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The Effect of Tier 2 Intervention on Student Achievement & Student Self-Efficacy

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The Effect of Tier 2 Intervention on Student Achievement & Student Self-Efficacy

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by

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Abstract

Biology is a key course in a student's learning path. It provides important information about the living world and creates foundational knowledge that will be used in other science courses as the student progresses through his or her secondary and post-secondary education. However, there is a pattern of low student achievement in this required science course. The inability for students to understand and retain the curriculum in turn leads to low self-efficacy. Together, this creates a poor attitude toward science and a reluctance to pursue further science courses and in turn science careers. Response to Intervention (RTI), a common educational strategy, adjusts the amount of time the student spends on the curriculum and the amount of personalized instruction received by the student to match the student's needs. RTI hinges around a three tier system, which places students according to their learning needs. The purpose of this study is to evaluate the effectiveness of a Tier 2 Intervention program on student achievement and student self-efficacy in Biology. The study's research paradigm is a mixed methods program evaluation study. The Biology students' semester grades, Biology end of course (EOC) proficiency levels, and checkpoint exam scores are quantitative data that were collected to determine the success of the Tier 2 Intervention. A student survey and teacher focus group interview are part of the qualitative data that were collected to evaluate the effectiveness of the program specifically on improving student self-efficacy.

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Dedication

This dissertation is dedicated to Emily Taylor.

CHAPTER ONE - INTRODUCTION

Introduction

The purpose of this study is to evaluate the effectiveness of a Tier 2 Intervention program on student achievement and student self-efficacy in Biology. Secondary students commonly struggle with Biology, a required science class for high school graduation. Biology lays the foundational knowledge for the other science courses students will encounter in secondary and post-secondary education. The basic Biology course also teaches students basic life science concepts that apply to their everyday lives.

Response to Intervention (RTI) is a popular educational strategy that arose in 2004. RTI was first created as a form of screening to differentiate between students who simply needed more time with the curriculum, and students who should be referred for special education testing (Lenksi, 2012). RTI employs a three-tier model approach which adjusts the amount of time the student spends on the curriculum and the amount of personalized instruction received by the student to match the student's needs. The first tier often only involves regular classroom instructional time. The second tier incorporates a smaller group of students who did not retain the concepts taught during the regular class period. This group of students in the second tier receives more individualized instruction during a period outside of the regular class time. Tier 3 is the most intensive intervention and often involves a one-to-one student/teacher ratio where the student receives individualized instruction. Students who repeatedly required Tier 3 instruction are often referred for special education services (Samuels, 2009).

The implementation of RTI in secondary education is uncommon due to the complexity of secondary education schedules. Since RTI has shown great success at the elementary level, this study will investigate the success rate of RTI implementation at the secondary level. The

data obtained from this study will serve as a guide for other secondary educators seeking to implement a Tier 2 Intervention.

Problem Statement

There is a pattern of low student achievement in the required science course Biology, a required high school graduation course. The District in this study reported as high as 30% of students received a D or F in Biology during the 2018-2019 school year. This high failure rate is also reflected in the Biology end of course (EOC) proficiency levels with 11% of students scoring below basic and 38% of students scoring basic during the 2018-2019 school year. The inability for students to understand and retain the curriculum, in turn, leads to low self-efficacy. Together, this creates a poor attitude toward science and a reluctance to pursue further science courses and in turn science careers. Advanced science courses such as Advanced Placement (AP) Biology, AP Chemistry, and Physics are struggling to meet the required student numbers to fill a class.

Instructional and Systemic Issues

High school students are met with many new challenges as they journey through each step of their educational careers. One of these challenges is learning how to adapt to a more demanding curriculum, specifically in science courses. Traditionally, students tend to struggle in science or at least find science courses to be one of the more challenging courses they take in high school. When students move from primary to secondary school, their interest in science drops (Osborne, Simon, & Collins, 2003). This could occur because science is a subject students do not cover in great depth until late in their elementary years. Another characteristic unique to the high school science courses that might add to their difficulty is that each science course

introduced in high school is a new branch of the science field, unlike math and English courses that build on the previous year's curriculum.

The struggle to acclimate to the rigors of high school science classes is evident in students' performances on standardized tests and the retention rates of students in science courses. According to the National Center for Education Statistics (NCES), the percent of secondary students attaining science achievement levels below basic in both 2009 and 2015 was 40%. Below basic denotes partial mastery of the knowledge and skills that are fundamental for proficient work (NCES, 2018). Students' underperformance leaves science instructors seeking answers on how to improve subject matter retention. It is a challenging balance between breaking down the content enough for students to grasp key ideas while also meeting curriculum requirements. In addition to the easily identifiable link between a failure to adjust to the demands of high school science and EOC test scores, there seems to be a link between a student's struggle to meet the standards required by high school science and a general malaise about science. When students struggle without relief or progress to adjust to high school science their academic struggle is also accompanied and accentuated by a loss of confidence or interest in the subject. With disinterest in the subject, it becomes difficult to get students to persevere through the challenging content. Several studies found that self-efficacy plays a vital role in determining students' declaration of majors. Students select a subject concentration based on the assumption they will succeed in that subject (Astin, 1993; Britner, 2008). This problem is manifested by the drastic drop in student enrollment in elective upper-level science courses outside of the required courses. These ill effects can snowball and lead to lower numbers of students pursuing science related majors in college or pursuing science related careers.

Directly Observable

The issue of student underperformance in the subject of science can be observed by using school data. Standardized test scores such as EOC exams or the ACT are useful to help pinpoint where students are struggling. The nation's composite ACT score was 20.8 and the Science sub score was 20.7 in 2018. The value of 20.7 falls below the Reading sub score of 21.3 and very close to the Math sub score of 20.5. Only 36% of students met the ACT college and career readiness benchmark in the science category, whereas 60% of students met this benchmark in English, 40% in Math, and 46% in Reading (ACT, 2018). Missouri reported in 2018 that only 40% of students scored advanced or proficient on the Biology EOC exams, while other EOC tested subjects such as Government scored 65.6%, English II scored 57.4%, and Algebra I scored 46.9%.

School leaders can also gauge science performance by tracking the number of high school students required to repeat science courses. Repetition of courses often compounds the problem of underperformance. When students repeat a course, they not only fall behind on their graduation track, the necessity of repeating a course fosters or aggravates a poor attitude toward the class, and the school in general. These circumstances can negatively impact school culture.

Actionable

Poor student performance in science related courses could be improved in real-time through the use of a program such as RTI. The goal of the intervention program is to equip students with a better understanding of the curriculum which in turn could improve student achievement and student self-efficacy. Higher rates of student achievement could have an impact on the District's Biology EOC proficiency levels, ACT scores, and the retention rate of students. A better grasp of the curriculum could allow for growth in student self-efficacy. By improving

self-efficacy, it is the intent that there could be an overall improvement of the student culture. By improving performance in core science classes, specifically, it is the intention that students would be more apt to pursue advanced science courses and eventually science related careers.

Connects to a Broader Strategy of Improvement

Science is not the only subject students struggle with in high school and high school is not the only time students struggle in their academic careers. Research on the efficacy of RTI to improve student performance in science could inform how student achievement could be bolstered in other subjects and grade levels. Even beyond individual classrooms, the problem of student underperformance in science courses is connected to a broader plan at the district level and state level. The school district is graded on its performance on state-mandated standardized tests and annual graduation rates, both of which can be linked to students' performances in science courses.

High Leverage

Strategies used in this study to improve science achievement might also be worthwhile tools for other core classes. In a broader sense, if students are obtaining more knowledge in science courses at the high school level they will be better prepared for college or career level science courses. In addition, if students have a more positive perception of science they might be more open to pursuing careers in science. These strategies tie into the District's mission statement--to prepare students for a successful future and the District's Comprehensive School Improvement Plan. The District School Improvement Plan states two goals that address the issue of student achievement and student self-efficacy-- to improve the graduation rate by establishing and maintaining systematic student intervention processes and to promote leadership by fostering persistence, initiative, and determination in all students.

There is a myriad of opportunities for students willing to pursue and excel in science as employment opportunities in the healthcare industry are in demand. Humans are living longer and new medical issues are on the rise making the healthcare industry ever more important and in need of a qualified workforce. The number of Science, Technology, Engineering, and Math (STEM) related jobs available due to technological advances are rapidly increasing (Richards & Terkanian, 2013). Ensuring that students develop a strong foundational knowledge of science and facilitating a passion for the subject, makes it more likely that students will pursue science careers despite the challenging coursework or lengthy degree requirements.

Research Questions

This study's research is centered around two main questions:

Question 1: How does a RTI Tier 2 Intervention at the secondary level affect student achievement in Biology?

Question 2: What are the perceptions of teachers and students regarding their involvement in the RTI Tier 2 intervention?

Overview of Methodology

The study's research paradigm is a mixed methods program evaluation study. A mixed method approach was chosen because it provides a better picture of the effectiveness of the program. The Biology students' semester grades, Biology EOC proficiency levels, and checkpoint exam scores are quantitative data that will be collected to determine the success of the Tier 2 intervention. Students' semester grades and EOC proficiency levels will be analyzed and compared to previous years using a chi-square test to see if the Tier 2 Intervention has been effective in improving students' knowledge. The students' pre and post checkpoint exam scores

will be evaluated using a t-test to determine the success of the Tier 2 Intervention on student achievement.

The student survey contains reflective questions regarding the effectiveness of the Tier 2 program on student self-efficacy. Through student responses to the survey, the researcher can determine the effect the program had on students' motivation, engagement, and self-confidence. The teacher focus group interview is another qualitative approach to further understand the implications of the Tier 2 Intervention regarding student self-efficacy. Teachers will be asked a variety of questions specific to their observations of student-self efficacy in the regular classroom after the student received the Tier 2 instruction.

Rationale

Biology is a key course in a student's learning path. It provides important information about the living world and creates foundational knowledge that will be used in other science courses as the student progresses through his or her secondary and post-secondary education. Students must understand and retain the information taught during this course. Students must also develop self-confidence and personal drive or motivation to inspire their desire to pursue other science courses and to achieve success in those higher-level courses. The need for health care employees is growing rapidly as science advances and human life expectancy increases. Students who complete Biology experiencing positive interactions and gaining confidence are more apt to pursue advanced science courses and in turn science related careers in the ever-growing medical field.

Goal of Study

The goal of this study is to determine if Tier 2 Interventions should be used in core subject areas at the secondary education level.

Positionality

Researcher's Role

My dual roles will include the researcher and participant. I will serve as an active participant in the problem of practice since I am a Biology teacher at the District where the study is being conducted. I will also be an active participant in the study by designing and implementing the RTI Tier 2 Intervention program in my classroom.

Assumptions

Several assumptions play a role in this study. It is assumed that if students have a good experience within their Biology course, they will develop a passion for the subject. This passion will then inspire them to enroll in more advanced science courses and perhaps post-secondary science careers. It is also thought that students' poor performance in Biology is due to a lack of understanding of the curriculum. This lack of understanding can be resolved by small group instruction outside of the regular classroom. In addition, it is believed that students' self-efficacy plays a key role in their motivation and self-confidence. Therefore, if students have high self-efficacy they will do better in Biology when compared to students who have low self-efficacy.

Definition of Key Terms

The following terms were used operationally in this study:

Biology. A general life science course designed to examine aspects of the living world including topics from cell biology and biochemistry to genetics, evolution, and ecology. After successful completion of Biology, students will be prepared for higher-level, college preparatory life science courses. Biology is a requirement for high school graduation.

Individuals with Disabilities Education Improvement Act (IDEIA of 2004). The federal legislation that "removes the requirement of the significant discrepancy formula for learning

disabilities classification based on IQ and requires that states must permit districts to instead adopt alternative models includes the Response to Intervention model" (Wedl, 2005, p.1).

Response to Intervention (RTI). Response to Intervention (RTI) integrates assessment and intervention within a multi-level prevention system to maximize student achievement. RTI helps schools identify students at risk for poor learning outcomes, monitor student progress, provide evidence-based intervention, to adjust the intensity and nature of those interventions based on each student's responsiveness, and identify students with learning disabilities (National Center on Response to Intervention, 2010).

Tiered Model. A multi-tiered model of service delivery where instruction is differentiated to meet the needs of the learner. In general, the higher degree of individualized learning is associated with the higher tier of intervention (National Center on Response to Intervention, 2010).

Secondary-level Students. Students enrolled in middle school, grades 6-8, and high school, grades 9-12.

Student Achievement. A measurement of student success that is based on a single point in time and how well the student performs against a standard. Student achievement is often measured based on students' state test scores (Battelle for Kids, n.d., para. 1).

Student Self-efficacy. The belief in one's capabilities to organize and execute the courses of action required to manage prospective situations. Self-efficacy encompasses personal motivation, engagement, and self-confidence (Bandura, 1986).

Organization of Dissertation

Chapter 1 described the problem, low student achievement in Biology, and discussed the purpose of the study, to examine the problem of practice found in the implementation of RTI, specifically Tier 2 Intervention in a Biology course.

The remainder of this study will be presented as follows:

- Chapter 2 presents a literature review of the history of RTI and current research related to the RTI delivery model.
- Chapter 3 describes the methodology, including the research design, research sample and data sources, data collection, and data analysis.
- Chapter 4 presents the quantitative findings of the study, including semester grades and test scores as well as the qualitative findings of the study including survey and interview documentation.
- Chapter 5 includes a discussion of the findings of the study, conclusions about the study, and recommendations for the use of the results and further investigations.

CHAPTER TWO – LITERATURE REVIEW

Introduction

The purpose of this study is to evaluate the effectiveness of a Tier 2 Intervention program on student achievement and student self-efficacy in Biology courses. An exhaustive review of the literature was conducted to inform the problem of practice. The search was wide-sweeping through the search engines EBSCO, ERIC and ProQuest. The literature focused on three prominent themes: self-efficacy, which consisted of an in-depth search on the effect self-efficacy has on student achievement; science courses at the secondary level focusing on evidence that shows a pattern of student retention and poor performance in secondary science courses; and RTI, which consisted of a thorough search of the history of RTI, the structure of RTI tiers and a multitude of successful aspects of different RTI models.

Review of the Literature

Self-efficacy and student achievement are explored through the lens of social cognitive theory as well as possible solutions to poor student achievement and low student self-efficacy--RTI. One goal will be to thoroughly review the different aspects of RTI implementation to unearth findings helpful in formulating a cohesive RTI model and implementation process which will improve student achievement and self-efficacy. Though the effects of RTI have proven successful, that success was not reached without great care and exhaustive planning. RTI can take multiple years of vigilant, thorough, collaborative planning to implement effectively. Training staff, scheduling, interventions, assessing student progress, implementation of the intervention, and evaluating the RTI effort as a whole are just a few examples of the components of RTI that require comprehensive planning (Robins & Antrim, 2013).

Social Cognitive Learning Theory Relation to Self-Efficacy

The social cognitive theory states the shared interactions among individual, behavioral, and environmental factors determine individuals' behavior (Bandura, 1986). Within these mechanisms, people have the potential to contribute to their own motivation and shape the course of events. In the social cognitive theory, the "social" part recognizes the environmental influences on human thought and action, whereas the "cognitive" portion recognizes the person's cognitive processes and the effect it plays on human motivation and action (Stajkovic & Luthans, 2003). Self-efficacy is a core concept within the social cognitive theory (Bandura, 1986) and in this sense plays a key role in individual behavior, specifically in the sense of personal motivation (Kirbulut & Uzuntiryaki- Kondakci, 2019). Psychologist Albert Bandura describes his theory on self-efficacy by claiming that individuals can only be as successful as he or she believes himself or herself to be; it is the control of one's own action through their beliefs in their ability to affect the environment and produce desired outcomes by their actions (Stajkovic & Luthans, 2003). Self-efficacious individuals are likely to participate in challenging tasks, put forth more effort and persist through difficult tasks, and use cognitive strategies to monitor their study and influence how they motivate themselves (Bandura, 1993).

Self-efficacy has also been found to be one of the best predictors of students' academic achievement and specifically in the core subject of science (Bandura, 1986; Britner & Pajares, 2006). Individuals develop self-efficacy in four ways: mastery experiences, vicarious experiences, social persuasion, and physiological states. To begin, mastery experiences include experiences where an individual finds repeated success in a skill. For example, a student who answers a question correctly in front of the class is more likely to participate again due to the mastery of the first experience. The second way to build self-efficacy is through vicarious

experiences provided by social models. Positive and self-efficacy building vicarious experiences occur when an individual observes another's success in a particular situation which consequently gives the observer confidence that the observer, too, can complete the skill. Using the same classroom example as previously stated, once the child answered the problem correctly, the child's peers would feel confident to then participate in class based on the success of the first child. The third aspect that builds one's self-efficacy is continual positive reinforcement from those who hold authority. In the classroom scenario, the teacher would offer praise to the student for answering the question correctly which would serve to encourage student self-efficacy in the classroom (Constantine et al., 2019). The final way the self-efficacy of students is influenced is through physiological states such as anxiety, stress, arousal, and mood. Negative physical states hinder performance and increase the likelihood of failure and in turn low self-efficacy (Britner & Pajares, 2006). Situations that can foster negative physical states include large classroom settings where students do not feel confident asking questions or expressing their learning struggles. Students build their self-efficacy through these four core constructs. Each can be more or less influential based on the source and cognitive processes of the individual but according to Bandura (1986, 1997), the mastery experience serves as the strongest and most consistent predictor of academic self-efficacy.

Low Science Achievement

According to the National Center for Educational Statistics (NCES), most students take a minimum of one year of science in high school; yet, only 60% of those students enroll in a second year and only 25% continue to enroll in a third-year (National Center for Educational Statistics [NCES], 2000). Educators are constantly searching for ways to increase the number of students that pursue science courses and in turn science careers. One of the key findings of the

research concerning student success is the powerful connection between student confidence and a student's decision to enroll in science courses (Andre, Whigham, Hendrickson, & Chambers, 1999). Researchers who focus specifically on the effects of self-efficacy propound that students' belief in their ability to be successful in science tasks or courses greatly influences their choices of science-related tasks, the effort they put forth on such tasks, the stamina they show when encountering challenges, and the ultimate success they experience in science (Zeldin & Pajares, 2000). Thus, self-efficacy is a key focal point for science educators who want to increase student achievement and engagement in the subject of science. Even in a grander picture, self-efficacy plays a role in determining major choice at the post-secondary level. Students' declaration of a major hinge on the notion they will succeed in that subject (Engberg & Wolnaik, 2013). Existing research found that science self-efficacy correlates strongly with science achievement and science-related choices across varying grade levels. Specifically, at the secondary level, science self-efficacy is a better predictor of achievement and engagement with science-related activities in and out of the classroom than are gender, ethnicity, and parental background (Britner & Pajares, 2006).

One solution to solving the problem of low student achievement in required science courses might lie within a somewhat popular phenomenon that hit education in 2004 known as "Response to Intervention" (RTI). RTI was first initiated in hopes of giving students multiple opportunities to understand the content before being referred for special education testing (Lenski, 2012). RTI is focused at the elementary level and hinges on a three-tier model approach that regulates the intensity and individualized instruction needed to help students succeed. Students' progress and response is closely monitored during the intervention. The first tier is often referred to as the "universal" tier because it encompasses instruction and services to all

students. The second tier represents directed and short-term instruction for students who need additional time and instruction. Students receiving Tier 2 support usually receive services in a small group and outside of the regular class time. Tier 3 represents the most intensive intervention and is often seen modeled in a one teacher to one student ratio. In addition, a student who routinely cannot move out of Tier 3 assistance is often tested for special education services (Samuels, 2009).

History of RTI

RTI began as a pedagogical practice for students PK-12 and was implemented in an attempt to identify students who needed special education services. Prior to RTI, students were forced to endure evaluations and multiple assessments to determine if they were candidates for special services. These evaluations and services were often not reflective of the students' abilities and would create false positives or false negatives. However, with the adoption of the Individuals with Disabilities Education Act in 2004, RTI became an alternative method for identifying students by determining if a student was responding to high-quality instruction and intervention tactics (Bouck & Cosby 2019).

RTI is a multi-tiered model that focuses on early intervention to improve student achievement. Students are placed in different tiers depending on their assessment scores for a particular time (Fuchs & Compton, 2012). The first tier of RTI is often associated with the regular classroom setting. Students receive instruction in large groups from a general education teacher. Tier 1 instruction helps teachers determine if students need further intervention or if the problem lies with the method of instruction. If more than 20% of students are not making acceptable progress in the general education program, teachers must revisit their core instruction (Bartholomew & De Jong, 2017). When students fall behind or fail to respond to Tier 1

instruction, and inadequacy of the method of instruction is eliminated as the cause, they are given Tier 2 instruction. Tier 2 instruction is targeted and intensive instruction where students are placed in much smaller groups with other students who are having similar issues. Tier 2 instruction is taught by either a general education teacher or special education teacher. If a student continues to fail to respond to instruction, they are then placed in Tier 3. Tier 3 is an individualized and alternative setting where students are typically placed with a special education teacher in groups of two to three students. RTI is a fluid model where students may move within the three tiers based on their performance on assessments regarding the curriculum being taught at that specific time (Hunt, Valentine, Bryant, Pfannenstiel, & Bryant, 2016).

Elementary schools have adopted RTI and implemented the three tier system with great success; however, there is little research regarding the implementation of RTI specific to secondary schools (Samuels, 2009). RTI can be appropriate for secondary schools if the goal behind each tier is defined. According to Lenski (2012), secondary RTI implementation should focus on three core purposes: to build capacity to meet graduation standards, to ensure appropriate instruction and intervention, and to provide a system of continuous school improvement. Secondary students face issues that impact their learning that are very different than the issues experienced by elementary students. Thus, it is imperative that the implementation of the RTI take these differences into consideration. Some social and behavioral issues unique to middle school and high school students include the disinclination for being labeled and the lack of motivation especially when faced with hardship (Samuels, 2009). Fortunately, RTI provides an opportunity where students can receive the assistance they need without being placed in special education. In addition, it is a challenge to monitor the progress of a secondary student because testing is much more frequent. It is often a concern in the high

school setting that the student might be getting better at taking the test instead of actually learning the material (Samuels, 2009).

Varying Approaches to RTI

There are substantial differences between RTI approaches in elementary and secondary schools. One key difference in intervention models used at the secondary level is the allocation of resources. At the elementary level, screening is necessary to identify at risk students before academic deficits develop. Due to the minimal range of performances that can be sampled at the elementary level, a lot of resources are devoted to assessing and identifying these students. However, at the secondary level, teacher nomination and existing test data can be used to identify at risk students because there is a greater range of performances that can be assessed, creating a more wide-spread set of data points (Fuchs & Compton, 2010). Secondly, as students advance through school, academic deficiencies become increasingly more severe and dramatic in comparison to same-aged peers without performance deficits. Finally, the nature of effective intervention is widely different. At the secondary level, the intervention must take into consideration what motivates and creatively engages students (Fuchs & Compton, 2010). Secondary students deserve new and restructured opportunities for decreasing their academic deficiencies to eliminate major obstacles toward successful adult life.

Due to varying factors, each secondary school takes a slightly different approach implementing RTI focusing on what is best for each school's students, teachers, and environment. Overarching themes seem to take shape in every secondary program though, such as a focused curriculum, a method for selecting students, professional development for teachers, and strong communication opportunities for all stakeholders involved. Though curriculum can take different shapes despite the content level, the content taught during an intervention period

should consist of explicit instruction and assessments in vocabulary, comprehension, and interpretation skills in to improve a student's reading ability. Teachers should also engage students in high-quality discussions regarding the material and how it relates to their lives in order to improve student motivation (Kamil, Borman, Dole, Kral, Salinger, Torgesen, & Institute of Education Sciences, 2008).

There are two main approaches to RTI implementation: the problem solving approach and the standard protocol approach. The problem solving approach focuses on preventative interventions that are specific to each student's individual learning requirements (Fuchs, Fuchs, Compton, Bryant, Hamlett, & Seethaler, 2007). This approach utilizes staff within the building to examine data and create intervention plans and assessments based on their findings. It requires substantial buy in from the staff and a complete culture change within the building about the intervention. The standard protocol approach is designed to promote the acquisition of new skills. Commonly, the intervention comes in the form of a commercial program that hones in on reading comprehension as the root of the problem. The standard protocol is a much simpler approach to RTI (Buffman, Mattos, & Weber, 2010).

Regarding the selection of students for secondary intervention services, faculty should focus on students who want to improve, use data to track students' progress, and incorporate core teachers in decisions regarding the students' placement and progress (Fuchs & Compton, 2010). Content area teachers should play a role in making these selections because often a student is poorly represented by the letter grade at the time of selection. Palmer High School, part of Colorado Springs' District 11 is asking teachers to screen students through the results of a computerized assessment that is aligned to the state standards called Measure of Academic Progress. These teachers track ten low performing students' progress as they progress through

the intervention program. These teachers are given the task of paying close attention to the interventions the student is receiving and the progress that is being made by the student (Samuels, 2009).

Districts often take a different approach to the implementation of the RTI model at the secondary level. Palmer High School, for example, created an after school tutoring time for Tier 2 and Tier 3 intervention students to receive help outside of the regular class time (Samuels, 2009). Another recommended approach that focused specifically on mathematics intervention recommended a strong focus on explicit instruction, students verbalizing their reasoning, multiple visual representations, example problems with guided strategies, and teachers receiving ongoing formative assessment data on students' performance (Gersten et al., 2008). One final model uses twenty to forty-minute supplemental class periods four to five times a week where students meet in small groups to receive Tier 2 Intervention. Students' progress is monitored throughout the intervention (Gersten et al., 2008).

Conceptual Framework

Self-efficacy is a great predictor of academic success. Successful academic programs foster self-efficacy in the classroom. It is particularly important that self-efficacy be taught and encouraged within the sciences. Students often struggle to understand the difficult concepts taught within introductory science courses such as Physical Science or Biology. The difficulty of entry level science course material, often results in predictors of overall poor student achievement. Without intervention or prophylactic measures, the difficulty of introductory science topics leads to low student achievement on standardized tests, poor semester grades, and the lack of desire to enroll in more advanced science classes. The poor experience that entry level science students frequently encounter due to the difficulty of the topics and the lack of self-

efficacy results in the desire to forgo enrollment in advanced science courses and consequently closes the door for those students to pursue post-secondary science majors. The domino effect continues and ultimately, fewer students are pursing the abundance of science related careers available. In short, low student self-efficacy coupled with the difficulty of science as a subject is causing a shortage of capable employees in STEM related career fields.

RTI works to combat the problem of low self-efficacy upon the outset of low student achievement and halt the cyclical problem. The RTI process is premier because it gives students the confidence required to comprehend difficult scientific concepts. In an average classroom unassisted by a RTI process, students do not understand the material and quickly fall behind. Unlike a history classroom or even a mathematics classroom that may teach separate and distinct units or concepts, most scientific concepts are built upon one another. In a science classroom, a failure to thrive quickly compounds as the material taught builds on itself from unit to unit and year to year. Thus, if a student is missing a key concept from the outset, the lack of understanding will be exacerbated as more complex scientific concepts are introduced. As the struggling student falls further behind, that student loses his or her confidence in learning the material and his or her passion for the subject. To prevent this cyclic, downward spiral, educators strategically implement a Tier 2 Intervention to close the learning gap before the lack of understanding compounds. The Tier 2 Intervention places the 15-20% of students who do not understand the material into a small group setting where those students receive individualized instruction. The small group setting allows teachers to identify the knowledge gaps and assist students in filling those voids. The social cognitive theory concept of self-efficacy becomes evident within these small groups as students observe other students' successes within the Tier 2 Intervention consequently giving the student observer confidence that they, too, can complete the

skill. Once the students have mastered the content, they are then released from the Tier 2 instructional time. The Tier 2 Intervention prevents students from falling further behind while simultaneously mending the achievement gap and growing student confidence.

This study's problem of practice focuses on the effect of Tier 2 Intervention on student achievement and self-efficacy. All Biology students will take a post assessment, after a given amount of time, that includes the curriculum they were previously taught. According to students' scores, they will be placed in a Tier 2 Intervention which will focus on reteaching the given curriculum using different learning strategies and a smaller group setting outside of the regular classroom. The group of students who received the Tier 2 instruction will then be reassessed using a similar post assessment to analyze their growth.

Chapter Summary

This chapter summarized research around the impact self-efficacy has on student achievement, science courses at the secondary level that show poor performance in secondary science courses, and the history and implications of RTI. The information presented regarding RTI consists of a thorough search of the history of RTI, the structure of RTI tiers, and a multitude of successful aspects of different RTI models. The following chapter will discuss the context of the research including the sample population, the methods used to collect data, and the methods used to analyze the data.

CHAPTER THREE – INQUIRY METHODS

Introduction

The purpose of this study was to evaluate the effectiveness of a Tier 2 Intervention program on student achievement. Traditionally, secondary students struggle with the required science class, Biology. This study was an evaluation of the program put in place to help students with this course. This research study used mixed methods to analyze the program. A mixed method approach ensured the study's findings were grounded in objective data while giving a voice to the participants through the use of descriptive data based on their experiences. Using qualitative and quantitative data are especially useful to understand any contradictions between the data sets or further support a claim from one data set with another.

In this study the first research question, how does a RTI Tier 2 Intervention at the secondary level impact student achievement, was measured by quantitative data in the form of Biology EOC proficiency levels, semester grades, and checkpoint exam scores. Through the statistical analysis, the impact of the RTI Tier 2 Intervention became apparent; however, this quantitative data did not depict the reason behind the success or failure. To gather a more holistic idea regarding the success of Tier 2 Intervention and to answer the second research question, how does RTI Tier 2 Intervention at the secondary level impact student self-efficacy? Qualitative data in the form of student surveys and a focus group interview with teachers was collected. The research was centered around two main questions:

Question 1: How does a RTI Tier 2 Intervention at the secondary level impact student achievement in Biology?

Question 2: What are the perceptions of teachers and students regarding their involvement in the RTI Tier 2 intervention?

This chapter includes detailed information on the rationale for the research paradigm; problem setting for the study; research sample and data source rational explanation; data collection methods; and trustworthiness, limitations, and delimitations of the study.

RTI began as a pedagogical practice for students in Pre-kindergarten - 12th grade that was implemented to identify students who needed special education services. Prior to RTI, students were forced to endure evaluations and multiple assessments to determine if they were candidates for special services. These evaluations and services were often not reflective of the students' abilities and would create scenarios where students who needed special services did not qualify or students who were capable of learning were pulled from courses and placed in alternative learning environments. Though the effects of RTI have proven successful, that success was not reached without great care and exhaustive planning. RTI can take multiple years of vigilant, thorough, collaborative planning to implement effectively. Training staff, scheduling, interventions, assessing student progress, implementation of the intervention, and evaluating the RTI effort as a whole are just a few examples of the components of RTI that require comprehensive planning (Robins & Antrim, 2013).

Rationale

The study's research paradigm was a mixed methods evaluation study. Evaluation research includes an effort to assess or improve human effectiveness through systematic data-based inquiry (Patton, 2015). This study focused on the evaluation of the Tier 2 Intervention portion of the RTI program that will be implemented in the District. A mixed method approach was chosen because it provided a better picture of the effectiveness of the program. The biology students' semester grades, Biology EOC proficiency levels, and checkpoint exam scores are

quantitative data that was collected to evidence the success of the Tier 2 Intervention. Students' semester grades and EOC proficiency levels were analyzed and compared to previous years using a chi-square test to see if the Tier 2 Intervention was effective in improving students' knowledge. The students' pre and post checkpoint exam scores were evaluated using a t-test to determine the success of the Tier 2 Intervention on student achievement. Through the statistical analysis, it became apparent if the RTI Tier 2 Intervention was successful; however, the quantitative data did not depict the reason behind the success or failure. Qualitative data was gathered in the form of a teacher focus group interview and a student survey to create a more holistic picture of the effect of the Tier 2 program, beyond simply student achievement.

The student survey contained reflective questions regarding the effectiveness of the Tier 2 program on student self-efficacy. It is through the student responses to the survey, the researcher gained a better grasp on the effect the program had on students' motivation, engagement, and self-confidence. Where the quantitative data might show students' understanding of the Biology curriculum, the survey data determined if the Tier 2 Intervention was successful in giving students more life skills such as self-confidence or motivation which would bring them success outside of the Biology course. The teacher focus group interview was another qualitative approach to further understand the implications of the Tier 2 Intervention regarding student self-efficacy. Teachers were asked a variety of questions specific to their observations of student self-efficacy in the regular classroom after the student received the Tier 2 instruction. The focus group interview was chosen in addition to the survey because the participating teachers have taught Biology for several years. Their observations determined if there was a change in student behavior during the implementation year compared to student behavior in previous years.

Problem Setting/Context

Following the adoption of the Individuals with Disabilities Education Act in 2004, RTI became an alternative method of identifying students in need of assistance. RTI determines if a student is responding to high-quality instruction and intervention tactics (Bouck & Cosby, 2019). RTI has been successful at the elementary level; but, there has been minimal research conducted at the secondary level (Samuels, 2009). It is believed that this disconnect is because there is an unclear model for implementing the program due to the complexity of secondary schedules for students and teachers. For RTI to be successful, there must be adequate time for teacher professional development and a remediation period for students which is challenging with the complex schedules secondary educators face. Due to the complexity of the implementation, secondary educators are creating RTI models that uniquely fit each school's needs.

The study's school district was located in southwest Missouri. The District was known in the community for being innovative and continuously striving for improvement. Over the past eight years, the District has become an academic leader in the Central Ozarks conference and in southwest Missouri. The study's high school was the only high school in the District and serves an average of 1,400 students. The high school carried an innovative reputation and strived to provide the best opportunities for future success for its students.

Republic High School's administration team adopted the District's RTI model to improve student retention in core subjects, and in turn, performances on standardized tests such as the ACT and End of Course (EOC) Exams. The Republic School District first adopted the "RTI at Work" model created by educator, Austin Buffum, in the Fall of 2016 after one of the elementary schools experienced a rapid decline in their MAP (Measures of Academic Performance) scores. After just one semester's implementation of this model, the elementary school saw

drastic improvement, earning scores on the MAP math exams 7.27 points above the state average and in MAP ELA (English Language Arts) exams 36.82 points above the state average. Following the 2016-2017 school year, the other district elementary schools adopted the program and experienced similar success. Thus, the district's curriculum department decided to propose an implementation of the model at the high school and middle school. The high school implemented the first phase of this adoption during the 2019-2020 school year in the EOC tested subjects of English II and Algebra I. Though both subjects had similar schedules, the manner of delivering the content differed within each subject. Teachers were instructed to design a curriculum for the Tier 2 Intervention that could be implemented during the twenty-five-minute remediation period that occurs four days a week. This study will investigate the second phase of the Tier 2 implementation on Biology students.

Research Sample and Data Sources

This study had two groups of participants, Biology students and Biology teachers. Any student that was enrolled in Biology in the district during the implementation year could have been included in the research study. This population consisted of approximately 350 students primarily in their sophomore year of high school. All students enrolled in Biology took a checkpoint exam following a period of instruction. If a student scored below the cut score on the checkpoint exam that student would then receive Tier 2 Intervention. The students' Biology EOC proficiency levels, semester grades, and checkpoint exam grades were used as quantitative data. The district provided grading program, Canvas, was used to administer any assessments and record grades. These students also took a self-reflecting survey at the end of the year. Google Forms was used to administer the student survey using the students' school-issued Google accounts. To keep students' names confidential, students' names were only used by district

employed Biology teachers to place students in the appropriate intervention section during a progress period. Students' names were removed from any further data analysis.

The decision regarding which students to place in Tier 2 intervention is a subjective decision making process. The selection process for this particular study began by giving the students a checkpoint exam following the unit of instruction. The exam score earned by each student determined whether or not the student would be placed on a list as a potential candidate for the Tier 2 intervention program that particular cycle. The opinion of the Biology teacher regarding the source of the student's struggles was then considered, be it a mere struggle to comprehend or a lack of effort. Student attitude played a crucial role in the RTI placement process. If the Biology teachers felt that the student was struggling due to their inability to understand the material they were more likely to place them in RTI, whereas if, in the teacher's observations and opinion, the student's struggle was the result of poor behavior or attendance, that student would be less likely to be placed in the program. The structure of the Tier 2 intervention lends itself to this type of subjective placement process. The intervention program expects students to be motivated to relearn material. Admittedly the selection of students could have played a role in the success of the program as only students who teachers felt would be successful in RTI were placed in the Tier 2 intervention. The underachieving students whose underachievement was attributable to disciplinary or attendance issues were left out of the program. At this time, the district in this study does not have a designated intervention in place for students who are struggling academically as a result of poor behavior or attendance.

There are four guiding principles of RTI commonly called the "four C's" include 1) collective responsibility, 2) concentrated instruction, 3) convergent assessment and 4) certain access. The fourth principal, certain access, is something the district in this study was missing.

One of the fundamental goals pursued by RTI is to provide all students with the time and support needed to learn at high levels. A selection process that only places students that teachers feel would be successful in a Tier 2 intervention falls short of providing or guaranteeing certain or equal access (Buffum et al., 2012). This approach to selection for participation in RTI leaves students with behavioral issues without the support necessary for post-secondary success.

The Pro-Solve Intervention Targeting Process is an alternative, and perhaps more appropriate, method which could be utilized to place students in an RTI program. The Pro-Solve Intervention Process protocol is a sequence of five critical questions that help determine the causes and potential solutions for a student in need of academic or behavioral interventions. These questions include: What is/are the concern(s), what is/are the cause(s) of the concern(s), What is/are the desired outcome(s), What steps should be taken to best achieve the desired outcome(s), and who is going to take lead responsibility to ensure that each intervention is implemented? The use of a checkpoint exam to initially sort students into two categories, those that need intervention and those that do not is a great place to begin. However, once students are identified as in need of intervention, a method such as the Pro-Solve Intervention targeting process would be beneficial in assigning students the help they need (Buffum et al., 2015). There could always be outliers--students who traditionally struggle because of their behavior could find themselves more successful in a Tier 3 intervention setting with not necessarily a classroom teacher but an educator that specializes in helping troubled students change behaviors. Also, a student could appear to be the perfect candidate for Tier 2 intervention and ultimately not succeed in the program. Nonetheless, Tier 2 intervention is a worthwhile endeavor that gives students opportunities for success.

Biology teachers were also a vital component of data collection. The three Biology teachers were selected for this study because they were directly implementing the Tier 1 and Tier 2 portion of the RTI program. This group of teachers provided their observations and opinions on the program's effect on student self-efficacy. The teachers were asked to participate in a voluntary focus group. The teachers who volunteered to participate in the focus group interview were asked to sign an informed consent stating that their names would not be used and their comments would be shared collectively.

Data Collection Methods

Approval was granted from the University of Arkansas's Institutional Review Board and the District prior to the commencement of research. Upon receiving permission from both institutes, data was collected from a focus group interview, a student survey, and several forms of archival data.

Interview

In this research study, a focus group interview style was chosen to match the Professional Learning Communities (PLC) structure that was already in place for the Biology teachers. A focus group is a form of interview which allows respondents to correspond with one another as if in an in-person conference. In this setting, the persons being interviewed were more likely to express feelings or opinions that might not emerge if they were interviewed individually (Gall, et al., 2009). The goal of the focus group interviews was for the researcher to learn about teachers' perceptions about the implementation of RTI and its effect on students' self-efficacy. There was one focus group interview conducted at the end of the study and the data collected were used to answer the second research question in this study.

The focus group interview included three Biology teachers who were directly involved in the Tier 2 implementation. The focus group took a semi structured approach to leave room for elaboration or further discussion on given topics. The focus group took place in a private classroom during the designated PLC time on Friday afternoons, according to the District's calendar. After informed consent was granted by the participants, the focus group was recorded. The questions focused on specific student behaviors, the impact Tier 2 Intervention had on the regular classroom instruction, and the participants' overall reflection. See Appendix D for interview questions. Each group member had a chance to give his or her response to the question or comment on someone else's response. Once the discussion had ceased the next question was read. The interview continued until all questions have been discussed. Following the interview, the researcher transcribed the conversation and convert it to Microsoft Excel for analysis.

Survey

Questionnaires are a form of surveying that can be useful in collecting data for a plethora of reasons, including the ability to collect significant amounts of information from a large number of participants in a short amount of time, the ability to allow individuals to remain anonymous, and the fact that questionnaires can be carried out by the researcher with limited impact on the validity or reliability of the questions (Ravitch & Carl, 2016). In this research study, a student survey was chosen to give students the comfort of expressing their feelings without the pressure of being interviewed by their teacher. It also allowed for a larger sample population due to the ease of administering a survey to all Biology students. This larger sample allowed for a more comprehensive analysis of the data. The goal of the student survey was for the researcher to learn about the students' perceptions about their own self-efficacy in Biology.

There was one survey conducted at the end of the school year and the collected data were used to answer the second research question in this study. See Appendix A for survey questions.

The student survey was administered to all Biology students during the Science RTI implementation year. The survey was administered through the use of Google Forms and contained a 5 point Likert Scale and free response questions to allow for students to elaborate on their experience. The questions focused on student motivation and level of engagement resulting from the Tier 2 Intervention. After informed consent was granted by the participants and the participants' guardians, the survey was administered to students at the end of the school year, following the administering of the Biology EOC. The researcher analyzed the data for the Likert questions and coded for common themes in the free-response questions.

Archival Data

In addition to a focus group interview and a student survey, quantitative data were collected in the form of archival data. Biology EOC proficiency levels were examined from the 2016-2017, 2018-2019 and 2020-2021 school years. Biology semester one and semester two grades were analyzed from the 2016-2017, 2017-2018, 2018-2019, 2019-2020, and 2020-2021school years. These data were taken from the District sponsored Tyler SISK12 program and used in statistical analysis. The archival data did reveal the test scores and grades that were indicative of the District's performance before the RTI implementation and after the implementation. These data helped answer the first research question in this study.

Checkpoint Exam Scores

During the RTI implementation school year, 2020-2021, checkpoint exam scores were collected from the District provided grading system, Canvas. All Biology students took a checkpoint exam following a unit of instruction. These checkpoint exams served as an

intervention placement test. Students who were placed in the Tier 2 Intervention took the same exam following the three weeks of instruction. The pre and post checkpoint exam scores were examined and compared among the groups to track growth. This set of data exposed the progress of the RTI Intervention, in turn, answering research question one.

Data Analysis Methods

To analyze the impact that Tier 2 Intervention has on student achievement, students' Biology end of course (EOC) proficiency levels, semester grades, and checkpoint exam scores were examined. The Biology EOC proficiency levels and semester grades from the year of implementation were compared to the previous school year's data before the implementation of the Tier 2 Intervention using a chi-square test. Pretest checkpoint exam scores and post-test checkpoint exam scores of students who have received Tier 2 Intervention were compared using a dependent t-test.

To analyze Tier 2 Intervention's impact on student self-efficacy, a focus group interview was conducted with Biology teachers and a student survey was given to all Biology students. The student survey was given using Google Forms and the survey consisted of sixteen Likert scale questions and free-response questions. The focus group interview was transcribed, and through the use of Microsoft Excel, the researcher analyzed the data and coded any relative themes.

Trustworthiness

To create such a research study, validity strategies were taken from Ravitch and Carl (2016). To best make use of and alter the study based on engagement among participants, a participant validation strategy was used. By engaging participants in the study, a sense of ownership developed and in turn a passion to see the implications of the study. This strategy was imperative to implement throughout the study to make necessary structural changes as a result of

interactions with participants (Ravitch & Carl, 2016). The teachers were involved in the data analysis of checkpoint exam scores. This allowed the teachers to visualize the impact the Tier 2 intervention had on student achievement. In addition, it was crucial to create a team-like atmosphere by consistently seeking the teachers' input and feedback and implementing changes accordingly. These teachers participated directly in the implementation of the RTI program, thus they were engaged in the strategies the program required. Since the researcher also served as a Biology teacher, it was important to have alternative opinions included in the reflection team to prevent personal bias. This strategy also created ownership in the program for the teachers involved and, in turn, encouraged their engagement and motivation within the study.

Participant Validation strategy was also used with the Biology students to engage the students in the study. There was a consistent "why" discussed and displayed during the Tier 2 intervention. The students were more motivated and more apt to take ownership of the learning process when they understood the reasoning behind the intervention strategy. Students also reflected on their pretest and post-test checkpoint scores with their assigned Tier 2 teacher to track their improvement, giving them ownership in their learning.

Research studies involving qualitative data are contextually based; thus, the findings of the studies are not generalizable across settings. Thick description was used to reflect on the contextual aspects of the study and how the data were portrayed in the research study. Thick description hinges on the thorough description of the study's setting, research participants and related experiences that produce the findings and interpretations. This allows for the reader to derive contextualized meaning of the data and discern the transferability of the findings (Bloomberg & Volpe, 2019). Sufficient information about the school and district as well as timely information regarding the history of the implementation of RTI was provided to the

reader. This contextual information gave the reader a glimpse into the circumstances in which the study was conducted. Furthermore, the research reflected on the details used to describe the data to ensure a person who does not have a background in RTI was able to understand and value the study's findings. It was necessary to provide enough information about the structure of RTI, specifically the structure of the Biology Tier 2 Intervention so that readers could make their interpretations of the data presented in the study. RTI is a very popular topic in education but it rarely means the same thing in any two schools, especially at the secondary level. Constant reflection on the detailed explanations of the program and how the data were obtained, was essential so that an outsider could process and understand the data. This is especially true when considering the statistical analysis of the checkpoint exam scores since it was a unique aspect of this study.

The researcher's role as both the researcher and participant was one of the most important aspects of the study's trustworthiness serving as a strength and a weakness to the study. Structured reflexivity was used to reflect, examine and understand the implications of the researcher's position on data analysis. Appropriate reflexive practices ensured a critical review of the participation of the researcher and how this participation impacted the processes and outcomes of the research (Bloomberg & Volpe, 2019). The researcher was not the only person analyzing the quantitative data or qualitative data in the form of the study survey but instead relied heavily on the help of the other Biology teachers who are directly involved in the implementation of the RTI program. Since the researcher was also a Biology teacher and program implementer there could have been a strong bias on the part of the researcher to see this program succeed. By allowing other teachers and administrators who are equally versed in the content and program to analyze the data and develop their own interpretations, a more holistic

and unbiased analysis was generated. It was also imperative that the group of teachers and administrators consciously look for other alternative reasons to explain the findings. As for the student surveys and focus group interviews, several rounds of coding were conducted by the researcher to prevent bias and reveal consistent themes. The first cycle of coding was inductive with no general focus on a particular concept. The findings generated from the first cycle of coding directed a more focused second round of coding. Patterns discovered in the first cycle of coding were used as the lenses for which the researcher then reanalyzed the data to further explore such patterns. This cycling continued through multiple rounds, ensuring consistent themes were revealed.

All participants were made aware of the reason for the study, and for what purpose the data were used. Before conducting any data collection, approval by the IRB was obtained. Participation was voluntary, and participants' identities remained confidential. The interview was transcribed and the transcription was shared with the focus group participants. As for the student survey, participation was voluntary and names were not collected. The results of the survey were shared with other Biology teachers for analysis. None of the other data including semester grades, EOC proficiency levels, and checkpoint exam scores identified student names. The focus group interview consisted of teachers who are colleagues of the researcher. To prevent pressure to participate, the interview was completely voluntary. To prevent any inhibitions about speaking freely regarding to administrative pressure, the interview recording was only shared with the participants and the interviewer. The transcription was also shared with participants and no names were associated with the transcription. To prevent bias on the student survey, the participants' names were not collected and the participants were not asked what Biology teacher they had for the school year. The survey was conducted during class time to ensure all students

had internet access and a safe environment to complete the survey away from distractions or biased opinions.

Limitations and Delimitations

This research study focused on the implementation of RTI in a school district which only has only one high school. It also focused only on one core subject, Biology. This specificity lend itself to a non-diverse population. This study pertained to a small population of student and teacher participants. There were approximately 350 students, predominantly sophomores who took Biology in the year, and of those 350 students, even fewer students qualified for the Tier 2 intervention. There were four Biology teachers, one of which was the researcher and did not directly participate in the focus group interview.

The District in this study implemented the Tier 2 Intervention in three other content areas at the secondary level; but, these areas were not included in this study because of the degree of differences in the structure of the program. There are nine teachers in the science department but only three were included in this study because they are the only teachers who taught Biology and serve as a Tier 2 Intervention teacher. All Biology students were given a student survey to not single out students; however, the survey contained an embedded question asking if the student participated in Tier 2 instruction. If they select they did not participate, meaning they always scored above the checkpoint exam score for a given progress, their answers were not included in the analysis of the survey data.

Chapter Summary

The purpose of this study was to evaluate the effectiveness of a Tier 2 Intervention program on student achievement and student self-efficacy in a Biology course. This study analyzed the effect RTI had on student achievement and student self-efficacy. This study took a

mixed-method approach incorporating quantitative data and qualitative data to answer the research questions. Quantitative data including semester grades, Biology EOC proficiency levels, and checkpoint exam scores were statistically analyzed to measure the effect Tier 2 Intervention had on student achievement. Qualitative data, including a focus group interview with participating Biology teachers and a student survey with participating Biology students, were analyzed to understand the perceived effect Tier 2 Intervention had on student self-efficacy. Careful consideration has been taken to ensure that there were a multitude of measures in place to prevent potential bias in the data analysis due to the fact the researcher is a Biology teacher as well.

CHAPTER FOUR – RESULTS AND ANALYSIS

Introduction

The purpose of this study was to evaluate the effectiveness of a Tier 2 Intervention program on student achievement and self-efficacy in Biology. A mixed method approach was employed to measure the success of the Tier 2 Intervention by analyzing qualitative and quantitative data.

The qualitative analysis of this study was based on survey findings collected from twenty-three students and a teacher focus group interview of three participants. This analysis used dependent t-tests to determine if there were significant differences between the pretest scores and post test scores of the study participants after a RTI was administered. In addition, a chi-square statistical analysis was utilized to assess the significance between semester grades earned in previous school years compared to the year of implementation. Additionally, EOC proficiency levels from the same date ranges were juxtaposed for analysis.

This mixed method study sought to answer the following research question.

Question 1: How does a RTI Tier 2 Intervention at the secondary level affect student achievement in Biology?

Question 2: What are the perceptions of teachers and students regarding their involvement in the RTI Tier 2 intervention?

The Program

As the literature reflected, each secondary RTI program is unique due to the complexity of a secondary schedule. The District in this study created the Tier 2 Intervention program to meet the students' needs without disrupting the schedules of the teachers involved. The school calendar was separated into four-week progress periods during which students identified for Tier

2 Intervention received Tier 2 Intervention support. Once the students placed in the Tier 2 Intervention completed the four-week cycle, they were reassessed. The Tier 2 Intervention took place outside of the regular class period during what is referred to as “W.I.N.”, a 20-minute class period embedded in the school day. During W.I.N., students reported to a designated classroom or area based on their placement for that particular progress period. Those students who were placed in the Tier 2 RTI program for Biology reported to their Tier 2 instructor to receive guided instruction on the material they learned during the preceding regular class period.

All Biology students took a checkpoint exam before each progress period commenced. This checkpoint exam consisted of five to seven multiple choice questions about content previously taught in the regular class period. The team of Biology teachers and the special education teacher reviewed the checkpoint exam scores and compiled a list of students who were ideal candidates for the Tier 2 Intervention. The teachers looked for students who they anticipated would be receptive to Tier 2 Intervention assistance. Furthermore, the teachers sought individuals for the Tier 2 program who would have minimal discipline issues to not distract from the learning environment.

The curriculum taught during the intervention period hinged on four spiral goals, objectives in Biology that were most important for future learning. All instruction focused on these four goals, with one individual goal being a progress period's focal point. Teachers retaught the material of a given unit and then provide guided practice and formative assessments to assess progress and learning gaps. Finally, a summative assessment, the post checkpoint exam, was given at the end of the four-week progress period to assess the growth of students during the progress period.

COVID-19 fostered some new challenges. Prior to COVID-19, students were placed with their Tier 2 instructor based on their checkpoint exam scores. For example, all students who scored a 0, 1, or 2 would be placed with "Teacher A" even though "Teacher A" might not have been the students' regular Biology teacher. Further, all students who scored a 3 or 4 might be assigned to "Teacher B", again even though "Teacher B" might not have taught all the 3 and 4 scoring students in "Teacher B's" regular Biology class. This method of assigning teachers to students under the Tier 2 Intervention program allowed teachers to break down the content appropriately based on the needs of each group of students. However, due to the need for contact tracing caused by the pandemic, students were kept with their primary Biology teacher for the Tier 2 instruction during Progress periods 1-3 for this study. Additionally, due to COVID-19 social distancing requirements, the target number of students for each teacher was reduced from 10-12 to 3-5 during progress periods 1-3, significantly cutting the number of students who could participate in RTI.

Quantitative Analysis

The quantitative data were collected through the use of archival school data in the form of exam scores, semester grades, and EOC proficiency levels. These data were analyzed and used to answer one of the research questions selected for this study.

Research Question 1

Question 1: How does a RTI Tier 2 Intervention at the secondary level affect student achievement in Biology?

Checkpoint Exam Scores

A total of 130 student participants completed at least one pretest and posttest throughout the duration of the 2020-2021 school year. There were originally 144 participants in the study

and 14 were removed from the analysis because a pretest and/or posttest score was not available. A *t*-test on 130 participant scores was conducted to determine whether significant differences existed between each group's pretest and posttest scores. According to Gravetter and Wallnau (2013), a t-test evaluates the mean difference between two sets of scores obtained from the same group of individuals.

Table 1 describes the mean pretest score and posttest score for the students who participated in the Tier 2 Intervention within each progress period. The pretest and posttest did not contain the exact same questions but each question on the pretest had a corresponding question on the post test that on the same learning objective. Each test had a maximum score of seven points.

Table 1
Progress Period Tier 2 Academic Performance

Categories	*Pretest Score* *M*	*Posttest Score* *M*
Tier 2 Progress Period		
Progress 1	2.71	4.29
Progress 2	1.77	5.64
Progress 3	2.50	5.93
Progress 4	2.71	3.36

Note. N = 130. All Students Mean Pretest Score = 2.42 and All Students Mean Posttest Scores = 4.81.

The researcher conducted a dependent *t*-test on each group to determine whether there was a significant difference between pretest and posttest scores for each progress period. Based on a *t-critical two-tail* of 1.96 the results indicated that the mean pretest score for Progress 1 (M=2.71, SD=0.94) was significantly different than the mean posttest score for Progress 1

(*M*=4.29, *SD*=2.36), *t(68)* =1.99, *p* <.05. The mean pretest score for Progress 2 (*M*=1.77, *SD*=1.13) was significantly different from the mean posttest score for Progress 2 (*M*=5.64, *SD*=1.61), *t(42)* =2.01, *p* <.05. The mean pretest score for Progress 3 (*M*=2.5, *SD*=1.12*)* was significantly different than the mean posttest score for Progress 3 (*M*=5.93, *SD*=1.03, *t(54)* =2.00, *p* <.05. The mean pretest score for Progress 4 (*M*=2.71, *SD=1.29*) was significantly different from the mean posttest score for Progress 4 (*M*=3.26, *SD*= 1.23, *t(88)* =2.00, *p* <.05. The posttest mean scores for each progress were significantly higher than the pretest mean scores. Since the pretest and posttest for each progress were aligned to the same learning standards, the significant difference in each progress period between the pretest and posttest indicates that the Tier 2 Intervention was successful in helping students grow in their content knowledge.

Semester Grades

A *chi-square test* on 506 student participants' fall semester letter grades was conducted to determine whether significant differences existed between Fall 2019 semester grades, a semester prior to the Tier 2 implementation and Fall 2020 semester grades, the first semester of the Tier 2 implementation. A *chi-square test* on 566 student participants' spring semester grades was conducted to determine whether significant differences existed between the Spring 2019 semester grades, a semester prior to the Tier 2 implementation and Spring 2021 semester grades, the second semester of the Tier 2 implementation. Due to the COVID-19 pandemic, the district in this study was not in session from March to May of 2020 therefore, the semester grades from Spring 2020 were not used, and instead, Spring of 2019 were used as they are a more accurate depictions of grade distribution prior to the implementation of the Tier 2 Intervention. This study

used letter grades and according to Gravetter and Wallnau (2013), a chi-square test was used because it evaluates the significance between non-numerical variables.

Table 2 describes the number of students receiving the designated letter grade for the Fall semester.

Table 2
Biology Fall Semester Letter Grades Summary Table

Categories	*n*	*%*
Fall 2019		
A	23	9.2
B	81	32.2
C	71	28.3
D	53	21.1
F	23	9.2
Fall 2020		
A	30	11.8
B	77	30.2
C	72	28.2
D	49	19.2
F	27	10.6

Note. N = 506

Table 3 describes the number of students receiving the designated letter grade for the Spring semester.

Table 3
Biology Spring Semester Letter Grades Summary Table

Categories	*n*	*%*
Spring 2019		
A	40	13.4
B	93	31.2
C	74	25.0
D	62	21.0
F	28	9.4
Spring 2021		
A	35	13.1
B	92	34.3
C	60	22.4
D	54	20.1
F	27	10.1

Note. N = 566

A chi-square test for independence was performed to examine the relationship between Biology semester grades during the Fall 2019 and Spring 2019 semesters, both of which were prior to the implementation of the RTI program and Biology semester grades during the Fall 2020 and Spring 2021 semesters, following the implementation of the RTI program. The difference between the fall semesters was not significant, X^2 (1, N = 506) = 1.47, p = .83. There was not a difference in Biology semester grades between the two semesters studied, X^2 (1, N = 566) = 0.83, p = .93. There was not a difference in Biology semester grades between the two semesters studied.

End of Course Exam Proficiency Levels

A total of 634 participants completed the Biology EOC and were selected for this study due to their enrollment in Biology. Due to the COVID-19 pandemic, the Biology EOC was not administered during the 2019-2020 school year and therefore the 2018-2019 scores were used for analysis. A *chi-square test* on 634 participant scores was conducted to determine whether significant differences exist between Biology groups based on EOC proficiency levels

Table 4 describes the percentage of students receiving the designated EOC proficiency levels.

Table 4
Biology EOC Proficiency Levels Summary Table

Categories	*n*	*%*
EOC Proficiency Levels 2018-2019		
Advanced	38	13
Proficient	84	29
Basic	129	45
Below Basic	37	13
EOC Proficiency Levels 2020-2021		
Advanced	70	20
Proficient	96	28
Basic	148	43
Below Basic	32	9

Note. N = 634

A chi-square test for independence was performed to examine the relationship between Biology EOC proficiency levels during the 2018-2019 school year, prior to the implementation of the RTI program and Biology EOC proficiency levels during the 2020-2021 school year,

following the implementation of the RTI program. The difference between these variables was not significant, X^2 (1, N = 634) = 6.69, p = .082. There was not a difference in Biology proficiency levels between the two years studied. While the chi-square analysis did not show a significant difference in Biology EOC proficiency levels after the Tier 2 Intervention there was a 6% increase in students scoring advanced or proficient on the Biology EOC exam.

Qualitative Data Analysis

The qualitative data were collected through a student survey and a teacher focus group interview. This data was analyzed and used to answer one of the research questions selected for this study.

Research Question 2

Question 2: What are the perceptions of teachers and students regarding their involvement in the RTI Tier 2 intervention?

Teacher Focus Group Interview

A teacher focus group interview was conducted with three Biology teachers who taught the Biology course and implemented the Tier 2 Intervention. This interview took a semi-structured approach and focused on two main aspects of the Tier 2 Intervention, its impact on student grades and student behavior. Like most aspects of the 2020-2021 school year, the COVID-19 pandemic posed significant changes to the original RTI program. Adopting a new bell schedule, contact tracing, and social distancing were just some of the factors that had to be taken into consideration and which posed problems for the original program structure and curriculum. One teacher reflected that the pandemic caused excessive stress on Biology teachers to plan and execute an effective intervention period while also adhering to the COVID-19

protection guidelines. The Tier 2 Intervention became an additional prep to their already full course schedules.

Student Behavior.

All participating teachers concurred that the success and the failure of the program hinged on the students' motivation. If a student was motivated to learn the material or at least improve his or her grade, the teachers unanimously said they saw success within that students due to the Tier 2 Intervention; however, the same could not be said for students who were not motivated to learn the material. The unmotivated students' grades did not improve and those students then negatively impacted the students around them.

All three teachers felt that the Tier2 Intervention had a positive impact on student behavior overall. One teacher reflected on the impact it had on building student-teacher relationships. This particular teacher who was able to build a relationship with an introverted student following the first progress explained,

> Student #1 in my mind was shy. Afraid to ask questions. This student landed themselves in RTI during the first cycle and I was able to determine the cause. From that point on, I selected that student to deepen their understanding. The student became more comfortable and began asking for help because they knew it would be provided.

The other teachers attested to similar experiences noting that the smaller class size allowed for better relationship building which lead to more personable motivation strategies.

During the regular class time, teachers noticed that students who had previously entered RTI were more focused and better at time management. The teachers suggested that this increased focus and efficiency could be attributed to the students' desires to avoid being again placed in the RTI program or perhaps, more optimistically, the improvement was due to increased student confidence and motivation. One teacher noted, it improved self-confidence for those students who fully engaged in the process. Success in RTI gave them confidence in the

regular classroom environment. Students who entered RTI often were behind on multiple assignments because they did not understand the material to complete the assignments. Once the trailing students learned the material they could catch up on those missing assignments, giving them more confidence and motivation to stop the downward spiral and redirect themselves for success.

Student Motivation.

The teachers felt that they were still able to reach some of the students who entered the Tier 2 Intervention without any motivation and perhaps a negative attitude toward their placement in the program, helping those students to change their trajectory. One teacher said extrinsic motivation really helped;

> They knew they had the opportunity to redo assignments within my course if they completed the RTI assignments and mastered them. Students who were interested in actually understanding the concept or the opportunity to improve their grade, increased their grade significantly. One student, due to absence, was able to go from a "F" to a "C" during one cycle. Others that worked often went from a minus to a plus or maybe made it to the next letter grade.

Another teacher explained that building relationships with students was the key; figuring out they were struggling and elevating those needs really helped to motivate them. Finally, one teacher felt giving students short instructional goals to accomplish each day and taking what seems like an overwhelming experience and breaking it into more manageable pieces helped motivate students.

Although none of the teachers stated that they noticed the students grow a love or passion for Biology, they did observe growth in student confidence. One teacher reflected that they had multiple conversations with students discussing how prior to the Tier 2 Intervention, those students felt science was impossible but after receiving more one-on-one instruction, success in Biology became feasible. That teacher reflected,

> Several students were able to realize that they were actually decent at science and started working better within the regular classroom. Those that don't enjoy science to begin with are not going to be more excited about the work after having to complete more work, even if their grade does improve. The enjoyment, I would say, would look more like confidence than cheers.

The three teachers attributed this growth in confidence to the small group setting and being able to teach students better time management strategies. By relearning the material, the students' scores on assessments improved, fostering the scenario for their self-confidence to grow. The students were able to equate the effort they put forth with a better grade in Biology. Though it was evident to these teachers that student confidence grew, the teachers could not see as large an impact on grades or the tendency for these students to pursue more advanced science courses or careers in the science field. Due to the pandemic, the number of students allowed into the Tier 2 Intervention was minimal. The teachers attested to improvement in the grades of the students who took the Tier 2 Intervention program seriously. One student's grade even improved by two letter grades in a four-week time frame.

Areas of Improvement.

Although the teachers felt that the program was beneficial in some aspects, they also saw many areas where the program could improve. One teacher discussed the challenges associated with the stigma of RTI. They thought motivation would always be a problem. They went on to explain that there was a need to find a better way to destigmatize or incentivize students to participate to their full potential. Within the district of this study, there are RTI programs in place for each core subject and that has created the reputation that RTI is for students who are "dumb" or "behind." This stigma left Biology teachers with the challenge of convincing students being placed in RTI that it was actually positive rather than a punishment.

Another noteworthy reflection was the difference between progress periods. The first progress was early in the school year and due to the pandemic, the administration wanted to limit student travel between classes during the intervention time. The Biology teachers tried a series of video lectures and independent practice where students who were in the Tier 2 Intervention remained in their homeroom and worked on the material independently. All three teachers reported minimal participation during this stage. During the second and third progress period students were allowed to relocate to their Biology teachers' classrooms for the intervention and they saw much better participation as they were there themselves, re-teaching and monitoring student progress. The fourth progress was focused on EOC remediation and did not impact student grades. The three teachers said this was the hardest progress period because without the chance of improving their grade, the students were not motivated to complete the extra practice. Progress four resulted in the lowest posttest checkpoint scores and the most behavioral issues when compared to the other three progress periods.

When asked what advice these teachers might have for a district or team of teachers implementing a similar program, it was unanimous that teachers participating in the program should front load as much of the preparation as possible before the start of the school year. One teacher elaborated that it was best to front-load the assessment and remediation pieces. They suggested it was imperative to consider both academic deficits that need to be remedied as well as engagement when selecting students for RTI. This team of teachers gathered the summer before implementing the program and wrote the implemented curriculum which included spiral goals, lesson plans, and the pre and post checkpoint exams for each progress period. One teacher reflected that the preparation made for a much smoother school year as the regular classroom requires a significant amount of preparation and attention and that had they not planned ahead

for the RTI program, either their regular classroom planning or the RTI program preparations would have been neglected.

Student Survey

In May of 2021, following the conclusion of the Biology course and RTI, a student survey was administered. Participation in the student survey required parental consent. Parental consent requested of the parents and guardians of the over 500 students enrolled in Biology. Permission forms for 74 students were returned. Twenty-four of the 74 students indicated on the survey that they participated in RTI at least once during the 2020-2021 school year. One surveyed student did not agree to the terms and conditions of the survey; thus 23 surveyed responses were accepted. These 23 accepted survey responses comprise the "sample population" discussed throughout the remainder of this section.

Tier 2 Experience.

The sample population of students in this study were asked a series of questions using a Likert scale regarding how the Tier 2 Intervention impacted their understanding of the Biology curriculum. Students were asked if they had a positive experience with the Tier 2 Biology Intervention. Seventy percent of the population agreed that participation in Tier 2 Biology Intervention was a positive experience. Twenty-six percent of the surveyed population remained neutral as to their experience with Tier 2 Biology Intervention. Only one student's survey response indicated that they disagreed with the statement that participation in Tier 2 Biology Intervention was a positive experience.

Effect on Content Knowledge.

Fifty-six percent of surveyed students stated that they learned concepts in RTI that they did not understand during their regular Biology instruction. Only 4% indicated the opposite.

Forty percent of the survey population were neutral, meaning that they did not state whether or not they learned concepts in RTI that they did not comprehend when taught during traditional Biology. When asked if the content taught in RTI helped students improve their grade, 70% of students agreed that RTI helped improve their grades and 4% did not. Students were also asked if they scored better on their assessments because of the additional practice they received through RTI. Sixty-one percent of students submitted a neutral response to this inquiry, while 35% agreed and 4% disagreed. Though the survey results came from a very small population of students, the conclusion that can be drawn is that the majority had a positive experience in the Tier 2 Intervention. Consequently, the majority of the surveyed population saw grade improvement correlating to the RTI instruction.

Effect on Self-Efficacy.

Although one of the major priorities of Tier 2 Intervention was curriculum comprehension, facilitating improved student self-efficacy was equally pursued. The student population was asked if they gained confidence in Biology concepts during the intervention period and 43% of students agreed that they did gain self-confidence while 52% of students remained neutral and only one student disagreed with the statement. When asked if RTI motivated them to try harder in the regular classroom, 39% of the student population agreed that RTI motivated them while 13% disagreed. The survey also revealed 39% of students agreed that they were more engaged in their regular Biology class after obtaining RTI support while 9% disagreed with the same statement. A majority of students had a positive experience with the Tier 2 Intervention when compared with those that did not. However, a majority of surveyed students marked neutral responses in answer to questions about the impact of RTI on their self-efficacy. Such neutral responses render it impossible to draw definite conclusions as to the impact of the

Tier 2 Intervention on student self-efficacy. It was also inquired of the population whether they had an interest in pursuing a career in a science field before taking Biology and if that changed after taking Biology. The responses indicated that 8 of 23 students prior to taking Biology were not interested in a science related career, but after taking Biology, they became interested in such a career. Additionally, 13 of 23 students indicated a neutral response to the above stated question and two students indicated the opposite effect suggesting that prior to taking Biology, they were interested in a career in the science field whereas after taking Biology, those two students were no longer interested in a science involved career. It was the hope that the intervention would give students more confidence which would result in a desire to pursue science related careers. There was not a large enough sample size to draw a strong conclusion for or against the impact of the intervention on the aspirations of students to pursue science in the working world.

Data Summary

This study sought to answer the following research question.

Question 1: How does a RTI Tier 2 Intervention at the secondary level affect student achievement in Biology?

Question 2: What are the perceptions of teachers and students regarding their involvement in the RTI Tier 2 intervention?

When determining if RTI Tier 2 Intervention at the secondary level has an impact on student achievement, the quantitative results of this study indicated there was a significant difference between student achievement before receiving the Tier 2 Intervention and after receiving the Tier 2 Intervention. However, when comparing yearlong measurement tools such as EOC proficiency levels and semester grades, the results indicated there was not a significant difference between semester letter grades or EOC proficiency levels before and after Tier 2

implementation. The qualitative results shed light on these findings. The teacher focus group interview revealed that the Biology teachers felt the RTI program was successful at improving content comprehension if they were intrinsically motivated. The student survey results strongly indicated that after receiving the Tier 2 Intervention, students did see an improvement in their content knowledge and that was reflected in their regular classroom grades.

When determining if RTI Tier 2 Intervention at the secondary level has an impact on student self-efficacy, the results of the teacher focus group interview and student survey were not as clear. Both sample populations were very small which inhibited the surveyor's ability to draw generalizable conclusions from the results. Though the results did not indicate the intervention inhibited student self-efficacy, the survey did not clearly indicate it strongly improved students' self-efficacy either.

CHAPTER FIVE – DISCUSSION, RECOMMENDATION, CONCLUSION

Problem

RTI is a historical intervention program used to determine if a student is responding to high-quality instruction and intervention methods. It has been widely used at the elementary level but there has been minimal research conducted at the secondary level (Samuels, 2009). Secondary education lends itself to complex schedules and therefore does not offer a one-size fits all implementation model for which the elementary setting allows. The complexity of the educational schedules of secondary level students prompted educators to create RTI models that uniquely fit individual schools' varying needs. This particular study focused on the implementation of an RTI model in the core subject of Biology at Republic High School, the only high school in the Republic School District. The Republic School District reported that 30% of students received a D or F in Biology during the 2018-2019 school year. In addition, 38% of students scored basic and 11% scored below basic on the Biology end of course (EOC) exam during the 2018-2019 school year.

The inability for students to understand and retain the curriculum results in low self-efficacy. Low self-efficacy in science creates a reluctance to pursue further science courses and science careers. This problem is evidenced by the drastic drop in enrollment of students in elective upper-level science courses outside of the required courses. Students select a subject concentration based on the assumption they will succeed in that subject (Astin, 1993; Britner, 2008). Therefore, self-efficacy plays a vital role in students' declaration of majors.

The purpose of this study is to evaluate the effectiveness of a Tier 2 Intervention program on student achievement and student self-efficacy in Biology. This study's research is centered around two main questions:

Question 1: How does a RTI Tier 2 Intervention at the secondary level affect student achievement in Biology?

Question 2: What are the perceptions of teachers and students regarding their involvement in the RTI Tier 2 intervention?

The goal of this study is to determine if Tier 2 Interventions should be used in core subject areas at the secondary education level.

Literature

The social cognitive theory states the shared interactions among individual, behavioral, and environmental factors determine individuals' behavior (Bandura, 1986). Within these interactions, people contribute to their own motivation and shape the course of events. Existing research found that science self-efficacy correlates strongly with science achievement and science-related choices across varying grade levels. Specifically, at the secondary level, science self-efficacy is a better predictor of achievement and engagement with science-related activities in and out of the classroom than are gender, ethnicity, and parental background (Britner & Pajares, 2006).

One intervention to address low student self-efficacy, RTI, was first created to provide students multiple opportunities to understand the content in various settings depending upon the students' comprehensive needs. Elementary schools have adopted RTI and implemented the three tier system with great success; however, there is little research regarding the implementation of RTI at the secondary level (Samuels, 2009). Secondary schools must take a slightly different approach when implementing RTI focusing on what is best for each school's students, teachers, and environment. Nonetheless, overarching themes become apparent in secondary programs' implementation of RTI, such as a focused curriculum, a method for selecting students,

professional development for teachers, and strong communication opportunities for all stakeholders. Though curriculum can take different shapes regardless of content level, the content taught during an intervention period should consist of explicit instruction and assessments in vocabulary, comprehension, and interpretation skills.

Data Collection

This study had two groups of participants, Biology students and Biology teachers. All students enrolled in Biology during the implementation year were potential candidates for inclusion in the research study. There were 350 students enrolled in Biology in the Republic School District during the implementation year, primarily sophomores in high school. All students enrolled in Biology took a checkpoint exam following a period of instruction. If a student scored below the cut score on the checkpoint exam, that student would then receive Tier 2 Intervention. The students' Biology EOC Proficiency Levels, semester grades, and checkpoint exam grades were used as quantitative data. Students who participated in RTI also took a self-reflecting survey at the end of the year. Three Biology teachers were selected for this study because they were directly implementing the Tier 1 and Tier 2 portion of the RTI program. This group of teachers provided their observations and opinions on the program's effect on student self-efficacy. The teachers were asked to participate in a voluntary focus group.

Data were collected in the form of a focus group interview, a student survey, and several forms of archival data. The goal of the focus group interviews was for the researcher to learn about teachers' perceptions about the implementation of RTI and its impact on students' self-efficacy. The goal of the student survey was for the researcher to learn about the students' personal perceptions of self-efficacy in Biology. In addition to a focus group interview and a student survey, quantitative data were collected in the form of archival data. Biology EOC exam

EOC Proficiency Levels were examined from the 2016-2017, 2018-2019, and 2020-2021 school years. Biology semester one and semester two grades were analyzed from the 2016-2017, 2017-2018, 2018-2019, 2019-2020, and 2020- 2021school years. The archival data were used to exemplify the test scores and grades that were indicative of the District's performance before RTI implementation and after the implementation. During the RTI implementation school year, 2020-2021, checkpoint exam scores were collected. Students were placed in the Tier 2 Intervention based on their initial checkpoint score. Following the Tier 2 instruction, said students took a similar checkpoint exam. The pre and post checkpoint scores were examined and compared to track growth.

Data Analysis

The t-test showed a significant difference between students' pretest scores and post-test scores evidencing the success of the RTI Tier 2 Intervention at improving students' achievement. Qualitative findings from the teacher focus group interview and student survey also spoke to the positive impact of the Tier 2 Intervention. The teachers who implemented the Tier 2 Intervention attested that students who put forth an effort during the RTI time demonstrated significant improvement in their content knowledge and consequently their Biology grade. According to the student survey results, a large majority of students saw improvement in their Biology grade after receiving RTI. The t-test showed that there was not a significant difference between students' semester grades and EOC Proficiency Levels 2018-2019 prior to the implementation of the Tier 2 program with the grades and scores earned during the implementation year. In addition, the student survey and teacher focus group interview did not generate any specific data supporting the idea that the RTI program improved student self-efficacy.

The COVID-19 pandemic played a major role in the execution of the program during the 2020-2021 school year. Due to social distancing requirements and a change in the school's master schedule, only a small population of students were able to participate in the RTI program. This made larger data analysis such as comparing EOC proficiency levels and semester grades or conducting a student survey challenging. Also, within the study there were four progress periods. During the first progress period, students were placed in an online module. As the data reveals, there was less of a significant difference between the pre and post test scores from that progress period than compared to the pre and post test scores for progress periods 2 and 3 where students reported to their Biology teacher every day. Additionally, progress period 4 focused on EOC review and did not have as strong of a tie to their Biology grade. Progress period 4 had a less significant impact on the difference between the pre and post test scores than the impact progress periods 2 and 3 generated. The conclusion drawn from these findings is that students were most successful in a seated RTI course instead of virtual modules to complete without direction of a Biology teacher. It was also concluded that students were motivated by extrinsic factors such as their Biology grade.

Further Studies

The RTI Tier 2 Intervention can be implemented at the secondary level despite the complexity of the school day schedule for both teachers and students. This study showed that the RTI Tier 2 Intervention can improve student content knowledge; however, the findings fell short of proving a positive impact on student self-efficacy.

The data analysis methods chosen were successful in answering the research questions. However, improvements could be made to the collection of qualitative data. Specifically, improvements could be made to the collection of data aimed at determining the impact Tier 2

intervention had on student self-efficacy. For example, a larger sample size would have benefited the study survey results. The twenty-three student survey population falls short of adequately representing three-hundred students accurately. Many students who participated in the Tier 2 intervention did not complete the student survey and therefore their opinions were not considered. A survey representing a more complete participating population would have better represented the effect of the Tier 2 Intervention on student self-efficacy.

One of the most powerful tools used to analyze the qualitative data piece of student self-efficacy was the teacher focus group interview. This teacher focus group interview was conducted only once at the conclusion of the school year. The placement of this teacher focus group interview at the end of the school year required teachers to reflect on events that occurred up to 10 months prior to the interview. The focus group interviews could be administered after each progress period to capture events directly after they occurred. More frequent focus group interviews would likely provide better examples of specific students' successes or failures as well as a more comparative analysis between each progress on what was successful and what could be changed before the next progress period.

A reflective aspect of the Tier 2 implementation is the differences between progress periods. Students showed the greatest improvement during progress period 2 and 3. Progress periods 2 and 3 allowed for students to relearn the material and then reassess their assignments, in turn improving their grade. This extrinsic motivation was reflected in the students' overall motivation and willingness to participate during the intervention time.

The checkpoint exam scores were an effective way to determine whether a student needed to be placed in RTI; however, it should not be the only tool used to sort students. The team of teachers should take a holistic approach to determine which students need intervention.

This comprehensive approach should consider students' absences, summative scores on unit exams, and behavioral issues. If a student experiences an extended absence, such as a surgery or vacation, RTI would be very helpful in front loading information or catching a student up on what they missed. If a student is routinely absent because they have poor attendance practices, RTI could also be a worthwhile tool to keep that student accountable and help him or her catch up on quickly moving content. Summative exam scores are also extremely eye opening. If a student scores poorly, perhaps RTI would help that student relearn the material and allow for exam reassessment. Finally, RTI is not a place for students who have major behavioral issues. Significant behavioral issues can distract from the learning environment and therefore it is imperative to determine students' skills before placing them in the Tier 2 Intervention.

It would also be informative to assess the Tier 2 implementation program over a course of multiple years especially since the year of implementation that was analyzed was during the COVID-19 pandemic. There were aspects of the program that were changed solely due to the pandemic that could have played a role in data analysis. These changes included the number of students selected for RTI, the placement of those students with other peers struggling at their same level, and the scheduled time RTI met and the teacher assigned to teach the RTI students. These changes to the program were temporary and will be reversed after COVID restrictions lighten. Future researchers could also consider assessing the implications a Tier 2 program has on other core subject areas outside of science and perhaps other ideas on the structure of the program such as when the intervention takes place, how often students meet for the intervention, and how long students are placed in the intervention.

There are a multitude of adaptations that could improve how a Tier 2 Intervention is structured and implemented, specifically how a program such as this could move the needle on

self-efficacy. To begin, in addition to the Biology curriculum, teachers should include lessons that will improve the students' learning abilities as a whole. Improving students' reading levels by teaching them different ways to approach a complex passage or how to summarize a long passage into their own words to analyze their understanding of the content are just a few examples. Study skills, time management, and organization are also areas in which increased focus and teacher guidance would be of benefit. Another area in which the intervention program could foster growth is by linking content knowledge to real world application. If students are able to connect what they are learning in the classroom to a use outside the classroom or after high school, then students are more apt to buy into the importance of what they are being taught. Prior to the COVID-19 pandemic, the RTI structure placed students in groups based on their performance on the checkpoint exam. For example, all Biology students who scored a 1 were placed with Teacher A and all students who scored a 4 were placed with Teacher B. Teacher A might not have these students in their regular Biology class but they could have them in RTI. This placement was chosen because students who scored a 1 had a lot of misconceptions and knowledge gaps from the content but students who scored a 4 might just be confused on one learning goal. This placement allows for the teacher to better target the students' needs and move at a pace contoured to each student’s learning needs. Due to the pandemic and the requirement for contact tracing students were not divided up this way. Instead, students stayed with their Biology teacher for their checkpoint score, therefore each Biology teacher had a blend of students with different learning needs.

The implementation of RTI seems like a daunting task at the secondary level due to the complexity of both student and teacher schedules. However, despite some challenges, this study has demonstrated that RTI can be successfully implemented at the secondary level. It revealed

that it was possible to incorporate individualized instruction outside of the regular class time within a high school schedule to better support struggling learners. The researcher noted that many students who participated in the program were able to repair some of the poor study and learning habits ingrained in them from previous educational experiences. The researcher also demonstrated that it was possible to easily identify students needing intervention and assess said students' individual growth. As noted throughout the study, there were areas where improvement or evolution is necessary. However, the most encouraging result of this study is that the results indicate that the Tier 2 intervention could be implemented in high schools across the country and could be expanded throughout other core subjects such as History, Mathematics and English. Tier 2 intervention could certainly help improve students' performances on state tests such as EOCs as well as standardized tests such as the American College Testing (ACT). This possibility is exciting because the universal struggle of low self-efficacy and low student achievement is not a problem limited to the world of science within secondary educational atmospheres but is a struggle felt in many different areas of learning.

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Appendix A: RTI Tier 2 Intervention Online Student Survey

Student Survey

RtI (Response to Intervention)

* Required

1. What was your first semester Biology grade? *

Mark only one oval.

- A
- B
- C
- D
- F

2. Before taking Biology, I had an interest in pursuing a career in a science field. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

3. After taking Biology, I have an interest in pursuing a career in a science field.

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

4. What science course do you plan to take next school year? *

Mark only one oval.

- Chemistry I
- Chemistry II
- AP Biology
- Anatomy & Physiology
- Physics
- Medical Interventions
- Biology Inquiry
- Earth & Space
- Forensics/Environmental Science
- I am not taking a science course next year.
- Online Science Course Option

5. Were you drafted into a Biology RtI WIN cycle? *

Mark only one oval.

- Yes
- No

6. If so, how many times were you drafted into a Biology RtI WIN cycle? *

Mark only one oval.

- 1
- 2
- 3
- 4
- I was not drafted into a Biology RtI WIN cycle.

7. I understand the purpose of RtI. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

8. During Biology RtI, I learned concepts that I didn't understand when I was in the regular Biology classroom. * *Mark only one oval.*

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

9. During Biology RtI, I learned information that helped me improve my Biology grade. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

10. During Biology RtI, I gained self-confidence in Biology concepts. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

11. I scored better on my assessments because of the additional practice I had in RtI. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

12. The instruction I received during RtI motivated me to try harder in the regular classroom. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

13. If RtI time was not built in, I would not have been as successful in Biology. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

14. I had a positive experience with Biology RtI. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

15. I was more engaged in regular class after getting RtI support. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

16. I gave my best effort during RtI. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

17. I had a positive experience in Biology class. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

18. I am likely to enroll in a challenging upper-level science course.

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

19. I enjoyed learning Biology concepts.

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

20. In my opinion, I was successful in Biology this year.

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

21. How did RtI give you the confidence to overcome the challenging lessons in Biology?

22. How did receiving RtI help motivate you to do better in the regular classroom?

23. What aspects of RtI did you like?

24. What aspects of RtI could be improved?

25. What science course(s) are you enrolled in next year?

Appendix B: Parental Consent for Participation in Online Student Survey

Parent Consent for Participation in Online Survey Research

TITLE OF RESEARCH PROJECT: The Effect of Tier 2 Intervention on Student Achievement & Self Efficacy

Name of Principal Researcher: Cheyenne Hill
Name of Faculty Advisor: John Pijanowski, Ph.D.

A. Purpose and Background

Students are invited to participate in a research study. Participation is completely voluntary. If a parent or guardian agrees to let their child participate now, the parent or guardian can always change their mind later. There are no negative consequences, whatever the parent or guardian decides.

The purpose of this study is to evaluate the effectiveness a Tier 2 intervention program has on student achievement and student self-efficacy in the secondary science course, Biology. The survey will be a time to reflect on the implementation of the Tier 2 intervention. The information collected at this time will be used to determine the success of the Tier 2 intervention on improving student self-efficacy. All students enrolled in Biology were invited to take this survey. This survey will take approximately 15-30 minutes in length and be given during the regular class period.

B. Voluntary Participation and Right to Discontinue

Student participation in this survey is voluntary and if the student decides not to participate in the study, or withdraw from the study at any time, including exiting from the electronic survey, the student will not be penalized. The student has the right to not answer any questions which make them feel uncomfortable or to end their participation in the survey altogether, at any time, by exiting the survey. No one from the school district or the University of Arkansas will be told. A Parent or guardian is aware that participants typically spend 15-30 minutes completing the survey which consists of 14 multiple choice questions and 5 free response questions.

C. Risks and Benefits

The parent or guardian understands this research study has been reviewed and approved by the Institutional Review Board (IRB) for Studies Involving Human Subjects at the University of Arkansas. There are no foreseen risks to those participating in this survey. By participating in this survey the student will be contributing to the existing research of the RTI program at the secondary level.

D. Confidentiality

All responses to the electronic survey will be kept confidential such that individual survey responses will not be personally identifiable. No identifying information, including student email addresses, will be used in the written transcription of this study and will not be collected.

Data collected in this study will be stored on a password protected cloud-storage service for use only by the principal researcher. Prospective use of data will adhere to standard data use policies which de-identify individuals and institutions. All information collected will be kept confidential to the extent allowed by law and University policy.

E. Questions

The parent or guardian has read and understands the explanation provided. The parent or guardian had all questions answered to their satisfaction.

For further information or questions, please contact:
Cheyenne Hill, Principal Researcher: cheyenne.hill@republicschools.org or ch083@uark.edu
Dr. John Pijanowski, Faculty Advisor: jpijanow@uark.edu

For questions or concerns about your rights as a researcher participant, please contact the University of Arkansas IRB by email at irb@uark.edu, by phone 479-575-2208, or on campus.

F. Informed Consent

I understand that by signing below, I voluntarily agree to allow my child to participate in this survey. I consent to the terms of my child's participation in this study's.

_____

Students Name (printed)

_____ _____

Parent or Guardian Signature Signature Date

Appendix C: Consent for Participation in Online Survey

Consent for Participation in Online Survey Research

TITLE OF RESEARCH PROJECT: The Effect of Tier 2 Intervention on Student Achievement & Self Efficacy

Name of Principal Researcher: Cheyenne Hill
Name of Faculty Advisor: John Pijanowski, Ph.D.

A. Purpose and Background

The purpose of this study is to evaluate the effectiveness a Tier 2 intervention program has on student achievement and student self-efficacy in the secondary science course, Biology. The survey will be a time to reflect on the implementation of the Tier 2 intervention. The information collected at this time will be used to determine the success of the Tier 2 intervention on improving student self-efficacy. All students enrolled in Biology were invited to take this survey. If students decide to participate, this survey will take approximately 15-30 minutes in length.

B. Voluntary Participation and Right to Discontinue

Student participation in this survey is voluntary and if the student decides not to participate in the study, or withdraw from the study at any time, including exiting from the electronic survey, the student will not be penalized. The student has the right to not answer any questions which makes them uncomfortable or to stop participating in the survey altogether, at any time, by exiting the survey. No one from the school district or the University of Arkansas will be told. The student is aware that participants typically spend 15-30 minutes completing the survey which consists of 14 multiple choice questions and 5 free response questions.

C. Risks and Benefits

The student understands this research study has been reviewed and approved by the Institutional Review Board (IRB) for Studies Involving Human Subjects at the University of Arkansas. There are no foreseen risks to those participating in this survey. By participating in this survey the student will be contributing to the existing research of the RTI program at the secondary level.

D. Confidentiality

All responses to the electronic survey will be kept confidential such that individual survey responses will not be personally identifiable. No identifying information, including student email addresses, will be used in the written transcription of this study and will not be collected.
Data collected in this study will be stored on a password protected cloud-storage service for use only by the principal researcher. Prospective use of data will adhere to standard data use policies which de-identify individuals and institutions. All information collected will be kept confidential to the extent allowed by law and University policy.

E. Questions

The student has read and understands the explanation provided. The student has all questions answered to their satisfaction.

For further information or questions, please contact:
Cheyenne Hill, Principal Researcher: cheyenne.hill@republicschools.org or ch083@uark.edu
Dr. John Pijanowski, Faculty Advisor: jpijanow@uark.edu

For questions or concerns about your rights as a researcher participant, please contact the University of Arkansas IRB by email at irb@uark.edu, by phone 479-575-2208, or on campus.

F. Informed Consent

I understand that by clicking agree, I voluntarily agree to participate in this survey. I consent to the terms of my participation in this study and I will be directed to the survey questions.

Appendix D: Focus Group Interview Questions

Research Questions:

1. How does RtI Tier 2 intervention at the secondary level impact student achievement in Biology?
2. How does RtI Tier 2 intervention at the secondary level impact student self-efficacy in Biology?

Interview Protocols:

This interview will be conducted as a reflection piece for the implementation of RTI, specifically Tier 2 intervention in the Biology classrooms at Republic High School. The results will be used to answer the second research question: How does RtI Tier 2 intervention at the secondary level impact student self-efficacy? This is a focus group interview with the three Biology teachers and one Special Education teacher who were directly involved in the implementation of the intervention.

Interview Questions:

Introduction

1. What are some of your reflections on the RtI process this year and what effect did it have on Biology student behavior?

Student Grade

2. What was the relationship between students who received Tier 2 intervention and their grade? Please explain using examples if possible.
3. What are some reasons you feel that students didn't originally learn the material in a regular classroom setting and needed that second level of intervention?
    a Of those reasons, what aspects of the Tier 2 intervention do you feel could have helped students learn the material?
4. Since students do not receive a grade for RtI, motivation could be a factor. When students seem highly motivated to complete their work, what are some reasons for this? What were you doing differently or what about the material or context seemed different to encourage intrinsic motivation?

Student Behavior

5. How did your students respond to hearing they were entering the Tier 2 intervention cycle?

6. How did the Tier 2 intervention affect student motivation and engagement in the regular classroom?
7. What role do you feel Tier 2 intervention has played on students' self-confidence?
8. What role do you feel Tier 2 intervention has played on students' enjoyment of science or excitement for learning?
9. What were your strategies for dealing with defiant students during the Tier 2 intervention period?

Reflection

10. How did students' opinion on Biology change following the Tier 2 intervention?
11. Did you notice a change in the number of students enrolling in the more challenging upper level science courses as compared to previous years?
12. What were some differences you noticed this year in regard to student self-efficacy in comparison to school years prior to implementing the intervention?
13. If another content area is looking to implement Tier 2 intervention, what is one piece of advice you would give in regard to student behavior and motivation?
14. Reflect on when RtI worked well and when it seemed to be not working. Describe the differences.

Appendix E: Consent for Participation in Focus Group Interview

Consent for Participation in Focus Group Research

TITLE OF RESEARCH PROJECT: The Effect of Tier 2 Intervention on Student Achievement & Self Efficacy

Name of Principal Researcher: Cheyenne Hill
Name of Faculty Advisor: John Pijanowski, Ph.D.

A. Purpose and Background

This is an invitation to participate in a focus group interview facilitated by Cheyenne Hill, principal researcher. The purpose of this study is to evaluate the effectiveness a Tier 2 intervention program has on student achievement and student self-efficacy in the secondary science course, Biology. The focus group will be a time to reflect on the implementation of the Tier 2 intervention. The information collected at this time will be used to determine the success of the Tier 2 intervention on improving student self-efficacy. This focus group will be approximately 90-120 minutes in length.

B. Voluntary Participation, right to Discontinue and Overview of Procedures

Teacher participation in a focus group interview is voluntary and if the teacher decides not to participate in the study, or withdraw from the study at any time, the teacher will not be penalized. The teacher has the right not to answer questions which make them uncomfortable or to stop participation in the focus group at any time. No one from the school district or the University of Arkansas will be told.

As part of this study, the teacher understands that they will be placed in a focus group of 3 Biology teachers. The principal researcher will facilitate the discussion using pre-drafted questions and follow-up questions, both which encourage the natural progression of a conversation. This focus group will be audio-recorded, and the researcher will act as a note-taker. The information collected will be kept confidential to the extent allowed by law and University policy. No identifying information will be used in any reports or publications resulting from this research.

C. Risks and Benefits

The teacher understands this research study has been reviewed and approved by the Institutional Review Board (IRB) for Studies Involving Human Subjects at the University of Arkansas. There are no foreseen risks to those participating in this focus group beyond those experienced during a typical conversation. By participating in the focus group interview the teacher will be contributing to the existing research of the RTI program at the secondary level.

D. Confidentiality

Should the teacher choose to participate in a researcher-moderated focus group, their privacy and anonymity will be protected by de-identification procedures by using an alias number during the session notes and in any written transcription. All information collected will be kept confidential to the extent allowed by law and University policy. The teacher will be asked to respect the privacy of other focus group members by not disclosing any content shared during the study.

E. Questions

The teacher has read and understand the explanation provided. The teacher had all my questions answered to their satisfaction.

For further information or questions, please contact:
Cheyenne Hill, Principal Researcher: cheyenne.hill@republicschools.org or ch083@uark.edu
Dr. John Pijanowski, Faculty Advisor: jpijanow@uark.edu
For questions or concerns about your rights as a researcher participant, please contact the University of Arkansas IRB by email at irb@uark.edu, by phone 479-575-2208, or on campus.

F. Informed Consent

I have read and understand the purpose and procedures of the focus group discussion. I have been given a copy of this consent form for my records.

_____ _____

Participant Alias Number My Signature Date

Appendix F: Official IRB

Protocol Number: 2102313315 **Expiration Date:**

Investigator: Cheyenne Hill **Last Approval Date:**

University of Arkansas System

Document Overview
Description: The purpose of this study is to evaluate the effectiveness a Tier 2 intervention program has on student achievement and student self-efficacy in the secondary science course, Biology.

Explanation:
Organization Doc Num:

Protocol Summary
Protocol Number: 2102313315

Sequence Number: 0

Status: Pending/In Progress

Expiration Date:
Last Approval Date:
Investigator: Cheyenne Hill

Protocol Details
Type: Exempt

Summary/Keywords:
Application Date:
Reference Num 1:
Reference Num 2:
FDA Application No:
Title: The Effect of Tier 2 Intervention on Student Achievement & Self Efficacy

Areas of Research

Code	Description
000001	All Research Areas

Organizations

Type	Organization	Address
Performing Organization	University	University 1125 West Maple Street 210 ADMN Bldg, Fayetteville, AR 72701 USA

Investigators

Person Name: Cheyenne Hill **Role:** Principal Investigator

Units: 9999 Student Department **Affiliation:**

Office Phone: 417-540-3395 **Mobile:**

Email: ch083@uark.edu **Training:** No

Questionnaire

Questionnaire Name: Human Subjects Protocol Interview

Description: Human Subjects Protocol Interview

Module: IRB **Sub Module:**

Protocol Number: 2102313315 **Sequence Number:** 0

Principal Investigator: Cheyenne Hill

Title: The Effect of Tier 2 Intervention on Student Achievement & Self Efficacy

What is the purpose of this research? Please explain both why you are doing the research (class assignment, thesis, etc.) AND/OR state your hypothesis. See attachment is not a sufficient response.

The purpose of this study is to evaluate the effectiveness a Tier 2 intervention program has on student achievement and student self-efficacy in the secondary science course, Biology. Biology lays the foundational knowledge for the other science courses students will encounter in a secondary and post-secondary education. The basic Biology course also teaches students basic life science concepts that are applicable to their everyday lives.

Traditionally, secondary students struggle with the required science class. This study is an evaluation of the RTI Tier 2 intervention program put in place to help students with this course. The principal researcher's hypothesis is that the Tier 2 intervention program will improve student self-efficacy and in turn student achievement. Students will receive the additional support they need to grasp the curriculum concepts. This will be reflected in their self-confidence and motivation in the Biology course.

Are you collecting data about living individuals?

Yes

Are you collecting data through intervention or interaction with these individuals?

Yes

Beyond the basic Participant Types (children, UofA Students, adults, etc.) named elsewhere in this application, do you have a target population (particular group of people) you want to recruit? Some examples might be students in a particular class, members of a particular group or network, people in a specific age range (whether adult or minor), children in a particular school or class, etc.

Yes

Describe your target population.

This study will have two groups of participants, Biology students and Biology teachers. Any student that is enrolled in Biology in the District during the implementation year could be included in the research study. This population consists of roughly 350 students of any race or gender primarily in their sophomore year of high school. All students enrolled in Biology will take a Checkpoint exam following a period of instruction. If a student scores below the cut score on the Checkpoint Exam that student would then receive Tier 2 intervention. The students' Biology EOC scores, semester grades, and checkpoint exam grades will be used as quantitative data. These students will also take a self-reflecting survey at the end of the year. There are three Biology teachers who are directly implementing the Tier 1 and Tier 2 portion of the RtI program for the District. This group of teachers will provide their observations and opinions on the programs effect on student self-efficacy. The teachers will be asked to participate in a voluntary focus group.

How are you recruiting participants? Are you standing in a public place asking people to take a survey, sending out introductory emails, posting an ad or blurb on a website or social media, posting a flyer in a public location, etc.? **Please note that all recruitment materials will need to be uploaded in the Notes and Attachments section.

In order to recruit student participants to complete the student survey an announcement with the consent form and link to the electronic survey will be posted in the student learning management system, Canvas. Students will be given a designated period of time during their Biology class to complete the survey. In order to recruit teacher participants to participate in the teacher focus group interview, teachers will receive an email using their school-based address with pertinent information regarding the format and expectations of the focus group interview. Those participants who accept the invitation to participate in the focus group interview will receive a follow-up email with a meeting time and consent form.

Provide a brief description of the procedures involving the participants.

The focus group interview will include three Biology teachers who were directly involved in the Tier 2 implementation. The focus group will take a semi structured approach to leave room for elaboration or further discussion on given topics. The focus group will take place in a private classroom during the designated PLC time, early out Friday afternoons, according to the Districts calendar. After informed consent is granted by the participants, the focus group will be audio recorded. The student survey will be administered to all Biology students during the implementation year. The survey will be administered through the use of Google Forms and contain a Likert Scale and free response questions to allow for students to elaborate on their experience. The questions will focus on student motivation and level of engagement resulting from the Tier 2 intervention. The survey will be administered to students at the end of the school year, following the administering of the Biology EOC.

How long are the procedures likely to take? Include duration and frequency.

The teacher focus group interview is estimated to last two hours. It will occur one time in which all three Biology teachers will be interviewed at the same time. The interview will take place at the end of the school year following the completion of the Biology EOC. The student survey is estimated to take 30 minutes. Each Biology I teacher will administer the survey to their class within a given two day period. The survey will be completed one time by each student participant.

How will information be given to people to get their informed consent to participate in this research? Answers should include specific methods (e.g., verbal consent, information handout, online consent form, full consent form requiring signature documentation.) **Please note that consent materials -- from a script for verbal consent to full consent forms that require participant signature -- must be uploaded in the Notes and Attachments section.

Student participants will receive an informed consent form within the introduction to the electronic survey. Participants must agree to the informed consent statements before they can view the survey questions and participate in this portion of the study. In addition, parental consent will be received for each student participant who is used in this study. A consent form will be sent home with each student and require a parent or guardian's signature. A consent form will be emailed to the focus group participants following their agreement to participate in the interview and verbal consent will be obtained before they can participate in this portion of the study.

Does data collection rely on a scheduled event, such as a convention or specific date?

No

How will your data be collected? Include all that apply: online, on paper/in person, audio and/or video recordings. **Please note that all data collection materials will need to be uploaded in the Notes and Attachments section. This includes: surveys, questionnaires, interview questions or anything that is given to or asked of a participant.

The focus group will be in person and audio recorded. Each group member will have a chance to give his or her response to the question or comment on someone elses response. Once the discussion has ceased the next question will be read. The interview will continue until all questions have been discussed.

Following the interview, the researcher will transcribe the conversation and convert it to Microsoft Excel for analysis. The survey will be administered online through the use of Google Forms and contain a Likert Scale and free response questions to allow for students to elaborate on their experience. The questions will focus on student motivation and level of engagement resulting from the Tier 2 intervention. The researcher will analyze the data specifically by finding the average scores for the Likert questions and coding for common themes in the free response questions. In addition to a focus group interview and a student survey, quantitative data will be collected online in the form of archival data. Biology EOC exam scores and Biology semester one and semester two grades will be examined from 2016-2021. Student enrollment numbers in upper level science classes will also be collected during the 2020-2021 school year. This data will be taken from the District sponsored Tyler SISK12 program and used in statistical analysis.

During the RtI implementation school year, 2020-2021, check point grades will be collected from the District provided learning management system, Canvas. All Biology students will take a checkpoint exam following a unit of instruction. The pre and post check points scores will be examined and compared among the groups to track growth.

How will your data be stored? Include all that apply: electronically, on paper, audio and/or video recordings.

All data will be stored electronically on the principal researcher's Google Drive account that is provided by the District within this study. The Google Drive account is a password protected cloud-storage service that is only used by the principal researcher.

How will that data be kept secure?

All data will be kept secure on the principal researchers Google Drive account which is a password protected cloud-storage service that is only used by the principal researcher. The data kept on this account includes documents which contain student data, transcription of the audio recording from the teacher focus interview and student survey responses. Once the teacher focus group interview audio recording has been transcribed, the audio recording will be deleted from the principal researchers account. Student `names will never be recorded.

Minimal Risk is defined as risks of harm not greater than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests. Will participants be exposed to more than minimal risk? Include in your consideration the potential of mental risks if asking sensitive questions, or legal or reputational risks in case of breach of confidentiality.

No

Are there any direct benefits to the participants for participating in this study?

No

Will the proposed research involve deception or the withholding of information from participants?

No

Will the proposed research necessitate medical clearance from a physician prior to participation?

No

Will the proposed research involve gathering biological samples (blood, tissue, etc.)?

No

Will the proposed research involve administering of substances or providing food and drink, other than water, to participants?

No

Will the proposed research involve physical exercise or conditioning?

No

Does the research require review by a non-UofA IRB?

No

Does this research require approval from another institution or agency, such as a school or privately owned business?

No

Protocol Number: 2102313315 **Expiration Date:**
Investigator: Cheyenne Hill **Last Approval Date:**
New/Changed Attachments

Description	Last Updated	Updated By
Student Survey Questionnaire	02/03/2021 21:02:47	ch083@uark.edu
Teacher Interview Questions	02/03/2021 21:03:35	ch083@uark.edu
Focus Group Consent	02/03/2021 21:04:06	ch083@uark.edu
Student Participation (Student) Consent	02/03/2021 21:04:36	ch083@uark.edu
Student Participation (Parent) Consent	02/03/2021 21:05:11	ch083@uark.edu

Actions

Description	Comments	Action Date
Protocol Created	Protocol created	02/03/2021

Review Comments

Protocol Number: 2102313315 **Sequence Number:** 0

Principal Cheyenne Hill **Investigator:**

Title: The Effect of Tier 2 Intervention on Student Achievement & Self Efficacy

Committee Id: **Committee Name:**

Schedule Id: **Schedule Date:**

Review Comments

Student Survey

RtI (Response to Intervention)

* Required

1. What was your first semester Biology grade? *

Mark only one oval.

- ◯ A
- ◯ B
- ◯ C
- ◯ D
- ◯ F

2. Before taking Biology, I had an interest in pursuing a career in a science field. *

Mark only one oval.

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

3. After taking Biology, I have an interest in pursuing a career in a science field.

Mark only one oval.

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

4. What science course do you plan to take next school year? *

Mark only one oval.

- Chemistry I
- Chemistry II
- AP Biology
- Anatomy & Physiology
- Physics
- Medical Interventions
- Biology Inquiry
- Earth & Space
- Forensics/Environmental Science
- I am not taking a science course next year.
- Online Science Course Option

5. Were you drafted into a Biology RtI WIN cycle? *

Mark only one oval.

- Yes
- No

6. If so, how many times were you drafted into a Biology RtI WIN cycle? *

Mark only one oval.

- 1
- 2
- 3
- 4
- I was not drafted into a Biology RtI WIN cycle.

7. I understand the purpose of RtI. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

8. During Biology RtI, I learned concepts that I didn't understand when I was in the regular Biology classroom. * *Mark only one oval.*

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

9. During Biology RtI, I learned information that helped me improve my Biology grade. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

10. During Biology RtI, I gained self-confidence in Biology concepts. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

11. I scored better on my assessments because of the additional practice I had in RtI. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

12. The instruction I received during RtI motivated me to try harder in the regular classroom. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

13. If RtI time was not built in, I would not have been as successful in Biology. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

14. I had a positive experience with Biology RtI. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

15. I was more engaged in regular class after getting RtI support. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

16. I gave my best effort during RtI. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

17. I had a positive experience in Biology class. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

18. I am likely to enroll in a challenging upper-level science course.

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

19. I enjoyed learning Biology concepts.

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

20. In my opinion, I was successful in Biology this year.

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

21. How did RtI give you the confidence to overcome the challenging lessons in Biology?

22. How did receiving RtI help motivate you to do better in the regular classroom?

23. What aspects of RtI did you like?

24. What aspects of RtI could be improved?

25. What science course(s) are you enrolled in next year?

Research Questions:

1. How does RtI Tier 2 intervention at the secondary level impact student achievement in Biology?
2. How does RtI Tier 2 intervention at the secondary level impact student self-efficacy in Biology?

Interview Protocols:

This interview will be conducted as a reflection piece for the implementation of RTI, specifically Tier 2 intervention in the Biology classrooms at Republic High School. The results will be used to answer the second research question: How does RtI Tier 2 intervention at the secondary level impact student self-efficacy? This is a focus group interview with the three Biology teachers and one Special Education teacher who were directly involved in the implementation of the intervention.

Interview Questions:

Introduction

1. What are some of your reflections on the RtI process this year and what effect did it have on Biology student behavior?

Student Grade

2. What was the relationship between students who received Tier 2 intervention and their grade? Please explain using examples if possible.
3. What are some reasons you feel that students didn't originally learn the material in a regular classroom setting and needed that second level of intervention?
    a. Of those reasons, what aspects of the Tier 2 intervention do you feel could have helped students learn the material?
4. Since students do not receive a grade for RtI, motivation could be a factor. When students seem highly motivated to complete their work, what are some reasons for this? What were you doing differently or what about the material or context seemed different to encourage intrinsic motivation?

Student Behavior

5. How did your students respond to hearing they were entering the Tier 2 intervention cycle?
6. How did the Tier 2 intervention affect student motivation and engagement in the regular classroom?
7. What role do you feel Tier 2 intervention has played on students' self-confidence?

8. What role do you feel Tier 2 intervention has played on students' enjoyment of science or excitement for learning?
9. What were your strategies for dealing with defiant students during the Tier 2 intervention period? *Reflection*

10. How did students' opinion on Biology change following the Tier 2 intervention?
11. Did you notice a change in the number of students enrolling in the more challenging upper level science courses as compared to previous years?
12. What were some differences you noticed this year in regard to student self-efficacy in comparison to school years prior to implementing the intervention?
13. If another content area is looking to implement Tier 2 intervention, what is one piece of advice you would give in regard to student behavior and motivation?
14. Reflect on when RtI worked well and when it seemed to be not working. Describe the differences.

Appendix G: Official IRB Approval

UNIVERSITY OF ARKANSAS

To:	Cheyenne Hill
From:	Douglas J Adams, Chair IRB Expedited Review
Date:	03/11/2021
Action:	**Expedited Approval**
Action Date:	03/11/2021
Protocol #:	2102313315
Study Title:	The Effect of Tier 2 Intervention on Student Achievement & Self Efficacy
Expiration Date:	02/23/2022
Last Approval Date:	

The above-referenced protocol has been approved following expedited review by the IRB Committee that oversees research with human subjects.

If the research involves collaboration with another institution then the research cannot commence until the Committee receives written notification of approval from the collaborating institution's IRB.

It is the Principal Investigator's responsibility to obtain review and continued approval before the expiration date.

Protocols are approved for a maximum period of one year. You may not continue any research activity beyond the expiration date without Committee approval. Please submit continuation requests early enough to allow sufficient time for review. Failure to receive approval for continuation before the expiration date will result in the automatic suspension of the approval of this protocol. Information collected following suspension is unapproved research and cannot be reported or published as research data. If you do not wish continued approval, please notify the Committee of the study closure.

Adverse Events: Any serious or unexpected adverse event must be reported to the IRB Committee within 48 hours. All other adverse events should be reported within 10 working days.

Amendments: If you wish to change any aspect of this study, such as the procedures, the consent forms, study personnel, or number of participants, please submit an amendment to the IRB. All changes must be approved by the IRB Committee before they can be initiated.

You must maintain a research file for at least 3 years after completion of the study. This file should include all correspondence with the IRB Committee, original signed consent forms, and study data. cc: John C Pijanowski, Investigator