening for students who are at-risk of graduation.

Primary databases that were used to obtain this research include ERIC-EBSCO HOST, Web of Science, PsycInfo, and PsycArticles. Key words used to search the databases include "response to intervention", "response to intervention in secondary schools", "decision-making models", "early warning risk indicators", "and early warning systems", "on track for graduation", "high school dropout", and "dropout prevention". Studies that were excluded from this search included studies that focused on standard intervention protocols or programs, rather than on intervention decision-making models or four step problem solving processes. Literature was reviewed from online or print journals such as *Review of Educational Research, Consortium on Chicago School Research, Journal of Education for Students Placed at Risk, Educational Psychologist, and Council for Exceptional Children, National High School Center at the American Institutes for Research, Research in Learning Technology, Journal of Learning Disabilities,* and more. Books written by scholars with expertise in response to intervention decision-making models have also been incorporated representing a culmination of searches conducted.

Trends in Academic Disengagement

Academic disengagement is defined as students who are less likely to graduate from high school, as measured by failed course benchmarks, grade point average, and course failure (Heppen & Therriault, 2008). Declines in academic disengagement can be attributed to many different risk factors, some of which are alterable in the educational setting and others that are less alterable (Gleason & Dynarski, 2002; Ingels, Curtin, Kaufman, Alt, & Chen, 2002). However, a consistent pattern exists whereby academic disengagement is not a sudden occurrence, but is rather a process that happens gradually (Alexander, Entwisle, & Kabbani, 2001). Whether such declines are due to familial, ecological factors, or instructional factors (Rumberger, 2011), students in transitional years often lack necessary structures and supports that set them up to be successful, especially during transitional years (Allensworth & Easton, 2007; Balfanz, Herzog, & Mac Iver, 2007). Combination risk factors, such as course failure, truancy, and retention have proven that students meeting certain thresholds of risk are less likely to graduate from high school (Gleason & Dyrnaski, 2002). Yet, when risk factors are combined, data can be used to flag students of which may be more prone to becoming academically disengaged so that school personnel can in turn intervene sooner (Hammond, Linton, Smink, & Drew, 2007). In examining the common trajectory and process of which academic disengagement occurs for students, risk score indicators can be used to quickly identify students who are prone to dropping out of high school.

Academic Disengagement in Transitional Years

Critical transitions occur for students moving from elementary to middle school, and middle school to high school (Lucas, 1997, Allensworth & Easton, 2007). Within the transitional periods, there is a greater likelihood of declines in academic achievement (Gleason &

Dynarski, 2002). The decline in academic engagement can be attributed to several factors, some of which are alterable and others unalterable (Gleason & Dynarski, 2002; Ingels et al., 2002). Regardless, the more risk factors a student has the more likely he is to drop out. Academic disengagement does not occur suddenly, but is rather a subtle change that occurs over an extensive period of time (Hammond et al., 2007). Alexander et al. (2001) validated this notion when they examined cohorts of student attendance patterns; starting from first grade on upwards through high school. The researchers found that attendance increased as years in school progressed, and levels of absenteeism were significantly escalated in transitional years (from grades fifth to sixth and eighth to ninth). Through the process of identifying specific risk factors that correlate to timely student graduation, the necessary structures and supports can be in place to reduce the likelihood of student academic disengagement (Allensworth & Easton, 2007; Balfanz et al., 2007). In student identification, a systems approach is needed to analyze barriers on a systematic level (Curtis, Castillo, & Cohen, 2008). In order to provide systematic support for all students, school-wide data and grade-level data should be used to identify trends and patterns (Eagle, Dowd-Eagle, Synder, & Gibbons, 2015). One such factor that can be used to aid in identification and pattern in academically disengaged is examination of risk factors.

Risk Factors

Risk factors can include alterable or unalterable characteristics that attribute to whether or not a student will drop out of high school (Alexander et al., 2001). The National Dropout Prevention Center examined over 20 studies that examined significant risk factors that attributed to students dropping out of school (Hammond et al., 2007). Among the studies, 25 risk factors were identified, and separated into four domains: (a) Factors Related to Individual Students (Individual Domain); (b) Factors Related to Family Background and Home Experiences (Family

Domain); (c) Factors Related to School Structure, Environment, and Policies (School Domain); (d) Factors Related to Communities and Neighborhood (Community Domain). These factors include characteristics within the family, community, or at school and create a displacement that inhibits a student from being successful in school (Hammond et al., 2007).

(a) Factors Related to Individual Students (Individual Domain) included high risk-demographic characteristics (i.e. race, ethnicity, gender, having a disability); early adult responsibilities; high risk attitudes, values, and behaviors; poor school performance; disengagement from school; academic disengagement; behavioral disengagement; psychological disengagement; social disengagement; and education stability.

(b) Factors Related to Family Background and Home Experiences (Family Domain) included background characteristics; level of household stress; family dynamics; attitudes, values, and beliefs about education; and behavior related to education.

(c) Factors Related to School Structure, Environment, and Policies (School Domain) included school structure; school resources; student body characteristics; student body performance; school environment; academic policies and practices; and supervision and discipline policies and practices.

(d) Factors Related to Communities and Neighborhood (Community Domain) include location and type (urban, suburban, rural schools); demographic characteristics; and environment.

When students exhibit certain risk factors (such as coming from a single parent household, free and reduced lunch status, or having prior grade retentions) the likelihood of academic disengagement may be higher (Hammond et al., 2007).

Other studies have examined whether there is one specific risk factor that may attribute to academic disengagement. Gleason and Dynarski (2002) examined 40 risk factors and the accuracy such factors were in predicting students dropping out of school. Factors included combination risk factors such as truancy, over age, course failure, low self-esteem, and lack of parental engagement. Of those students with two or more risk factors, twenty-five percent dropped out of high school. Of those students with three or more risk factors, thirty-four percent dropped out of high school. A summary of findings emerged that identified there is not one independent risk factor that can be used to predict academic disengagement, but that when multiple risk factors are present, the likelihood of dropout increases (Gleason & Dyrnaski, 2002; Ingels et al., 2001). While researchers have confirmed that not one risk factor alone characterizes academic disengagement, this yields question to which combination of risk factors might most accurately identify at-risk students. Allensworth and Easton (2005) concluded risk factors could be used to more accurately identify and predict students at risk of graduating. They found that there was a significant relationship between students' graduation and their credits earned and course failures at the end of students ninth grade year. Correlations between the variables at the end of their ninth grade year were -.56 (number of F's), .61 (credits earned and grade point average), and -.51 (absence count). Thus it can be determined that specific risk indicators might be able to be used to predict whether a student will graduate from high school on time (Hammond et al., 2007).

Risk Score Indicators

Combination risk factors, such as course failure, truancy, and retention have supported the notion that students meeting multiple thresholds of risk in early years are less likely to graduate from high school (Gleason & Dyrnaski, 2002). When risk factors are combined, data

can be used to flag students who are more likely to become academically disengaged and eventually drop out of school (Hammond et al., 2007). It is important to consider that risk factors encompass more than just categorical data that is readily available to school districts. Factors such as self-efficacy, high-risk attitudes, beliefs, family dynamics, and social supervision also impact student achievement (Hammond et al., 2007). Neild, Stoner-Eby, and Fustenberg (2008) found that inter-relationships exist among student risk indicators (high absenteeism, discipline, and failing courses) and student self-efficacy.

While some social, emotional, and environmental risk factors are more difficult to track through a categorical approach, studies still validate the notion that the use of risk thresholds correlate to students' academic disengagement. Risk factors made up of measureable data outcomes that are available to school districts have still confirmed the notion that students exhibiting more risk thresholds are more likely to drop out of high school (Balfanz et al., 2007; Jerald, 2006).

Other studies have continued to validate these conclusions by supporting the use of combined risk score metrics as a predictor of students' likelihood of dropping out of high school. Henry, Knight, and Thornberry (2012), examined the use of a school disengagement warning index to determine if there was a relationship between student risk indicators and dropping out of school. Findings yielded that the higher the risk indicators, the stronger the possibility that students dropped out of high school ($b = .47$, $SE = .04$, $p < .05$). This suggests that a risk score indicator could be used to aid in targeting students who are academically disengaged in turn interventions could be provided earlier.

Another study was conducted to examine at two high schools if the risk score indicators utilized were an accurate predictor of students' on track for graduation status. Findings were

consistent with other findings that the risk indicator metric was an accurate predictor of students with increased likelihood of dropping out of high school. In addition, the single predictors were also examined to determine the efficacy of the predictors that were used. GPA was the highest predictor, followed by absenteeism (Johnson & Semmelroth, 2010).

Risk Score Indicators: Controlling for Variability

When examining the efficacy of risk score indicators, it is important in data analyses to consider the difference between causality and predictability when using risk score indicators to predict on track for graduation status (Carl, Richardson, Cheng, Kim, & Meyer, 2013). Whereby if a student has a high risk score threshold, under causality one might assume that a high risk score threshold would cause a student to be academically disengaged. However, it is important to note that this is not the case, rather the risk score can be used as a predictor, whereby it is more likely that a student that has a high risk score can be predicted not to be academically off-track for graduation. The use of how risk score indicators are interpreted is just as important as understanding what data elements contribute to the risk score indicator.

While research findings in large support the use of combined risk score indicators, recent studies have examined approaches within risk scores to control for variability. While generally speaking, the use of a risk score can lead to quicker identification of at risk students, it is important to consider what data elements might most accurately predict students' academic achievement (Johnson & Semmelroth, 2010). The American Institute of Research in collaboration with the Department of Education in Massachusetts (2013) developed a risk score indicator that would provide most accurate predictors of students' academic achievement. They closely examined which indicators (or combination of indicators) most accurately predicted key missing benchmarks for students in order to measure the appropriate risk score configuration at

each grade level. In their analysis, it became evident that the most accurate risk scores would not look the same at each grade level, therefore they used a multilevel modeling framework. In early elementary and late elementary, different indicators made up the risk score. For example, for early elementary students, English/Language Arts grades were not a part of their early warning indicator score, but for late elementary; these grades were a part of their early warning indicator score. Thus they found it to most valid to use four separate risk score metrics determined for k-12 grade levels because there was varying data at each level. Factors used in the risk score configuration were as follows: (a) attendance; (b) school moves in a single year; (c) number of in-school and out of school suspensions; (d) standardized test levels; (e) retention status; (f) low income; (g) special education level of need; (h) EL status; (i) gender; (j) urban residence; (k) over age for grade; (l) school wide Title 1; (m) targeted Title 1; (n) math course performance; (o) English/language arts course performance; (p) Science course performance; (q) Social Studies course performance; and (r) non-core course performance. This study aided in improving the efficacy of risk score indicators, to ensure they accurately measure on track for graduation status at each grade level.

Another study conducted in a large urban school district found that there were limitations to the methodology used in the risk score indicator (Carl et al., 2013). The study examined the application of early warning indicators as related to on track for high school graduation, and beyond high school. Findings concluded that most students were accurately identified as on or off track for graduation, but that there were some limitations to the methodology used in the risk indicator. One example of this limitation was that 30% of students had below a 1.0 GPA in their mathematics courses, and yet still graduated from high school. Based upon this finding, the study suggested reexamining the use of the metrics that were being used. Recommendations

discussed the possibility of using a total quality point GPA as a more appropriate predictor in the early warning system, to ensure that students not only graduate from high school but also obtain necessary skills to be successful in post-secondary settings. As the concept of using multiple risk score indicators is new, it is important to consider the data elements included in the risk score and control for variability.

Table 2

Summary of Literature Reviewed: Trends in Academic Disengagement

Subsection Summary of Findings	Authors
Academic Disengagement in Transitional Years. Academic disengagement is a process that occurs gradually over time, most markedly in transitional years from elementary to middle school and middle to high school.	Alexander, Entwisle, & Kabbani (2001); Allensworth & Easton (2007); Balfanz, Herzog, & Mac Iver, 2007); Curtis, Castillo, & Cohen (2008); Gleason & Dyrnaski (2002); Hammond, Linton, Smink, & Drew (2007); Ingels, Curtin, Kaufman, Alt, & Chen (2002), Rumberger (2011)
Risk Factors. Risk factors include unalterable and alterable characteristics that are linked to the likelihood of students being on track for graduation.	Alexander et al. (2001); Allensworth & Easton (2005); Hammond et al. (2007); Gleason & Dyrnaski (2002); Ingels et al. (2001)
Risk Score Indicators. When risk score indicators are combined, data can be used to flag students who are prone to academic disengagement and more likely to drop-out of school.	Balfanz et al. (2007); Gleason & Dyrnaski, (2002); Hammond et al. (2007); Henry, Knight, & Thornberry (2012); Johnson & Semmelroth (2010); Neild, Stoner-Eby, & Fustenberg (2008); Jerald (2006)
Risk Score Indicators: Controlling for Variability. While research findings in large support the use of risk score indicators, recent studies have examined approaches within risk score metrics to control for variability. Differentiating between causality verses correlational can ensure appropriate use of risk score.	American Institute of Research & Department of Massachusettes (2012); Carl, Richardson, Cheng, Kim, & Meyer (2013); Johnson & Semmelroth (2010)

Early Warning Systems (EWS)

In examining academic trends and the patterns of disengagement, a risk score indicator can be used to quickly identify student at risk of academic disengagement (Allensworth & Easton, 2007; Balfanz et al., 2007). With advances in technology, schools staff have begun to utilize early warning systems that use predictive analytics to identify those students who are at risk for dropping out of high school. As defined by Heppen and Therriault (2008), early warning systems (EWS) are a predictive analytic tool utilized in school districts where available data are aggregated to identify student risk patterns and predict the likelihood that students are at high-risk of dropping out. By recognizing student patterns related to drop out rates, predictive analytics are designed to identify potential dropouts early on. EWS identify students who are high-risk of dropping out, by recognizing student patterns related to drop out rates, and identifying potential dropouts early on (Hammond, et al., 2007). By identifying students at risk of dropping out as early as possible, school can in turn provide interventions, effectively allocating resources to preventing dropouts.

Student data are used to identify key indicator factors that correlate to academic outcomes and graduation. These risk indicators are used to flag students in a manner in which the educator can see what type of educational barriers are present for a student, and to what degree of severity of risk the student is in. Risk indicators may include data in the areas of academic achievement, misconduct, attendance, retention, mobility, and other measurable outcomes used in the educational setting. While longitudinal research examining the impact of early warning systems is still emerging, the use in schools has rapidly increased since 2007 because it allows school based administrators, counselors, and teachers to have quicker awareness to areas of concern (truancy, misconduct, course failure, mobility, etc.). Early

warning systems allow for quick analysis of all students or one student, to drive process improvements within schools, in school districts (Allensworth & Easton, 2007; Henry et al., 2012), and even down to individual student needs (Johnson & Semmelroth, 2010).

Educational Policy Relevance of Early Warning Systems

The concept of early warning systems was first launched in 2007 in the state of Louisiana. Since then, pilot programs in various states and districts have utilized EWS on a voluntary basis rather than outlined in state statute or administrative code (Curtin, Hurwitch, & Olson, 2012). However since 2008, the utilization of EWS has become such a wide spread discussion of public concern that states have not neglected to include early warning systems in legislative discussion. In fact, it became such an important issue of national concern, that there was a bill introduced in Senate in the 113th Congress in June of 2013 related to early warning identification and risk indicators. The proposed bill, Early Warning Intervention of Graduation Success Act of 2013, attempted to amend the Elementary and Secondary Education Act of 1965 and revise provisions concerning programs to reduce school dropout rates. Part of this bill included the use of risk indicators in all 50 states. This effort died in Committee, and did not pass due to the division of power in education between federal and state. Therefore it was decided that early warning identification through risk indicators would ultimately be left up to the states (Early Intervention for Graduation Success Act, 2013).

But in the state of Florida, increasing attention has highlighted the need for early warning systems as "a school that includes any of grades 6, 7, or 8 shall implement an early warning system to identify students in grades 6, 7, and 8 who need additional support to improve academic performance and stay engaged in school" (Fla. Stat. §1001.42). Specifically, as students transition to larger schools, achievement gaps are susceptible to expanding for students;

therefore, there is a need to ensure identification and interventions for students who are prone to disengagement (Balfanz et al., 2007). To address this need, policies enacted through Florida legislation through Senate Bill 850 in July of 2014 require middle school personnel to identify students showing signs of academic disengagement and intervene based upon specific risk indicators (Fla. Stat. §1001.42). If a student meets two or more risk indicators including: (a) attendance below 90 percent, regardless of whether it is excused or a result of out-of-school suspension; (b) one or more suspensions, whether in school or out of school; (c) course failure in English/language arts or mathematics; and (d) a Level 1 score on the statewide assessment in English/language arts or mathematics. For any student in Florida possessing two or more early warning risk indicators, school personnel must convene a team for the purposes of examining what interventions need to be in place for the student (Fla. Stat. §1001.42). As a result of this need for student identification, school districts in Florida must ensure the appropriate technology mechanisms are in place in order to systematically identify students who meet early warning thresholds.

Not only should staff identify students meeting certain risk thresholds, but they should also ensure interventions and supports are in place in order to increase the probability that students will regain on-track status or reduce the severity of off-track status (Balfanz, 2009; Johnson & Semmelroth, 2010). Fla. Stat. §1001.42 requires that when a student meets the early warning system threshold, school staff are also required to convene a meeting to determine appropriate interventions. In addition, the parent should be afforded the opportunity to engage in this problem solving process and must be provided written notice at least 10 days in advance of this meeting. As this legislation calls for increased identification of students who are

academically disengaged, this requirements could ensure increased identification of academically disengaged students, in turn providing faster response ensuring interventions are in place.

Utilization of Early Warning Systems

While the concept of early warning systems is still new, the number of states utilizing EWS continues to grow. According to the Data Quality Campaign's *Data for Action 2014: State Analytics*, since initial launching of EWS, now 30 of 50 states utilize EWS systematically. While states and districts have varying approaches to how EWS programs are being implemented, the number of states utilizing early warning systems continues to be on the up rise.

Other industries have also been identified as having used early warning systems and categorical factors in predicting return on investment outcomes. Paralleled findings exist in the medical research findings, yielding that doctor's diagnosis was most accurate when decisions were made based upon categorical decisions that were combined with their medical expertise and intuition (Whitecotton, Sanders, & Norris, 1998). Related work in the medical field has continued to expel upon the concept of using predictive analytics as a tool to identify certain health factors as related to risk. In the medical field, the use of early warning systems creates potential to ensure greater cost savings and a greater return on investment in diagnosis and treatment of patients. Predictive analytics can serve as a strategy for managing costs by delivering more customized care to patients that improves the quality of their care (Essa & Ayad, 2012). Additionally, in law enforcement the use of early warning systems has rapidly increased (Shjarback, 2015). Early warning systems in policing target specific areas of high density crime, restoration efforts for prisoners, and even interactions between officers and inmates. As aligned with the goals of education, it is believes that utilization of EWS in these organization can aid in efficiency, data analysis, and process improvement, ultimately assisting more individuals at a

lower cost. However, it in order to ensure return on investment with regards to early warning systems, first the predictability of such systems should be considered (Carl et al., 2013; Department of Massachusetts, 2013).

Predictability of Early Warning Risk Score

It is one thing to be able to identify students who are academically disengaged through the use of EWS. It is another thing to use the tool to predict whether a student will be disengaged later on. While research is still emerging on the concept of using EWS as a predictive tool, studies have validated that EWS have a positive relationship to identifying students who are prone to be off track for graduation later. Studies have examined a multitude of risk factors, including absenteeism, retention, behavior, grades, achievement scores on standardized tests, and GPA (Balfanz et al., 2007; Carl et al., 2013; Department of Massachusetts, 2013). Balfanz et al. (2007) found that when students in middle school (n=12,000) exhibited multiple risk factors, they were less likely to graduate than students who did not exhibit multiple risk factors ($p < .0001$ significance was found in all areas). Additionally students who were chronically absent were 68% less prone to graduate, those exhibiting significant misconduct were 56% less prone to graduate, and students who failed mathematics were 54% less prone to graduate. Of students who met zero risk indicators, 56% graduated within one year of their graduation base year, but for students who met all four risk indicator areas, only 7% graduated within the projected graduation year. This research validates that students exhibiting more risk thresholds earlier on are more likely to drop out of high school later on down the road (Allensworth & Easton, 2005; Balfanz et al., 2007). Similarly, Carl et al. (2013) discovered that EWS could be used to predict not only students who are off track for graduation, but also success beyond high school. Other studies have formed similar conclusions, finding connections between students' risk scores and

significant problem behaviors later on in life. Henry et al. (2012) validated conclusions that risk scores could be used as a valid predictor of high school dropout, but they also found there was indeed a connection between high school dropout and significant problem behaviors later on in life. By examining the use of a school disengagement warning index, they also concluded it could be used to predict who may drop out of high school. Furthermore, they also found that school disengagement has long term effects on problem behaviors and that a risk indicator was a robust gage of academic disengagement. They concluded that (1) the early warning risk score was a valid predictor of high school dropout; (2) school disengagement has a significant impact on problem behavior; and (3) high school dropout is a significant contributor to significant problem behaviors, serious violent crime, official arrest/police contact, and substance abuse later on in life.

While the evidence suggests that there is a strong relationship between students' risk scores and their on track for graduation status later on, on the other hand, educational institutions should take great care in examining exactly what combination of risk factors are being used to predict academic disengagement in students. Semmelroth and Johnson (2012) warned that close examination of single predictors that might best determine the efficacy of predictors will aid in greater predictability. They found GPA was the highest predictor, followed by absenteeism but criticized that certain elements were not taken in to account that led to greater information on academic achievement. Thus, a thoughtful approach should be used in developing an EWS that can aid in targeting students who are academically disengaged with validity, and furthermore be used as a predictor.

Still studies overwhelming yield findings that a categorical approach to predicting students' on track for graduation, such as an EWS, can aid in better identification of students

with needs. Even while systematic identification of such students is important, it is of equal importance to consider implication for the classroom. The power of professional discretion and teacher intuition should not be discounted. One study by Soland (2013) that examined teacher intuition in conjunction with the use of EWS as a predictor of student achievement later on in life concluded that teacher intuition and judgment were a strong predictor of student academic achievement. However, predictability was highest when EWS and teacher intuition were combined (accurate in 70-80% predictions). When teacher intuition proved wrong, the early warning system recovered accuracy 55% of the time. Paralleled findings exist in the medical research findings, yielding that doctor's diagnosis was most accurate when decisions were made based upon categorical decisions that were combined with their intuition (Whitecotton et al., 1998). Based on these findings, a predictive analytic model such as an EWS could be useful to balance professional judgement and subjectivity with categorical factors offered through an EWS.

Intervening Based on Early Warning Risk Scores

Even while there is ongoing debate whether schools staff can compensate for what may come down to societal, familial, or environmental factors (Gallagher, Goodyear, Brewer, & Rueda, 2012), it is important to identify students' trajectories. The essence behind ensuring proper identification of at risk students in transitional years is to ensure connection between student identification and implementation of interventions (Johnson & Semmelroth, 2010). With increasing technological advances, early warning systems (EWS) are utilized as an avenue for identifying students at high-risk of drop out, especially in transitional years. The long term goal is to reduce risk that leads to negative outcomes by responding quickly to the student's need for intervention (National Center for Intensive Intervention, 2013). If implemented properly, the

design of interventions through a systematic decision-making framework might further aid in increasing graduation rates.

Early warning systems also aid in the broader goal of providing interventions to at risk students who may not otherwise be recognized as at risk (Allensworth, 2013). Allensworth (2013) found that from 2001 to 2011 there was an increase in graduation from 56.8% to 72.7%. While this causality cannot be proved within this increase in on-track rates in, there is evidence that student performance increased significantly when schools began using data to drive interventions provided to students. These findings place emphasis on using risk indicators to aid educators in focusing efforts on a problem solving process that includes root cause analysis and implementation of interventions based upon student's areas of need (Allensworth, 2013). While emerging research validates the use of EWS as a reliable predictor of academic disengagement (Allensworth, 2013; Semmelroth & Johnson, 2012) the ultimate goal is to reduce risk score indicators and improve student's trajectory towards academic achievement.

In student identification and intervention implementation, a systems approach is needed to analyze barriers on a systematic level (Curtis et al., 2008). In order to provide systematic support for all students, school-wide data and grade-level data should be used to identify trends and patterns (Eagle et al., 2015). Included in this data were the use of an early warning system. Once student needs are identified through the early warning system, an approach can be used to address the needs of students through both academic and behavioral intervention decision-making processes. MTSS (Multi-Tiered System of Supports) is utilized by examining school-wide data to identify trends and patterns in students in order to provide systematic support through a tiered approach. This unified approach can accelerate the efforts of school-wide improvement for all students, while schools systematically address the needs of interventions

through a continuum of support based upon their academic or behavioral needs (Sugai & Horner, 2006; Eagle et al., 2015).

Authors suggest there is a need to go beyond student identification and ensure systematic intervention are in place (Johnson & Semmelroth, 2010). Specifically for students whose needs are not being met through standard protocol interventions, the Response to Intervention framework is suggested as a potential avenue for addressing the needs of students who still are not meeting success even with prescriptive interventions in place (Fuchs, Fuchs, & Compton, 2010; Johnson & Semmelroth, 2010; National Center for Intensive Intervention, 2010). The use of early warning systems have become an increasingly popular avenue for ensuring that at risk students are not only identified but are also monitored and receiving interventions through the Response to Intervention framework (Allensworth, 2013; Heppen & Therriault, 2008). School districts should work towards ensuring capacity and infrastructure are in place to meet the broader goal of intervening for students before they become academically disengaged (Curtis et al., 2008).

Table 3

Summary of Literature Reviewed: Early Warning Systems

Subsection Summary of Findings	Authors
Educational Policy and Relevance of Early Warning Systems. The use of EWS has become a wide spread discussion of public concern, so much so that in many states it is part of the legislative discussion. In Florida, the use of EWS in middle schools is required to identify and intervene for students with characteristics that are linked to academic disengagement.	Curtin, Hurwitch, & Olson (2012); Early Intervention for Graduation Success Act, 2013; Fla. Stat. § 1001.42; Johnson & Semmelroth (2010)
Utilization of Early Warning Systems. Industries outside of education, such as medical and policing have also used the EWS in targeting efforts to help identification and intervention.	American Institute of Research & Department of Massachusetts (2012); Essa & Ayad (2012); Whitecotton, Sanders, & Norris (1998); Shjarback (2015), Carl et al. (2013); Whitecotton, Sanders, & Norris (1998)
Predictability of Early Warning Systems. Research findings are consistent that EWS can be used a valid predictor of problem behaviors later on in life and academic disengagement.	Allensworth & Easton (2005); Balfanz et al. (2007); Carl et al. (2013); Essa & Ayad (2012); Henry et al. (2012); Semmelroth & Johnson (2010); Soland (2013)
Intervening Based on Early Warning Risk Scores. Once student's needs are identified through the EWS, an approach can be used to address the needs of students through both academic and behavioral intervention decision-making processes.	Allensworth (2013); Gallagher, Goodyear, Brewer, & Rueda (2012); Eagle, Dowd-Eagle, Synder, & Gibbons (2015); Fuchs, Fuchs, & Compton (2010); Heppen & Therriault (2008); Johnson & Semmelroth (2010); Sugai & Horner (2006)

Response to Intervention: An Intervention Decision-Making Model

Researchers continue to place emphasis on using risk indicators to aid educators in focusing efforts on a problem solving process that include root cause analysis and implementation of interventions based upon student's areas of need (Allensworth, 2013; Johnson & Semmelroth, 2010; Slander, 2013). While emerging research validates the use of EWS as a reliable predictor of academic disengagement (Balfanz, et al., 2007; Henry et al., 2012; Soland,

2013) the ultimate goal is to reduce risk score indicators and improve student's likelihood of graduating from high school. Authors suggest there is a need to go beyond student identification and ensure systematic interventions are in place (Johnson & Semmelroth, 2010). The Response to Intervention decision-making framework is suggested as a potential avenue for reducing risk indicators, to improve academic engagement (Fuchs, et al., 2010; Johnson & Semmelroth, 2010; National Center for Intensive Intervention, 2010). Whether in the classroom or school-wide, the long term goal is to reduce areas of risk that lead to negative outcomes by responding faster to the student's need for intervention.

The Response to Intervention decision-making model is a problem solving approach used to provide intervention based upon student's needs. Within the RtI decision-making model, a four-step problem solving process is utilized which includes (a) charted data to drive root cause analysis in problem identification; (b) incremental goals established by a problem solving team; (c) assessment driven interventions and instruction; and (d) deliberate monitoring of the impact on student learning (Batsche et al., 2007; Gresham, 2004; Hattie, 2012). MTSS (Multi-Tiered System of Supports) offers a foundation for how RtI decision-making mitigates academic disengagement on a school wide level. By identifying students' academic and behavioral needs through a tiered approach, it can be determined which intervention needs can be met through standard protocol interventions, and which might require a more intensive problem solving process (such as described in the Response to Intervention decision-making model). A unified approach of integrating MTSS and RtI promotes collaborative teaming cross-departmentally to accelerate the efforts of school-wide improvement for all students (Eagle et al., 2015). Within a multi-tiered system to address needs of all students through both a behavioral and academic framework within schools, school personnel efficiently allocate resources through systematic

identification and interventions (Eagle et al., 2015; Sugai & Horner, 2006; Problem Solving & Response to Intervention Project, 2013).

As research has identified critical transitions occur for students moving from elementary to middle school, and middle school to high school (Allensworth & Easton, 2007; Lucas, 1997), there is greater opportunity to identify and intervene for students who may be academically disengaged. Response to Intervention is a prevention framework focused on individual students who are making minimal learning gains, by monitoring student's performance, and adjusting the intensity and frequency of interventions based upon the student's response. Therefore, Response to Intervention has the potential to align with school improvement efforts in ensuring intervention related initiatives are systematic in an effort to ensure on time graduation (Johnson & Semmelroth, 2010).

Policy and Evolution of Response to Intervention

In the identification of students with learning disabilities, certain criteria must be met in order for a student to qualify for special education. Prior to the authorization of IDEIA (2004), child study teams utilized an IQ discrepancy model to identify students with a specific learning disability. The IQ discrepancy model examined used evaluations to examine statistical differences between student's achievement and their intellectual ability; whereby if there was significant disparity between a student's intellectual ability and achievement, he would be found eligible for a learning disability. Fuchs et al., (2003) asserted the need for further inquiry on this method used to determine a child eligible for a learning disability. They asserted the need to reexamine how evaluations were being conducted and whether appropriate student outcome data were being utilized in special education eligibility decision-making. Authors argued that often times the IQ discrepancy approach created multi-faceted concerns as the approach indirectly

cultivated a "wait to fail" approach, due to delays in the evaluation processes for students of additional services or programs under special education (Gresham, 2007; Vaughn & Fuchs, 2003). In addition researchers assert that this method resulted in an over representation of students identified with disabilities based on achievement, and an over representation of students identified with learning disabilities among students who were black (Skiba, Simmons, Ritter, Gibb, Rausch, Cuadrado, & Chung, 2008). Under IDEIA, states can no longer require the use of the IQ-discrepancy model alone as an avenue for determining eligibility or ineligibility of special education services (2004). In order for a child to be eligible for a learning disability, he must undergo general education interventions with data that shows the need for special education.

The Child Find requirement under IDEIA (2004) ensures that students who are suspected of having a disability undergo the evaluation process for special education eligibility. In addition to several other states across the country, Response to Intervention has been adopted as a process that requires there must be evidence of research based general education interventions under Response to Intervention. Under the Florida administrative code Exceptional Education Eligibility for Students with Specific Learning Disabilities (2009), there should be parent involvement in general education procedures with specified data that drives the future actions of interventions. There should be observations of students in the educational environment, a review of achievement data, and hearing and vision screenings to rule these out as inhibiting factors. In addition, IDEIA (2004) authorized that a local education agency may use up to 15% of it's funding to develop, implement, and coordinate early intervening services for students who have not been identified as needing special education services or students who need additional academic or behavioral support to be successful in the general education classroom [P.L. 108-446, § 613(f)(1)]. With child find requirements and the need to intervene for students who are in

the general education environment, Response to Intervention is utilized as an avenue for targeting all students in need of additional academic or behavioral interventions.

Response to Intervention: A Decision-Making Model

Response to Intervention is a data driven multi-tiered approach to the identification and support of students with learning and/or behavioral needs. It is a prevention framework focused on students making minimal learning gains, by monitoring student's performance, and adjusting the intensity and frequency of interventions based upon the student progress (Fuchs & Fuchs, 2006; National Center on Response to Intervention, 2010). Response to Intervention is not an intervention program, but a process: a way to identify who is at risk and the root cause of why a student is at risk. The long term goal is to reduce risk indicators that lead to negative outcomes by responding quickly to the student's need for intervention (Fuchs & Fuchs, 2006; National Center for Intensive Intervention, 2013). Response to Intervention creates an opportunity to develop a systematic approach to targeting not only special education students, but generally speaking, any students at risk of graduating (Curtis et al., 2008). School staff increasingly implement interventions in order to most effectively address student learning needs and student outcomes. Specifically designed to provide intervention to at risk students, targeted interventions are provided to students based upon specific skill deficits. These interventions are monitored and the intensity and frequency of such interventions are adjusted based upon student progress.

Even while some research findings are mixed, even in theoretical aspects, many scholars recommend the implementation of Response to Intervention as an intervention decision-making model (Duffey; 2007; Johnson & Semmelroth, 2010; National Center on Intensive Intervention, 2013). As evidenced by Ball and Christ (2012), "RtI holds substantial promise because it

emphasizes evidence based practices along with the collection and use of the right kind of assessment data" (p.238). The Response to Intervention decision-making model is a planned set of supplemental or intensive procedures that address specific skill deficits for students not meeting standards. Within the decision-making model, a four-step problem solving process includes (a) charted data to drive root cause analysis in problem identification; (b) incremental goals established by a problem solving team; (c) assessment driven interventions and instruction, and; (d) deliberate monitoring of the impact on student learning (Batsche et al., 2007; Gresham, 2004; Hattie, 2012). Within this four step problem solving process, RtI operates on the premise of a multi-tiered system of supports, a continuum of instruction and interventions delivered to all students based upon their performance (National Center on Intensive Intervention, 2010). Tier 1 represents the universal instruction delivered to all students. Tier 2 represents the supplemental intervention instruction provided to students who are not mastering the grade level expectations taught universally to all students. Tier 3 represents the most intensive mode of instruction or intervention, delivered to students who have not mastered grade level expectations with universal instruction (Tier 1 instruction), and with supplemental (Tier 2 intervention).

The differentiation within the Response to Intervention four step problem solving process varies based upon the needs of learners. Within the context of making educational decisions for students not meeting standards, two approaches are typically used by school personnel: either a four step problem solving process or a standard intervention protocol. A standard intervention protocol involves prescribing systematic interventions offered to students who have been identified as not meeting specified levels of performance who demonstrate a need for remediation. Interventions are typically predetermined, based upon available school resources and are implemented after having proven effective for other students in need of remediation

(Christ, Burns, & Ysseldyke, 2005; Johnson et al, 2006). The marked difference when using a standard protocol approach is the lack of individualization that occurs throughout the selection and monitoring of the student's response to intervention. In some cases needs of students are adequately met through standard protocol interventions and decision-making (Christ et al., 2005; Johnson et al, 2006), in other cases, the four step problem solving process calls for a greater intensity and a team of educators with specific knowledge to aid in decision-making.

In an RtI decision-making model, the four step problem solving process, does not stop at school-wide efforts or on individual students, but is also utilized in instruction. Implementation of the RtI decision-making process is focused on high impact instructional practices and strategies that impact student performance. Teachers differentiate their instruction by using assessments to drive the core instruction, in turn influencing their teaching and maximize student learning. As students are unsuccessful with core instruction, the teacher undergoes the deeper four step problem solving process, in order to meet each student's need for intervention within the instruction. In some cases, the teacher revisits the approach being used with the core instruction. In other cases with a provision of an effective core instruction already in place, the teacher provides more intensive instruction and intervention to students not mastering standards. With an effect size of 1.07, Hattie (2012) listed response to intervention as the number three highest influence teaching strategy on student achievement. One component of the response to intervention model referenced by Hattie (p. 61) is the testing effect. A major component of this principle is frequent assessment, making instructional decisions based upon student performance, and monitoring the impact on student learning. In addition to instructional decisions made based upon assessments, students become more engaged because the most deliberate and immediate feedback within the RtI helps to guide their learning.

In a three tiered approach, the RtI process exists in all mediums of instruction at a school. Whether through standard protocol interventions, differentiating instruction, or through a most intensive level of problem solving, a multi-tiered system of supports ensures systematic interventions are in place to safeguard success for all students (Eagle et al., 2015; Sugai & Horner, 2006; Problem Solving & Response to Intervention Project, 2013).

Other decision-making models also promote components of a Response to Intervention decision-making model, one example, Positive Behavior Supports (PBS), links school-wide behavioral systems to overall school improvement efforts (Sugai & Horner, 2006). Just as in MTSS, school-wide PBS operated on the framework of a three tiered approach where by different students have different levels of need for prevention and intervention. The *IDEAL* problem solving model elaborates on the components of decision making as driven by data and response to intervention (Ball & Christ, 2012): (a) problem identification; (b) defining the problem; (c) examining alternative options; (d) applying the selected option; and (e) assessment the results. As promoted through an RtI decision-making model, data were used to drive decision-making. Another example *EBA (Eco Behavioral Assessment),* encourages the relevancy of examining student's ecological factors and environmental factors both within the context of a classroom and within the student's familial factors when implementing interventions. Watson, Gables, and Greenwood (2010) suggest that without looking at ecological systems (encompassing both alterable and unalterable factors), educators cannot provide the most meaningful and effective interventions. The *EBA* process includes collecting data on not only the student's behavior, but also surrounding behaviors that may impact behaviors (i.e. teacher behavior). As a result, Watson et al. (2010), promoted combining practices within the Response to Intervention decision-making model with *EBA.* Whether *PBS, IDEAL, EBA,* or Response to

Intervention, consistency exists in the common thread of using a four-step problem solving decision making model to ensure appropriate identification of student needs and intervention implementation (Batsche et al., 2007; Gresham, 2004).

Utilization of Response to Intervention Decision-Making Models (K-12)

Even while RtI is promoted throughout several scholarly articles, research findings on the effectiveness of the Response to Intervention decision-making model are mixed (Lembke, McMaster, & Stecker, 2010). There is a common theme that most research shows improvement in outcomes among students in primary grades (kindergarten through fifth) and that highest gains are found in students in early grades. One example, in a synthesis of 18 students, Wanzek and Vaughn (2007) concluded positive outcomes among students participating in systematic reading interventions in grades kindergarten through third grade. Highest effects were found for students in kindergarten and first grade. In an update of this synthesis, Wanzek and Vaughn focused on students in grade 4 through 12 in 2013. Researchers revealed that reading intervention gains held minimal statistical significance for students grade 4-12 (reading comprehension effects was .10 ($p<.001$; 95% confidence interval [C1] [.06, 0.19]) and reading fluency measures were .16 ($p=.004$; 95% C1 [.05, .26]). These findings suggest that the systematic intervention design model had more significant results for students in primary grades, but that they can have a small, positive effect on student outcomes in reading (Wanzek, Vaughn, Scammacca, Metz, Murray, Roberts, & Danielson, 2013). On the other hand, researchers have indicated reading improvements have been evidenced by a response to intervention decision-making approach. Scammacca, Roberts, Vaughn, Edmonds, Wexler, & Reutebuch (2007) reported an effect of .95 for students in grades 4 through 12. The notion that reading difficulties can improve when targeted interventions are provided in specific sub skill areas was also supported in another meta-

analysis conducted by Edmonds, Vaughn, Wexler, Reutebuch, Cable, Tackett, & Wick (2009) where there was an average effect size of .89 for the weighted average of the difference in outcomes between the treatment and comparison groups for students in grade 6 through 12.

Additional studies have supported the notion that a Response to Intervention decision-making model can lead to higher student outcomes. Coyne et al., 2013 evaluated a response to intervention instructional approach whereby the intensity of reading interventions were adjusted for kindergarten students based upon student progress. The study included an experimental group of 70 students who received interventions in groups that were changed every four to six weeks based upon their progress with the current interventions. Findings concluded that students in the experimental comparison group outperformed students who received unmodified interventions on all posttest measures (effect sizes ranged from .29 to .76). Follow up analysis also revealed that students continued to have greater academic outcomes at the end of first grade. But again, this study examined students in primary grades. There is a need for further examination of a Response to Intervention decision-making model in secondary schools (Duffey, 2007; Ehrens, 2009)

Response to Intervention Decision-Making Models in Secondary Schools

To ensure fidelity and relevancy for secondary level schools, the design of systematic interventions through a Response to Intervention decision-making model must be customized to the needs at the secondary level. Translation of the RtI framework and structures is essential to ensure effective practice in secondary schools. Most RtI literature assumes implementation at the secondary level mirrors the components of RtI implementation at the elementary level. Due to the structure and organization of secondary schools, RtI implementation should be implemented to meet the unique infrastructure of secondary schools (Duffey, 2007).

While studies suggest that systematic interventions are effective, there has been reluctance to implement RtI in secondary schools that go above and beyond the use of standard protocol interventions (Canter, Klotz, & Cowan, 2008). A common perception among secondary staff is that educational outcomes are less alterable when students reach middle and high school and that it may be too late to intervene (Ehren, 2009). Where interventions under the framework of RtI are perceived as an elementary focus, secondary school staff often times emphasize content level expertise, an increase in rigor and higher level critical thinking skills (Fuchs et al., 2010). The need to balance acceleration efforts with intervention needs poses another challenge to effective implementation of a Response to Intervention model that is linked to school improvement efforts.

The notion that an intervention decision-making model can improve achievement in middle and high schools however, is not unconfirmed. Specifically in the area of reading, meta-analyses conducted by Scammacca et al. (2007) and Edmonds et al. (2009), reflected that adolescence is not too late to intervene on reading difficulties, as students did improve on their reading levels when placed in intervention decision-making problem solving processes. Additional studies by Johnson, Galow, and Allenger (2012) supported the notion that students could make gains in mathematics based upon using a Response to Intervention Decision-Making Model (Four Step Problem Solving Process). Not only were learning gains among students outcomes observed, but also a focus on such a model improved educators' ability to identify targeted needs for interventions in students. In conducting a study focused on the examination of instructional responses to intervention decision-making models, they concluded that the use of a curriculum based measurement improved teacher's accuracy in using screening tools through more accurate grade classification for students. By improving educator's efficacy in identifying

specific areas of deficit for students, mathematics teachers are able to ensure targeted interventions were delivered to the students in need (Johnson, et al, 2012)

However, there are mixed findings with respect to the efficacy of intervention implementation. Vaughn and Fletcher (2012) studied remediating reading deficits through a response to intervention framework for middle school students. While students who received tier two level intervention had higher gains in decoding, fluency, and comprehension (d=.16) than the comparison group, there was no major statistical significance for students receiving the interventions. The evidence is also supported by Fuchs and Vaughn (2012) in that the response to intervention process innately looks different at the secondary level and has a different area of emphasis. Where at the elementary level, students work through a continuum of tiers based upon skill deficit, at the secondary level there is less emphasis on specific sub-skill deficits and more on current student performance and instructional relevancy. Additional studies have demonstrated that different types of reading interventions may not have a high variance for impact on student achievement in reading. Corrin, Somers, Kemple, Nelson, and Sepanik (2009) examined a reading intervention course for high school students who was geared towards motivating students to read more often. Student's comprehension improved by only .09 standard deviation (p value=.019). As is validated in other research findings, an intervention course with a reading focus under the framework may emphasize critical thinking skills (Fuchs et al., 2010), but ignore educational relevancy for secondary students. As the area of focus shifts from sub skill deficits to grades, credits, and GPA at the secondary level, this yields question to whether reading programs are the solution, or if they should move toward a Response to Intervention problem solving process. While standard protocol reading or mathematics courses may demonstrate reading gains, often times treatment integrity is missed (Ball & Christ, 2012; Kilgus,

Collier-Meek, Johnson, & Jaffery, 2014) because root cause analysis was not carried out to ensure interventions are targeting the area of greatest need and at the greatest intensity. For example, a student may be receive intervention through a standard protocol reading course, however, in root cause analysis a problem solving team may determine avoidance of work is interfering with success. It is improbable that the prescribed reading course is going to improve work avoidance across all courses. In the Response to Intervention four step problem solving process, it can be assured that this student would receive appropriate interventions that are matched to specific skill deficits.

National Center for Intensive Interventions, et al. (2010) identified four essential components for effective Response to Intervention implementation at the high school level: (a) Leadership; (b) Evaluation; (c) Interventions; and (d) Professional learning (Duffey, 2012). Components are not only individual student based, but also systematic, and school wide. With these components, it is important to note that intervention process and effect might vary from the actual implementation, and that a systems approach is needed in order to address the barriers to provided streamlined and systematic interventions in a school (Curtis et al., 2008). In a case study of one high school's RtI implementation in Colorado, it was reported that professional learning communities were an integral part of driving their RtI implementation. Teachers were provided an extra hour each week to aid in additional collaboration time. In addition, they built an extra period indo the master schedule, allowing students to receive intervention support during the school day. School leadership examined data to ensure a strong Tier 1 and examined data to action plan for Tier 2 and Tier 3 as they monitored the systematic implementation. With an emphasis on allocating time and professional learning, they were able to develop an RtI system that met the organizational needs of the high school setting (Duffey, 2012).

Challenges of Response to Intervention in Secondary Schools

While the RtI framework is suggested as a potential avenue for reducing risk indicators, as related to academic disengagement (Johnson & Semmelroth, 2010), secondary school staff have struggled with implementation. Because it creates more time and staffing needs of general education professionals, capacity and infrastructure barriers have prevented secondary schools in creating school wide systematic delivery of intervention implementation. Researchers suggest that response to intervention implementation must be customized to the different infrastructure needs in the high school setting (Duffey, 2007). Based upon the limited resources and capacity for interventions in secondary settings, many schools personnel struggle as to how to target appropriate implementation of interventions. "High-cost and high benefit verses low-cost and low benefit" (page 42) interventions are described as a potential avenue for determining interventions that are not costly, but have a higher variance for improvement on student outcomes. Whereas in determining appropriate interventions, school leadership might be selective to implement low-cost, low benefit interventions to those students who are bordering graduation, compared to providing high-cost, high benefit interventions to those students who display significant academic disengagement (Carl et al., 2013).

In addition to implementation challenges in secondary schools, one essential component of an intervention decision-making models is ensuring that root cause analysis drives the problem solving process. If the intervention selection does not correspond to the specific skill deficit, interventions being provided may be less effective. While on one hand early warning systems (EWS) can aid in deeper root cause analysis (Heppen & Therriault, 2008), on the other hand, research supports that in many cases, and intervention design does not match specific skill deficits in students. According to Kilgus et al. (2014), this level of treatment integrity is often times missed or not validated. Ball and Christ (2012) validate this notion, that while intervention

decision-making models often have shared common components in their makeup, decision validity is often times inconsistent across districts and grade levels. Without delivering matched interventions with validity to the corresponding skill deficit, the opportunity may be missed to markedly help a disengaged student; without which we cannot determine if an operational relationship actually exists between an independent and dependent variable. Data should be collected to ensure integrity treatment of interventions and instruction that are designed to meet the specific skill deficits of students (Lane, Bocian, Macmillan, & Gresham, 2004). Collection of data with frequent assessment that are related to the specific skill deficit is essential to ensuring integrity of the response to intervention. Student outcome improvement is allayed by the fidelity of using a problem solving process in matching intervention design with specific skills (Ball & Christ, 2012).

Summary

Critical transitions occur for students moving from elementary to middle school, and middle school to high school (Lucas, 1997, Allensworth & Easton, 2007). Within these transitional periods, there is a greater likelihood of declines in academic achievement (Gleason & Dynarski, 2002). Within the process of academic disengagement, it is important to identify students' trajectories towards on track graduation, identify students who are potentially becoming academically disengaged, and employ interventions. This chapter presented the rationale for conducting research on the predictability of early warning systems and the efficacy of a Response to Intervention decision-making model. While research is still emerging, educational researchers have studied the constructs of EWS and RtI vastly over the past ten years. Both EWS and RtI have been reviewed within a framework related to an individual student's needs and as related to systematic school improvement efforts. This study sought to

build upon the research through a combined lense of at risk student identification, and the efficacy of interventions employed upon a student being identified as academically disengaged. Within the process of academic disengagement, it is important to identify students' trajectories towards on track graduation, identify students who are potentially becoming academically disengaged, and employ interventions. Thus, this study sought to examine the predictability of an EWS and Response to Intervention Decision-Making Model.

Table 4

Summary of Literature Reviewed: RtI: An Intervention Decision-Making Model

Subsection Summary of Findings	Authors
Policy and Evolution of RtI. Child Find requirement specifies that students must undergo general education interventions when suspected of having a disability, however RtI is used to target all students in need of interventions.	Florida administrative code Exceptional Education Eligibility for Students with Specific Learning Disabilities (2009); Fuchs et al. (2003); Gresham (2007); IDEIA (2004), Vaughn & Fuchs (2003); Skiba, Simmons, Ritter, Gibb, Rausch, Cuadrado, & Chung (2008)
RtI: A Decision-Making Model. RtI is implemented through a mutli-tiered system of supports where a continuum of instruction and intervention are delivered to all students based upon need.	Ball & Christ (2012); Batsche et al. (2007); Christ, Burns, & Ysseldyke (2005); Curtis et al. (2008); Fuchs & Fuchs (2006); Gresham (2004); Hattie (2012); Johnson et al. (2006); Johnson & Semmelroth (2010); Sugai & Horner (2006); Watson, Gables, and Greenwood (2010)
Utilization of RtI Decision-Making Models (K-12). There is a common theme in RtI research that greatest outcomes are observed for students in elementary grades, especially primary grades.	Coyne et al. (2013); Edmonds, Vaughn, Wexler, Reutebuch, Cable, Tackett, & Wick (2009); Lembke, McMaster, & Stecker, (2010); Scammacca, Roberts, Vaughn, Edmonds, Wexler, & Reutebuch (2007); Wanzek, Vaughn, Scammacca, Metz, Murray, Roberts, & Danielson (2013)
RtI Decision-Making Models in Secondary Schools. Research findings are mixed at the secondary level, however most are linked to greater student outcomes.	Canter, Klotz, & Cowan (2008); Corrin, Somers, Kemple, Nelson, and Sepanik (2009); Curtis et al. (2008); Duffey (2007 & 2012); Edmonds et al. (2009), Ehren (2009); Fuchs et al. (2010); Fuchs & Vaughn (2012); Johnson, Galow, & Allenger (2012); Kilgus, Collier-Meek, Johnson, & Jaffery, 2014; Scammacca et al. (2007); Vaughn & Fletcher (2012)
Challenges of RtI in Secondary Schools. RtI has proven most successful when implementation is aligned with the varying infrastructure and needs of secondary schools.	Ball and Christ (2012); Carl et al. (2013); Duffey (2007); Kilgus et al. (2014); Johnson & Semmelroth (2010); Lane, Bocian, Macmillan, & Gresham (2004)

CHAPTER THREE
METHODOLOGY

Introduction

The primary goal of this study was to examine the validity of using an early warning systems as a mean for identifying students at-risk of academic disengagement. Additionally the questions tested student outcome gains when participating in a Response to Intervention (RtI) decision-making model compared to those that did not participate. Separate methods of data analysis were used to test the research questions. The research design for this study was correlational and used existing, quantitative data, collected through a student performance data management system in the school district. As is suggested by Lunenberg and Irby (2008), the chapter is organized into three sections: (a) selection of participants; (b) data collection; and (c) data analysis.

Each research question is derived within the context of examining the problem statement: The need to examine the predictability of one early warning identification system (EWS) in the identification of students who are off-track for graduation and the efficacy of an RtI decision-making models for such students. As initially stated in chapter one, the study contains three research questions:

1. To what extent was there a relationship between the early warning identification risk score and academic achievement for students in grades six and nine, as determined by their grade point average (GPA)?
2. To what extent was there a relationship between the early warning risk score for students in grade four and grade seven (end of 2012-2013 school year) and their academic achievement

two years later in grade six and nine (end of 2014-2015) respectively, as determined by their GPA and credits earned?

3. Based on participation or lack of participation in the RtI process, how did students in grade six and nine compare in achievement (risk score, GPA, and an English/language arts assessment)?

Selection of Participants

As a means to investigate students in transitional years during the 2014-2015 school year the sample for this study consisted of sixth and ninth grade students in one mid-size local school district. Existing data were examined for this selection of this study. For Research Question One and Research Question Two, data were separated into two groups, one group representing students in sixth grade and the other representing students in ninth grade. Frequencies were obtained for key demographic variables, including students in certain programs such as the free and reduced lunch program, the special education program as determined by students with an identified disability (SWD), or students in the English for Speakers of Other Languages (ESOL) program.

For Research Question One, the sample included 7,579 students in grades six or nine in the 2014-2015 school year. Research Question Two, included a sample of 4,861 students who were enrolled in the school district in both 2012-2013 and 2014-2015. For Research Question Three, purposive sampling (Neuman, 1997) was used to include students who participated in the RtI process. The sample included 412 general education students who participated in the RtI process that were matched to 412 students who did not participate in the RtI process. Caliper matching (Stuart, 2010) was used to allow for examination of students where inferences could be generalizable to the population of interest.

Instrumentation

The key variables in this study were measured by student outcome data. The risk score was as a variable in all three research questions. This aggregate covariate was developed in a local mid-size school district by a team of data analysts and district level administrators as a means of identifying students who are less likely to graduate from high school. In the development of the risk score, the team examined research on what factors that are available and most alterable in a school district that correlate to on track graduation (Balfanz, Bridgeland, Moore, & Hornig Fox, 2010; Hammond et al., 2007). Two years prior to this research, the following measurable factors were assigned a point value (Appendix A) based upon the team's evaluation of risk associated with each factor: (a) 2 or more absence in the first 25 days of school; (b) 5 absences in a grading period; (c) course failure in each grading period; (d) course failures from the prior school year; (e)) cumulative grade point average (GPA); (f) total out of school suspensions per year; (g) over expected age for grade level; (h) prior retention; and (i) mobility. Additional variables were also used in the analysis. Credits earned assessed successful completion of a course to measure ono track for graduation (International Affairs Office, 2008). Differences in Discovery Education Reading Assessments was a universal assessment that examined student performance growth on specific Florida standards (Discovery Education Assessment, 2008). The reading reliability across the state of Florida was .83 with a sample size of 3,266 in grade 9 and .86 with a sample size of 3,872 in grade 6. To ensure content validity assessments are aligned to the standards being taught across the state's grade level using the Webb Alignment Tool (WAT). Grade Point Average (GPA) was used to measure of student's academic achievement representing the average value of total quality points earned derived by total quality points attempted during a specific time period. Overall research studies confirm that

the GPA and earned credits are a valid and reliable indicator of student achievement (Bacon & Bean, 2006).

Data were obtained from the school district student performance data management system. SPSS Version 21 was used to analyze data. Quantitative measures will be used to provide an indication as to whether a relationship exists between the risk score and academic achievement.

Data Collection

For the entirety of this study, quantitative methods were used. Approval to conduct this research was a two-fold approval process. First, permission had to be obtained from the University of Central Florida's Institutional Review Board (IRB). Upon receiving approval from the IRB, additional permission was secured from the local school district for approval to access this data for the purposes of this research.

The research design for this study used existing, quantitative data, collected through a student performance data management system in the school district. The student performance data management system pulls student enrollment and demographic information directly from the student information system, where survey data are collected (Florida Department of Education, 2015), so the assumption of this data are that it is relatively accurate. The researcher pulled the initial data, however to ensure accuracy and transparency, an external evaluator in the school district reviewed the data and checked it for accuracy prior to it being assigned randomized numbers. Data collection was completed upholding student privacy in accordance with Family Educational Rights and Privacy Act (FERPA). Data used included all students enrolled in sixth and ninth grade from the beginning of the 2015-2016 school year to the end. Data were linked to subjects identifying information through a randomized number which was

assigned to participant variables in place of student identifying information (names, student numbers). Once all identifying information was removed, data were downloaded into SPSS.

For Research Question One 7,579 students were included in the sample. Data included students' risk scores in the beginning of the 2014-2015 school year, risk scores in the end of the 2014-2015 school year, and their GPAs at the end of the 2014-2015 school year.

For Research Question Two 4,861 students were included in the sample. This decrease is due to the students being excluded when not enrolled in 2012-2013 and 2014-2015. Data included students' risk scores at the end of the 2012-2013 school year, risk scores at the end of the 2014-2015 school year, 2014-2015 end of year cumulative GPAs, and 2014-2015 credits earned (for ninth grade students only).

For Research Question Three 824 students were included in the sample; 412 of which were in the treatment group and 412 of which were in the comparison group. Data included students' risk scores in the beginning of the 2014-2015 school year, risk scores in the end of the 2014-2015 school year, quarter one GPAs, quarter four cumulative GPAs, beginning of the year English/language arts assessment scores on Discovery Education and end of year English/language arts assessment scores on Discovery Education. For this question, purposive sampling (Neuman, 1997) was used to remove students from the study under certain conditions: (a) If a student was identified as in the RtI process for tutorial only, it was probable this decision was made for a district requirement to report tutorial, rather than an RtI decision-making model. In this case students were removed from the study because it could not be confirmed they were placed in the process under the definitions of an RtI decision-making model (Batsche et al., 2007; Gresham, 2004; Hattie, 2012). In some cases students were (b) If a student participated in the RtI process for less than one month in duration he was removed from the data collection,

because the examined change scores examined progress from the beginning of the year to the end. (c) If a student was eligible or became eligible for a special education program (IDEIA, 2008) during the 2014-2015 school year, he was removed from the study because this study sought to examine general education students who might not otherwise be identified as needing interventions. Hence the purpose of this study was to examine students in an RtI decision-making model (Batsche et al., 2007; Gresham, 2004; Hattie, 2012), therefore additional monitoring and services under other special education programs resulted in certain students to be ineligible in the data collection process. (d) If a student had a risk score of a zero during the first quarter. This helped to control for variability in circumstances where students transferred from other school districts resulting in lacking data to contribute to the risk score. When matched to another student ~~that~~ who had previous school year data with the same risk score, lacking data may have resulted in their risk score being less likely an accurate reflection of their true risk.

Data Analysis

Data were obtained from the school district student performance data management system. SPSS Version 21 was used to run statistical tests. For Research Question One and Research Question Two, a Pearson correlation coefficient was used to test the strength of the relationship between the early warning system and students' grade point average. For Research Question Three caliper matching was used to match students who participated in the RtI process with another single variable from a student that did not participate in the RtI process (Painter, 2004; Stuart, 2010; Clark, 2015). Caliper matching is a statistical method of matching, where by a variable of interest in the treatment group is matched to a variable in the control group in order to correspond with the closest point search (Rubin, 1973, Lunt, 2013). The 2014-2015 first quarter risk score was used as an aggregate covariate to ensure subjects were matched to other

subjects with like characteristics. In order to control for variability, when there were large differences between the risk scores as the aggregate covariate, caliper matching was used. Caliper matching is a statistical method of determining a point of estimate in order to accurately identify the parameter of interest to a specific subject based upon proximity to the mean (Lunt, 2013). Within this process, students were removed from the study if the matched student's risk score was not within two standard deviations of the mean. This helped to ensure that if a student was not matched with another student that had the exact same risk score, it could be assured that students selected were still a close match. Once students were matched, a related samples *t*-test (matched subjects design) was used to answer the research question (Steinberg, 2008).

Table 5

Research Questions and Data Sources

Questions	Data Sources	Method of Analysis
To what extent was there a relationship between the early warning identification risk score and academic achievement for students in grades six and nine, as determined by their grade point average (GPA)?	Sample of all students Grade six (2014-2015 school year) 2014-2015 risk score data 2014-2015 year to date GPA Grades nine (2014-2015 school year) 2014-2015 risk score data 2014-2015 cumulative GPA	Pearson correlation coefficient
To what extent was there a relationship between the early warning risk score for students in grade four and grade six (end of 2012-2013 school year) and their academic achievement two years later in grade six and nine (end of 2014-2015) respectively, as determined by their grade point average (GPA) and credits earned?	Sample of all students Grade four (2012-2013 school year) 2012-2013 risk score 2014-2015 year to date GPA Grade six (2012-2013 school year) 2012-2013 risk score 2014-2015 cumulative GPA 2014-2015 credits earned	Pearson correlation coefficient
Based on participation or lack of participation in the RtI process, how did students in grade six and nine compare in achievement (risk score, GPA, and an English/language arts assessment)?	Grades six and nine RtI process Changes in GPA from quarter one to quarter four Changes in risk score from quarter one to quarter four Changes in English/Language Arts assessment from quarter one to quarter four	Related samples *t*-test (matched subjects design)

Summary

This chapter reviewed the purpose of this research and restated the research questions. The selection of 7,579 participants in one local school district was discussed. In addition, to the selection of participants, data collection procedures, and data analysis were presented. The methods of data analysis for each question were also discussed for each question, followed by a review of the statistical test being used. Results of the data analysis are presented in the following chapter, as they relate to each research question.

CHAPTER FOUR
PRESENTATION AND ANALYSIS OF DATA

Introduction

The primary goal of this study was to address the gap in the extant literature by examining the use of an early warning system to aide in recognizing early school disengagement. Additionally, the goal of this study was to examine an intensive response to intervention decision-making process and the difference in student outcomes for those who were selected for the RtI process. By combining the exploration of an early warning system and an RtI decision-making process, this research could aid in further recommendations for more effective methods of identifying students who are academically disengaged and gain insight on intervention processes in secondary schools. Therefore the research questions tested the validity of an early warning system as a means for identifying students at-risk of academic disengagement and student outcome gains when participating in a Response to Intervention (RtI) decision-making process compared to those who did not participate. Populations of concern included students in transitional periods, moving from elementary to middle school and middle school to high school; therefore the population included students in grades six and nine. The purpose of this study was achieved by examining relationships and changes in students' risk scores and other achievement outcomes.

Chapter four presents findings and demographic variables for each of the research questions. The chapter is organized into sections, presenting the results of each data analysis for the three research questions. In each section, descriptive statistics were first reported followed by the results. The presentation of the findings is arranged by the three research questions. For Research Question One and Research Question Two, the Pearson correlation

coefficient was used to determine the strength of the relationship between the early warning risk score, grade point average (GPA), and credits earned. For Research Question Three, caliper matching was used to match students who participated in the RtI process with another single variable from a student who did not participate in the RtI process (Painter, 2004; Stuart, 2010; Clark, 2015). After students were matched to students through an aggregate covariate (risk score in the beginning of the year), a related samples *t*-test (matched subjects design) was used to compare changes in the measured outcome variables.

Student Demographic Variables

Throughout the study, data were separated into two groups; one group representing students in grade six and the other representing students in grade nine. Program status was examined for students who were eligible for the following programs: (a) free and reduced lunch (FRL) program,(b)special education program, as defined by a student with a disability (SWD) placed in a special education program, and (c) English for Speakers of Other Languages (ESOL) program. For grade six, nearly half of students were identified as having met criteria for free and reduced lunch (*n=2365*, 49.8%). Students with an identified disability made up 12% of the population (*n=572*). Similar to students with an identified disability, a minority of students were identified in the ESOL program, (*n=487*, 10.3%). For grade nine, nearly half of students were identified as meeting criteria for free and reduced lunch (*n=2,720*, 49%). Students with an identified disability made up 11.7% of the population (*n=652*) and students identified in the ESOL program made up 9.2% (*n=509).* Table 6 provides demographic variable data as frequencies and percentages for the grade levels.

Table 6

Student Demographic Variables for All Students Grades Six and Nine

	Grade Six (*N* = 4,749)		Grade Nine (*N*=5,557)	
Variables	*f*	%	*f*	%
Free and Reduced Lunch (FRL) program				
No	2384	50.2	2837	51.0
Yes	2365	49.8	2720	49.0
Students with a disability (SWD) program				
No	4177	88.0	4905	88.3
Yes	572	12.0	652	11.7
English for Speakers of Other Languages (ESOL) program				
No	4262	89.7	5048	90.8
Yes	487	10.3	509	9.2

Research Question One: Relationship between Risk Score and Student Outcomes

Question One: To what extent was there a relationship between the early warning identification risk score and academic achievement for students in grades six and nine, as determined by their grade point average (GPA)?

The first question examined the relationship between students' 2014-2015 end of year risk score and the 2014-2015 end of year grade point average (GPA). Data included a total of 7,579 students (six grade: 4,284; ninth grade: 3,295). When data were initially pulled, if students were withdrawn, identified in another grade level, or missing a key variable for the purposes of this research study, they were excluded from the study. For example, if a student was withdrawn from the school district, he may have been missing a risk score or GPA and therefore was excluded. In several cases students in grade nine were removed from the study because the data system did not automatically carry their GPAs over from one school to the next.

Student Demographic Variables

Free and Reduced Lunch (FRL) status, students with an identified disability (SWD), and English for Speakers of Other Languages (ESOL) program data were examined. For grade six, nearly half of students were identified as having met criteria for free and reduced lunch (*n=2050*, 47.9%). Students with an identified disability made up 10.7% of the population (*n=457*). Similar to students with an identified disability, a minority of students were identified in the English Language Learners program, (*n=408*, 9.5%). For grade nine, over half of students were identified as meeting criteria for free and reduced lunch (*n=1,683*, 51.1%). Students with an identified disability made up 12.2% of the population (*n=402*) and students identified in the English for Speakers of Other Languages (ESOL) program made up 9.4% (*n=309).* Table 7 provides demographic variable data as frequencies and percentages for the grade levels.

Table 7

Student Demographic Variables When Examining Achievement Based on Risk Score

	Grade Six (*n* = 4,284)		Grade Nine (n=3,295)	
Variables	*f*	%	*f*	%
Free and Reduced Lunch (FRL) program				
No	2234	52.1	1612	48.9
Yes	2050	47.9	1683	51.1
Students with a disability (SWD) program				
No	3287	89.3	2893	87.8
Yes	457	10.7	402	12.2
English for Speakers of Other Languages (ESOL) program				
No	3876	90.5	2986	90.6
Yes	408	9.5	309	9.4

Setup and Rationale

The key variable in this study was the risk score indicator. This aggregate covariate was developed in a local mid-size school district by a team of data analysts and district level administrators as a means of identifying students who are less likely to graduate from high school. The following measurable factors were assigned a point value by the school district (Appendix A) based upon a team's evaluation of risk associated with each factor: (a) 2 or more absence in the first 25 days of school; (b) 5 absences in a grading period; (c) course failure in each grading period; (d) course failures from the prior school year; (e) cumulative grade point average (GPA); (f) total out of school suspensions per year; (g) over expected age for grade level; (h) prior retention; and (i) mobility.

Since the dependent variable for this study included the grade point average and the grade point average was also included in the risk score, a method was used to ensure the grade point average variable in the risk score did not inflate the results of this study. For any student who had a GPA of a 2.0 or less, ten points were added to the risk score. For any student who had a GPA of 2.79 or less, five points were added to the risk score. For any student where the risk score included a point value that was associated with GPA, these points were deducted from the student's risk score total. This method helped to control for variability by ensuring the GPA variable did not inflate findings, since GPA is one of the variables within the risk score methodology.

Prior to conducting the analysis of testing the relationships between risk scores and GPAs using the Pearson correlation coefficient, the distribution for GPA and risk score was tested for normality. Results indicated that the distribution of GPA and risk score approximated a normal distribution.

Results

When GPAs were compared across the grade levels, students in grade six had a higher reported GPA (M = 3.26, SD = .63, n = 4,284) than students in grade nine (M = 2.6, SD = .7, n = 3,295). When the early warning risk score was compared across grade levels, students in grade nine had a higher reported risk score (M = 36.87, SD = 34.11, n = 3,295) than students in grade six (M = 16.8, SD = 24.71, n = 3,295). When considering the mean score, on average, students in grade nine had over twice the risk score than students in grade six. Based on this data, it could be concluded that the risk score was typically higher for students in grade nine, and that the GPA was typically higher for students in grade six. Table 8 provides students' means and standard deviations of the 2014-2015 risk scores and grade point averages (GPA) for each grade level.

Table 8

Mean 14-15 Risk Score and Grade Point Average Results

N = 7,579

	Grade Six (n = 4,284)		Grade Nine (n = 3,295)	
Descriptives	*Mean*	*St Dev*	*Mean*	*St Dev*
GPA	3.26	.63	2.6	.7
Risk Score	16.8	24.71	36.87	34.11

Interpretation Grade Six

The strength of the relationship was tested between students' end of year risk score in 2014-15 and their end of year GPA in 2014-15 for grade six. Findings resulting from this test indicated a highly significant relationship between students' risk scores and their Grade Point Average at the end of the 2014-2015 school year (r = -.775, n = 4,282, p <.01). Table 9 presents the results of the correlational analysis examining the relationships among students' risk scores and their

GPAs.

$r(4,282) = +.775$, $p < .01$

The scatterplot in Figure 1 represents these results.

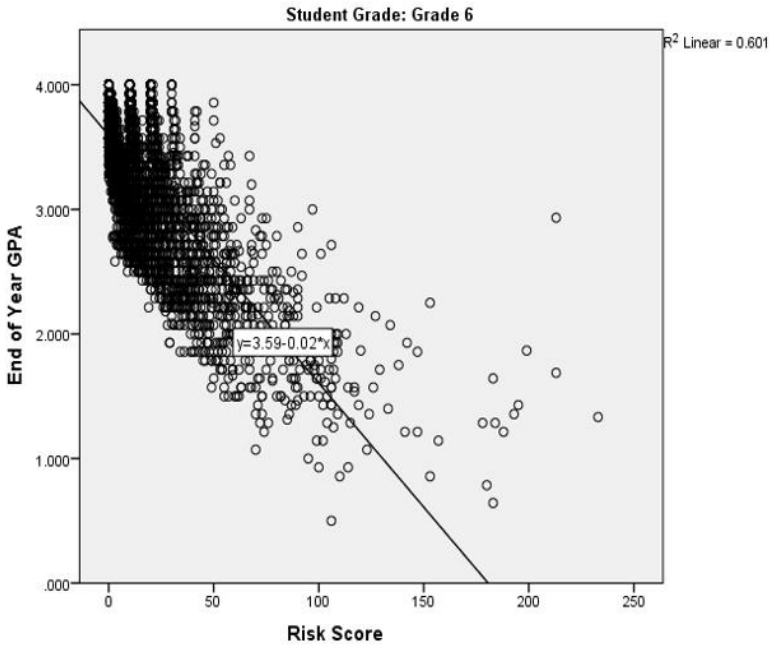

Figure 1: Correlation between 14-15 Risk Score and 14-15 GPA Grade 6

Interpretation Grade Nine

The strength of the relationship was tested between students' 2014-2015 end of year risk score and 2014-2015 end of year GPA in grade nine. Findings resulting from this test indicated a highly significant relationship between students' risk scores and their Grade Point Average at the end of the 2014-2015 school year ($r = -.848$, $n = 3,293$, $p < .01$). Table 9 presents the results of the correlational analysis examining the relationships among students' risk scores and their GPAs.

$r(3,293) = +.848$, $p < .01$

The scatterplot in Figure 2 represents these results.

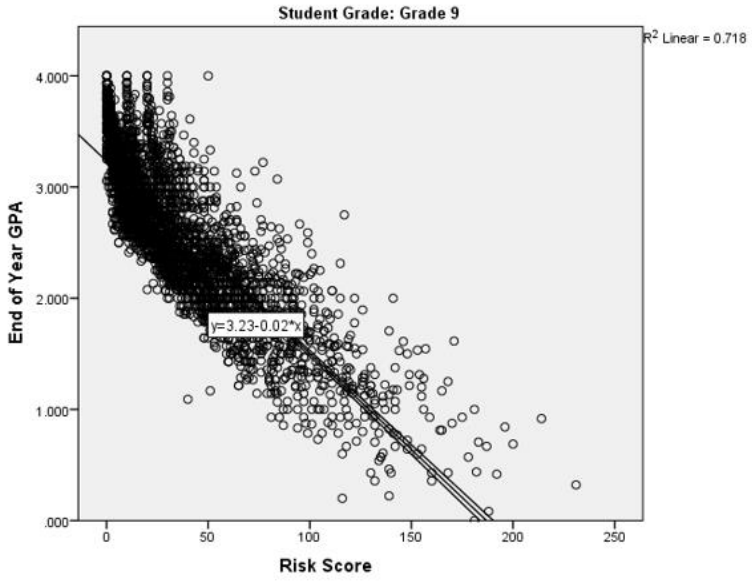

Figure 2: Correlation between 14-15 Risk Score and 14-15 GPA Grade 9

Table 9

Pearson Correlation Coefficient for 14-15 Risk Score and 14-15 Grade Point Average

N = 7,579

	Grade Six (n = 4,284)	Grade Nine (n = 3,295)
Descriptives	*2014-2015 Risk Score*	*2014-2015 Risk Score*
2014-2015 End of Year GPA		
Pearson correlation (*r*)	-.775**	-.848**

Note. **Correlation is significant at the .01 level (2-tailed)

Research Question Two: Predicting Student Outcomes Based on Risk Score

Question Two: To what extent is there a relationship between the early warning risk score for

students in grade four and grade seven (end of 2012-2013 school year) and their academic achievement two years later in grade six and nine (end of 2014-2015) respectively, as determined by their grade point average (GPA) and credits earned?

The second question tests the strength of the relationship between students' risk scores (in 2012-13) and students' achievement outcomes two years later (in 2014-15). By examining this data, it could be inferred whether student outcome variables could be predicted based upon a prior year's risk score. Data included 4,861 students (sixth grade: 2,256; ninth grade: 2,605). For students in grade nine, in addition to testing the relationship between prior risk score and GPA, the relationship between prior risk score and credits earned were also tested.

Setup and Rationale

Data were separated into two groups, one group representing students in grade six and the other representing students in grade nine. Frequencies were obtained for key demographic variables, including students in certain programs such as the free and reduced lunch program, the special education program as determined by students with an identified disability (SWD), or students in the English for Speakers of Other Languages (ESOL) program.

As was implemented with Research Question One, students were again removed from this question when data were missing. Missing data were an indication that he may have been reassigned to a different grade level, no longer attend school in the same school district, or were withdrawn from the school district. When data were initially pulled, if students were withdrawn two years prior, identified in another grade level, or missing a key variable for the purposes of this question, they were excluded from the study. For example, if a student was withdrawn from the school district, he may have been missing a risk score or GPA. In several cases, students were removed from the study because their GPA did not transfer from one school to

the next in the data system.

Also consistent with Research Question One, since the risk score configuration includes grade point average (GPA), which is also a dependent variable for this study, for any student where the risk score included a point value that was associated with GPA, these points were deducted from this student's risk score total. This method helped to better control for variability by ensuring the GPA variable did not inflate findings, since GPA is one of the variables within the risk score methodology.

Prior to conducting the analysis of testing the relationships between risk scores and GPAs using the Pearson correlation coefficient, the distribution for the other variables were tested. The distribution for GPA, credits earned, and risk score were tested for normality. Results indicated that the distribution of GPA, credits earned, and risk score approximated a normal distribution.

Results

Student Demographic Variables

Program status was examined for students who were eligible for the following programs: (a) free and reduced lunch (FRL) program, (b) special education program, as defined by a student with an identified disability (SWD) placed in a special education program, and (c) English for Speakers of Other Languages (ESOL) program. For grade six, over half of students were identified as having met criteria for free and reduced lunch (*n=1,281*, 56.8%). Students with identified disabilities made up 16.4% of the population (*n=371*). Students identified in the ESOL program made up 9.5% of the population (*n=238*).

For grade nine, over half of students were identified as meeting criteria for free and reduced lunch (*n=1,355*, 52%). Students with an identified disability made up 12.5% of the

population (*n=326*). Students identified in the English for Speakers of Other Languages (ESOL) program made up 9.2% of the population (*n=241*). Table 10 provides demographic variable data as frequencies and percentages for the grade levels.

Table 10

Student Demographic Variables When Predicting Achievement Based on Risk Score

	Grade Six (*n*=2,256)		Grade Nine (n=2,605)	
Variables	*f*	%	*f*	%
Free and Reduced Lunch (FRL) program				
No	975	43.2	1250	48.0
Yes	1281	56.8	1355	52.0
Students with a disability (SWD) program				
No	1885	83.5	2279	87.5
Yes	371	16.5	652	12.5
English for Speakers of Other Languages (ESOL) program				
No	2018	89.5	2364	90.8
Yes	238	9.5	241	9.2

Student Achievement Analysis

When the 2012-2013 early warning risk score was compared across grade levels, students in the grade nine cohort had a higher reported risk score (M = 24.33, SD = 25.15, n = 2,605) than students in grade six (M = 15.06, SD = 15.64, n = 2,256). On the other hand, when the 2014-2015 GPA was compared across the grade levels, students in grade six had a higher reported GPA (M = 3.06, SD = .63, n = 2,256) than students in grade nine (M = 2.6, SD = .71, n = 2,605).

When considering the mean 2012-2013 risk score, on average students in the grade nine cohort had a higher risk score than students in the grade six cohort. Based on this data, it could be concluded that the risk score was generally higher for students in the grade nine cohort, and that the GPA was generally higher for students in the grade six cohort. In addition to GPA,

credits earned in 2014-2015 were also examined for students in the grade nine cohort (M = 7.57, SD = 1.67, n = 2,605). Table 11 provides student means and standard deviations for grade six and grade nine.

Table 11

Mean 2012-13 Risk Score and 2014-15 Student Outcome Results

N = 4,861

	Grade Six (n = 2,256)		Grade Nine (n = 2,605)	
Descriptives	*Mean*	*St Dev*	*Mean*	*St Dev*
2012-2013 Risk Score	15.06	15.64	24.33	25.15
2014-2015 End of Year GPA	3.06	.63	2.6	.71
2014-2015 Credits Earned	N/A	N/A	7.57	1.67

Interpretation Grade Six

The strength of the relationship was tested between students' risk scores two years prior in grade four (2012-2013) and end of year GPA two years later in grade six (2014-2015). Findings resulting from this test indicated a moderately significant relationship between students' risk scores in grade four in the 2012-13 school year, and their Grade Point Average two years later in grade six in the 2014-15 school year (r = -.373, n = 2,254, p <.01). Table 12 presents the results of the correlational analysis examining the relationships among students' risk scores two years prior (2012-2013) and their academic achievement variables two years later (2014-2015) as measured by GPA and credits earned. Table 12 presents the results of the correlational analysis examining the relationships among students' risk scores in 2012-13 and their GPAs two years later in 2014-15.

$r(2254) = -.373, p < .01$

The scatterplot in Figure 3 represents these results.

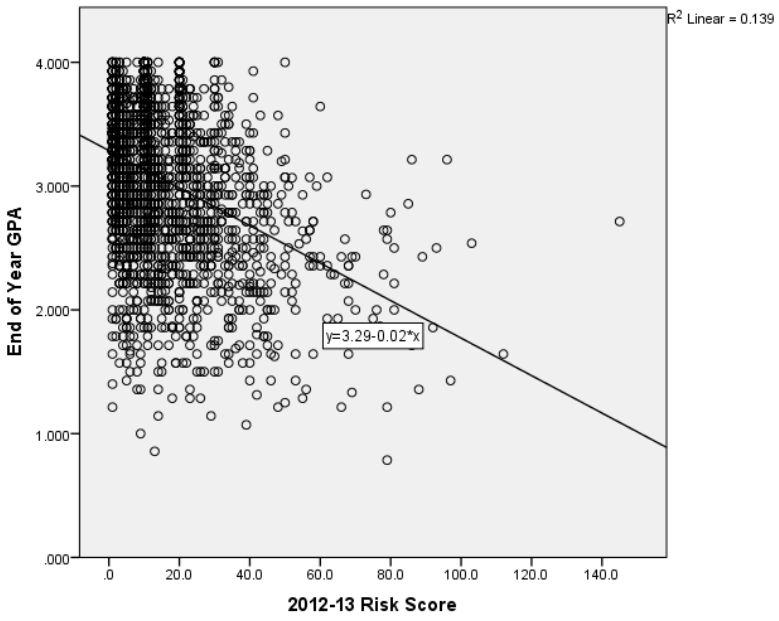

Figure 3: Correlation between 12-13 Risk Score and 14-15 GPA Grade 6

Interpretation Grade Nine

The strength of the relationship was also tested between students' risk score two years prior in grade seven (2012-2013) and end of year GPA two years later in grade nine (2014-2015). Findings resulting from this test indicated a moderately significant relationship between students' risk scores in grade seven in the 2012-13 school year, and their Grade Point Average two years later in grade nine in the 2014-15 school year (r = -.476, n = 2,603, p <.01). Table 12 presents the results of the correlational analysis examining the relationships among students' risk scores two years prior (2012-2013) and their academic achievement variables two years later (2014-2015) as measured by GPA and credits earned. Table 12 presents the results of the correlational analysis examining the relationships among students' risk scores in 2012-13 and their GPAs two years later in 2014-15.

$r(2603) = -.476, p < .01$

The scatterplot in Figure 4 represents these results.

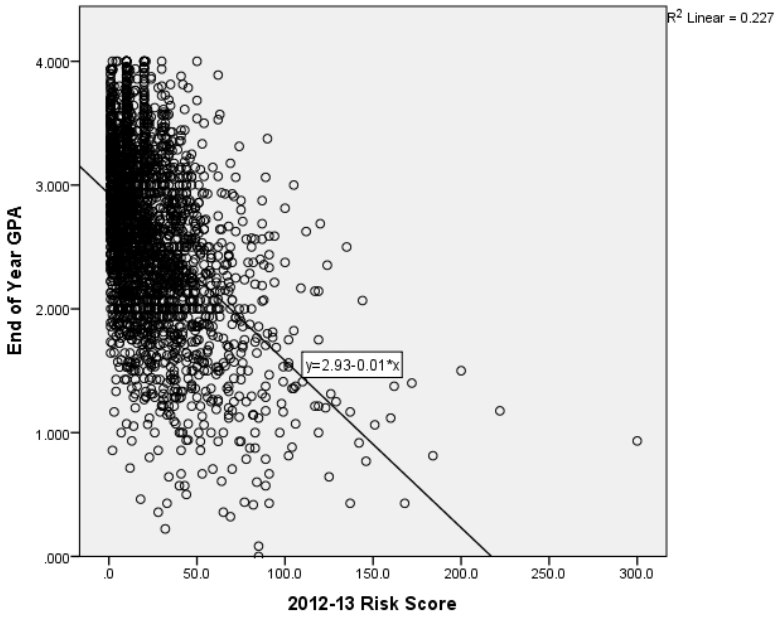

Figure 4: Correlation between 12-13 Risk Score and 14-15 GPA Grade 9

Credits earned was also tested in grade nine, compared with students' risk score in grade seven (two years prior). Findings resulting from this test also indicated a moderately significant relationship between students' risk scores in grade seven in the 2012-13 school year, and their credits earned two years later in grade nine in the 2014-15 school year (r = -.473, n = 2,603, p <.01). Table 12 presents the results of the correlational analysis examining the relationships among students' risk scores in 2012-13 and their credits earned two years later in 2014-15.

$r(2603) = -.473$, $p < .01$

The scatterplot in Figure 5 represents these results.

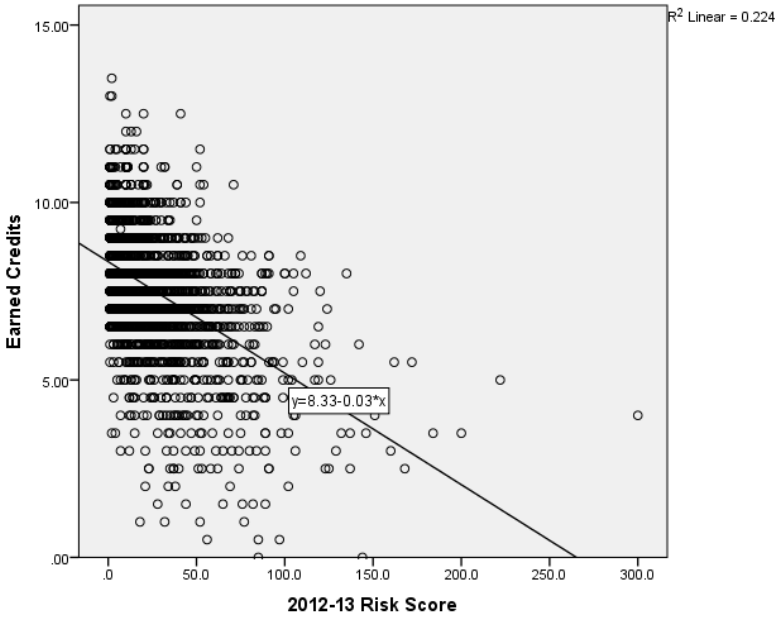

Figure 5: Correlation between 12-13 Risk Score and 14-15 Earned Credits Grade 9

Table 12

Pearson Correlation Coefficient for 12-13 Risk Score and 14-15 Outcomes

	Grade Six (n = 2,256)	Grade 9 (n = 2,605)
Descriptives	*2012-2013 Risk Score*	*2012-2013 Risk Score*
2014-2015 End of Year GPA Pearson correlation (*r*)	-.373*	-.476*
2014-2015 Credits Earned Pearson correlation (*r*)	N/A	-.473*

Note. *Correlation is significant at the .01 level (2-tailed)

Research Question Three: Student Outcome Differences and RtI Process

Question 3: Based on participation or lack of participation in the RtI process, how did students in grade six and nine compare in achievement (risk score, GPA, and an English/language arts assessment)?

The third question examined the observed differences between students in an intensive

RtI decision-making process, and those who were not in the RtI process. Students in the RtI process were matched to students who were not in the RtI process by using a risk score captured at the end of quarter one. Matching students improved the likelihood that students in the RtI process had like characteristics when compared to students who were not in the RtI process. Therefore 235 students in the treatment group (for grade six) were matched with 235 students in the control group and 177 students in the treatment group (for grade nine) were match to 177 students in the control group. The number of students included in this question decreased greatly because only students in need of the most intensive level of problem solving were identified in the RtI Decision-Making model.

Setup and Rationale

In order to compare achievement among students who were in the RtI process against those who were not in the RtI process, changes in student outcomes were examined from the beginning to the end of the 2014-2015 school year. Changes in three specific outcome variables were examined (risk score, grade point average, and an English/language arts assessment).

Purposive sampling (Neuman, 1997) was used to remove students from the study under certain conditions:

(a) If a student participated in the RtI process under a school district requirement to report tutorial. For the year that this research was conducted, there was a business practice in place that prompted certain schools to identify students attending tutorial through the RtI process. However, it could not be confirmed that students in tutorial were placed in the process under the definitions of an RtI decision-making model (Gresham, 2004; Batsche et al., 2007; Hattie, 2012). In order for a student to be included in this study, he had to be identified in the RtI four step problem solving process.

(b) If a student participated in the RtI process for less than one month in duration. The intent of the research was to examine progress for students who participated in the RtI process for a longer duration.

(c) If a student was eligible or became eligible for a special education program (IDEIA, 2008) during the 2014-2015 school year. This study sought to examine general education students who might not otherwise be identified as needing interventions. Hence, the purpose of this study was to examine students in an RtI decision-making model (Gresham, 2004; Batsche et al., 2007; Hattie, 2012), therefore additional monitoring and services under other special education programs resulted in certain students to be ineligible in the data collection process.

(d) If a student was missing one or more key variables being assessed. This most frequently occurred in cases where a student transferred in or out of the school district during the time student outcome data were captured.

(e) If a student had a risk score of a zero during the first quarter. This helped to control for variability in circumstances where students transferred from other school districts resulting in missing data to contribute to the risk score. When compared to another student that had previous school year data with the same risk score, missing data may have resulted in their risk score being less likely an accurate reflection of their true risk.

Procedures

Caliper matching was used to match students who participated in the RtI process with those who did not participate in the RtI process based on an aggregate covariate, the risk score from quarter one (Painter, 2004; Stuart, 2010; Clark, 2015). Caliper matching is a statistical method of matching, where each participant in the treatment group is matched to a participant in the control group based on the proximity of a single variable of interest (Rubin, 1973, Lunt,

2013). Using caliber matching not only ensured variables were matched based on like characteristics, but also ensured subjects were matched based on close proximal distance. Once students were matched on the risk score, only those with matches within a distance of .25 standard deviations of the mean were retained for analyses. In total, this resulted in 66 of the original 890 being removed from the study. Since students who were in the RtI process were matched to students who were not in the RtI process using caliper matching, a related samples *t*-test was used. This test was used to determine if there were observed differences based on outcome change scores between the groups of students who participated in the RtI Decision-Making process compared to those who did not (Steinberg, 2008). Their change scores and outcomes were calculated by subtracting the differences from first quarter and fourth quarter for each of the variables (grade point average, risk score, and English/language arts assessment). Results are presented separately for students in grade six and nine. Mean change scores for those in grade six are presented in Tables 13 and 14. Mean change scores for grade nine are presented in Tables 15 and 16.

Results

Changes in Grade Point Average Grade Six

Although both groups of students' mean GPAs decreased from quarter one to quarter four, students who were in the RtI process (M =-.28, SD = .35, n = 235) had greater declines in GPA than those who were not in the RtI process (M = -.17, SD = .35, n =235). Table 13 provides mean scores and standard deviations. The bar chart in Figure 6 also represents these results. At 234 degrees of freedom the t value was -3.63, $p < .0001$ level. The t test showed statistically significant marked differences toward those who were not in the RtI process. Those

who were in the RtI process had significantly more of a decline in GPA than students who were not in the RtI process. Table 14 provides the results from the related samples *t*-test.

Students who were in the RtI process (*M* =-.28, *SD* = .35, *n* = 235) had greater declines in GPA than those who were not in the RtI process (*M* = -.17, *SD* = .35, *n* =235).

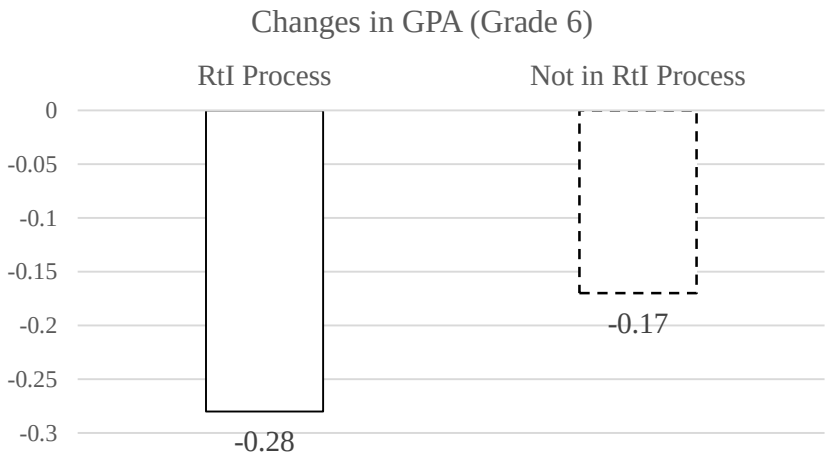

Figure 6: Changes in Grade Point Average Based On RtI Participation Grade 6

Changes in Risk Score Grade Six

For the purposes of this analyses the desired effect on risk score outcomes is demonstrated when a group shows less increase in risk score as the school year goes on. The increase in risk as reflected through the risk score was greater among those in the RtI process (M = 40.82, SD = 34.45, n = 235), when compared to those who were not in the RtI process (M = 23.20, SD = 22.96, n = 235). Table 13 provides mean scores and standard deviations. Figure 7 also provides results in a bar chart. At 234 degrees of freedom the t value was 7.01, $p < .0001$ level. The t test showed statistical significance in that those who were in the RtI process had larger increases in risk score than students than were not in the RtI process. Table 14 provides the results from the related samples t-test.

The increase in risk as reflected through the risk score was greater among those in the RtI process (M = 40.82, SD = 34.45, n = 235), when compared to those who were not in the RtI process (M = 23.20, SD = 22.96, n = 235).

Figure 7: Changes in Risk Score Based On RtI Participation Grade 6

Changes in English/Language Arts Assessment Grade Six

Although both groups had decreases in the English/Language Arts assessment scores from testing period one (in quarter one) to testing period three (in quarter four), students who were in the RtI process (M = -4.07, SD = 63.23, n = 235) had less decrease in their assessment than did those who were not in the RtI process (M = -14.06, SD = 61.94, n =235). Table 13 provides mean scores and standard deviations. Figure 8 displays results in a bar chart. There was not a significant difference in the mean scores between students who were in the RtI process compared to those who were not in the RtI process. At 234 degrees of freedom the t value was 1.68, $p > .05$ level. Even though students who were in the RtI process showed less decrease on the English/Language Arts assessment, the t test showed no statistical significance. Table 14 provides the results from the related samples t-test.

Students who were in the RtI process (M = -4.07, SD = 63.23, n = 235) had less decrease in their assessment than did those who were not in the RtI process (M = -14.06, SD = 61.94, n =235).

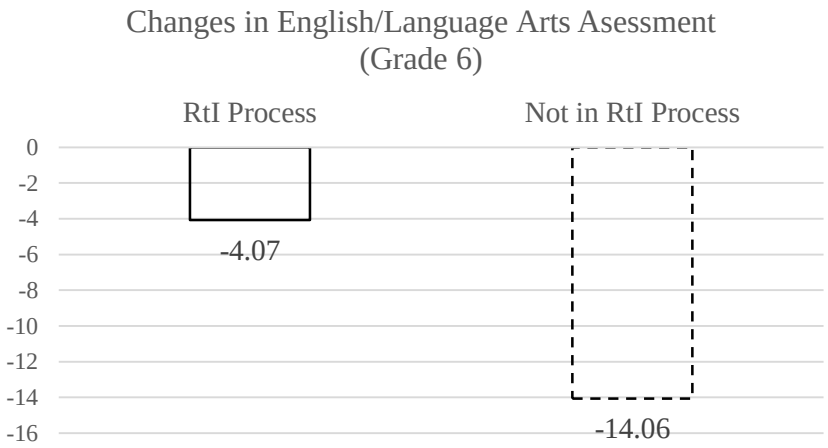

Figure 8: Changes in ELA Assessment Based On RtI Participation Grade 6

Table 13

Mean Student Achievement Changes Based on Participation in RtI Grade 6

	Grade Six (n = 470)	
Descriptives	Mean	SD
Changes in GPA		
RtI Process	-.28	.35
Not in Process	-.17	.35
Changes in Risk Score		
RtI Process	40.82	34.45
Not in Process	23.20	22.96
Changes in English/Language Arts Assessment		
RtI Process	-4.07	63.23
Not in Process	-14.06	61.94

Table 14

Differences between Groups in Mean Change Scores Grade 6

	Mean	SD	*t*	Df	Sig (2-tailed)
Change in GPA	-.11	.46	-3.63	234	.000
Change in Risk Score	17.62	38.54	7.01	234	.000
Change in English/Language Arts Assessment	10.00	91.12	1.68	234	.094

Changes in Grade Point Average Grade Nine

Although both groups of students' mean GPAs decreased from quarter one to quarter four, students who were in the RtI process (M = -.07, SD = .49, n =177) had slightly less declines in GPA than those who were not in the RtI process (M = -.09, SD = .42, n =177). Table 15 provides mean scores and standard deviations. Figure 9 presents results in a bar chart. At 176

degrees of freedom the *t* value was .40, $p > .690$ level. The *t* test showed no statistically significant marked differences toward those who were in the RtI process, although those who were in the process had slightly less declines in GPA than those students who were not in the RtI process. Table 16 provides the results from the related samples *t*-test for grade nine.

Students who were in the RtI process ($M = -.07$, $SD = .49$, $n = 177$) had slightly less declines in GPA than those who were not in the RtI process ($M = -.09$, $SD = .42$, $n = 177$).

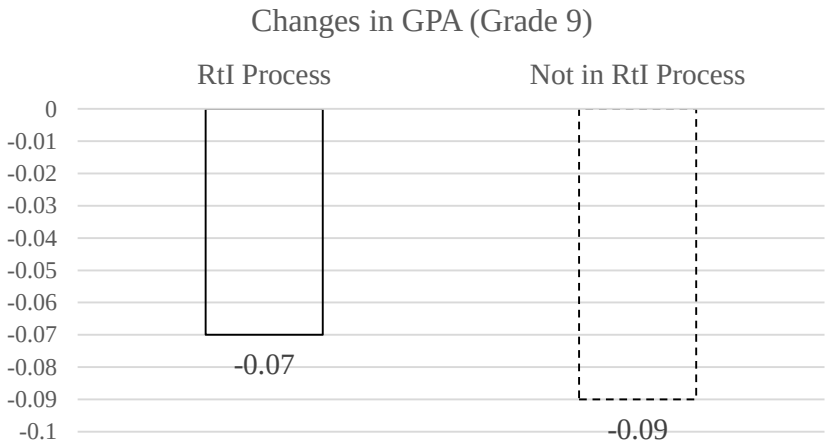

Figure 9: Changes in Grade Point Average Based On RtI Participation Grade 9

Changes in Risk Score Grade Nine

For the purposes of this analyses the desired effect on risk score outcomes is demonstrated when a group shows less increase in risk score as the school year goes on. The increase in risk (as demonstrated by an increase in the risk score) was greater among those in the RtI process ($M = 45.26$, $SD = 31.55$, $n = 177$) when compared to those who were not in the RtI process ($M = 31.97$, $SD = 30.16$, $n = 177$). Table 15 provides mean scores and standard deviations. Figure 10 presents findings in a bar chart. At 176 degrees of freedom the *t* value was 5.25, $p < .0001$ level. The *t* test showed statistically significant distinct differences toward those

who were not in the RtI process, than those who were in the RtI process. Table 16 provides the results from the related samples *t*-test.

The increase in risk (as demonstrated by an increase in the risk score) was greater among those in the RtI process (*M* = 45.26, *SD* = 31.55, *n* =177) when compared to those who were not in the RtI process (*M* = 31.97, *SD* = 30.16, *n* =177).

Figure 10: Changes in Risk Score Based On RtI Participation Grade 9

Changes in English/Language Arts Assessment Grade Nine

Students who were not in the RtI process (*M* =31.82, *SD* =57.31, *n* = 177), had greater increases in their assessments from quarter one to quarter four than did those who were in the RtI process (*M* =-8.93, *SD* = 62.04, *n* =177). Table 15 provides mean scores and standard deviations. At 176 degrees of freedom the *t* value was -3.69, $p < .0001$ level. The *t* test showed statistically significant differences toward those who were not in the RtI process, when compared to those who were in the RtI process. Table 16 provides the results from the related samples *t*-test.

Students who were not in the RtI process (*M* =31.82, *SD* =57.31, *n* = 177), had greater increases in their assessments from quarter one to quarter four than did those who were in the RtI process (*M* =-8.93, *SD* = 62.04, *n* =177).

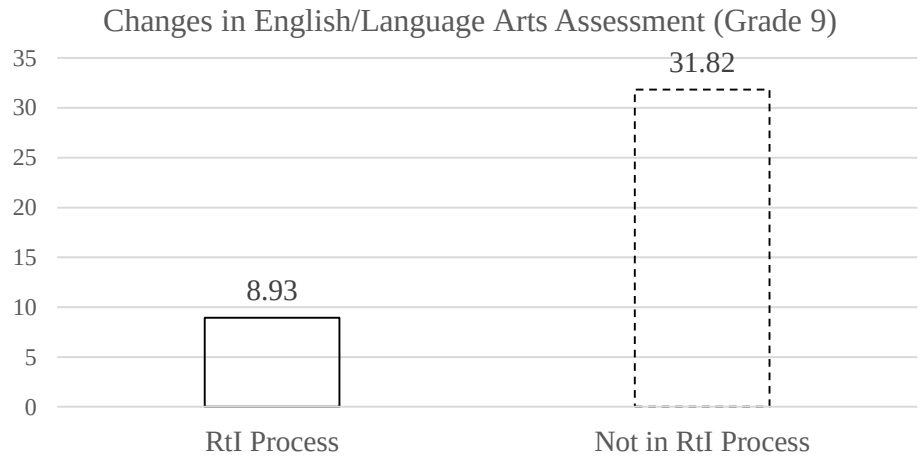

Figure 11: Changes in ELA Assessment Based On RtI Participation Grade 9

Table 15

Mean Student Achievement Changes Based on Participation in RtI Grade 9

	Grade Six (*n* = 354)	
Descriptives	Mean	SD
Changes in GPA		
RtI Process	-.07	.49
Not in Process	-.09	.42
Changes in Risk Score		
RtI Process	45.26	31.55
Not in Process	31.97	30.16
Changes in English/Language Arts Assessment		
RtI Process	8.93	62.04
Not in Process	31.82	57.31

Table 16

Differences between Groups in Mean Change Scores Grade 9

	Mean	SD	*t*	Df	Sig (2-tailed)
Change in GPA	.02	.65	.40	176	.690
Change in Risk Score	13.29	33.68	5.25	176	.000
Change in English/Language Arts Assessment	-22.90	82.61	-3.69	176	.000

Summary

Chapter four provided a review of the purpose of the study, followed by discussing how each question would fulfill the purpose of the study. Demographic and achievement data were discussed, in addition to results pertaining to each question.

The Pearson correlation coefficient was used to determine the strength of the relationship between the early warning risk score, grade point average (GPA), and credits earned. Overall, the results suggest that the higher the students' risk scores, the lower the GPAs were, while those with lower risk scores tended to have higher GPAs. The results of the correlation analysis proved the existence of the relationship between students' risk scores, and their academic achievement based upon grade point average and earned credits. All Pearson correlation coefficients for both grade six and grade nine were statistically significant, suggesting a strong relationship between students' GPAs and early warning risk scores. Even when GPAs were examined two years later, those students with lower risk scores two years prior tended to have higher GPAs and more credits earned two years later. Based upon the findings in Research Question One and Research Question Two, there is 99% certainty that a relationship exists between students' risk score, GPA, and eared credits.

For Research Question Three, caliper matching was used to match students who participated in the RtI process with another single variable from a student who did not participate in the RtI process (Painter, 2004; Stuart, 2010; Clark, 2015). A related samples *t*-test (matched subjects design) was used to test the observed differences in student outcomes for students who were in the RtI process compared to those who were not in the RtI process. In summarizing, students in grade six and nine generally had greater increases in risk indicators (as measured by change in risk score) and less increase in academic outcomes when participating in the RtI process compared to those who did not participate in the process.

CHAPTER FIVE
SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

In the preceding chapter, the presentation and analysis of data were reported. In Chapter Five a summary of the study, discussion of the findings, implications for practice, and recommendations for future research are expanded upon. The purpose of this section is to elaborate upon the concepts studied in an effort to connect research and theory to leadership practice. By furthering these connections and the implications for leadership practice, greater understanding may influence how school leaders can develop systems to identify at-risk students and intervene. Therefore, recommendations for practice and future studies will be shared.

Summary of the Study

Academic disengagement produces a long lasting cycle of inequity and disparity over time. In addition to jeopardizing graduation status on the short term, school disengagement has lasting effects into adulthood, including behavior trajectories that lead to increased crime and drug use (Henry, Knight, & Thornberry, 2012). Therefore, ensuring early identification of students who are academically disengaged is not only of educational interest, but also an interest related to national public health, the judicial system, and the economy at large. To address this concern, linking risk indicators to academic disengagement can help concentrate educational efforts in ensuring on time graduation for students. Critical transitions occur for students as they move from elementary school to middle school, and middle school to high school (Lucas, 1997; Allensworth & Easton, 2007). The process of disengagement starts early, but increases overtime and can be recognized through increased patterns in risk indicators (Alexander, Entwisle, &

Kabbani, 2001). Therefore, it is important to identify student patterns in critical transition years and employ interventions when necessary (Henry et al., 2012).

Once students are identified as exhibiting risk factors, a systems approach is needed to analyze barriers on a systematic level (Curtis, Castillo, & Cohen, 2008). In order to provide systematic support for all students through a multi-tiered approach that addresses both academic and behavioral domains, school-wide data and grade-level data can be used to identify trends and patterns (Eagle, Dowd-Eagle, Synder, & Gibbons, 2015).

Early warning systems (EWS) may be utilized as an avenue for identifying academically disengaged students who are at high-risk of dropping out of school. As defined by Heppen and Therriault (2008), EWS identify students who are academically disengaged and are at high-risk of dropping out by recognizing student patterns related to drop out rates. By identifying students at high-risk of dropping out as early as possible, educators can ensure interventions are in place. EWS identify academically disengaged students by aggregating student indicators that are linked to educational outcomes and graduation. Risk indicators are used to identify students so that the educator can investigate the educational barriers present, including risk indicator types, and the degree of severity. Risk indicators may include data in the areas of academic achievement, misconduct, attendance, retention, mobility, and other tertiary factors (Gleason & Dynarski, 2002; Heppen & Therriault, 2008). EWS allows for a more timely awareness of specific student risk indicators that may facilitate more efficient responses by educators who are providing interventions and supports to remediate and help students get back on track.

Once students are identified with risk indicators, an approach can be used to address the needs of students through both academic and behavioral intervention decision-making processes. RtI (Response to Intervention) is an approach that is used to systematically identify and intervene

for students who demonstrate at-risk characteristics. By examining school-wide data to identify risk factors and trends in order to provide systematic support, educators within schools can systematically address the needs of interventions through a continuum of support based upon their academic and behavioral needs (Sugai & Horner, 2006; Eagle, Dowd-Eagle, Synder, & Gibbons, 2015). Within this continuum to address the needs of all learners, a Response to Intervention (RtI) decision-making model is used to ensure the needs of all students through a tiered approach.

Research and procedures focused on effective implementation of RtI are most often found at the elementary level (Duffey, 2007), but to ensure effective interventions, it is essential that the design of an RtI decision-making model address the structure and organization that exists in secondary schools. The design and implementation of effective academic and behavioral intervention processes through support structures in secondary schools are essential components to ensuring intervention decision-making processes effectively meet the needs of academically disengaged students in secondary school settings (Duffey, 2007). The use of EWS can help address student's need for interventions in a manner that aligns with the organizational structures available at the secondary level (Johnson & Semmelroth, 2010).

The primary goal of this study was to test the research questions as they relate to the validity of using an early warning system as a means for identifying students at-risk of academic disengagement. Additionally, student outcome changes when participating in a Response to Intervention (RtI) decision-making model were compared to those who did not participate. The study contained three research questions.

1. To what extent was there a relationship between the early warning identification risk score and academic achievement for students in grades six and nine, as determined by their grade point average (GPA)?
2. To what extent was there a relationship between the early warning risk score for students in grade four and grade six (end of 2012-2013 school year) and their academic achievement two years later in grade seven and nine (end of 2014-2015) respectively, as determined by their grade point average (GPA) and credits earned?
3. Based on participation or lack of participation in the RtI process, how did students in grade six and nine compare in achievement (risk score, GPA, and an English/language arts assessment)?

The purpose of these research questions was to address the gap in the extant literature by examining the use of an early warning system to aide recognition of early school disengagement. An additional purpose was to examine an intensive Response to Intervention (RtI) decision-making process and the difference interventions have on student's academic achievement. This study contributed to the body of research focused on the implementation of an electronic, district-wide early warning system (EWS) to inform educators during the problem-solving processes within a multi-tiered system of supports approach to address the needs of students in secondary schools.

Discussion of the Findings

Emerging research studies present extensive findings related to the efficacy of early warning systems as a means of identifying at-risk students of academic disengagement (Balfanz et al., 2007; Henry, Knights, & Thornberry, 2012; Carl et al., 2013). Previous researchers have also studied outcome gains for students when participating in a Response to Intervention (RtI)

decision-making model (Edmonds, Vaughn, Wexler, Reutebuch, Cable, Tackett, & Wick, 2009; Fuchs, Fuchs, & Compton, 2010; Wanzek, Vaughn, Scammacca, Metz, Murray, Roberts, & Danielson, 2013). This section discusses the implications of the findings for each of the three research questions.

Research Question One

To what extent was there a relationship between the early warning identification risk score and academic achievement for students in grades six and nine, as determined by their grade point average (GPA)?

Consistent with the notion that multiple risk factors should be used to identify academically disengaged students, the early warning risk score included a combination of risk factors (Appendix A). The findings indicated a highly significant relationship between students' risk scores and their Grade Point Average at the end of the 2014-2015 school year for students in both grade six ($r = -.775$, $n = 4{,}282$, $p < .01$) and grade nine ($r = -.848$, $n = 3{,}293$, $p < .01$). These findings support the existence of a relationship between the risk score and students' GPA. This finding speaks to the validity of using the early warning risk score to identify students who may be academically disengaged and at-risk of dropping out of school. Furthermore, there was even greater statistical significance in grade nine, even though at both grade levels, increases in the students' risk scores were highly correlated with decreases in GPAs. There are a few reasons why greater significance among students in ninth grade might exist. In examining the risk factors (Appendix A) it could be that students are more likely to have obtained some of the risk factors (such as retention or overage) that are related to academic achievement. It could also be related to course failure, whereby students who have lower GPAs or more course failures, are more likely to have a higher risk score.

One of the confounding variables that was notable to the results of this research question was the large difference in the mean GPA between grade levels. When GPAs were compared across the grade levels, students in grade six had a higher reported GPA (M = 3.26, SD = .63, n = 4,284) than students in grade nine (M = 2.6, SD = .7, n = 3,295). Based on this finding, the GPA being lower in grade nine could be due to several factors. As a result, students in grade nine would naturally have a higher risk score because they are identified as more at risk as a result of having a lower GPA and lower grades. As we continue to examine why there are increases in academic disengagement during transitional years (Lucas, 1997), this finding might lead us to root cause analysis related to whether different grading systems or procedures at the middle and high school levels might attribute to declines in academic achievement. It could also mean that interventions become less effective as students move into high school or that there is a greater need for professional learning on students' disposition towards academic disengagement.

By using the early warning risk score to examine academic trends and patterns of disengagement, school personnel can ensure quick identification of at-risk students. Early warning systems can identify students who are high-risk of dropping out, by recognizing student patterns related to drop out rates, and identifying potential dropouts early on (Hammond, et al., 2007). By identifying students at risk of dropping out as early as possible, schools can in turn respond quicker to providing interventions, and effectively allocate resources to improving their educational outcomes, such as GPA.

Research Question Two

To what extent was there a relationship between the early warning risk score for students in grade four and grade six (end of 2012-2013 school year) and their academic achievement two

years later in grade seven and nine (end of 2014-2015) respectively, as determined by their grade point average (GPA) and credits earned?

While Research Question One examined the relationship between risk score and GPA in the same year, the intent of Research Question Two was to examine whether the risk score in 2012-13 could be used to predict academic achievement two years later in 2014-15. Researchers have suggested that early warning risk scores could be used to predict success in school and even beyond school years (Balfanz, 2007; Carl, Richardson, Cheng, Kim, & Meyer, 2013). Similarly, findings in Research Question Two showed a moderately significant relationship between students' risk scores two years prior (in 2012-13) and their academic achievement two years later in 2014-15 (grade six: r = -.373, n = 2,254, p <.01; grade nine: r = -.476, n = 2,603, p <.01). These findings speak to the potential of using the early warning risk score to predict students who may be academically disengaged and be at-risk of dropping out of school. In spite of the fact that there was greater statistical significance in grade nine, at both grade levels, increases in the students' risk scores two years prior in 2012-13 were correlated with lower GPAs or earned credits (r = -.473, n = 2,603, p <.01) two years later in 2014-15. This finding is consistent with previous research which also indicates that students are more likely to be academically disengaged or drop out of high school when exhibiting more risk thresholds earlier (Allensworth & Easton, 2005; Balfanz et al., 2007). Additionally, this finding affirms that EWS can be used to predict not only students who are off track for graduation, but also success beyond high school (Carl et al., 2007 & Henry et al., 2012).

The problem studied was the need to examine the effectiveness of recognizing early school disengagement for students in transitional years. These findings suggest that not only can the risk score be used for identification of academically disengaged students, but

furthermore might be used to predict students who may be at-risk to academic disengagement as they progress through their education. This research validates previous research findings that a risk score can be used not only to identify academically disengaged students, but also to gain deeper insights into students' academic trajectory in secondary school years. Ultimately, a categorical approach to predicting students' on track for graduation through the use of EWS can aid in better identification of students with academic and/or emotional/social needs (Soland, 2013).

Research Question Three

Based on participation or lack of participation in the RtI process, how did students in grade six and nine compare in achievement (risk score, GPA, and an English/language arts assessment)?

While Research Question One and Two sought to examine relationships and predictability between risk scores and academic achievement, the intent of Research Question Three was to examine the effect when students were identified as needing interventions, based upon the risk score. Mean differences and changes in achievement were analyzed among students who participated in the RtI process when compared with those who did not participate in the RtI process. By matching each student to another student who had the same risk score in the beginning of the school year (quarter one), the risk score variable was used to best ensure each student was matched to another student with like characteristics.

For students in grade six, the study revealed that students who were identified in the RtI process had significantly greater declines in GPA; $t(234) = -3.63$, $p < .0001$ and significantly greater increases in risk score; $t(234)=7.01$, $p <.0001$ than students who were not in the RtI process. Even though students in the RtI process ($M = -4.07$, $SD = 63.23$, $n = 235$) had less decline on the English/language arts assessment when compared to those who were

not in the RtI process (M = -4.07, SD = 63.23, n = 235), there was no statistical significance reported with this measure ($t(234)=1.68$, $p > .05$). Findings of this study reveal that students in grade six who were in the RtI process had greater increases in risk factors associated with the risk score and grade point average, but improved more on the English/language Arts assessment than students who were not in the RtI process. It is notable that while the risk score and GPA risk increased among students who were in the RtI process compared to those who were not in the process, students who were in the RtI process had great increases on the English/language arts assessment. This finding shows that that although their risk factors were increasing, their reading proficiency were also increasing when compared to students who were not in the RtI process. This could occur for students who are receiving more targeted instruction in English/language arts or content areas, in spite of other extenuating risk factors.

For students in grade nine, the study revealed that students who were identified in the RtI process had less of a decline GPA; $t(176) = -.40$, $p < .690$ when compared to students who were not in the RtI process, but no statistical significance was found. However, significant differences were found when examining the risk score and English/language Arts assessment variables. Students who were in the RtI process had significantly greater increases in risk score; $t(176)=5.25$, $p <.0001$ than students who were not in the RtI process. Students who were in the RtI process had significantly less improvement on the English/language Arts assessment; $t(176)= -3.69$, $p <.0001$.

Overall, the findings of this study reveal that students who were identified in the RtI process had greater increases in risk factors as the year progressed, when compared to those who were not in the RtI process. The research findings do indicate that students who are most at-risk are being identified through the most intensive level of the problem solving process.

However, those students who are in the RtI process, are not improving at a greater rate or even the same rate as those who are not in the RtI process. The ultimate goal of the RtI process is to mitigate risk factors leading to poor academic performance for improved educational outcomes. While this finding points to fidelity in student identification, it is clear there is a need to further reevaluate intervention decision-making processes at the secondary level.

One of the key limitations of this research is that the early warning system and digitized RtI process was only in second year of implementation. Even while RtI had been implemented since 2008, up until this point the district was focused on using RtI for the purpose of identifying students with an identified disability, rather than as a means of closing the achievement gap for success of all students. Generally in education, implementation is a gradual process that occurs in phases over time. The beginning phases of implementation are naturally focused on assessing program needs and aligning programs and resources with implementation needs (Sugai et al., 2010). It is likely when this research was conducted, full scale implementation was not yet in existence. This limitation might attribute to why student outcome gains were minimal among students in the RtI decision-making process.

Summary of Implications for Policy and Practice

A systems perspective is needed to solve barriers in the identification of students who are academically disengaged (Curtis et al., 2008). In addition, there is a need to ensure identification and effective interventions for students who are prone to disengagement (Balfanz et al., 2007). Recent adoption of legislation in Florida now requires schools to implement an early warning system for students in grades six, seven, and eight who need additional support to improve academic performance and stay engaged in school (Fla. Stat. §1001.42). The research in this study provides evidence that the higher the risk score, the greater the likelihood students will

have low academic achievement outcomes, particularly when academic achievement was examined two years later. These findings hold great promise that an early warning system can be used as a means of accelerating the identification of students who are at-risk. Consistent with other research findings, these findings validate that the early warning risk score can be used to accurately identify and predict student achievement in school and beyond school years (Balfanz, 2007; Carl, Richardson, Cheng, Kim, & Meyer, 2013).

Critical transitions occur for students as they move from elementary to middle school, and middle school to high school, impacting not only the educational system but society at large (Lucas, 1997, Allensworth & Easton, 2007). Thus the findings of this study have far-reaching implications for educators, researchers, and policy-makers. Stakeholders interested in trends in academic disengagement and identification of at-risk students will find evidence of links between the early warning risk score and student achievement. Implications of these findings can apply to educational leaders, researchers, and policy-makers with interest in identification of students who are academically disengaged and in need of intervention supports. Implications of these findings might also be useful to other organizations that are implementing early warning systems. Similar to kindergarten through twelfth grade education, higher education, healthcare, and law enforcement organizations are also developing early warning systems in an effort to more systematically and efficiently identify areas of risk (Whitecotton, Sanders, & Norris, 1998, Shjarback, 2015). As a result, of these emerging efforts, findings from this study could be relevant to the development of their early warning systems. Each implication will be discussed as to how it applies to policy or practice.

Implications of findings related to RtI decision-making models might be especially useful to school district and school based educational leaders, school counselors, interventionists,

teachers, and other stakeholders involved in implementation of the RtI process. Based upon research findings, it may be necessary to modify the implementation approach of the intervention decision-making process for academically disengaged students. Additionally, considering the needs for professional learning support for the RtI decision-making model will help improve the fidelity within the RtI decision-making process. While the RtI decision-making model is suggested as a potential avenue for improving academic disengagement (Johnson & Semmelroth, 2010), secondary staff have struggled with implementation. The use of student outcomes to drive intervention decision making processes can help ensure a model that meets the academic barriers faced by students in secondary schools. Especially when tied to school improvement planning, considering the intervention design on a school-wide level would encourage a systems perspective to addressing the need of academically disengaged students. Because effective intervention design creates more time and staffing needs of general education professionals, capacity and infrastructure barriers have prevented secondary schools from creating school-wide systematic delivery of intervention implementation. While this study investigates changes in achievement outcomes as students participate in the RtI process, further inquiry is still needed to explore how RtI might be customized to meet the infrastructure demands of the secondary setting (Duffey, 2007). The following implications expand upon these findings, first in summary form then in greater detail.

Summary of Implications

1. Use of an early warning system and a risk score can be used as a valid predictor of academic disengagement.
2. The studied intervention decision-making model may need to be reevaluated to determine whether it improves academic performance for academically disengaged students.

3. A strategic professional learning plan will directly impact how an early warning system and RtI process is implemented.
4. Ensuring fidelity within the RtI decision-making process is essential to improving student outcomes for academically disengaged students.
5. Greater connection needs to be made in intervention design processes that connect academic disengagement to vocational goals and interests of students.
6. In addition to student identification, the risk score has the potential to be used for other educational decision-making.
7. In the development of a risk score metric, technology infrastructures that ensure data quality will lead to greater effectiveness in the use of risk scores to identify students who are academically disengaged.

Implications for Policy and Practice

Use of an early warning system and a risk score can be used as a valid predictor of academic disengagement. Research findings provided overwhelming evidence that the use of a risk score that includes multiple risk factors can be used to identify academically disengaged students (Hammond et al., Allensworth & Easton, 2005, 2007, American Institute of Research & Department of Massachusetts, 2012). Research findings also provide overwhelming evidence that a risk score can be used to predict academic achievement later on in life (Balfanz et al., 2007; Henry, Knight, & Thornberry, 2012., Carl et al., 2013). Even when academic achievement was measured two years after the risk score was assigned, the higher the students' risk score, the lower their GPAs. Students with lower risk scores tended to have higher GPAs and were more likely to be on track for graduation. This research validates the decisions of policy makers who influenced Senate Bill 850 in July of 2014 to require middle school personnel to identify students

showing signs of academic disengagement and intervene based upon specific risk indicators (Fla. Stat. §1001.42). Not only in the state of Florida, but across the country, the use of early warning systems are being adopted by school districts and mandated through policy and practice (Data Quality Campaign, 2014). For education policy makers and leaders, these findings reaffirm the adoption and implementation of using a risk score to drive school improvement efforts. In fact, research findings consistently confirm the validity and predictability of the early warning risk score. As a result of these findings, policy-makers and educational leaders ought to consider expanding the practices identified in legislation and policy of using early warning systems to other grade levels.

The studied intervention decision-making model may need to be reevaluated to determine whether it improves academic performance for academically disengaged students. Another important finding that relates to educational decision-making were the minimal gains for students in the RtI process. Even though the purpose of this study was not to assess causality, in further analysis of this finding, it remains unclear as to why there were minimal gains. It could be that the school district is making notable achievement in their identification of at-risk students. In this case, this finding would support the argument that students in most intensive need of support are the ones making most minimal gains. On the other hand, it could be that gains are minimal among students receiving the most intensive level of support through an RtI decision-making model, in which case one might question the efficacy of whether this process truly impacts student outcomes. This finding is consistent with another recent research finding that has emerged. Sparks (2015) found that first grade students who were receiving interventions performed at a lower expected level than their like peers who did not receive the interventions. Sparks indicated that this finding points to the need to further examine and increase fidelity in

implementation, with greater emphasis on intervention selection and delivery. This finding begs question to whether educators are missing the mark, and if root cause analysis is not adequately examined. Regardless of grade level, when curriculum selection and intervention delivery are matched based upon corresponding deficits, student outcomes can be markedly improved. Therefore it is important to ensure intervention selection and assessments are matched to the targeted area of need.

A strategic professional learning plan will directly impact how an early warning system and RtI process is implemented. Part of the notion of using an early warning system is so teachers have easily accessible data that can be used in conjunction with their professional discretion (Johnson, et al, 2012). Ensuring teachers have a foundational understanding of risk score components is essential. More importantly, teachers need to know what to do for students with elevated risk factors. Therefore, a strategic professional learning plan should not only include technology training on risk factors, but also thoughtful, comprehensive professional learning on the RtI decision-making model (Four Step Problem Solving Process). Research findings in one high school showed positive links between deliberate professional learning on RtI and student achievement outcomes (Fisher & Frey, 2013). By ensuring professional learning is in place, it can be assured that the use of an early warning system will have direct influence on at-risk student identification and intervention.

Ensuring fidelity within the RtI decision-making process is essential to improving student outcomes for academically disengaged students. In light of the consideration of expanding the use of early warning systems across the country (Data Quality Campaign, 2014) the use of a risk score to drive at-risk student identification, nor adoption of a bill nor a requirement is enough to ensure the intent of such notions are met. Once students are identified at-risk, true school

improvement is moderated by implementation integrity of an intervention decision-making model (Forman, et al., 2013). As findings in Research Question Three reveal, the ability to make a difference on student outcomes is contingent upon ensuring fidelity in the application of an intervention decision-making model (such as the RtI Four Step Problem Solving Process) for individual student needs. Ensuring treatment integrity in intervention decision-making can take many different forms. It could mean ensuring appropriate curriculum and materials selected that matches the intervention skill or area of need. It could mean ensuring the problem area of a student is clearly defined through a root cause analysis approach. It could mean ensuring proper planning and delivery of adequate interventions by qualified personnel. For those in a school responsible for the RtI decision-making model, the structure of teams and interactions amongst team members can affect the fidelity of intervention planning and implementation (Forman, et al., 2013). Middle schools and high schools should give careful thought to both team processes and infrastructure to ensure quality of intervention selection. Technical assistance offered by the state and district-level should ensure procedures and business practices that are aligned to the systems and structures available in secondary schools (Duffey, 2010). Whether the RtI Four Step Problem Solving Process is used school-wide, in professional learning communities, or for individual student problem solving, all intervention related initiatives should align and exist within the RtI process (truancy interventions, standard protocol interventions, school-wide behavior programs, tutorial programs, differentiation in instruction). Risk score data (among other data elements) should be used school-wide to braid these intervention related initiatives in such a way where implementation is effective, efficient, relevant, and sustainable (Sugai et al., 2010). By using a systems perspective that is tied to school improvement processes, barriers in

fidelity of implementation can be resolved to maximize the efficacy in addressing student needs (Curtis et al., 2008; Forman et al., 2013).

Greater connection needs to be made in intervention design processes that connect academic disengagement to vocational goals and interests of students. Within the RtI decision-making model (Four Step Problem Solving Process), the first and second require identifying the problem and root cause analyzing the reason behind a student's deficit. In RtI decision-making at the secondary level, connecting the student's need for educational attainment to their own career and vocational interests can increase their motivation to be successful (Malloy, 1997).

In addition to student identification, the risk score has the potential to be used for other educational decision-making. As consistent with this research, findings prove that the risk score is an accurate gage of student achievement. This finding yields question as to whether a risk score might be used for other purposes in educational decision-making. The use of a risk score could be similarly applied to staffing allocations or school funding metrics. Just as risk score data can be used to assess and predict individual student progress, it can also be used to assess school-wide needs. Risk scores could potentially be used to ensure equitable funding and resource allocations on a district-wide level. The risk score provides school districts a readily accessible source of data that can aid in predicting the needs of students in certain feeder patterns. It could be used to measure return on investment in certain programs. One of the largest impacts on a middle or high school is the course scheduling process. At the school-level, the risk score could be used to ensure equity across classrooms. Encouraging process improvement through a categorical approach might ensure more equity for all students and staffing needs.

In the development of a risk score metric, technology infrastructure that ensure data quality will lead to greater effectiveness in the use of risk scores to identify students who are academically disengaged. The links discovered through the research findings between the risk score and academic achievement will be useful to educational stakeholders, however it must be assured the necessary technology infrastructure is in place to implement effectively. Levels or bandwidth, interactions between different information systems, and data quality within the components of the risk score, all influence the educator's experience and ultimately their efficacy in using this data to inform instruction and decision-making. For example, if one data system changes the logic used to calculate one of the factors within the risk score, this could impact the accuracy of the risk score. Therefore, it is important that the use of an early warning system is integrated into a school district's information technology business operations. This will help ensure data quality within any data analysis and ultimately lead to greater effectiveness for educators that are using early warning system data.

Recommendations for Further Research

The primary goal of this study was to test the validity of using an early warning system as a mean for identifying students at-risk of academic disengagement. Additionally, the questions tested student outcome changes when participating in a Response to Intervention (RtI) decision-making model compared to those who did not participate. Further research is warranted and recommendations are noted in this section.

1. Replicate this study for other grade levels, particularly at the elementary level where often times there are less data available to generate a risk score. This would help determine if risk factors that make up the risk score should change based upon the grade level.

2. Relationships should be further investigated to determine if there are specific components within the risk score that correlate more highly to whether a student is academically disengaged. Understanding the effects of combined indicators within the risk score will help ensure it a valid indicator of academic achievement at all grade levels.
3. In order to have greater validity in the predictability of the risk score, student academic achievement should be studied in relation to their risk score more than two years out. Relationships between student risk score and academic achievement were highly significant, but were only examined to predict academic achievement two years later. A longitudinal study will provide greater insight on how a risk score can predict academic achievement.
4. A qualitative study could be conducted to further examine the effectiveness of intervening with students. By studying the implementation and fidelity of the RtI decision-making model, more insight could be gained as to how the model can be used to increase student outcomes. The findings in this study related to the efficacy of using the RtI decision-making model (Research Question Three) explain only the differences related to improvement in student outcomes. The quality or fidelity of implementation were not assessed. Qualitative studies can be used to map specific themes and findings to gain further insight into the efficacy of programs.
5. The findings in this study related to the efficacy of using the RtI decision-making model should be replicated when implementation has been in place a few more years and is in a full scale implementation stage. Since the research questions were tested only one year after implementation began, findings might vary greatly if this study was replicated. In addition, additional research questions could examine causality links between students

who are in the most intensive level of the RtI decision-making process. Examining causality might help educators to obtain additional data on how to implement the RtI decision-making model with the greatest level of impact on student outcomes.

6. By identifying a more exact duration of interventions being delivered, more insight could be obtained on the efficacy of the RtI decision-making model. An additional limitation to Research Question Three was that it did not take into account the duration of which a student was in the RtI decision-making model. While the study only included students who were in the process for a month or greater, it would be beneficial to capture the exact dates of which a student was identified in the RtI process and when exiting the most intensive level of the RtI process.

Conclusion

The research was implemented to address a need within a school district to examine the predictability of one early warning identification system (EWS) in the identification of students who are off-track for graduation and the efficacy of an RtI decision-making model for such students. The goal of this study was to test the research questions as they related to the validity of using an early warning system as a mean for identifying and predicting students at-risk of academic disengagement. Additionally the questions tested student outcome gains when participating in a Response to Intervention (RtI) decision-making model compared to those that did not participate. This study identified several statistically significant and educationally meaningful difference between the use of a risk score indicator and academic achievement. Findings were consistent with other research that have shown statistically significant relationships between student achievement outcomes and early warning systems. While additional research is needed to develop specific recommendations to educational leaders,

researchers, and policy makers, this study validates the notion that an early warning identification risk score can be used to predict academic achievement. An early warning system can aid in student identification, but as noted in the last research question of this study, there is still a great need to reach the ultimate goal: mitigating risk factors for students who are academically disengaged. Specifically, as students transition to larger schools, achievement gaps are susceptible to expanding for students; therefore, there is a great need to ensure intervention processes that address the needs of students who are prone to disengagement.

APPENDIX A
EARLY WARNING RISK SCORE CONFIGURATION METRICS

Table 2 (*Early Warning Risk Score Metrics*) displays the indicators for the early warning risk score configuration studied in the Central Florida school district's performance data management system (Onhand Schools, 2013). As a student hits at risk thresholds, students are assigned a point value based upon certain criteria.

Daily Attendance: Day 6-25 of School Year: When a student misses 2 or more days in the first 20 days of school (starting from day count six), 10 points are added to their risk score. This point value is reset at the beginning of every school year.

Daily Attendance Each Grading Period: When a student misses 5 or more days in any grading period, for each grading period, 10 points are added to their risk score. This point value is reset at the beginning of every school year.

Course Failures Each Grading Period: When a student earns a grade deemed at-risk, points are added to the risk score. Depending on the grade a different point value is assigned to their risk score: F or N is 10 points, D is 5 points, and C is 1 point. This point value is reset at the beginning of every school year.

Course Failure Prior School Year: When a student receives a grade of an N or F from the prior school year, ten points are added to their risk score for each course failure.

Cumulative/Transcript GPA: When a student has a cumulative Grade Point Average (GPA) deemed at-risk, points are added to their risk score. As described in the table below, ten points are assigned when a student has below a 2.0 GPA. Five points are assigned when a student has between a 2.01 and 2.79 GPA.

Total Suspensions per Year (OSS): When a student has received an out of school suspension for the current school year, ten points are added to their risk score for each out of school suspension incident. This point value is reset at the beginning of every school year.

Over Age (21 months above grade level): When a student is 21 months or older above their typical age for their grade level, 10 points are added to their risk score.

Prior Retention: If a student has been marked as retained at any point in time, 20 points are added to their risk score.

Mobility: If a student moves 3 or more schools in the current or prior school year, 20 points are added to their risk score.

Table 17

Early Warning Risk Score Metrics

Risk Score Type	Point Values
Daily Attendance: 2 or more absences starting from day count 6 to 25 of School Year (reset each year)	10
Daily Attendance Each Grading Period: Five or more absences in each grading period (reset each year)	10
Course Failure Each Grading Period: Course failure in each course for each quarter in the current year (reset each year)	5=F or N 3=D 1=C
Course Failures in Prior School Year: Each N or F in final or semester grade from prior school year	10
Cumulative GPA	10=Below 2.05=2.01-2.79
Total Suspensions per Year: Each out of school suspension incident from the current school year (reset each year)	10
Over Age: 21 months or older than expected age for grade level	10
Prior Retention: One or more retentions from any previous school year	20
Mobility: Three or more schools in the current or prior school year	20

Note. Risk score metrics was developed with district's partnership with Onhand Schools (2013).

APPENDIX B
INSTITUTIONAL REVIEW BOARD APPROVAL

Date: **March 16, 2015**

Dear Researcher:

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246 Telephone:
407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt

Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Andrea Lynn Walsh**

On 03/16/2015, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Project Title:	THE EFFICACY OF AN EARLY WARNING IDENTIFICATION SYSTEM AND AN INTERVENTION DECISION-MAKING MODEL FOR STUDENTS TRANSITIONING TO SECONDARY EDUCATION
Investigator:	Andrea Lynn Walsh
IRB Number:	SBE-15-11161
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Patria Davis on 03/16/2015 10:21:24 AM EDT

IRB Coordinator

APPENDIX C
SCHOOL DISTRICT APPROVAL

March 20, 2015

Ms. Andrea Walsh
1528 Woodsglen Drive
Winter Springs, FL 32708

Dear Ms. Walsh,

I am in receipt of the proposal and supplemental information that you submitted for permission to conduct research in the _____ Public Schools. After a review of these documents, it has been determined that you are granted permission to conduct the study described in these documents.

Please contact _____ at your earliest convenience to discuss the options for securing and compensating a _____ data analyst as detailed in your submission. Thank you for very clearly delineating the required components of your research request.

Best of luck with your research. I look forward to receiving a copy of your completed study.

Respectfully,

Deputy Superintendent, Instructional Excellence and Equity

cc. Director, ePathways
Coordinator, Assessment and Accountability

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