DISSEYATION APPROVED BY

10-16-2013
Date

Britt Watwood, Ed.D., Chair

Jerry Beach, Ed.D.

Jennifer Moss Breen, Ph.D., Program Chair

Gail M. Jensen, Ph.D., Dean
CREDIT RECOVERY IN SECONDARY SCHOOLS: A QUANTITATIVE EVALUATION

By
SHAWN JOSEPH BOWMAN

A DISSERTATION IN PRACTICE

Submitted to the faculty of the Graduate School of Creighton University in Partial Fulfillment of the Requirements for the degree of Doctor of Education in Interdisciplinary Leadership

Omaha, NE
October 16, 2015
Abstract

The purpose of this quantitative, longitudinal study on secondary school credit recovery (CR) systems was to examine the effectiveness by which these programs operate. The study was intended to aid the discussion of the effectiveness of CR programs for like situated school districts. Efficacy was measured via three different outcomes:

- The grades the students received in the subsequent class.
- The amount of knowledge based growth, as measured via the Northwest Evaluation Association (NWEA) test.
- The graduation rates of those students who utilized CR.

The study reviewed student records dating from 1997 to 2014. Subsequent class grades and NWEA scores achieved by the CR students were compared against a control group. The study utilized a quasi-experimental non-equivalent control group design with a stratified and restricted data set. The data set was stratified by school year, grade level, and grade received in the CR class with a population of n = 157. The control group was chosen at random from those students who completed Algebra I and was stratified in the same manner. An analysis of covariance (ANCOVA) was chosen for NWEA Rauch Unit (RIT) score analysis for comparison between CR students and the regular Algebra I group. It was found the data indicated that a lack of statistical significance existed between the treatment group and the control group yet the data sets were equivalent. The CR students from blended CR classes showed higher levels of growth on the NWEA when compared to students in the completely online classes via a t-test. Further testing showed that a statistically significant difference existed in the subsequent class grades of the CR students versus the regular students in their Geometry I class. This outcome,
when coupled with data indicating that CR students were comparably prepared and
displayed lower graduation rates, suggested the need for a change in methodology for
recovery students as they move back into the regular curriculum. As a result of the data
analysis, it is recommended that CR programs adopt a blended format, and post-CR
Geometry I classes are augmented to allow for continued success for the CR student.

*Keywords: Algebra I credit recovery, credit recovery efficacy.*
Dedication

This work is dedicated to my loving wife Jessica, my children Allexandra and Joshua, and my parents. Mom, I only wish that you had been able to see just how far that I have gone. Thank you for your love, your patience, and understanding as I completed this journey.
Acknowledgements

First and foremost, I want to acknowledge Drs. Britt Watwood and Jerry Beach. The two of you have been my greatest allies as I moved through this process. Dr. Watwood, thank you for your enthusiasm and your exceptional support of my research. Dr. Beach, thank you for your wise advice and your ability to push my writing onto levels that I had previously not considered.

I want to acknowledge my professors at Creighton University who have opened uncountable areas of understanding and created opportunities for my professional development that will allow me to elicit change within a greater locus than my classroom.

Lastly, I want to thank my wife Jessica, my children, Allexandra and Joshua, and my parents, Michael and Mary. It was their understanding of my schedule, ability to see the problem from a different perspective, and unconditional support that have allowed this work to come to fruition.
# Table of Contents

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
</tr>
<tr>
<td>Dedication</td>
</tr>
<tr>
<td>Acknowledgments</td>
</tr>
<tr>
<td>Table of Contents</td>
</tr>
<tr>
<td>List of Tables</td>
</tr>
<tr>
<td>List of Figures</td>
</tr>
<tr>
<td>CHAPTER ONE: INTRODUCTION</td>
</tr>
<tr>
<td>Background of the Problem</td>
</tr>
<tr>
<td>Statement of the Problem</td>
</tr>
<tr>
<td>Purpose of the Study</td>
</tr>
<tr>
<td>Quantitative Purpose Statement</td>
</tr>
<tr>
<td>Research Questions</td>
</tr>
<tr>
<td>Hypotheses</td>
</tr>
<tr>
<td>Significance of the Study</td>
</tr>
<tr>
<td>Aim of the Study</td>
</tr>
<tr>
<td>Methodology Overview</td>
</tr>
<tr>
<td>Definition of Relevant Terms</td>
</tr>
</tbody>
</table>
Delimitations and Limitations ..................................................................................................................10

The Role of Leadership in this Study ..................................................................................................11

Summary .......................................................................................................................................................13

CHAPTER TWO: LITERATURE REVIEW .................................................................................................15

Introduction ..................................................................................................................................................15

Purpose Statement .......................................................................................................................................15

Aim of the Study ..........................................................................................................................................16

Historical Pressures ......................................................................................................................................16

  Legislative Pressures ...............................................................................................................................16

  School District Pressures .........................................................................................................................18

Graduation Matters Montana Movement .............................................................................................20

Summary of Pressures Leading to Credit Recovery .............................................................................22

Recovery Design ........................................................................................................................................22

  Summer School .......................................................................................................................................23

    Traditional Summer School ..................................................................................................................24

    Blended Summer School .....................................................................................................................24

  Computer Based Learning in a Summer School Model ........................................................................25

Concurrent Enrollment Within the School Year Programs ....................................................................26

  During School and After School .............................................................................................................26
Summary .......................................................................................................................... 55

CHAPTER FOUR: FINDINGS AND THE EVIDENCE-BASED SOLUTION ........ 57

Introduction .................................................................................................................. 57

Purpose of the Study ................................................................................................. 57

Aim of the Study ....................................................................................................... 57

Summary and Presentation of the Findings ................................................................. 57

Hypothesis 1 ........................................................................................................... 58

Hypothesis 2 ........................................................................................................... 61

Hypothesis 3 ........................................................................................................... 64

Hypothesis 4 ........................................................................................................... 66

Hypothesis 5 ........................................................................................................... 67

Analysis and Synthesis of Findings ......................................................................... 69

NWEA RIT Scores ................................................................................................. 70

Blended Credit Recovery Versus Completely Online Credit Recovery ............. 71

Subsequent Geometry I Class Grades ................................................................. 71

Graduation Rates .................................................................................................... 72

Analysis ................................................................................................................. 72

Proposed Solution .................................................................................................... 73

Blended Recovery Format ..................................................................................... 74
Appendix E ...................................................................................................................121

Appendix F....................................................................................................................122
List of Tables

Table 1. Grade Point Average Scores by Grade Received .....................................................44
Table 2. Descriptive Statistics and Comparison Score for NWEA Online Groups .................59
Table 3. ANOVA Results for Completely Online Group Comparison .................................60
Table 4. δ Interval versus 95% CI Indication of Equivalence Chart for Online Groups ..........61
Table 5. Descriptive Statistics and Comparison Score for NWEA Blended Groups ...............62
Table 6. ANCOVA Results for Blended Group Comparison .................................................63
Table 7. δ Interval versus 95% CI Indication of Equivalence Chart for Online Groups ..........64
Table 8. Descriptive Statistics for Change in RIT Scores for
Blended Versus Online CR Classes ..................................................................................65
Table 9. Confidence Interval and T-Test Results for Blended Versus Online CR Classes ......65
Table 10. Descriptive Statistics of Average Geometry Grades By Student Group ...............66
Table 11. T-Test Results for Subsequent Class Average Grades .........................................67
Table 12. Totals and Percentages of Graduates, Drop Outs, and Students who
Transferred Out During Academic Years 2001/2002 - 2011/2012 ...............................68
Table 13. Summary of hypotheses under review .................................................................69
Table 14. Summary of key players roles for blended classroom implementation ..................88
Table 15. Summary of key players roles for alternative Geometry I classroom...................89
Table 16. Stages and timeline proposed for blended CR program implementation.
All dates in timeline in the academic year prior to summer CR term...........................91

Table 17. Stages and timeline proposed for post-CR Geometry I program implementation.

All dates in timeline in the academic year prior to the fall semester rollout .................94

Table 18. Assessment timeline and description by year post implementation .......................100
List of Figures

Page

Figure 1. Credit Recovery Timeline of Events ........................................................................18
CHAPTER ONE: INTRODUCTION

Background of the Problem

Within the standard high school curriculum, students are required to earn credit in core subjects to graduate from high school. Some students are unable to pass one or more core subject classes during the school year. This failure to earn credit means those students are now behind their peers and must repeat coursework to graduate on time. Credit recovery (CR) programs “(provide) the opportunity for students to earn credit for courses previously failed” (Franco & Patel, 2011, p.15).

Credit recovery systems occur in three different manners: online, blended, and face-to-face. These systems can be found throughout the nation in a during-the-school-year and summer-school setup. However, CR systems, whether online, blended, or face-to-face, have been subject to little review and an even smaller amount of actual study. Heppen, Walters, Allensworth, Sorensen, Pareja, Stachel, and Nomi (2013) went so far as to assert, “no rigorous evidence exists about the efficacy of online credit recovery courses” (p.3).

Statement of the Problem

Heppen et al. (2013) make the claim that little, if any, research exists regarding the efficacy of online CR courses. Their claim is not to say that online CR courses might not be as effective as intended. Instead, this could be a by-product of the relative newness of such programs. Regardless, no real evidence appears to exist in either direction. As CR programs are beginning to prove to be a necessary part of secondary
school systems, they must be studied to determine the levels of efficacy in which they provide the intended service.

It has been estimated that each year almost 1.3 million students, equating to approximately one out of every five students, fails to graduate within the United States (Plummer, 2012; Stetser & Stillwell, 2014). A lack of evidence either for or against CR programs could become an issue for school districts looking to utilize CR to improve graduation rates. The main issue that could arise from this lack of research is a situation in which students do enough work to pass the CR class, yet do not have the information necessary to pass a subsequent class. If that occurs, the students are in danger of failing to graduate from high school. As such, it is paramount that the CR is used in an effective manner and acts as a stopgap strategy against the creation of high school dropouts.

**Purpose of the Study**

The purpose of this quantitative study was to investigate the effectiveness of Algebra I computer-based CR within a Montana school district by examining average grade achieved in the subsequent Geometry I class, graduation rates for CR students, and the levels of reported growth on the Northwestern Evaluation Association (NWEA) normative referenced test.

**Research Question and Hypotheses**

The main goal of CR is to prepare the student for the subsequent class. As this study dealt with Algebra I CR systems, Geometry I is the subsequent class. This study examined the preparation for the subsequent class via three different areas. The first area used, the NWEA normative test, is a test of measured progress that creates a set of
growth indicators for each student and is given to most Montana public school students in the fall and spring of their freshman, sophomore, and junior years (NWEA, 2011). The results of the NWEA test are given in Rauch unit (RIT) scores. The Rauch unit is a stable, equal interval scale that allows for the comparison of the achievement of a student relative to national achievement and growth norms. For the purpose of this study those results from the NWEA test were used to examine student growth towards the levels of mastery necessary for subsequent class achievement. Next, the average grades in the subsequent class were examined and finally, as the overarching goal of CR is to ensure on time graduation of the participating student, graduation rates were examined. As such, these following hypotheses were tested within this study:

**H1:** There will be a statistically significant difference in the measured skill levels as reported by the RIT score on the NWEA normative test between those students who receive credit via traditional methods and those who receive credit from an online Algebra I CR program.

**H2:** There will be a statistically significant difference in the measured skill levels as reported by the RIT score on the NWEA normative test between those students who receive credit via traditional methods and those that receive credit from a blended online Algebra I CR program.

**H3:** There will be a statistically significant difference in the NWEA growth rates as recorded by the RIT score between the blended Algebra I CR classroom and the completely online Algebra I CR classroom on the NWEA normative test.
H4: There will be a statistically significant difference in the average subsequent class grades for students who receive Algebra I credit via CR and those who receive Algebra I credit via the regular school program.

H5: The students who participate within the Algebra I CR program will show a different rate of graduation when compared to those students who did not require Algebra I CR for graduation.

Significance of the Dissertation in Practice Study

Credit recovery systems in secondary schools are in place to create an opportunity for students to retake a class that is required for graduation in a manner that is different than retaking the class in the following academic year. Not every student will pass each class during their high school career (Allensworth & Easton, 2005). This has left school administrators and policy makers searching for ways to keep students on track for graduation (McCabe, 2012). The choice of most school districts was to offer classes over the summer break that were taught at an accelerated pace by content area certified teachers in the traditional summer school model (Cooper, Charlton, Valentine, & Muhlenbruck, 2000). This strategy allowed students to stay on track for graduation with their cohort, and appeared to prepare the students for the next class in the curriculum (Dessoff, 2009). This however occurred at an ever-increasing amount of cost. As such, most school districts have discontinued the use of the traditional summer school format; it is necessary and prudent to use data from 1990 to discuss the cost of the traditional summer school model. As reported by Shepard and Smith (1990) the national average cost of summer school in a traditional format was $1,300 dollars per student. That figure translates, when accounting for inflation, to approximately $2,300 per student in 2015.
dollars. Online and blended classrooms, due to a slightly lower cost per student, have supplanted the traditional summer school format in most districts (Franco & Patel, 2011). The Montana school district whose records were used for the purposes of this study used a completely online format for summer 2015 and experienced costs of $675 per student license, with additional staffing costs of approximately $5040. Those costs yielded an approximate per student cost of $843 per student. The blended classrooms, whose use was more prevalent in the years prior to the 2009-2010 academic year, experienced a similar cost when adjusted for inflation. These figures do not take into account any of the facilities costs associated with the blended or completely online CR programs, as those figures are difficult to differentiate from the normal operation costs of an already in-use building. Ultimately, the cost of summer school classes for school districts which when coupled with the pressure to increase graduation rates, at 78.2% for those students who were high school freshman in 2009, indicates that schools must ensure that those students who are completing credit via the CR model are adequately prepared for the subsequent class (Synder & Dillow, 2012).

More recently, school districts have turned to a more modern approach and have begun utilizing computer-based learning setups to replace the traditional summer school model (Dessoff, 2009). The utilization of the computer-based learning has allowed many school districts to begin offering CR during the school year and in some cases, while the student is working through the subsequent class in a concurrent enrollment arrangement. This system occurs at a lower cost than the traditional accelerated classroom model that occurred during the summer months.
A smaller study that was completed at one high school (n = 61) showed that only three out of five students who recovered credit would go on to pass the subsequent mathematics course, and in the concurrent enrollment method that is becoming more common, only one in five would pass the subsequent class (Bowman, 2013). This does not mean that the students are not learning the material via the CR program, as many of those students whose records were studied could have experienced other issues that could have led to their subsequent class failure. However, it does indicate the need for further research on the subject.

**Aim of the Study**

The aim of this study was to investigate the effectiveness of computer based CR systems to inform the decision making process within school systems considering CR implementation.

**Methodology Overview**

This study focused on Algebra I students in a Montana public school system in an effort to ascertain the effectiveness of the different CR programs dating back to the 1997 / 1998 school year. Participants were chosen from the population of all students whose records were available and had utilized a CR Algebra I class during their time within the school district. This master list had an n value of n = 687. A secondary group was selected utilizing random selection from those students who over the same time period completed an Algebra I class. They acted as the comparison group for testing purposes.

The CR population that was selected from the master list of CR participants was subjected to specific criteria to ensure that the sample for study was selected in order to
mitigate many of the reasons that students fail classes. The goal was to create a sample of students that failed the Algebra I class due to academic difficulty that was not based upon personal decisions or external influences. The control group was subject to the same selection criteria as the CR student group. The selection process yielded a final \( n \) value of \( n = 157 \). This number experienced a moderately even distribution within the CR sample with a slight skew towards the last three academic years as participation within CR programs has increased. However, as the control group selection process matched the students by academic year, any skew that could occur within the data set was marginalized.

This study utilized quantitative analysis techniques to ascertain the effectiveness of CR programs within secondary schools. This was accomplished by analyzing growth scores on the NWEA test in a comparative manner, employing an analysis of variance within the CR population and its control group, and reviewing graduation rates of those students who required CR for graduation. This study has two independent variables, CR via a completely online classroom and CR via a blended classroom; with those students who passed Algebra I via traditional methods acting as the control. Three dependent variables exist. The first being the growth scores on the NWEA test, the second being the grade achieved in the subsequent Geometry I class, with graduation rates of CR participants being the third variable.

The data set was stratified by grade received within the CR class, by cohort, and the year in which the CR was required. This was to mitigate external effects upon the educational outcomes of the CR student. In accordance with the Family Educational Rights and Privacy Act and best research practices, the data that was collected was
subject to the upmost of security and privacy. No data was recorded with any identifying characteristics and all data was kept in a secure location that utilized password protection. During the duration of the study all connected parties ensured that no data was viewed by anyone not in direct connection with the study. Ultimately, this study took all precautions necessary to ensure the privacy of the student subjects was maintained.

Algebra I was the logical choice for study as the knowledge base that is developed with the Algebra I curriculum is directly related to student success in the subsequent Geometry I class (Heppen et al. 2013). Algebra I is worthy of extra consideration as it has been found that Algebra I can act as a gatekeeper to graduation for many students. Failure in Algebra I precludes students the ability to pass Geometry I almost completely; with both classes being needed for graduation (Heppen et al. 2013). Additionally, Algebra I classrooms primarily have students who are at the grade level in which the evaluation tool, the NWEA normative test, transpires. This allows for a larger population size, thus increasing the likelihood of more descriptive and accurate statistics.

Definitions of Relevant Terms

This study deals with academic achievement of students within a system that includes a substantial amount of operational terms. As such, it is important, for the purposes of discussion that the following terms are defined as such:

*Credit recovery (CR) program*: An educational program that offers students the ability to regain credit that was previously lost due to failure during the regular school year.
**Completely online computer-based learning CR classrooms:** Credit recovery programs that utilize little or no interaction with a content area certified staff member during the duration of the class. These are self-paced and independent.

**Blended computer based learning CR classrooms:** Credit recovery programs that use both online and standard classroom portions for the duration of the class.

**Computer based recovery:** A system of credit recovery that utilizes either a completely online or a blended format for CR.

**Regular school year:** The standard school year in which school commences at or around the first of September and ends at or around the first of June.

**Control group:** The group of students that were used as a comparison non-treatment group for the purposes of this study.

**Regular Algebra I or Geometry I classroom:** The standard Algebra I or Geometry I class that can be found within the school year that was used to populate the control group for the comparison portions of this study.

**Summer school:** A program for student education that is offered in the summer months of June, July and August.

**Core classes:** Classes that are required for graduation from high school.

**Normative based test:** A test that compares how the test taker performed on the set of predetermined tasks to how other students within the same cohort performed.

**Traditional methods:** Those teaching methods that are found within the regular classroom during the school year.
Growth score: An inter-cohort score created by NWEA that measures the increase of each student's understanding of topics within the curriculum.

Cohort: Each graduating class of students.

Rauch Unit (RIT) Score: A score utilized by NWEA that uses measures of individual item difficulty values to estimate student achievement that was used for comparison between the group of students that participated in a CR classroom and those students that were utilized for as a control group.

Transfer student: A student that attends classes in one school district after attending classes in another school district.

Delimitations and Limitations

Many variables such as home life, economic conditions, bullying, mental disorders, illiteracy, academic uncertainty and unwillingness, teacher relationships, instructional methodological mismatch, can all lead to student failure in a core class within their time in secondary school. Furthermore, some students will simply choose to not pass a class so as to take the course over the summer in what has been perceived as an easier environment. Student apathy would be difficult to measure and even more difficult to account for within this study. Additionally, scores on a normative test were used for comparison within and across student groups and were used to determine educational growth. Those scores are dependent upon the willingness to complete such tests and as some of these students are already, by nature of failing a course, seemingly disinterested in academic pursuits it should be noted that such a situation could arise in which the results on the NWEA test and ultimately the results of this study could be skewed.
This study was only concerned with those students who took an Algebra I CR class as those classes have been in use over time within a Montana public school district. However, CR programs generally include the remaining core classes. As such, CR programs as a whole are not being studied for efficacy, only those programs that provide CR for Algebra I and the students that participate in those programs are under study. Additionally, the focus of the study will not include any qualitative analysis regarding student outcomes. This study is limited by only measuring growth via one test. Finally, student socioeconomic factors will not be included for the purposes of study completion.

The Role of Leadership in this Study

School and district leadership must continue to actively monitor the results of CR programs as they are tasked with providing the necessary supports to create an environment that is conducive to student learning and in the case of secondary schools, promote graduation from high school. As stated previously, not all students will pass each core course that they take in high school. This indicates a need for a system that will allow those students to recover the credit that they have lost. Leaders within the school district must continuously verify that the CR efforts are making progress towards increased student achievement and allowing for full recovery of the previously lost credit. As such, the results from this study will aid district leaders in ascertaining the results of the CR programs, and as needed, adjust them to meet the needs of the CR students.

Transformational leaders commonly act as if driven by duty and selflessly look to put the needs of their followers ahead of their own needs (Johnson, 2013). School district leaders, if presented with compelling data that suggests a redesign of current CR methods is warranted, may find that a transformational leadership style could help initiate
movement towards an effective CR choice and post CR classroom design as indicated by this study. It has been found that transformational leaders often create stronger bonds with their followers and foster higher levels of commitment. These two areas are key to implementing the CR design that was found to be most beneficial to the students.

Further, transformational leaders are often those that will inspire their subordinates to forgo their own self-interests for the good of the organization (Robbins & Judge, 2013). This study, via its evaluation of CR, is intended to provide leaders with more information on the range of options. That could mean a change over from existing practices, an occurrence that can be subject to moderate push back by subordinates (Burke, 2013).

The leader who adopts a transformational style could mitigate that pushback. A transformational leader, by way of the natural byproducts of that leadership style, could be able to successfully integrate the findings of this study without significant issue.

The transcendental or servant style leader could have a more difficult time creating the change within the school as a byproduct of the more collective leadership process that is a hallmark of the style (Gardiner, 2006). Transcendental leaders are those who view their organizational structure as a partnership between leaders and followers (Gardiner, 2006). It could be difficult to create the group consensus necessary for any change with respect to the findings of this study. However, one of the tenants of transcendental leadership is the creation of a collective, and in doing so, fostering the creation of a collective interest. If the findings are presented to the group in such a manner to where those in followership positions view the change as necessary, then it might be easier for the transcendental leader to integrate the findings of this study.

Both transformational and transcendental leadership methods can influence
leadership structures in which all organizational parties can flourish. However, as much of the change within a school district requires less collective processing and more results based directed decisions, a transformational leader could experience higher levels of success. That success can be attributed to the transformational leader who will often create an environment that fosters larger amounts of followership within the organization.

The results within this study suggest a need for programmatic changes within the CR process. That change while presented in a collective fashion presents a problem for a transcendental leader, as they cannot guarantee that the collective process will provide solutions in a timely or appropriate manner. However, a leader who does not recognize the good that can come from the collective process could be missing previously unconsidered innovation. As such, the recommendations that this study presented call for a hybrid of both leadership qualities in that the transformational aspect acts as a springboard by which the collective, more transcendental leadership qualities take control by allowing for the design of the curriculum. Ultimately, leaders must adopt the style that best suits the situation, for to choose one style at the expense of another creates a situation by which the best solutions can be lost.

Summary

The goal of this study was to report evidence on the efficacy of CR systems. As such, the research investigated the educational growth observed for students who used a CR course to continue towards graduation, utilizing the NWEA test, grades in the subsequent Geometry I class, and graduation rates of those students. The investigation reflected students who recovered mathematics credit in Algebra I via the CR program within a Montana public school district during the previous 18 academic years. The
research was needed as there was an absence of quantitative analysis of CR programs. When creating, maintaining, and evaluating CR programs, school leadership may consider utilizing the findings within this study as baseline information. As the author is an employee of a Montana public school system, this research provided a unique opportunity to aid in program design. However, a strict methodology was followed to decrease the introduction of any bias into the findings within the study. Ultimately, the goal of this research was to inform school districts of the efficacy regarding CR design.
CHAPTER TWO: LITERATURE REVIEW

Introduction

A review of literature suggests few studies provide quantitative results on the efficacy of CR programs, and most simply have observational or anecdotal data. This study deals with two different forms of CR: blended computer based learning, and completely online computer based learning, with traditional face-to-face instructional models acting as a point of reference and for comparative purposes. The study has examined both models of CR for efficacy by reviewing NWEA scores, grades in subsequent classes, and graduation rates.

As quantitative data for comparison and review is lacking, this literature review will instead contain three different themes. First, an analysis of historical pressures and occurrences that have led to current CR design will occur. This is to create better understanding of designs and implementation procedures commonly found within secondary schools that utilize CR. That discussion leads to the second theme in which a discussion of the various formats of CR designs will occur. Lastly, these two discussions will be followed by a review of related studies of CR designs in an effort to describe the current knowledge base regarding CR design and efficacy.

Purpose Statement

The purpose of this quantitative study was to investigate the effectiveness of Algebra I computer-based CR within a Montana school district by examining average grade achieved in the subsequent Geometry I class, graduation rates for CR students, and
the levels of reported growth on the Northwestern Evaluation Association (NWEA) normative referenced test.

**Aim of the Study**

The aim of this study was to investigate the effectiveness of computer based CR systems to inform the decision making process within school systems considering CR implementation.

**Historical Pressures**

Initially intended in the early 1900’s as a system in which children on break from school could continue to make progress with their learning goals, summer and after school programs in recent years have seen a dramatic shift in their scope and intention (Cooper et al, 2000). By the 1950’s, summer and after school programs began to move away from the goal of extending the school year and began to provide additional curricular opportunities and programs for remediation. Within the last 15 years, that remediation has begun to utilize various levels of technology (Cooper et al., 2000).

**Legislative Pressures**

The Elementary and Secondary Education Act of 1965 (ESEA) was introduced as a method to guarantee money for the education of low-income students as a part of President Lyndon Johnson’s War on Poverty. Within three years, Congress added the Bilingual Education Act to ESEA to ensure bilingual students would receive support to ensure a proper education (Guilfoyle, 2006). The National Commission of Excellence in Education (NCEE) was chartered in 1981 by the Department of Education to “review and synthesize the data and scholarly literature on the quality of learning and teaching in the
nation’s schools, colleges, and universities, both public and private, with special concern for the educational experience of teen-age youth” (United States. National Commission on Excellence in Education, 1983, p. 1). Their report, A Nation at Risk, was published in 1983 by the NCEE. Within five years from the release of A Nation at Risk the United States began to require school districts to use standardized test scores as a method of assessing school efficacy (Guilfoyle, 2006). In an additional response to the findings of A Nation at Risk, the Improving America’s Schools Act of 1994, in conjunction with the Goals 2000: Educate America Act, changed the ESEA to reflect a growing concern for all students and not just those who fell into either low income or bilingual categories (Jorgenson, 2003). Additionally, these two bills introduced a requirement that States identify schools that were not making annual yearly progress towards higher levels of achievement (U.S. Department of Education, 1996). Ultimately, these external pressures have caused school districts to become more concerned with the learning and subsequent graduation of all children.

With the passage of the No Child Left Behind act in 2001, an even more significant amount of focus has been placed upon each school district’s graduation rates (Trotter, 2008). That increased focus has put the onus upon school districts to help those students who lose credit, recover that credit as quickly as possible so as to allow them to reach graduation on time. The graduation rate is a four year clock, meaning those students who still graduate, albeit with additional credit earned after the four year mark has been reached, are not included as graduates (Heppen et al., 2013). Approximately 1.3 million students will fail to graduate each year across the United States (Plummer, 2012). Those drop outs are a part of a cycle that begins with the first failed class, as there is a
significant relationship between each earned credit and graduation. Each semester
course failure in the ninth grade yields a 15 percent decline in four-year graduation rates
(Allensworth & Easton, 2007). As such, school districts have realized that they must
counteract these pressures so as to meet graduation expectations.

Credit Recovery Timeline of Events

Figure 1. Credit recovery legislative timeline of events.

School District Pressures

Heppen et al. (2013) studied recovery programs that were designed to aid students
in recovering Algebra I credit. Failure rates have been observed to be higher within
urban districts with a failure rate of 44% for high school freshman in Algebra I in Los
Angeles, a 47% failure rate for freshman in Milwaukee, and for the entire state of
Michigan, 20% of high school freshman fail their Algebra I course. These facts point to a significant problem that school districts look to mitigate with CR programs.

United States school districts are under pressure to graduate students, on time, and as such it is a wise choice to create a system that allows for the recovery of credit by students. Credit recovery programs are a way for school districts to catch students before they fall too far behind and as reported by Heppen et al. (2013) falling behind peers can lead to a higher likelihood of dropping out. However, keeping students from dropping out is not just a problem for school districts. From a social system standpoint, each student who drops out of high school, as reported by Plummer (2012), has a higher statistical chance of unproductive work within the societal structure. Snyder and Dillow (2013) report that 55.2% of high school dropouts report themselves as either unemployed or not currently within the workforce. When expanding the employment view to all individuals aged between 25 and 64 years of age with less than a 12th grade education, the unemployment rate, meaning those actively searching for a job, over the last five years was at a high of 16.8% in 2010 and a low of 12.7% in 2013. These high and low points seem to coincide with the economic downturn experienced across the country. It appears that students who fail to complete high school are most affected by such economic pressures. As such, it seems that CR systems are in the best interests of not only school districts, but also the general population.

On a more localized level to the subjects of this study, the State of Montana reports that nearly 80% of male inmates and 75% of female inmates currently incarcerated within the Montana State Prison are high school dropouts (Montana Department of Corrections, 2009). Further data suggests that nearly 30% of high school
To reintroduce the issue, not all students pass their classes. However, school districts are tasked with ensuring the graduation of all students. As such, school administrators and policy makers continue to look for ways to re-teach topics and allow the students to reach the prescribed levels of mastery so as to graduate on time. In years past, most school districts have completed this remediation within the summer break. The model was simple; students who needed to recover the credit they were unable to attain within the school year were required to spend a majority of their summer vacation in the classroom retaking the classes they failed (Cooper et al., 2000). For most districts these classes were taught at an accelerated pace, as such the students were only able to take one or two classes in one summer session. Summer classes in the historically found summer school model were taught by instructors who held certifications within the subject area, were paid according to a standardized district pay scale, and had class sizes comparable to those found during the school year (Cooper et al., 2000).

**Graduation Matters Montana Movement**

In recognizing the need for improving high school graduation rates, the State of Montana Office of Public Instruction and its State Superintendent of Schools, Denise Juneau, began a statewide initiative known as *Graduation Matters Montana* prior to the 2011 school year. This program was very similar to the rollout of a local program within the Missoula School District in which the community, through the work of local businesses and non-profits, set a goal of a one hundred percent graduation rate. Within
the first year, as a direct result of the community effort and focus, dropout rates were reduced by forty percent (Herling & Dillon, 2012).

The *Graduation Matters Montana* program for the State of Montana could ultimately be the result of the federal legislation that requires schools to report the graduation rates of those students currently enrolled within their school systems. The program looks to provide the means to develop a support structure that allows those students who are on the verge of dropping out to receive the scaffolding that they require to stay on track toward graduation. The program recommends that schools move to review policies regarding attendance, student retention and promotion, grading systems, and look to provide alternative settings by which the student can make progress towards graduation. It also recommends the implementation of systems that quickly identify students at risk of dropping out and move towards the corrective action necessary to keep them in school (Herling & Dillon, 2012).

In a move similar to the program that Missoula, the state superintendent state has traveled to communities to create partnerships between the schools and local businesses in hopes of creating a localized network that will aid in reducing high school dropout rates. Additionally, the program has solicited monies from larger business and in doing so has created a system in which students have the opportunity to receive college credit from classes taken on their high school campus. These same fundraising efforts have created a program that offers the ACT test to all high school juniors free of charge. To date the *Graduation Matters Montana* program has increased the graduation rate within the State of Montana to 85%, with an accompanying decrease in the dropout rate of nearly 5% across the state (Office of Public Instruction, 2014).
Summary of Pressures Leading to Credit Recovery

Historically, school systems have been continuously looking for procedures or programs that would allow them to remediate those students who do not pass one or more classes. With more legislation having been introduced with the hopes of improving a shrinking standing within the world’s academic rankings, school districts must now work to meet higher standards in many different areas. Much of that data indicates that the act of dropping out by a high school student can lead to significantly reduced levels of income and a higher predication towards incarceration. On a more local level, the State of Montana has implemented programs that look to meet the criteria put forth by the federal government and local business leaders and officials. Ultimately, school systems must continue to look for programs or procedures that will allow them to continue students’ progress towards graduation. Credit recovery programs, with their ability to act as a stopgap by putting a student back on track for graduation, offer much of what school districts need to increase graduation rates, meet federal requirements, and exceed public expectations.

Recovery Design

Credit recovery programs have generally been delivered in one of three designs. Historically, the standard classroom approach was prevalent in school systems. In the standard approach CR classroom, the student retakes the class during either a night session or traditional summer school. The class is the same as the class that was already failed, is taught in a face-to-face method, and is taught by a teacher certified in that particular subject matter (Cooper et al., 2000). The second type that has been found more recently is commonly known as the blended model. In this model the student receives
some face-to-face instruction, which is then coupled with a computer-based learning methodology. The third model found and is currently prevalent, is completely computer based credit recovery. Students recovering credit within this model generally will recover their credit in a self-paced, modular fashion, utilizing a computer for all teaching and learning (Franco & Patel, 2011; see also Trotter, 2009).

Summer School

Summer school programs were first observed in use by school districts with programs that were designed for children who were no longer eligible to work due to the passage of child labor laws. Summer programs continued to develop, and by the 1950s, it was found that the summer school model was an excellent opportunity for the remediation of struggling or reluctant learners. Students who had failed a course, were below level, or who required extra work due to learning disabilities were all served by the traditional summer school model through the 1960s (Cooper et al., 2000). Summer programs, which had been traditionally focused on the lower level students, began to offer enrichment courses for the advanced students (Cooper et al, 2000). Cooper et al (2000) found that summer school programs of this type displayed favorable results for students and characterized these summer school programs as “an effective system for attaining specific educational and social goals” (p. 109). However, decreasing budgets in many areas have led a decrease in the availability of these programs. In a move that could be attributed to the lower cost of the completely online coursework, a majority of school districts have moved into the computer based classroom environment. As an example, the Montana school district within this study moved into completely online coursework for CR in the 2010 academic year. However, in a move that appears to
depend upon funding levels, some school districts still offer blended and traditional credit recovery during the school year (see Blackboard K-12, 2009). The following sections outline the methodology utilized within the three forms of summer school that can be found currently.

**Traditional summer school.** The traditional summer school primarily takes two out of the three summer months for students to complete remediation. Upon completion of studies, those students should be prepared to continue on with their peers without grade retention. Teachers licensed in that particular subject area teach summer school classes. This allows for the standard classroom-learning model to commence. It is a way for those students to *try again* as they re-take the entire course as found within the school year. Even though this method has been shown as an effective method for recovery, the traditional model has been discontinued by many districts in response to higher staffing and building costs (Franco & Patel, 2011).

**Blended summer school.** The blended summer school type of computer-based learning is a newer development within secondary school systems (Snow, 2011). Most school districts began the process with computer-aided instruction. Computer-aided instruction (CAI) is primarily a process in which students use a computer for a workspace and problem solution system while gaining further understanding from a classroom teacher (Snow, 2011). Most blended recovery programs begin with the students taking a diagnostic test on the computer that will allow the teacher to identify areas in which the student has academic deficiencies. Upon completion of that process, the learner moves forward towards rectifying those deficiencies through CAI work that is accompanied by additional work and instruction from the classroom teacher. The learning units are
modular in design; a design that allows for grouping of like topics. It has been described as the best of both worlds, as it offers the independence to allow for self-reliance, yet when coupled with the classroom-teaching component, offers the oversight necessary for learning to occur. This modality has been in use throughout the nation for decades; first being seen in the 1980s with the Apple IIe and IBM computer labs that were found within primary and secondary schools. The modality has been quite effective in driving instruction as it offers the students, by way of the design, what can be described as an educational experience that is individualized for each learner (Dessof, 2009).

**Computer based learning in a summer school model.** More recently, computer based learning has been found in recovery programs, and unlike the blended approach, has little or no oversight by a classroom teacher. Students complete a diagnostic test upon entrance into the program to identify deficiencies. Upon completion, they begin to work their way through modules that envelop their deficient areas. These courses are completely self-paced and as such could be characterized as independent learning.

Within most districts, a deadline by which the student must complete their course work exists (Dessof, 2009). This is to ensure that students move through the program within a reasonable amount of time. School districts have the option of creating their own course or implementing an outsourced program. The choice for many school districts is to outsource, as they are ill equipped to create an entire program for each class that they look to offer students (Trotter, 2008). There are a few different providers: some are for-profit companies, such as APEX Learning, Plato Learning, K12, Telania and Aventa Learning, with some non-profit providers such as Florida Virtual School and Georgia
Virtual School (Trotter, 2008; see also Dessoff, 2009). Most offerings available to school districts are housed on offsite servers, requiring licenses to be purchased by the school district for each student to be enrolled in the program.

**Concurrent Enrollment Within the School Year Programs**

Some school districts have chosen to integrate the recovery model into the school day. These programs are almost always in the same format as the CBL or CAI classrooms that can be found within the summer school model except they are found within the school day or after school (Trotter, 2008). This style occurs in two manners: during and after school programs, and completely online via outside providers.

**During school and after school.** Programs that are used during and after school are module based and like the CBL programs within the summer schools, are generally served via outside companies (Trotter, 2008). The module-based format still allows for individualized education. However, these CR interventions can begin while the student is currently in school as opposed to waiting until as summer session. A recent development is moving into an in-semester intervention style of recovery. For instance: if a student is failing a class due to missing a major learning component, the student will be able to enroll in an after school program that allows for the recovery of that portion of the class or the class in its entirety before the next semester begins. This concurrent enrollment enables the students to not only stay on track for graduation but it allows for immediate remediation (Means, Toyama, Murphy, Bakia, & Jones, 2009)

**Completely online via outside providers.** Some online educational providers offer students the opportunity to take classes in a completely online format independent from the school. Upon completion of those classes, students are allowed to transfer
credits earned in the same manner as any transfer student. The cost can be the obligation of the student, or in some cases the school district will incur the cost (McCabe, 2012).

A few school districts have moved towards a combined style of recovery program and experiencing success. Ector County Schools in Texas, a school system serving over 26,000 students, has an expansive program for CR. It offers an all day, drop in lab, where students can receive assistance prior to failure. If failure of a class occurs, the student can attend a five-week course that meets after school hours and issues credit by paper examination. Or a further option that is available for students is taking an online version of the CR class in where the learning adopts the more self-paced format. Both methods are supported directly by content area certified staff members. Ector county schools offers each program all twelve months (Blackboard K-12, 2009). Other school districts are not as expansive with their programs, and are beginning to limit participation in recovery programs for only those students that achieve at least a 50% in the class that they failed (Blackboard K-12, 2009).

**Summary of Credit Recovery Design**

Cooper et al. (2000) found that class size does have an effect upon student outcomes within a CR system and reported that, if possible, CR classes should be as individualized as possible. Through a meta-analysis they found that CR should be just as rigorous as the regular classroom experience so as to ensure success in subsequent classes. Their findings also suggest that the most effective programs are those that are designed in a more localized fashion and maintain that close locus of control in operation, as opposed to programs that are externally developed. Additionally, Barbour and Reeves
(2008) found that those students that exhibit the highest amounts of success with computer based learning models are those that are able to work independently, are intrinsically motivated, have strong time management skills, and are well versed in different forms of technology. Often, those students who need CR are the types of students who do not possess many, if any, of those skills.

As programs are developed for CR, it is paramount that those programs contain the material that is necessary for the student to be successful in the subsequent class. If not, students could find themselves without any other option than to drop out. This is a by-product of the method used by most secondary schools to maintain student records. If a student recovers credit for an Algebra I class, yet does not gain enough information to pass the subsequent Geometry I class, the student will not be allowed to retake Algebra I. This could become a problem, as students will be stuck attempting to pass Geometry I repeatedly, without the skill set necessary for success. Student morale will likely be lowered by the repeated failure (Allensworth & Easton, 2005). The student will often quit trying, as they begin to consider the likelihood of failing one or more classes. Once that level of disparagement is reached the student often begins to show little effort in other classes (Allensworth & Easton, 2005). This in turn leads to more failures and as those failing grades add up, the student begins to lose hope of graduating in a downward spiral. As such, morale and its tie-in with passage and failure rates can have a direct influence upon the probability of that student becoming a drop out (Plummer, 2012).

**Similar Research Results**

Credit recovery is increasingly being found in an online format. Franco and Patel (2011) found when studying online CR, that completely online courses were not
furthering student academic achievement. They compared online offerings and standard face-to-face courses and found that students are more likely to drop out and fail the online course. This could in part be due to the levels of self-pace and self-motivation that are required for success in an online format (Lewis et al., 2014).

Heppen et al. (2013) researched attitudes and results of students who took Algebra I through a CR system in a longitudinal comparison between students (n = 390) who took a face-to-face CR class and other students who took an online CR class. They found that in the areas of student engagement, confidence, perceptions of classroom personalization, and results on the national PLAN® test, which serves as the midpoint measure of academic progress in the American College Testing (ACT) College and Career Readiness System, no significant difference existed between online and face-to-face iterations of the same class. However, it was found that the students generally regarded the online course to be more difficult than the face-to-face version of the same course. With regards to content knowledge, Heppen et al. (2013) provided a pre and post-test format for determination of student results. There was a slightly higher level of knowledge found within the face-to-face recovery classrooms. They found that students were more likely to recover credit in the face-to-face classroom and do so with a higher grade than in the online portion. It was determined that students who took the online CR course were no less likely to earn credit in the subsequent class than those who took the class via a face-to-face model.

Heppen et al. (2013) utilized an end of course survey to gather student opinions on engagement, personal nature, usefulness of mathematics, liking of and confidence in mathematics, teacher expectations, and perceived difficulty of the class. Each section
had between 4 and 8 items to determine opinion and was scored on a four-point scale ranging from 0 to 4. A score of 0 indicated that the student strongly disagreed with the statement and a score of 3 indicated that they strongly agreed with the statement. Effect size was calculated and resulted in little variation between the online and face-to-face versions with +/- .1 being observed in all areas except class difficulty. Within class difficulty, Heppen et al. (2013) found an effect size of .49. To determine the educational results, Heppen et al. (2013) utilized a posttest that included 28 items from the National Assessment of Educational Progress (NAEP) test. The students’ scores on the NAEP based posttest showed very little variation between online and face-to-face sections with an effect size of -.05 being observed. The PLAN assessment indicated that little difference between online and face-to-face versions with an observed effect size of less than .15 in composite scores and the algebra and mathematics subsections.

Means et al. (2009), via meta-analysis, determined that students in online classrooms performed slightly higher than their counterparts within the face-to-face classrooms. However, much of these online classrooms were of a blended variety, meaning that the classroom utilized both online and face-to-face components. Means et al. (2009) made the point that at this time they were unable to locate any true academic studies that compared truly online learning to face-to-face classroom achievement. Their focus was primarily, by way of the amount of studies available, with students outside of the K-12 environment. Only 5 of the 84 studies included within their analysis used results gathered from K-12 students. As such, Means et al. (2009) make the caveat that their results should act as suggestions.
The five studies that dealt with K-12 students included in the Means et al. (2009) meta-analysis drew results from a total of 2,045 students. One showed a slight inclination towards face-to-face classrooms with effect sizes measured across two areas of achievement in reading and mathematics of .15 and .24. However, neither of these are effect sizes are large enough to indicate an advantage within either learning style. The remaining studies favored the blended classroom with reported effect sizes that varied from .03 to .74.

O’Dwyer, Carey, and Kleinman (2007) found that results for online courses slightly outpaced their face-to-face counterparts in a study of Algebra I students. Once again, the online courses were blended and not entirely online. These findings were echoed by Long and Jennings (2005) whose experiment measured outcomes for history students who used online materials versus history students who were not exposed to those materials and it was found the students whose classroom included the online portions experienced levels of performance that slightly outpaced their strictly face-to-face counterparts.

The O’Dwyer et al. (2007) study included a total of 463 students in which the students were considered to be a homogenous selection. All students exhibited a similar ability level, were taught within the same environment, and classroom size was equivalent. Classes were taught in either the standard face-to-face model or a blended online methodology. O’Dwyer et al. (2007) found an effect size of .37, with those students in the blended model outperforming their counterparts in the standard classroom. Long and Jennings (2005) studied history students (n =971) and in the first round of their study found an effect size of .03, showing relatively no difference between the scores of
the online enhanced classrooms and the standard classrooms on a multiple choice test. Long and Jennings (2005) then studied six classrooms (n = 846) with three teachers acting as a control group and three teachers using the online materials. A significant effect size of .55 was observed in which the online enhanced conditions were favored. It was hypothesized that the large change from the effect size in the first round to the second round could be attributed to the teachers being more effective with their use of the online materials.

Most of the studies indicate a similar outcome; blended classrooms appear to result in better results with regards to student achievement (O’Dwyer et al; Snow, 2011; Plummer, 2012; Means et al, 2009). However, this observation comes with a caveat that many of those studies were not looking at CR and were instead considering computer-enhanced classrooms. Heppen et al. (2013) performed a significant amount of research regarding not only educational outcomes, but student experiences and found that ultimately, only one true difference when comparing face-to-face and online CR classrooms exists: students generally felt that the online CR was more difficult. As blended classrooms appear to experience a higher amount of success, perhaps if the blended classroom was to be combined with the CR classroom measureable success could be found.

**Summary**

The purpose of this study was to research the educational outcomes of students who make use of recovery programs to continue on their pathway towards graduation. As reported, keeping students on track for graduation is key to lowering the dropout rate and further evidence supports that lowering the dropout rate is an important societal
endeavor. Credit recovery programs could, if implemented effectively, aid in this enterprise. There are three main ways in which a student who has failed a course can recover lost credit without retaking the class. A student could make use of an accelerated class that is taught over the summer. This method recently has expanded into the school year and can be found in after school offerings. The student could also recover the credit via an online provider in either an independent setup or one that is tied into the school district. Or the student can recover credit in a blended classroom environment where online portions are supplemented with traditional face-to-face instruction. Much of the research points to the blended classroom as being the more efficient manner of teaching when utilizing computer-based learning (Snow, 2011; Plummer, 2012; Means et al, 2009). However, a majority of this research does not include students who have failed and are looking to recover credit. This study had the intent of working towards solving this deficiency.
CHAPTER THREE: PROJECT METHODOLOGY

Introduction

The essence of this study was to examine CR programs for their efficacy. Reviewing student data from a Montana school district completed this investigation. As much of the analysis that has been previously performed utilized qualitative methods, this study chose to adopt a quantitative method to help close the information gap that currently exists. Quantitative analysis is generally utilized for testing of hypotheses using numerical data and statistical procedures (Creswell, 2013). This study utilized a quantitative method to analyze growth rates reported on the NWEA test, graduation rates of CR students, and their grades in the subsequent Geometry I class. Furthermore, as this study had the objective of enabling better informed decisions for school districts implementation plans for CR by comparing the different styles of CR, the study made use of 18 years of data to create a longitudinal viewpoint. This study employed a quasi-experimental, non-equivalent control group, matched design. This was due to the nonrandom selection of students.

Purpose of the Study

The purpose of this quantitative study was to investigate the effectiveness of Algebra I computer-based CR within a Montana school district by examining average grades in the subsequent Geometry I class, graduation rates for CR students, and the levels of reported growth on the Northwestern Evaluation Association (NWEA) normative referenced test.
CREDIT RECOVERY IN SECONDARY SCHOOLS

Aim of the Study

The aim of this study was to investigate the effectiveness of computer-based CR systems to inform decision making within school systems considering CR implementation.

Baseline Assessment

This study gathered data from a school district within the State of Montana that has shown a slightly increasing enrollment over the last ten years and served 16,238 students in 2013. The comprehensive K-12 school system provides educational services with twenty-two elementary schools, four middle schools, and three high schools. The three high schools, which utilize a 9-12 grade model for classroom instruction, have maintained a stable enrollment over the last ten years that has averaged 5400 students. The graduation rate has been steady over the last ten years and was 82.5% in 2013. The school district demographics indicate a slightly higher than United States average median household income of $48,908, a slightly lower than average poverty rate of 14.1%, and a higher than the United States average White, non-Hispanic or Latino population at 86.9% (U.S. Census Bureau, 2015). Within the last 18 years, Algebra I CR programs within the school district have served approximately 687 students. This study will be focusing on those students (n = 687) who have participated within the CR system within the past 18 years.

Research Question and Hypotheses

The overarching ideal was to study the efficacy of blended and completely online CR programs. This study examined the efficacy of two Algebra I CR programs within the Montana school district via three different areas: NWEA scores, grades in subsequent
classes, and graduation rates. As such the essential research question is: What are the levels of efficacy that can be observed for the various types of CR programs within the Montana school district. The following hypotheses looked to answer this question:

**H1: There will be a statistically significant difference in the measured skill levels as reported by the RIT score on the NWEA normative test between those students who receive credit via traditional methods and those who receive credit from an online CR program.**

This hypothesis was created to provide a comparison between the students who have recovered credit via a completely online environment with those students who received credit via the traditional pathway. If those students were to show a negative difference in reported growth levels on the NWEA test when compared to traditional students, that could suggest that the completely online provider is not preparing those students for the next class. Additionally, that could indicate that the online recovery method is a not a viable system for recovery of credit. Whereas if the students scores indicate a positive difference then that would indicate the methodology within the CR program is a preferred style of teaching and learning for the CR student. Further, a positive observed effect could indicate that the completely online style of CR is a viable system for the recovery of credit.

**H2: There will be a statistically significant difference in the measured skill levels as reported by the RIT score on the NWEA normative test between those students who receive credit via traditional methods and those that receive credit from a blended online CR program.**
This hypothesis was created to provide a comparison between the reported growth levels on the NWEA test of those students who recover credit via a blended classroom and those who received credit during the school year. It was hypothesized that if those students show a negative difference when compared, the data indicates that the blended model is not creating sufficient opportunity for those students who require CR to maintain pace towards graduation and additionally it could indicate that the blended model is not a viable system for CR. However, if the data indicated a positive difference then the blended model will have been shown to be an effective model of CR. Additionally, it could indicate that the blended model is a more effective methodology for the teaching and learning for the CR student.

\[ H3: \text{There will be a statistically significant difference in the NWEA growth rates as recorded by the RIT score between the blended classroom and the completely online classroom on the NWEA normative test.} \]

This hypothesis intended to measure the method that has been providing the best opportunity for educational growth within the sample group by comparing effect size between each recovery method. Comparing the growth rates of the completely online provider to the growth rates of the blended classroom could indicate to leaders which CR arrangement has shown higher levels of effectiveness.

\[ H4: \text{There will be a statistically significant difference in the average subsequent class grades for students who receive Algebra I credit via CR and those who receive Algebra I credit via the regular school program.} \]

The purpose of this hypothesis was to test the efficacy of CR programs on the performance of the students within the subsequent class in the curriculum. If the CR
students show a negative statistically significant difference in subsequent class grades when compared to those students who did not require CR for Algebra I this could indicate that the CR classes are not preparing those CR students for the subsequent Geometry I class adequately. While if the difference is not statistically significant then the data could be indicating that the CR programs are effectively preparing the CR students for the subsequent class.

**H5: The students who participate within the Algebra I CR program will show a different rate of graduation when compared to those students who did not require Algebra I CR for graduation.**

The ultimate goal of the CR program is to ensure on-time graduation of the student and as such this hypothesis was intended to test the thematic efficacy of the Algebra I CR program.

**Method Rationale**

As previously discussed within the review of related literature, quantitative studies are woefully absent from the knowledge base regarding CR programs. Far more often the study of CR programs has focused upon the perception of those involved in the CR program as opposed to conducting a numerical analysis. If quantitative analysis was utilized in efficacy determination by those studies, none of those studies involved a period of longer than three years. This paucity of data indicated that a longitudinal, quantitative study would best amend the knowledge base as that would allow for a better numerical analysis of efficacy.
Description of Participants

There were two groups of participants for this study. The first group, those that have utilized a CR program for the recovery of Algebra I credit, was identified as having taken a CR Algebra I class within the last 18 academic years. Those students were found by utilizing a search string in which all students whose records are stored within the school district database had their academic records reviewed for classes with one of the following names: CR Algebra I, SS Algebra I, NN Algebra I, Recovery Algebra I, and Nova Net Algebra I. This enabled full coverage of the different course names that have been used by the school district to describe the CR Algebra I class over the time frame that was under investigation.

The second group, those that acted as the control group, were identified via random sample from a list of all those students who had taken and passed Algebra I during each of the years under review. Associating a number with each record upon the list and then using a random number generator to determine the record that would be used for comparison purposes created the random sample for the control group.

The selection process included controls that were in place to ensure that as many external variables that effect student outcomes were mitigated. It was the intent of this study that only those students who required the CR process to get back on track towards graduation were subject to study and comparison. As such, the following selection criteria were in place during the vetting process that created the final data set:

- The student must have earned credit for Algebra I via a recovery class.
- The student must have received full credit for Algebra I prior to being placed into Geometry I. Concurrent enrollment, where a student attempts to recover credit for
Algebra I while taking Geometry I, is worthy of research but was not within the scope of this study.

- The student must have been continuously enrolled for the duration of Algebra I and Geometry I.
- The student must not have missed more than 15 days in the term in which they are recovering credit.
- The student must have been in continuously enrolled in the Montana school district being studied throughout the duration of their secondary education. One exception of the continuous enrollment criteria existed within those students who were included in the group of students utilized for the graduation rate calculation as reported graduation rates do not make the distinction between those students who were enrolled continuously in the Montana school district.
- The student must have earned a passing grade in the CR Algebra I class.
- The student must have taken the CR class from the Montana school district and not any other school district.
- The student must have earned the failing grade in the Montana school district in question.
  - No students that transferred into the Montana school district during secondary school from other school districts were included in the study.
- The student must have earned a recordable grade.
  - The Montana school district has the option of recording a grade of “P” for any course. This grade may or may not reflect a passing score. Instead
indicates that some issue arose during the duration of the course that preempted the issuance of an actual letter grade.

- The student must have spent more than 30 minutes on the mathematics portion of the NWEA test that is being used for comparison.
  - Part of the score that is recorded for each student is time spent. It is surmised that if they spent less than 30 minutes on the test, then their score could be an improper measure of their ability levels as the average time spent on that portion for students within the Montana school district is approximately 50 minutes.

When this vetting process was placed upon the 687 students from the list of all students who have taken a CR Algebra I class over the last 18 years, a final sample \( n \) value of \( n = 157 \) was found. That amount when tested at a 95% confidence interval is sufficiently large to draw valid and relevant conclusions.

The comparison group received the same \( n \) value as each student was compared directly, \( n = 157 \). The comparison group students were selected utilizing the following criteria to ensure that the comparison group and the CR group were as alike as possible as this allows for the largest amount of control over external variables:

- The student must have been continuously enrolled for the duration of Algebra I and Geometry I.
- The student must have earned a recordable grade. No “P” grades.
- The student must have spent more than 30 minutes on the mathematics portion of the NWEA test that is being used for comparison.
• The student must have taken the Algebra I and Geometry I courses while being enrolled in the Montana school district secondary schools. No transfer students were included.

• The student must not have missed more than 15 days each semester that is being used for the purposes of comparison.

Access to the student records who were subject to review required gaining administrative agreement to the study (see appendix A). This required meeting with the assistant superintendent to discuss the study, planned procedures, offer assurances and processes to maintain complete anonymity of each set of student records, and provide a research prospectus (see appendix B). Following that meeting, the assistant superintendent brought the study before the superintendent for review and subsequent approval. School district policy is such that no notification is required to the participants as the data collected will be maintained in an anonymous manner and will be utilized to inform school policy (see appendix C).

Method

This study was concerned with the describing the efficacy of Algebra I CR programs by analyzing student records from a Montana school district from the past 18 years. Efficacy for the CR program was measured via three different characteristics. First, the normative referenced NWEA test RIT scores were used in a comparative manner in which the results achieved by those students who have participated in a CR program for Algebra I were compared with the random sample of students who did not require CR. Next, the grades from the Geometry I class were examined and compared
against the control group. Lastly, the graduation rates of those students who utilized CR to complete their Algebra I credit were examined.

The comparison between groups occurred within a multiple stratified manner. Each group of CR students was separated by year in which they received a failing grade within the Algebra I; with further stratification by grade received within the CR class. Lastly, the CR students were grouped by grade level. Stratification by grade level and year were placed upon the data in an effort to account for variation in the academic history of each graduating class. For instance: Sophomore class members in the 2005-2006 academic year could have experienced different styles of mathematics learning that could be attributed to different focal points within the educational community during their primary grades than Sophomore class members in the 2013-2014 academic year. As an example: this type of stratification meant that Freshman class members from the 2005-2006 academic year would only be compared against Freshman members from that same academic year.

Stratification by grade received was utilized to ensure that the students were compared against other students of similar ability level. Students with a “D” in the recovery classroom were only compared against students who received a “D” in the regular classroom, “C” recovery students will be matched with “C” regular classroom students, “B” recovery students will be matched with “B” regular classroom students, and “A” recovery students will be matched with “A” regular students. This stratification allowed for better matching of ability levels so as to decrease the chance of data being skewed by a mismatch of mathematical abilities. However, for the purposes of statistical
analysis all grades were recorded and evaluated within the statistical tests by the associated common grade point average score (see Table 1)

Table 1

*Grade Point Average Scores by Grade Received*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
</tr>
</tbody>
</table>

**Data Collection**

This study utilized students who have completed an Algebra I CR program within the aforementioned Montana school district over the last 18 years \((n = 687)\). These students attended one of the three high schools within the school district and primarily consist of 9th or 10th grade students. This list was compiled through the application of a database search upon all available student records for classes that indicated that Algebra I CR had occurred. This list was exported onto a Microsoft Excel spreadsheet for record keeping. The data that was subject to review was numerical or was recorded in a numerical nature. As such, Excel was chosen for its ease in maintaining a spreadsheet of numerical data. The Excel spreadsheet was maintained in a password protected manner on a removable USB drive. The NWEA RIT scores for the district are maintained within a separate database from the student records. The entire NWEA database was downloaded into a series of Excel spreadsheets and was kept separately from the data collection spreadsheets. These were also kept under password protection on a removable
USB drive. The selection criteria was put into place and yielded a final $n$ value of $n = 157$.

Those remaining 157 students were placed into tabs of the Excel spreadsheet delineated by school year (see appendix D). Each student was then checked against the NWEA records for review of the NWEA scores. Those students who had completed a series of NWEA tests that would allow for growth comparison had their RIT scores recorded within the Excel spreadsheet (see appendix D).

The control group was determined by first creating a master list of all students who had completed Algebra I within the last 18 years from the graduated students database. The master list was populated by performing a database query and export into an Excel spreadsheet. The search was designed to list the students by their graduation year. This was completed to allow for an easier time matching the control group with the treatment group. By importing the students into a spreadsheet they were automatically assigned a cell number. That cell number was the basis for the random number look up that allowed for random sampling within the comparison group. Using a random number generator to populate a sample the search for students that matched the grade level and Algebra I grade was commenced. Algebra I grades and subsequent Geometry I grades earned by the student were kept on Excel spreadsheets that utilized the same style and form as other data sets (see appendix D). Once that list was created a search for NWEA scores occurred and the resulting RIT score was recorded within the Excel spreadsheet.

**Variables Within the Study**

Within the study there are a few variables that have been subject to examination via the research question. As the study itself is concerned with the two prevalent forms
of CR, blended and completely online, these are the two independent variables found within the study. However, these two independent variables will be tested independently for the purposes of hypothesis testing. The study itself has adopted a quasi-experimental format in which participation within CR for Algebra I act as the treatment group and those students who did not require CR act as the control group. The dependent variables are those areas that are being tested within the hypotheses: NWEA scores, subsequent class grades, and graduation rates. There are several variables that exist exterior to the study by which the best efforts have been made to control. Attendance, student apathy by way of effort inadequacy on the NWEA test, student transiency, and deficient preparation for subsequent classes were all accounted for within the selection process.

Within the analysis portion of the NWEA scores the covariant variable was the NWEA score prior to the CR efforts. The independent variable was placement of the student in either the CR group or the regular Algebra I group, and the dependent variable was the NWEA score taken after CR efforts. This is a reflection of the pretest / posttest, treatment and control group design of the study.

The analysis of the subsequent class grades identified the dependent variable as the average Geometry I grade earned and the independent variable was the placement in either the CR or the regular Algebra I group. This variable structure is reflective of the pretest / posttest, treatment and control group design of the study.

**Data Collection Procedures**

Upon receiving full access to the PowerSchool administrative database a review of the records of those students found on the master list of Algebra I CR students occurred over the next two weeks. That master list was populated with the help of one of
the Montana school district database administrators. The master list of Algebra I CR students was examined and all those students whose listing indicated that they had not received a passing grade within the CR class were removed. Those remaining students were then reviewed for inclusion into the study by reviewing each student transcript via the PowerSchool administrator database. This process continued until all 687 students had been reviewed and recorded. This left the study with an \( n \) value of \( n = 157 \). Each student that was identified as a candidate for inclusion within the study had the following items recorded within the spreadsheet:

- Grade in the CR class.
- Grade for both semesters of Geometry I.
- The student grade level.

Next a review of the NWEA RIT scores for those students who remained after the selection process began with the checking of the NWEA database that was provided. It was found that not all students had taken the series of NWEA tests. Those students were not removed from the study as their subsequent class grades were of value for hypothesis testing. They were not included within the hypothesis testing that relied upon NWEA results. Each student that did have a pair of NWEA RIT scores by which to measure growth had those scores recorded, along with the time of year that the test was given, on the Excel spreadsheet. Finally, students within the included set had their graduation status recorded. This was recorded as either yes or no within the spreadsheet.

Following the recording of NWEA, graduation, and subsequent class grade results, the search for the comparison group began. It was surmised that if the student graduated from the Montana school district, they must have taken Algebra I. Some
students are placed into Geometry I upon entrance into secondary school. They were not included in the study, as they did not complete Algebra I at the secondary level. As such, a query that asked the database for a listing of students, by year of graduation, whom had completed Algebra I was ran against the database of graduated students. Once that list was compiled onto an Excel spreadsheet, the students were picked at random, using a random number generator, to populate the sample for comparison. However, if the student that was chosen at random did not meet the needs of the comparison group, meaning they did not have the correct grade in Algebra I as outlined within the methodology section, they were removed from study and the next random student was selected until the comparison sample was populated in the stratified manner outlined earlier. All data was placed into the Excel spreadsheet (see appendix D).

**Data Analysis Plan**

The data that was collected for the CR group included the NWEA RIT scores, grades received within the Algebra I CR and Geometry I classes, if the student graduated, and the grade level in school in which they received a failing grade in Algebra I. The comparison group had NWEA RIT scores and those grades received in Algebra I and Geometry I classes collected and placed upon the Excel spreadsheet. Each group was aggregated by school year. For the purposes of this study all scores that occurred within the 2010/2011 school year and prior will be considered as occurring within a blended format and all those scores after that time will be considered as occurring within the completely online format as that is the approximate time frame for change over within the Montana school district.
For the purposes of this study all statistical testing was completed on the IBM SPSS statistics software. This software was chosen as it enables the completion of several different statistical tests in an easy manner and experiences relatively high levels of trust within the academic world. Additional consideration was made for the output of the IBM SPSS software in that the tables and graphs are easily included into Microsoft Word. All tests were checked at a confidence interval of 95%. For all statistically verified hypotheses, in the event that the null hypothesis fails to be rejected, an analysis of equivalence between data sets occurred. This was in response to the understanding that failing to reject a null hypothesis does not indicate the ability to assume equivalence (Tyron, 2001). As such, a delta value $\delta$ for the purposes of confidence interval equivalence testing relevant to the data under analysis was attached and tested for equivalence. The confidence interval method of equivalence testing is interchangeable with and provides the same amount of statistical relevance as the two one sided tests procedure for equivalence testing while being a fairly easy computation (Chow & Liu, 2000; see also Blackwelder, 1982; Webber & Papova, 2012; Tyron, 2001).

The NWEA RIT scores were analyzed via reliability corrected ANCOVA as this study employed a nonequivalent groups design. The reliability correction came via Cronbach alpha. This reliability correction was placed upon the pretest scores prior to the running of ANCOVA (Lockwood & McCaffrey, 2014). Assumptions upon the data set that were required of ANCOVA were completed. Those were met in the following ways: the residuals were tested for normalcy via Shapiro-Wilk and visual inspection of their histograms and Q-Q plots, linearity was verified via visual inspection of the scatter plots, homogeneity of variance and homogeneity of the regression slopes was verified,
the covariate term, pre CR NWEA RIT score was checked for linear relation to the
dependent variable, and the data was tested for homoscedasticity (Gay, Mills, & Airasian,
2006). Additional testing was completed that included identification of patterns and
descriptive statistics in an effort to perform a complete analysis of the NWEA data set.

The hypothesis that examined if a difference between the two types CR programs
exists dealt with values that were continuous, split between two groups, and had
independence of observations. As such, the data was examined using an independent
samples $t$-test. A few assumptions must be met to utilize a $t$-test. The data was reviewed
to ensure that no significant outliers exist, examined for approximate normal distribution,
and tested to ensure that homogeneity of variances exists between the two groups (Gay,
Mills, & Airasian, 2006).

The grade in subsequent class was subject to an independent samples $t$-test. The
data within the grades database that was created via collection was subject to some initial
simple averages as that allowed for more powerful statistics to be computed. Geometry I
scores were averaged across both semesters. This was done to allow for a better
comparison of the two groups of students and to allow for the use of the statistical
measure. An independent $t$-test requires a few initial assumptions to be in place to enable
the statistical test to maintain relevancy (Gay, Mills, & Airasian, 2006). Those were met
in the following ways: the data has continuous dependent variable, the independent
variable is categorical with two groups, the data displays an independence of
observations, and does not contain any outliers. Further assumptions include: the data
was tested for normalcy via a visual inspection of their histograms and Q-Q plots as the
common Shapiro Wilk test could have problems computing accurately with the larger
sample size found within this hypothesis. However, homogeneity of variance within
the data could not be verified via Laverne’s test for equality of the variances. This
outcome required the use of Welch’s t-test for the purposes of hypothesis testing (Gay,
Mills, & Airasian, 2006).

To examine the graduation rates of those students who participated within the CR
Algebra I program no statistical tests were performed. This was due to the study design
that populated the control group via graduated students. However, a comparison between
the observed graduation rates of CR Algebra I students who met the criteria for inclusion
and the remaining district students occurred. This analysis was accompanied by an
investigation into observed trends within the Algebra I CR group. These two analyses
were combined for the completion of hypothesis testing.

Legal and Ethical Issues That Influenced Evidence Collection

This study dealt with a population of students that have attended high school
within a suburban Montana school district. To complete any such study that is associated
with a University it is required that the research be approved by an institutional review
board (IRB). This study dealt with existing data and recorded that data in an anonymous
manner. As such, the research was granted exempt status from the IRB under 45 CFR
46.101 (b) (see appendix E). The IRB approval process was completed prior to collection
of any evidence.

Additionally, the IRB required documentation from the Montana school district
indicating that they were aware of the study occurring and are in agreement with the
methodology the study has outlined. Additionally, the school district asked for a signed
confidentiality agreement to be in place prior to any data gathering (see appendix D).
The Family Educational Rights and Privacy Act (FERPA) guarantee students and families the right to privacy of their educational records. FERPA requires consent and written notification of the review of any student records and as such, the records that will be reviewed as a part of this study fall under the guidelines of this legislation (20 U.S.C. § 1232g; 34 CFR Part 99). However, § 99.31 of the FERPA act allows for the review of student records without notification and consent gathering if the disclosure is to school officials who have a legitimate educational interest. Additionally, paragraph six of § 99.31 allows for disclosure to organizations conducting studies whose intent is to, under part c of section one, improve instruction. This disclosure is subject to the following conditions as per parts A-C of section three of paragraph six of § 99.31:

- Individuals outside of those who have a legitimate interest in the information will see no personal identification of the parents or students.
- The information must be destroyed when no longer needed.
- The representative of the educational agency must enter into a written agreement that specifically states:
  - The specific purpose, scope, and duration of the study.
  - Personally identifiable information will only be used to meet the purposes of the study.
  - The study will be conducted in a manner in which the personal identification will not be permitted by anyone other than those within the study or those with legitimate interests.
o All personally identifiable information will be destroyed when that information is no longer needed. A timeline for this destruction must be specified.

This study has met all these criteria so as to ensure that all records were reviewed in a legal manner.

Of primary concern is protecting the identities of those students whose records will be subject to review within this study. As such, the following protocols were followed:

- All data was kept in a secure location and under password protection.
- All identifying characteristics were expunged from the data set.
- Any hard copies that were created were destroyed once the data has been transferred into the electronic database.
- Once the data was subject to statistical testing, it was placed onto a password protected storage device and stored in a secure location until such time as it was destroyed. Destruction of the data took place on August 31, 2015.
- Data collections took place in an expedient and secure a manner as possible to ensure that no data was observed, or recorded, by anyone unrelated to the study.
- All FERPA laws and district guidelines were followed.

This study investigated outcomes of the CR programs that are in place within the school district in which the author is employed. This creates the possibility for adverse reflections upon collegial staff members within the school district. To ensure that no disparaging data is introduced, any identification of CR teacher was removed from all data that was under review during the duration of the study.
Limitations

This study was only concerned with the outcomes of those students that participate in CR for Algebra I. This decreases the ability of the results to be applied to other areas of CR. Additionally, the generalizability of the study is reduced by the essence of the study, in that it was performed within an area that is of smaller population with a decided rural component. Generalizability could also be threatened by the demographical makeup of the school population. Also, as this study was only concerned with only those students who participate in Algebra I CR programs any conclusions or subsequent recommendations that are reached via data analysis should not be extended to include total school populations.

By nature of design this study has some threats to its validity. Any statistically based analysis of student populations over time can experience various threats of which many were attempted to control via design (Shadish, Cook, & Campbell, 2002; see also Campbell, Stanley, & Gage, 1963). However, the fact remains that some of these types of threats exist and could have affected the outcomes within this study.

This study could have experienced some threats to its internal validity. First, maturation threats could have had an effect in some of the areas that this study measures (Campbell, Stanley, & Gage, 1963). As students move into higher grades it could be assumed that they would mature and as such begin to place more emphasis upon their schoolwork and testing situations. Instrumentation validity threats could have had an effect upon the NWEA RIT scores in that over time the test could have changed levels of difficulty (Campbell, Stanley, & Gage, 1963). Statistical regression could have skewed some of the data points within both the NWEA RIT scores and the subsequent class
grades (Campbell, Stanley, & Gage, 1963). As the students under review for this study were selected because of their participation within the CR program, differential selection of participants could have had an effect on the areas that this study measures (Campbell, Stanley, & Gage, 1963). This was observed in that those students within the CR group were already different from the control group; which when coupled with the different characteristics found within the control group, could effect the outcomes subject to study.

External threats to validity can also affect the generalizability of this study (Bracht & Glass, 1968; see also Campbell, Stanley, & Gage, 1963). Those students who participate in CR Algebra I classes could be displaying signs of multiple-treatment interference in that they are receiving Algebra I instruction, in essence, twice. Also, due to the non-random selection, selection-treatment interaction also could be problematic in that the experimental group could be in some way fundamentally different from the control group (Bracht & Glass, 1968). Additionally, external validity could have been subject to a compensatory rivalry or John Henry effect, in that those students within the CR group could have felt that they were under threat by the students who did not receive CR and as such viewed their time in the subsequent Geometry I class as a challenge and thus experienced higher levels of achievement (Bracht & Glass, 1968).

**Summary**

The purpose of this study was to investigate the effectiveness of Algebra I CR programs within a secondary school environment. A significant amount of data was reviewed for statistical testing. Data included evidence from the NWEA testing service and grades that the recovery student was able to achieve in the subsequent Geometry I class. Data was stratified by grade achieved within the Algebra I class to mitigate any
concern of a non-homogenous data comparison. External and internal threats to validity were addressed through the selection process by which the CR students were chosen for inclusion in the study and through the stratification process that was placed upon the data set. The most pressing legal and ethical issue affecting this study was the Family Educational Rights and Privacy Act (FERPA) which specifically outlined the manner in which any student data was handled as related to the study. In order to maintain a completely ethical stance during the duration of the study, all data had identifying characteristics removed and was kept completely secure throughout the duration of the study.
CHAPTER FOUR: FINDINGS AND THE EVIDENCE-BASED SOLUTION

Introduction

As stated in Chapter 1, this study has a primary research question that asks what levels of efficacy computer based Algebra I CR programs experience. Two areas within Algebra I CR programs have been examined, the blended and more historical Algebra I CR programs and the more recently utilized completely online Algebra I CR program. In looking to answer the research question, five hypotheses, which examine levels of efficacy based upon NWEA RIT scores, subsequent class grades, and graduation rates have been introduced and will be answered in order within this chapter.

Purpose of the Study

The purpose of this quantitative study was to investigate the effectiveness of Algebra I computer-based CR within a Montana school district by examining average grades in the subsequent Geometry I class, graduation rates for CR students, and the levels of reported growth on the Northwestern Evaluation Association (NWEA) normative referenced test.

Aim of the Study

The aim of this study was to investigate the effectiveness of computer based CR systems to inform decision making within school systems considering CR implementation.

Summary and Presentation of Findings

This section will systematically examine and report the findings relative to the five research hypotheses. Each hypothesis will be restated along with a description of all relevant data, figures, and will be followed by any relevant descriptive statistics. Once a
firm description of the factual basis within each hypothesis has been created, a listing of all relevant statistics will occur with the results given.

**Hypothesis 1**

*H1: There will be a statistically significant difference in the measured skill levels as reported by the RIT score on the NWEA normative test between those students who receive credit via traditional methods and those who receive credit from an online Algebra I CR program.*

The intent of this hypothesis was to test the efficacy of Algebra I completely online CR programs using the NWEA RIT score for both the CR students and the matched comparison group. Initial comparisons of growth rates for those students during the time period allocated as *completely online* were completed through IBM SPSS descriptive statistics.

A measure of descriptive statistics on this data set was completed that matched each CR student to their counterpart which scored the same grade in Algebra I as the CR student did in their CR Algebra I by creating a *comparison* score (see Table 2). Taking the average score achieved by the CR student and subtracting that from the average score of the regular student, comparison = CR Average - Regular Average, created this score. This yielded a measurement that would indicate which group had a higher average score. In the case of the completely online course, the *comparison* score was at +4.53. This statistic indicates that the regular Algebra I students RIT scores grew at a higher rate on the NWEA then the CR Algebra I students. Further descriptive statistics showed that the average change for the CR students was at 0.81 and the average change for those students not requiring CR was at 0.20.
Reliability adjusted ANCOVA was performed. In order to perform this task a measure of the reliability of the NWEA RIT scores was completed prior to data analysis. This was accomplished via Cronbach Alpha, which yielded $\alpha = .84$. This score was used to adjust the pre-CR NWEA RIT scores to account for the non-equivalent nature of the study. To use ANCOVA, assumptions were checked. There was a linear relationship between pre- and post-intervention NWEA RIT score for each group type, as assessed by visual inspection of a scatterplot (see appendix F). There was homogeneity of regression slopes as the interaction term was not statistically significant, $F(1,65) = .014$, $p = .907$ (see appendix F). Standardized residuals for the interventions and for the overall model were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$) and visual inspection of the histograms and Q-Q plots (see appendix F). There was homoscedasticity and homogeneity of variances, as assessed by visual inspection of a scatterplot and Levene's test of homogeneity of variance ($p = .416$), respectively (see appendix F). There were no outliers in the data, as assessed by no cases with standardized residuals greater than ±3 standard deviations. After adjustment of the pre-
CR NWEA RIT scores, there was a not a statistically significant difference in post CR NWEA RIT scores between CR students and regular students, $F(1, 66) = .002, p = .97$, partial $\eta^2 < .05$ (see Table 3). Given the results of the ANCOVA analysis the null hypothesis must fail to be rejected.

Table 3

**ANCOVA Results for Completely Online Group Comparison**

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest by Group Pretest Covariate Term</td>
<td>.07</td>
<td>1</td>
<td>.07</td>
<td>.002</td>
<td>.97</td>
<td>.00</td>
</tr>
</tbody>
</table>

As the null hypothesis, the assumption that there is no difference between the data sets, cannot be ruled out, a check for equivalence between the data sets occurred. The ANCOVA test was performed at a 95% confidence interval CI [232.92, 237.47]. It is reasonable to assume that a difference within the data ($\delta = 4$) can occur given the comparison score of four. Additionally, as evidenced within the NWEA data from the district, a standard error level within the RIT scores ranging from 3-5 occurs. As such, the $\delta$ value was set at four for the purposes of equivalence testing across the pre and post treatment data sets. The analysis reported a mean ($M = 235.21$), which means that our $\delta$ interval would be given by $235.21 \pm 4$, = [231.21, 239.21] as the delta interval is created based upon the mean value within the data set. This $\delta$ interval encompasses the 95% CI
[232.92, 237.47] and as such indicates that the data sets, completely online CR students and regular Algebra I students NWEA RIT scores were equivalent (see Table 4).

Table 4

\[ \delta \text{ Interval versus 95\% CI Indication of Equivalence Chart for Online Groups} \]

<table>
<thead>
<tr>
<th>( \delta \text{ Interval} )</th>
<th>231.21-------------------------235.21--------------------------239.21</th>
</tr>
</thead>
<tbody>
<tr>
<td>95% CI</td>
<td>232.92-------------------------235.21--------------------------237.47</td>
</tr>
</tbody>
</table>

Hypothesis 2

\( H2: \) There will be a statistically significant difference in the measured skill levels as reported by the RIT score on the NWEA normative test between those students who receive credit via traditional methods and those that receive credit from a blended online Algebra I CR program.

The intent of this hypothesis was to test the efficacy of CR Algebra I programs by examining the NWEA RIT scores of both groups. Descriptive statistics were performed via SPSS and with simple formulas within Excel. For this data set a comparison score of +10.6 was observed. This indicates that the regular Algebra I students on average scored higher than the CR Algebra I student on the NWEA test. Further descriptive statistics indicated that the CR students experienced an average change of 3.16 while the regular Algebra I student showed an average change of 2.5 in RIT score (see Table 5).
A reliability corrected ANCOVA analysis was completed upon the data set. The pretest scores were adjusted given the Cronbach Alpha $\alpha = .838$. This was in response to the non-equivalent study design. Those scores were entered into SPSS and to enable the use of ANCOVA, the appropriate assumptions were checked. There was a linear relationship between pre- and post-intervention NWEA RIT score for each group type, as assessed by visual inspection of a scatterplot (see appendix F). There was homogeneity of regression slopes as the interaction term was not statistically significant, $F(1,55) = .729, p = .397$ (see appendix F). Standardized residuals for the interventions and for the overall model were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$) and visual inspection of the histograms and Q-Q plots (see appendix F). There was homoscedasticity and homogeneity of variances, as assessed by visual inspection of a scatterplot and Levene's test of homogeneity of variance ($p = .209$), respectively. There were no outliers in the data, as assessed by no cases with the standardized residuals greater than ±3 standard deviations. After adjustment for pre-CR NWEA RIT scores, there was not a statistically significant difference in post CR NWEA RIT scores between

<table>
<thead>
<tr>
<th>Student Group</th>
<th>Average Score</th>
<th>Comparison Score</th>
<th>Average Change In RIT Score Between Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>234.58</td>
<td>+ 10.6</td>
<td>3.16</td>
</tr>
<tr>
<td>Regular</td>
<td>245.10</td>
<td></td>
<td>2.50</td>
</tr>
</tbody>
</table>
CR students and regular students, \( F(1,56) = .025, p = .876, \) partial \( \eta^2 < .05 \) (see table X). Given the results of the ANCOVA analysis the null hypothesis must fail to be rejected (see Table 6).

Table 6

**ANCOVA Results for Blended Group Comparison**

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest by Group</td>
<td></td>
<td></td>
<td></td>
<td>.03</td>
<td>.88</td>
<td>.000</td>
</tr>
<tr>
<td>Pretest Covariate</td>
<td>1.25</td>
<td>1</td>
<td>1.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Term</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As the null hypothesis, the assumption that there is no difference between the data sets, cannot be ruled out, a check for equivalence between the data sets occurred. The ANCOVA test was performed at a 95% confidence interval CI [238.24, 244.43]. It is reasonable to assume that a difference within the data (\( \delta = 5 \)) could occur as the comparison score indicated a +11 relationship between the groups of students. As the NWEA scores from the district report a error level that ranges from 3-5 it seems appropriate to choose a \( \delta \) value on the high end of that amount. The analysis reported a mean (\( M = 241.31 \)), which means that our \( \delta \) interval would be given by 241.31 ± 5, = [236.31, 246.31]. This \( \delta \) interval encompasses the 95% CI [238.24,244.43] and as such indicates that the data sets, blended CR students and regular Algebra I students NWEA RIT scores were equivalent (see Table 7).
Table 7

\( \delta \) Interval versus 95\% CI Indication of Equivalence Chart for Online Groups

<table>
<thead>
<tr>
<th>( \delta ) Interval</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>236.31-----------------241.35-----------------246.31</td>
<td>238.24-----------------241.35-----------------244.43</td>
</tr>
</tbody>
</table>

Hypothesis 3

H3: There will be a statistically significant difference in the NWEA growth rates between the Algebra I CR blended classroom and the completely online Algebra I CR classroom on the NWEA normative test.

This hypothesis looks to determine the differences, if any exist, between the two types of CR systems under review within this study. This data was continuous and derived by taking the observed pretest score and posttest score and computing the difference for recording. These data points were entered into SPSS and placed into associated groups and was tested for basic assumptions. An independent-samples t-test was run to determine if there were differences in NWEA RIT growth scores between those students who received CR instruction via a blended system versus those who received the CR instruction via a completely online format. In checking for the assumptions necessary for use of an independent samples t-test it was found that there were no outliers in the data, as assessed by inspection of a boxplot (see appendix F). Scores for each style of CR were normally distributed, as assessed by Shapiro-Wilk's test.
(\(p > .05\)), and a visual review of histograms (see appendix F). There was homogeneity of variances for NWEA RIT scores across both styles of CR, as assessed by Levene's test for equality of variances (\(p = .069\)). The blended system showed higher amounts of growth (\(M = 3.97, SD = 7.99\)) than the completely online system (\(M = .25, SD = 5.57\)) (see table 8). Descriptive statistics indicate a difference between the data sets (see table 8). Further, a statistically significant difference, \(M = 3.72, 95\% CI [0.10, 7.34], t(56) = 2.061, p = .044 d = .54\) occurred within this data set (see table 9). There was a statistically significant difference between means (\(p < .05\)), and therefore, we can reject the null hypothesis and accept the alternative hypothesis.

Table 8

**Descriptive Statistics for Change in RIT Scores for Blended Versus Online CR Classes**

<table>
<thead>
<tr>
<th>Recovery Style</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change In RIT</td>
<td>Blended</td>
<td>29</td>
<td>3.98</td>
<td>7.98</td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td>29</td>
<td>.25</td>
<td>5.57</td>
</tr>
</tbody>
</table>

Table 9

**Confidence Interval and T-Test Results for Blended Versus Online CR Classes**

<table>
<thead>
<tr>
<th>95% Confidence Interval of the Difference</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change In RIT Across Groups</td>
<td>.10</td>
<td>7.34</td>
</tr>
</tbody>
</table>
Hypothesis 4

_H4:_ There will be a statistically significant difference in the average subsequent class grades for students who receive Algebra I credit via CR and those who receive Algebra I credit via the regular school program.

Initial descriptive statistics indicate a significant difference in means between those students who required CR and those in the regular Algebra I group, CR \( (M = .95) \) and regular Algebra I \( (M = 2.21) \) (see table 10).

Table 10

_Descriptive Statistics of Average Geometry Grades By Student Group_

<table>
<thead>
<tr>
<th>Student Type</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Geometry Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit Recovery</td>
<td>155</td>
<td>.95</td>
<td>.74</td>
<td>.06</td>
</tr>
<tr>
<td>Regular</td>
<td>155</td>
<td>2.21</td>
<td>.82</td>
<td>.07</td>
</tr>
</tbody>
</table>

An independent samples _t_-test was performed upon this data to check for statistical significance. There were no outliers in the data, as assessed by inspection of a boxplot (see appendix F). Normalcy was verified via a review of histograms and visual inspection of Normal Q-Q Plots. (see appendix F). The assumption of homogeneity of variances was violated, as assessed by Levene's test for equality of variances \( (p = .018) \). As such the results for the _t_-test in which equal variances are not assumed, Welch _t_-test, was utilized. There was a statistically significant difference in subsequent class grades between CR students and regular Algebra I students, with regular Algebra I students scoring higher than CR students, \( M = 1.26, 95\% \text{ CI } [1.08, 1.43], t(304.78) = 14.19, p < .001 \).
.05 \( d = .62 \) (see table 11). As such the null hypothesis is rejected and the alternative hypothesis is accepted.

Table 11

**T-Test Results for Subsequent Class Average Grades**

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
<th>95% Confidence Lower</th>
<th>95% Confidence Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Geometry Grade</td>
<td>Equal variances not assumed</td>
<td>14.19</td>
<td>304.78</td>
<td>.000</td>
<td>1.26</td>
<td>.09</td>
<td>1.08</td>
</tr>
</tbody>
</table>

**Hypothesis 5**

*H5: The students who participate within the Algebra I CR program will show a different rate of graduation than those students who did not require Algebra I CR for graduation.*

Over the time period that this study encompassed the graduation rate for the Montana school district was reported as varying from 78% to 83% (BPS, 2011). However, as those students who participated in CR beginning with the 2012/2013 academic year have not graduated by the time this study was completed they were not included in any computations within this study. The number of possible graduates from the Algebra I CR group beginning with the 2001/2002 academic year have an \( n = 121 \).

Out of the total possible, 91 students are listed as graduated upon their academic records. The difference in totals is made up of 23 students listed as *dropped out* on their official record and seven students listed as transfer students (see table 12).
Table 12

*Totals and Percentages of Graduates, Drop Outs, and Students who Transferred Out During Academic Years 2001/2002 - 2011/2012*

<table>
<thead>
<tr>
<th>Total</th>
<th>Graduated</th>
<th>Dropped Out</th>
<th>Transferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>121</td>
<td>96</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>76%</td>
<td>19%</td>
<td>5%</td>
</tr>
</tbody>
</table>

The raw data suggests that the students who participate in Algebra I CR programs do not graduate at the same rate as those that do not require CR for their Algebra credit. This is seen by the graduation rate for CR equal to 76% and the non-CR student graduation rate was at an average of 80.5%. As such the null hypothesis is rejected and the alternative hypothesis is accepted.
Table 13

*Summary of hypotheses under review*

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Statistical Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Comparison of NWEA RIT scores for completely online Algebra I CR students and regular Algebra I students.</td>
<td>Fail to reject the null hypothesis. Delta values when paired with confidence intervals indicate equivalence between the data sets.</td>
</tr>
<tr>
<td>2. Comparison of NWEA RIT scores for blended Algebra I CR students and regular Algebra I students.</td>
<td>Fail to reject the null hypothesis. Delta values when paired with confidence intervals indicate equivalence between the data sets.</td>
</tr>
<tr>
<td>3. Comparison of NWEA RIT scores for blended Algebra I CR students and online Algebra I CR students.</td>
<td>Reject the null hypothesis. The blended style Algebra I CR program showed statistically significant higher levels of average change in RIT score.</td>
</tr>
<tr>
<td>4. Comparison between the average Geometry I grades of CR students and regular Algebra I students.</td>
<td>Reject the null hypothesis. The average Geometry I grades of the CR students was different by a statistically significant amount.</td>
</tr>
<tr>
<td>5. Comparison of the graduation rates of those students who required Algebra I CR and those students who did not require Algebra I CR.</td>
<td>Reject the null hypothesis. The graduation rates of the students who required Algebra I CR over the time period within this student was shown to be lower than those students who did not require Algebra I CR.</td>
</tr>
</tbody>
</table>

**Analysis and Synthesis of Findings**

The aim of this study was to analyze the CR process using Algebra I CR student scores on NWEA tests and grades in subsequent classes. This process was intended to
enable informed decision making by those considering implementation of CR programs. The data from the past 18 years within the Montana school district was analyzed via ANCOVA for the analysis of the NWEA RIT scores for Algebra I CR students when compared against similarly stratified regular Algebra I students. The analysis of which CR program, blended or online, has produced better results was completed using an independent samples $t$-test. The comparison of the stratified grade data was completed using Welch’s $t$-test, as the data did not show homogeneity of variance and the comparison of the graduation rates of the CR students was completed using descriptive statistics (see table 13).

**NWEA RIT Scores**

The CR students did show a slightly higher level of growth when compared to their stratified counterparts. However, this could be explained by the lower level of achievement displayed by the CR student. They are students who have already failed a class not due to the standard reasons that were controlled for within the selection process. Their slightly higher levels of growth could also be explained by an exposure effect found by the extra instruction experienced through participation within the CR program. The research question for the study was concerned with controlling for the lower levels of achievement and as such the ANCOVA test was chosen as it allowed the statistic chosen to control for the pre-CR NWEA score. The results indicated that in both cases, completely online and blended CR classes, that little difference exists within the realm of measured growth when compared to the regular Algebra I students. Both alternative hypotheses were rejected in favor of a failure to reject the null hypothesis. However, through the utilization of the confidence interval and a measure of expected change, it
was determined that with both sets of data were equivalent. This indicated that the CR students and the regular Algebra I students showed the same amount of growth on the NWEA tests across both types of CR under analysis and are equivalently prepared across the domains tested via NWEA.

**Blended Credit Recovery versus Completely Online Credit Recovery**

As a part of the analysis process of CR programs, it is important to analyze which of the two more prevalent styles of CR have shown greater levels of success. The measure utilized by this study for this purpose was the NWEA RIT scores as segmented by years in which each type of system was implemented. The NWEA RIT scores from the time frame in which the blended style of CR was prevalent within the Montana school district was compared against the NWEA RIT scores from those students who experienced a completely online experience. To make this comparison the study utilized an independent samples *t*-test and it was found that a significant difference did exist between styles of CR within the Montana school district. It was found, via post-hoc analysis that the blended style student showed higher levels of growth than those students who participated in the completely online CR programs.

**Subsequent Geometry I Class Grades**

This data set reviewed the average grade across both semesters recorded for the subsequent Geometry I class. Algebra I CR programs are created to prepare those students that fail their regular Algebra I class for the subsequent Geometry I class which is to allow those students the opportunity to continue towards graduation on time (Heppen et. al, 2013). As such, this study evaluated the CR students average Geometry I grades and compared those averages against the averages displayed by the regular
Algebra I students, utilizing Welch’s $t$-test for data that cannot assume homogeneity variance. It was found that the average Geometry I grade for CR students lagged well behind the regular Algebra I students across the 18 years that this study examined. This indicates that the CR Algebra students, upon placement in the subsequent Geometry I class, continue to experience difficulty in the classroom.

**Graduation Rates**

The ultimate goal of CR efforts is to enable the return to on-time graduation for those students. To test this outcome the study examined the graduation rates across the 18 years of stratified and controlled data from the Montana school district. It was found the CR students, whom were selected for inclusion within the study, lagged slightly behind the Montana school district average graduation rate over that same time period with a total graduation rate of 76%. Over that same time period the non-CR Algebra I students showed an average graduation rate of 80.5%. This indicates that the CR programs, while making progress with those students who are behind, are not quite returning those students to on-time graduation at the same rate as their peers.

**Analysis**

The data introduces a few trends within the Montana school district whose data was subject to review within this study. It appears that the student who participated within the CR process displayed growth on the NWEA test and this growth was higher for those students who experienced the blended style of CR with the Montana school district. This indicates a finding that is commensurate with most research regarding online course design and especially those that were looking to be utilized for CR purposes within the secondary school system (see O’Dwyer, Carey & Kleiman, 2007;
Long & Jennings, 2005). The equivalence of the NWEA data indicates that the CR students are displaying equivalent amount of growth. Yet when a comparison of subsequent class grades occurs, the CR student falls behind. They are not doing as well in their Geometry I class as those students that did not require CR. If the CR students are showing equivalent growth, yet are experiencing a lowered level of success in the subsequent class, it is logical to consider that an issue within the design of the subsequent class is at fault. While alternative explanations could exist, the majority of the reasons that students tend towards class failure have been controlled via the selection process within this study. This does not mean that humanistic issues are controlled for entirely as issues such as student motivation are difficult to control for outright. Instead, those actions that are commonly attributed to such issues were identified within the selection process and used to help control for human conditional explanations. Regardless, in absence of another viable option for failure, the only non-controlled variable is most likely. Additionally, it could be hypothesized that the issue within the subsequent class is responsible for the lowered graduation levels that have been observed across the study timeline.

**Proposed Solution**

The research conducted within this study indicates that an issue arrives in two different areas. First, the blended format for CR has been shown via this study and related research to be more effective in the CR process. Second, the data suggests that students experience a continued lower level of achievement after completing the CR process. As such this study proposes two separate areas of resolution for these observations.
**Blended Recovery Format**

The data within this research and related studies suggests that the blended format experiences higher levels of success with students (see O’Dwyer et al; Snow, 2011; Plummer, 2012; Means et al, 2009). As such, it is recommended that CR efforts within school districts similarly situated to the Montana school district move into a blended format as opposed to the completely online format that is found within the Montana school district at this time. It is unknown what implications this recommendation would hold for other school districts as the current percentage of the programs, blended, completely online, and traditional is unknown at this time. However, as it has been reported that many school districts have moved towards completely online CR classes it is probable that the impact will be similar to what is experienced within the Montana school district.

**Subsequent Class Design**

The data that this research collected indicates that while CR students experience equivalent levels of growth, an outcome that is echoed by the similar research, they do not experience expected levels of success in their subsequent classroom (see Heppen et al., 2013). This could indicate that there is an issue with the standard classroom instructional method. This is further evidenced by the initial failure in the Algebra I classroom. As the data suggests that the CR student has difficulties with the standard methodology, it is recommended that the subsequent class be changed to the same style as is found within the CR format as opposed to the standard, lecture-homework-assessment methodology. This format would mean that the student is taught in a semi-self-paced environment with scaffolding assignments and lessons that are utilized in a
smaller group or individualized format within the classroom. The post-CR Geometry I classroom would have computer workstations and desks for small group instruction. This would enable the students to gain the advantage of the blended CR environment in which the data suggests they experience success.

**Support of the Solution from Data Collected**

The data analysis of the different types of CR programs indicated an effect size, as measured by Cohan’s d, of .54 on a dataset that reported a difference of means equal to 3.72; with associated means of 3.98 for the blended CR students and .25 for the online CR students. This large amount of variation between the means and the medium level effect size indicate that the blended format yields higher results on NWEA RIT score growth within the CR students. The data set was statistically significant indicating that the likelihood of a Type I error was at less than 5%. As such there is a strong argument for the implementation of blended style CR programs for use with the CR student population.

Analysis of data regarding subsequent class grades indicated that CR students’ average grades for their subsequent Geometry I class fell below a passing grade at .95 on a four point scale. The regular Algebra I students fared much better in their Geometry I class with an average Geometry I score of 2.21 on a four point scale. The statistical tests indicated a large effect size, with Cohen’s d equal to .62. These data indicate that CR students have a significantly higher likelihood of failing their subsequent class. Credit recovery programs are designed to prepare students for the next class. The data indicated within the first two hypotheses suggested that the CR students displayed the same amount of growth in Algebra I skills, and further indicated that the data sets themselves were
largely equivalent. As such, it could be argued that the CR students are being similarly prepared for the subsequent class as the regular Algebra I students. With the design of the study controlling much of the standard reasons that students fail classes it is reasonable to assume that much of the problem that the CR student experiences is within the classroom. Given their previous failure in the Algebra I class, it appears that CR students are unable to experience success in the regular mathematics classroom. However, as the CR students show equivalent growth with their NWEA RIT scores following the CR class, it appears that the CR format does create successful outcomes. Therefore, it is recommended that the CR format for Geometry I be adopted for those students who enter into the CR program as an alternative learning environment to the standard classroom. Additionally, it is recommended that only those student such as those that qualified for inclusion in the study be allowed to participate in the post-CR Geometry I class. This is to keep the failed-by-choice student from using resources that would be better allocated towards students of which this program will benefit.

**Implementation of Recommended Solution**

The solution presented will require some shifts in resource allocation, policies and procedures within the Montana school district. This section outlines the various internal issues, external issues, and barriers to implementation that are currently in place. It also discusses the assorted existing resources that will enable application of the recommended solution.

**Existing Support Structure and Resources**

Currently the Montana school district employs between 12-14 mathematics teachers per secondary school. These 12-14 full time equivalent (FTE) positions are used
only for the purposes of mathematics instruction and create a classroom size of approximately 25 students per classroom. Currently, all three secondary schools have a classroom that is set up in a computer lab format with 30 computer workstations for during-school CR processes. These CR computer labs are not utilized to full capacity but are scheduled for use all periods during the school day. Each school has two additional general use computer labs that are open for use by the entire school staff. Each of these labs has 30 computer workstations. All workstations within all three labs are on a three-year replacement cycle that operates on an ongoing basis. These workstations upon replacement are moved into computer labs within the elementary school district.

**Policies and Implementation**

It is the current policy that a student must fail their class in the regular environment prior to placement into the CR environment. The proposed solution calls for those students who have failed their Algebra I class and then moved on to recover credit for that class via the CR process to be moved into a blended style CR-type classroom for their Geometry class. This class could be described as a post-CR Geometry I class. The post-CR Geometry I classroom will utilize the blended CR approach for the purposes of standard educational advancement. The data suggests that the students are successful within the CR style of classroom thus the previous failure policy must be change to allow for those students who failed Algebra I and earned credit via CR to move into a post-CR Geometry I class. That post-CR Geometry class will require staffing by content area certified instructors as it will be of the blended variety in that the class will have both online and offline components. This will require the creation of materials and development of appropriate equivalent curriculum.
At this time, as the CR offerings are completely online, the Montana school district allows for non-content area staff to supervise the CR classroom. If the blended format, that was shown to be more successful, is to be put into place then it is essential that all CR classrooms be lead by content certified staff. Further, if those CR classes were to be moved back into the blended format it would require the development and design of materials to accompany the online materials.

**Potential Barriers and Obstacles to the Solution**

The recommended solution calls for the development of two new classes. The first being developed with the return to the blended format within the Algebra I CR course. This course will still utilize the online portion that is currently in place but will require the use of additional materials to create the blended format. Those additional materials will need to be created or found within existing materials. This may prove difficult, as many CR programs within the United States have moved to a completely online format (Heppen et al., 2013). Additionally, the development of these new materials will require a time commitment from district CR staff and administration at a time when most schedules are already loaded. At this time the CR classroom is entirely self-paced and as such is not as easily moved into a traditional blended format that includes group instruction. As the data in this study suggests that whole group instruction does not create student success, a system in which individualized or small group instruction on topics would be allowed to occur which should be immediately followed by the students utilizing an online lesson will be required. This will require a change in methodology by which the CR student will move through the class with others using both online and offline materials.
The second recommendation is for the students to move into a post-CR Geometry I class following their CR Algebra I class. This class will utilize a blended classroom format for primary instruction. This will also require the development of materials, which will necessitate a time commitment from staff and administration. The post-CR Geometry classroom will also require the development of a methodology that allows for small group instruction within the larger group and allocation of space. One of more desired traits of the standard CR classroom is the more self-paced format that allows for students to spend time on those aspects that give them the highest amount of difficulty (Means et al., 2009). As such the post-CR Geometry I classrooms will require the creation of methodology by which the students are afforded the ability to self-pace, with small group or individual instruction. This is a significant departure from the standard classroom found within the Montana school district.

**Financial issues related to the solution.** At this time the Montana school district purchases licenses for the online CR classes on an as needed basis dependent upon enrollment. As the post-CR classroom could utilize the same online program for the online portion of the blended class the district will incur a cost for licenses for each student enrolled in the post-CR Geometry I classroom. Additional staff might be required to staff the post-CR Geometry I classroom as current Geometry I classrooms are averaging 24 students per section. Most classrooms that are designed with a small group and individualized style of education require a class size of less than 20 (Snow, 2011). As with any program that is implemented district wide, training on new technology, software, and methods will require additional training for district staff. Additionally, there could be a cost associated with the computer usage that will be necessary with the
blended format of the classroom, as depending on enrollment numbers, the number of available workstations might be exceeded.

**Legal issues related to the solution.** As with any curriculum implementation the standard curriculum must be met within that implementation. Currently, the State of Montana has implemented the Common Core curriculum for all public school districts. As the Montana school district moves to implement the post-CR Geometry I class, as recommended and indicated by the data, it must ensure that the newly designed class meets the standards set forth by the Common Core curriculum.

**Change Theory**

As with any change to an existing structure, push back by existing employees is an area of concern that must be mitigated. One of the hallmarks of most educators is the desire to complete tasks and lessons that lead to the betterment of the students. This is one of the basic goals of education. As such, to properly implore the changes to policy, course structure, and methodology found within this document, district leadership must move to disseminate the data that has been found within this study to all parties.

However, as the Montana school district is primarily made up of experienced and long-time teachers that as a group have developed a level of skepticism of innovations and initiatives. Many of the staff members within the Montana school district could be defined by Rogers (2003) as *late innovators or laggards.* As such leadership must be careful to present the initiative in such a manner that will be acceptable to those staff members. The change from existing practices could be viewed as a loss of familiarity. Leaders within the Montana school district must look to provide a way to work through that perceived loss through the use of change agents (Levinson, 1976).
The change outlined within this study involves a change of curriculum, which is a *deep structure* within a school district and as Burke (2011) discusses, change of those types of structures can be a difficult proposition. As a response to this type of change it is imperative that the Montana school district move towards the creation of *in-group champions* to act as change agents, so as to lead the move towards a different style of CR and post-CR classroom. Burke (2011) makes the argument that the creation of these types of individuals will lead to the creation of an environment more conducive to change. In addition, to ensure a higher likelihood of buy-in by staff it would be beneficial to utilize the opinion leaders, as defined by Rogers (2003). These individuals are able to, by acting as peer-leaders, influence the attitudes of those within the department.

Rogers (2003) makes the case for convincing organizational change by creating the insistence that familiar aspects will still be in place post adoption of the new practices. The ideal of children learning, a familiar aspect, must be at the forefront of the discussion as that will help reduce feelings of structural change. Further, the case must be made that the learning of those children will be occurring in a more effective manner with the change that is being proposed. However, it is important that the change in CR structure not be confused with prior innovations as a failure to be mindful of this mindset could lead to a passive rejection of the CR initiatives.

It is important that leaders continue to articulate the vision of improved graduation rates for the CR subgroup of students through the creation of an improved CR process. In this sense it is important to note that any change within a system can cause a drop in morale, as it is easy for staff members to quickly begin to look at change, such as
this implementation, as redundant or not in line with what is believed to be best practices (Mooney & Mausbach, 2008). However, if leadership makes the continued case, without variation, of the necessity of the school improvement that will be created via these recommendations and continues to involve all affected parties with the design process outlined in the following chapter than an opposite effect can be experienced in that the staff members morale is improved as they see the change as making sense for the school (Mooney & Mausbach, 2008).

Summary

This study utilized a quasi-experimental non-equivalent control group design with pre and posttest analysis. This process was completed using ANCOVA for the analysis of NWEA RIT growth scores and t-test for the analysis of subsequent class grades and comparison of online versus blended classes. It was found that CR students experienced equivalent growth on the NWEA yet fell far behind the regular Algebra I students in the subsequent class. Additionally, it was found the blended classroom experienced higher levels of success. As such, it was the recommendation that the CR classrooms return to the blended format and the CR students are placed into a different style of classroom for their Geometry I class that utilizes a blended format for teaching and learning.

There are some possible problems that could arise with the implementation of the changes recommended. Both recommendations will require the creation of new methods and materials for the post-CR Geometry I classroom. Further implications of the implementation process include concerns about the creation of the computer classroom for the blended post-CR classroom, licensing for the online components, and ensuring the new course meets common core curriculum guidelines.
As a move from existing practices can often lead to pushback by existing staff it is recommended that district leaders utilize change agents and opinion leaders to create an environment conducive to change. Further, it is recommended that all information is presented in such a way that a preponderance of evidence makes it apparent that the changes outlined will still be in line with the standard goals of the Montana school district.
CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter will provide conclusions and recommendations based upon the data analysis and review of existing knowledge presented within this study. Upon review of the related literature it was found that there was a deficit of quantitative analysis of CR programs. As such, this study has helped to mitigate that deficit through the analysis of 18 years of data regarding the observed growth of CR students and their academic results in the subsequent class within the state of Montana. This study had the purpose of conducting an investigation of the effectiveness of CR classes within the mathematics curriculum. As a result of the data analysis that was performed within this study two recommendations have been made and will be discussed thoroughly within this chapter. The first that will be discussed is the return to a blended style of CR course for CR Algebra I students. The second recommendation is for those students who complete the CR Algebra I class to be placed into a different style of class for their subsequent Geometry I class.

Summary of the Study

This study had the intent of investigating the effectiveness of computer based Algebra I CR by examining the average grades in the subsequent Geometry I class, graduation rates of CR students, and the levels of growth as reported by the NWEA test. This was completed for two main reasons: First, the study had the intention of working towards rectifying the dearth of quantitative analysis of CR programs in the knowledge base as evidenced within the literature review. Second, by providing that quantitative analysis this study had the aim of providing school leadership with data pertaining to the
CREDIT RECOVERY IN SECONDARY SCHOOLS

effectiveness of the various forms of CR to so as to inform decision making for school systems considering CR implementation. The study utilized a quasi-experimental non-equivalent control group design with a stratified and restricted data set. Those restrictions were placed upon the population of students that had participated in Algebra I CR to create a sample that controlled for as many of the reasons for student failure not related to academics as possible. If the data was not restricted as such and those students were included in the data set, their inclusion would have skewed the data and invalidated the results. The control group was selected at random from those students who met the same restrictions as those in the CR group. Modern CR within secondary schools has primarily used two methods of delivery, blended and completely online. This study tested both of these styles for efficacy against a matched stratified control group and then compared the styles against each other. Additionally, the study examined efficacy by examining the average grades recorded in the subsequent Geometry I class against the matched, stratified control group. Lastly the study compared the graduation rates of the CR students over the time period against the observed graduation rates for the Montana school district whose data was subject to review. For the data analysis the following statistics were used:

- NWEA RIT growth utilized ANCOVA. It was employed with a post hoc test of equivalence utilizing a logical delta (δ) value.
- The CR style comparison used an independent samples $t$-test and the comparison of grades utilized Welch’s $t$-test as homogeneity of the variances was non-verifiable.
• Simple statistics were utilized to compare the graduation rates of the CR students against the observed graduation rates within the same time period.

It was found via statistical analysis that CR students, when controlling for the initial RIT levels, displayed the same amount of growth on the NWEA test. Furthermore, it was found that the blended style CR classroom displayed a statistically significant higher level of growth than the completely online CR classroom. When the subsequent Geometry I class grades were averaged and compared against the control group a statistically significant result was found indicating that the CR students performed worse in their subsequent class than the control group. The graduation rates of the CR students were found to be less than the average graduation rate for the Montana school district over that same time period. These results prompted two separate recommendations. It was recommended that the CR Algebra I classes utilize the blended classroom style as that was shown to be more effective and it was recommended that the CR student placement in subsequent class be changed from a standard classroom to a blended classroom environment.

**Purpose of the Study**

The purpose of this quantitative study was to investigate the effectiveness of Algebra I computer-based CR within a Montana school district by examining average grades in the subsequent Geometry I class, graduation rates for CR students, and the levels of reported growth on the Northwestern Evaluation Association (NWEA) normative referenced test.
Aim of the Study

The aim of this study was to investigate the effectiveness of computer based CR systems to inform decision making within school systems considering CR implementation.

Implementation of Solutions Processes and Considerations

The process of implementation for the Montana school district would include: roles and responsibilities of key players, the role of leadership in implementing the recommendations, an evaluation timeline that will provide assessment of the recommendations, a plan to convince key players of the merit of the recommendations, critical pieces for implementation and assessment, a survey of external and internal implication of implementation, and implications and considerations of leaders will be discussed in the following sections. Ultimately, the proposed solutions have the potential for increasing the achievement of CR students and in could increase the graduation rates of that subgroup. It is key that all leadership positions articulate this vision prior, during, and after the implementation of the recommendations.

Roles and Responsibilities of Key Players in Implementation

The CR program is managed by the assistant superintendent within the Montana school district. Any modification of instructional delivery style, as supported by the results of this study, will require the support of the assistant superintendent. In addition, the CR program has two directors whom would need to support any changes to the CR program. These two directors will act as opinion leaders within the CR program as they have been involved within the program for many years. Given their levels of expertise in the field, they will be involved in the curriculum design process in which the additional
CREDIT RECOVERY IN SECONDARY SCHOOLS

materials that will be required for the blended format will be designed. As this study is creating a set of recommendations for CR mathematics students, the district mathematics coach, an administrative position that aids in curriculum design, implementation, and training, would be tasked with the development of the training program that would allow the CR teachers to implement the blended design within CR classroom. Lastly, the teachers will be required to attend training to learn the requirements of a blended CR classroom (see table 14).

Table 14

*Summary of key players roles for blended classroom implementation*

<table>
<thead>
<tr>
<th>Position</th>
<th>New Responsibilities / Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistant Superintendent</td>
<td>Oversee implementation</td>
</tr>
<tr>
<td>CR Program Directors</td>
<td>Oversee implementation, act as opinion leaders within initial implementation, curriculum and materials design.</td>
</tr>
<tr>
<td>District Mathematics Coach</td>
<td>Development of training program for teachers to prepare them for the blended process.</td>
</tr>
<tr>
<td>District Teachers</td>
<td>Attend training regarding the new blended classroom.</td>
</tr>
</tbody>
</table>

The secondary recommendation for the creation of a alternative placement for the CR students upon entrance in to the Geometry I classroom will require the district mathematics coach to create a curriculum design and training schedule. School level leadership, in combination with department chairs, will brought in to act as opinion leaders so as to elicit group support. The scheduling administrator, in conjunction with the guidance department, will be required to create a master schedule that allows for the
tracking of those students into the post-CR Geometry I classroom as opposed to the regular Geometry I classroom. All of these steps will require the support of the district curriculum director as that office provides guidance, edict, leadership, and provides direction for the curriculum offerings within the school district (see Table 15). That position will be key for ensuring the implementation process.

Table 15

Summary of key players roles for alternative Geometry I classroom

<table>
<thead>
<tr>
<th>Position</th>
<th>New Responsibilities / Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>District Mathematics Coach</td>
<td>Curriculum design, training program design and schedule.</td>
</tr>
<tr>
<td>School level leadership / Department Chair</td>
<td>Act as opinion leaders to sell change in Geometry I program within the schools.</td>
</tr>
<tr>
<td>Scheduling Administrator / Guidance Office</td>
<td>Creation of master schedule that allows for tracking and appropriate placement for post-CR students.</td>
</tr>
<tr>
<td>District Curriculum Director</td>
<td>Development of curriculum that allows for the implementation of a blended classroom for the post-CR Geometry I students, act as opinion leader.</td>
</tr>
</tbody>
</table>

The Role of Leadership in Implementation

As with any implementation the leaders role, and the manner in which they perform that role, is paramount to the success to of the implementation. School district leadership must ensure that a few things occur within the implementation process that this study recommended. This section divides the actions of leaders into three areas: actions prior to implementation, actions during implementation, and actions after implementation. Rogers (2003) makes a case for an assurance to be made by leaders that
the organization will continue with its organizational mission, the creation of change agents, the outlay of opinion leaders.

**Prior to implementation.** Prior to the implementation of the recommendations that this study outlines it is important for leadership to identify those individuals that will be able to act as opinion leaders and change agents. School level leadership is in the best position to identify those individuals as they are better situated within the school with knowledge of personalities and identification of teacher leaders. The changes outlined will not require significant changes in existing processes or large-scale change within organizational structure. As is the case with smaller level changes the key is preparation and ease of implementation (Burke, 2013). Mooney and Mausbach (2012) make the case for the creation of action plans. These plans outline the steps that will be followed in the rollout process. This process allows the school level leadership to prepare themselves and their staff for upcoming changes.

**During implementation.** It is important that district leaders be mindful of the change process and continue to maintain a close relationship by checking with building level supervisors to help control for any issues that may arise during implementation. All computer systems, to include licenses, must be checked to ensure that they are in proper working order. The action plans that were designed in the pre-implementation phase should be verified for emplacement and a list of actions that must occur within each classroom should have been placed into practice within the classroom. This is key for the creation of the evaluation process.

**After implementation.** It is integral that support is maintained for those teachers who are involved in the CR and post-CR process. Any questions must be answered as
soon as they are received and a culture of collaboration between the recovery teachers must be fostered and maintained. As the recommended course of action relies upon technology, it is essential that district supports be in place to maintain the computer infrastructures. In the event that the computer systems are rendered unavailable, systems or lessons should be in place to ensure that forward progress is maintained towards competency. The list of expected actions that were created during the pre-implementation and during implementation phase should be observed during class visits.

**Evaluation and Timeline for Implementation and Assessment**

Implementation of the both recommendations should take place in stages. This section will outline these stages for each recommendation and then propose a plan for evaluation of each recommendation.

**Blended program implementation.** The return to a blended style CR for Algebra I recovery as indicated by the data should be completed via the following stages found in table 16 and will be described within this section.

Table 16

*Stages and timeline proposed for blended CR program implementation. All dates in timeline in the academic year prior to summer CR term*

<table>
<thead>
<tr>
<th>Stage</th>
<th>Proposed Time to Occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blended design organizational meeting</td>
<td>August</td>
</tr>
<tr>
<td>Budgeting meeting</td>
<td>September</td>
</tr>
<tr>
<td>Development of curriculum</td>
<td>September / November / February</td>
</tr>
<tr>
<td>Blended CR training for staff</td>
<td>October / December / March</td>
</tr>
<tr>
<td>Computer lab design meeting</td>
<td>October</td>
</tr>
<tr>
<td>Computer lab setup</td>
<td>April</td>
</tr>
<tr>
<td>Systems check and finalization of classroom space</td>
<td>May</td>
</tr>
</tbody>
</table>
Staring with an organizational meeting in August with central office curriculum directors, counseling department heads, mathematics department heads, and at least one administrator per high school, the process towards implementing a blended CR program within the Montana school district will take place over an academic year; with program rollout occurring for summer CR sessions at the conclusion of that academic year. That organizational meeting will be primarily informational in nature in which the plan for a return to the Blended CR format will be given with accompanying evidentiary support showing the need for the proposed change. The timeline for completion of needed processes will be outlined and recommendations for team members will be gathered.

The next stage will be a meeting to discuss budgetary items such as those that will be required to complete the programmatic change. This meeting will be more of presentation to the budgeting committee showing the cash outlay that will be required for the change over. Much of the cost will be more facilities orientated in that some classrooms might require remodel or removal of existing structures to include, but not limited to: the purchase of desks, white boards and movement of existing furniture. Each high school already has in place a computer lab dedicated to the CR process and any changes can be done during session or after class hours. In the event that a process takes longer than expected, each high school has additional computer labs that can be utilized for the existing CR program. Each staff member will be required to attend training sessions at the central office facility. That facility is the home of the CR process in the summer and will be setup as early as possible to allow for the trainings to occur in a blended CR classroom. Those training will coincide with the Wednesday late in scheduled time for professional learning community meetings. As such no human
resource cost will be incurred for those trainings. The last cost remaining is the cost of the licenses themselves. As it has been proposed to keep the existing program and simply augment that program will additional materials, no new costs will be incurred.

With the proper building infrastructure in place this means the development of the curriculum as the next important step for implementation. This will occur at a district level with school level input in an open documentation fashion that utilizes an open document program such as Google Docs. This way no time out of class for those teachers will occur and all parties get a chance to provide feedback in a collaborative fashion. Crafting of the original documents will fall upon the shoulders of the mathematics coach and curriculum director as those duties are within their job descriptions. The curriculum will be cut in to three portions, with accompanying trainings occurring in the month after curriculum completion.

In the next stage staff members who will be a part of the blended CR classrooms will come together to review the work of the curriculum director, mathematics coach, and district staff committee members. This will occur three times during the year in the month following the full development of each curriculum third. This will allow the staff members to meet and hone the proposed strategies in an ongoing process as curriculum is developed over the course of an academic year. This will occur over a one to two week period on Wednesdays during the professional learning community time.

The computer lab design meeting will occur within the first training meeting. At that time the proposed setup for the new style of CR classroom will have occurred at the summer CR classrooms that are found at the central office. This will allow for an open forum and constructive criticism to occur with the teachers who will be utilizing the
structures and classrooms for the blended CR curriculum. Once the finalized design has been agreed upon the final design will be placed into the existing CR classrooms in all high schools. As indicated earlier, no substantial changes will be occurring, as such these changes can occur during the school year.

Once final preparations have been made a systems readiness and finalization of classroom space will occur in the weeks occurring directly prior to the end of the school year. This will act as a final run through for all involved teachers and will include a last minute check of the curriculum to ensure that all parties understand the expectations and program design.

**Post CR Geometry I class.** The process by which the post-CR Geometry I class is implemented will follow these stages that will be outlined in table 17 and described in the following section.

Table 17

*Stages and timeline proposed for post-CR Geometry I program implementation. All dates in timeline in the academic year prior to the fall semester rollout*

<table>
<thead>
<tr>
<th>Stage</th>
<th>Proposed Time to Occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-CR Geometry I organizational meeting</td>
<td>August</td>
</tr>
<tr>
<td>Budgeting meeting</td>
<td>September</td>
</tr>
<tr>
<td>Stage</td>
<td>Proposed Time to Occur</td>
</tr>
<tr>
<td>Development of curriculum</td>
<td>September / November / February</td>
</tr>
<tr>
<td>Post-CR Geometry training for staff</td>
<td>October / December / March</td>
</tr>
<tr>
<td>Classroom setup</td>
<td>Summer months</td>
</tr>
<tr>
<td>Systems check and finalization of classroom space</td>
<td>Summer months</td>
</tr>
</tbody>
</table>

The implementation of a post CR Geometry I class begins with a developmental meeting by which central office administration, mathematics department chairs,
counseling department chairs and at least one administrator from each high school will be in attendance. This meeting will be primarily informational by which the case for a post-CR Geometry I classroom will be made and described. At this time identification of proposed teachers will take place. Prior to the meeting the expectation will be that the department chairs of each high school identify and contact the teacher, or teachers, at each high school that will be teaching the post-CR Geometry I class.

Unlike the change in CR class from completely online to a blended format, the new course offering will require some extra budgeting work as it will require the purchase of software licenses to enable the blended format that the data indicates yield the highest amount of success with CR students. However, as the average enrollment of students who are prepared for Geometry I levels after passing an Algebra I CR class is approximately 20 the cost per school will be negligible. The budgeting meeting should be attended by delegations from each high school to ensure that all necessary changes will be met for each individual high school. The Montana school district has in place a yearly grant from a large-scale benefit fund for mathematics and the sciences. This fund is earmarked for technology and could easily be used to purchase the technology necessary for the blended format.

Upon completion of budgetary and planning items the next phase of the project includes the creation of the curriculum that will accompany the post-CR Geometry I class. The Montana school district already has in place a moderately robust Geometry I curriculum that meets or exceeds the requirements of the state mandated common core curriculum. As such, it is not necessary to completely start from scratch. It is however, necessary to integrate the existing Geometry I curriculum into a blended format. The
same company that offers the CR Algebra I software also offers Geometry I software and as such it could be adapted in the same manner as the blended Algebra I CR program. Regardless, the curriculum director with the aid of the district mathematics coach and school level curricular teams, in an open source format, such as Google Docs, will complete this process. The process is open source to allow for group editing without lost instructional time.

As was the case with the blended CR class design, the post-CR Geometry I class will complete the curriculum in thirds with each third being reviewed by all post-CR Geometry I teachers in the month following the curriculum design process. This will be completed over the course of one or two Wednesday morning professional learning community time at the central office.

With the completion of the curriculum and training program the creation of the classroom in which the post-CR Geometry I class will occur. This process will not require any additional meetings and will take place over the summer months. As the district has moved toward the usage of Cromebook® style labs for their ease of use and portability it is expected that the post-CR Geometry classroom will utilize such a lab for its computer portions.

**Assessment timeline.** Both programs must be assessed for efficacy in the same way that this study conducted its initial assessment. This is to allow for a fair and equivalent evaluation of the program. It is recommended that the evaluation cycle take place over a three-year time period to allow for a build of teacher familiarity within the style. Three years will also allow for the evaluation of more than one year worth of students that complete the blended style Algebra I class and move on into the post-CR
Geometry I class. If the program is showing increased levels of achievement within the CR students when compared to the baseline data provided within this study, it is recommended that the program complete an additional three-year cycle of evaluation. If at the end of that time frame the program is still showing higher levels of achievement it is recommended that the program gain permanence within the district.

**Convincing Others to Support the Proposed Recommendations**

As referenced earlier, much of change theory suggests the use of change agents to create lasting organizational change. The changes outlined within the recommendations are not substantial and as such should not require much more than presentation of the data that has been collected and the resultant analysis that was completed. This indicates that the main players, once the central office is in agreement with the recommendations, lie within each high school building. Each high school has a department chair. Those individuals must be made aware of the analysis of the program and should be convinced of the recommendations merit via the findings within this study. It is paramount that their support is gained, as they are opinion leaders within each department. It is these department chairs that should be tapped for the role of change agent. As such, the early developmental stages within the proposed implementations include their involvement.

**Critical Pieces Needed for Implementation and Assessment**

As was the case with this study, the NWEA RIT scores and the average grades within for Geometry I are necessary for assessment of the programs recommended within this study. Both recommendations will not require significant funding from the Montana school district general fund and may likely be able to be completely funded via grant monies. It is critical that each of the programs gain the use of a lab of computers as both
programs outline a blended format for student learning. This could once again be funded entirely from the recurring grant monies available to the mathematics and science departments. This is an additional reason why it is key to gain the support of the mathematics department chairs as they have final say with the grant monies.

**Internal and External Implications for the Organization**

As this process is working towards creating better opportunities for the students, this sort of implementation could provide the opportunity to create higher levels of goodwill within the public. If this process were enabled via the grant monies, this would indicate that the entire process, by which higher levels of achievement are gained, has been completed without any cost to the taxpayer. This is an excellent opportunity for the school district. However, if the recommendations do not yield measureable results, that same goodwill could easily become negative. As such it is key that initial public knowledge of the program be limited until such a time that the program has been evaluated for efficacy.

**Implications and Considerations for Leaders Facing Implementation of Proposed Solution**

Any leader that moves to create change within a school system must keep in mind that results are difficult to show in a manner that the layperson will understand. The program may indeed be providing a better opportunity for the students and showing gains in programmatic understanding yet those gains might not show up as large enough to sate the voting public. The leader must be prepared for any criticism with foolproof and easily representable data to rebuke those that would look for fault within the change. As there is likelihood that the program could be more difficult for the CR student, parent
backlash is a distinct possibility. Once again, the data will allow for a justification of the change that has occurred. This is why it has been proposed that the evaluation of the program take place over a three year period to allow for the collection of the data, analysis, and presentation to the school board and as a consequence the voting public.

Evaluation Cycle

As previously discussed it is recommended that both programs utilize a six-year evaluation cycle in which an initial full evaluation will occur after the first three years. That evaluation will consist of applying the same methodology found within this study so as to maintain an equivalent basis of measure. Baseline data is provided by the results of this study and will be used for comparison during the evaluation cycle. Each year will have an assessment structure as found in table 18.
Table 18

Assessment timeline and description by year post implementation

<table>
<thead>
<tr>
<th>Year</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NWEA RIT score and subsequent class grades recorded for each student participating in both programs. Average post-CR grades and NWEA RIT scores compared against the existing data from this study.</td>
</tr>
<tr>
<td>2</td>
<td>NWEA RIT scores and subsequent class grades recorded for each student participating in both programs. Average post-CR grades and NWEA RIT scores compared against the existing data from this study.</td>
</tr>
<tr>
<td>3</td>
<td>NWEA RIT scores and subsequent class grades recorded for each student participating in both programs. This year and the previous two years will be grouped together and treated as a treatment group for comparison against students in a stratified methodology as found within this study.</td>
</tr>
<tr>
<td>4</td>
<td>NWEA RIT scores and subsequent class grades recorded for each student participating in both programs. Average post-CR grades and NWEA RIT scores compared against the existing data from this study.</td>
</tr>
<tr>
<td>5</td>
<td>NWEA RIT scores and subsequent class grades recorded for each student participating in both programs. Average post-CR grades and NWEA RIT scores compared against the existing data from this study.</td>
</tr>
<tr>
<td>6</td>
<td>NWEA RIT scores and subsequent class grades recorded for each student participating in both programs. This year and the previous five years will be grouped together and treated as a treatment group for comparison against students in a stratified methodology as found within this study.</td>
</tr>
</tbody>
</table>
As shown in table 18, each year includes a comparison of averages to get an idea of the progress, if any, that is being made. On a three year cycle the data is grouped together and compared against the non-CR students from the same time period and will be matched up in the same fashion as found within this study. This data will then be tested against the data from this study to verify that the programs are having a positive effect upon student outcomes. A three year cycle was chosen for two reasons: First, it allows for a larger data set, thus improving the validity of the data and second, it allows those CR students to experience both programs, the blended Algebra I CR class and the post-CR Geometry I class, prior to an analysis of efficacy.

**Summary of the Study**

This study was initially intended to primarily research and ascertain if a difference existed between the outcomes of two commonly found CR styles. It was determined that a difference did exist, and was more profound when the data indicated that CR students presented an essentially equivalent data set within the NWEA RIT scores. Further analysis indicated that CR student should do as well in the subsequent Geometry I class as their peers. However, the data showed a disparity between the average Geometry I grades when compared to the regular Algebra I students and then against the CR Algebra I students. Research data appeared to support that the true problem identified was not the style of CR, but the problems CR students were having in their subsequent class. A recommendation for change to blended style CR was made. However, based upon the results of this study, a recommendation for the post-CR student to be placed into an alternative Geometry I class was made. Furthermore, based upon the successes that the CR students had shown in the CR classes, it is hypothesized that a blended Geometry I
class would yield the same successful results as the Algebra I CR class as the data
within this study appeared to indicate.

**Implications for Action / Recommendations for Further Research**

It was the intent of this study to inform school districts of the efficacy of the
different styles of CR programs. It was found the blended style of CR has been shown to
work best within the population subject to analysis within this study. However, it was
further found that the CR students while being adequately prepared for Geometry I were
not being successful. Research reflects that proper support for the students who are
placed into CR must be in place so as to ensure successful outcomes (Lewis, Whiteside,
& Dikkers, 2014).

School districts considering implementation of CR programs should not only
make those CR program a blended variety, but should also seek alternative class
structures for those students after the CR process. It is recommended that future research
be made on more varied populations to help verify the validity of the results from this
study. Further research could be completed that utilized a different test of student
understanding other than the NWEA RIT scores that were utilized within this study.
Also, a more qualitative study could be completed post-implementation of the
recommended programs to search for further understanding of the CR student feelings of
preparedness for the next class. This idea could be expanded into additional study in
which mixed methods could be utilized in such a way to allow for the CR students
thoughts about the CR process and feelings of preparedness which could then be coupled
with a quantitative analysis of the resultant levels of understanding and subsequent class
grades. It would be of benefit to research those students who did not experience success
in CR programs and test their outcomes further to enable better CR program design. Also, this study did not include any students concurrently enrolled in Geometry I while attempting CR. This is an area of which no study was found to exist and as such is recommended for further research.

Summary

This chapter presented conclusions based upon the data analysis completed in prior chapters and offered as a summary of the entire study. A lack of quantitative analysis existed and this study had the intent of working towards closing that knowledge gap. A complete plan for the implementation of the recommended solutions which included implications for leadership, roles of those key players in the implementation, implications of the implementation and a full evaluation cycle was created and described in detail. It was determined that district level leadership should work in conjunction with building level leadership to create programs over a year’s time for full implementation the following year. Budgetary items were discussed and possible solutions to any budgetary challenges were offered. The recommended solutions are intended to be analyzed for efficacy over a six year time frame utilizing a similar methodology as found within this study. Lastly, this study is intended to act as the starting point for further research into CR design and most importantly, post-CR student placement to ensure the continued success that the CR student showed within the Algebra I CR classroom.
References


Plummer, L. (2012). Assuring a virtual second chance: In an effort to stem high school dropout rates, some districts are turning to blended credit recovery models that combine online learning with in-person support. But how do they work?. *THE Journal (Technological Horizons In Education), 39*(2), 20.


Appendix A

Division of School Leadership Support

PUBLIC SCHOOLS

Letter of Agreement

June 15, 2015

To the CU IRB:

We are familiar with Shawn Bowman’s research project entitled Credit Recovery in Secondary Schools: A Quantitative Evaluation. I understand involvement to be allowing access to the records of those students who are subject to the study from the last ten years. Shawn Bowman’s data collection will mean that he will be allowed to review the records of students who have taken mathematics credit recovery classes and their Northwest Evaluation Association scores. Additionally, for the purposes of comparison via analysis of variance and covariance, Shawn Bowman will be allowed review a random sampling of mathematics students who did not require credit recovery from each year in which credit recovery students’ records are being reviewed. The study in question will not record any identifying characteristics and will not involve any direct contact with any students. Upon conclusion of the study all identifying characteristics will be deleted upon data collection.

We understand that this research will be carried out following sound ethical principles, that participant involvement in this research study is strictly voluntary, and that confidentiality of participants’ research data is ensured, as described in the protocol.

Public Schools acts in accordance with and maintains constant compliance with all facets of the Protection of Pupil Rights Amendment.

Therefore, as a representative of project may be conducted at our agency/organization. , I agree that Shawn Bowman’s research

Brenda Koch
K-12 Executive Director - Leadership Support

Inspire • Educate • Empower
Research Title

Credit Recovery in Secondary Schools: A Quantitative Evaluation

Executive Summary

Credit recovery systems are in place to enable students who have failed a course within the standard high school curriculum the opportunity to regain lost credit and maintain pace for on-time graduation. It is my intention to study, via a quantitative analysis, the educational outcomes of students who participate in credit recovery courses within secondary schools. Credit recovery primary instruction models have undergone significant change over the last ten years and have moved from the traditional face-to-face summer school model to either blended classrooms, that use both face-to-face and online portions, or completely online, computer-based learning classrooms. Currently, there has been little study regarding the efficacy of either the blended or completely online credit recovery courses. As such, it is my intent to help inform school districts of the educational outcomes of all forms of credit recovery so as to enable data-driven decisions regarding credit recovery course design.

Purpose of the Study

The purpose of this quantitative study is to investigate the effectiveness of Algebra I computer-based credit recovery by examining passing rates in the subsequent Geometry class and the levels of reported growth on the Northwestern Evaluation Association normative referenced test.

Methodology

This study will utilize quantitative analysis techniques to ascertain the effectiveness of credit recovery programs within secondary schools. This quantitative study will analyze the growth scores, as reported by the NWEA test, in a comparative manner, employing an analysis of variance and covariance within the credit recovery population and its control group. This study has two independent variables, credit recovery via a completely online classroom and credit recovery via a blended classroom; with those students who passed Algebra I via traditional methods acting as the control.
Two dependent variables exist. The first being the growth scores on the NWEA test and the second being the grade achieved in the subsequent Geometry class. These variables will be subject to testing via a standard null hypothesis setup.

The data set will be stratified by grade received within the credit recovery class and by cohort group to mitigate external effects upon the educational outcomes of the credit recovery student and will be recorded within a data array style spreadsheet. The control group will be chosen at random from the population of students who passed Algebra I during the school year. The students’ grades in both regular and credit recovery style Algebra I will be recorded and used to stratify the data set; students with a “D” in the recovery classroom with be only compared against students who received a “D” in the regular classroom, “C” recovery students will be matched with “C” regular classroom students, with this pattern continuing throughout the data set. This stratification will allow for better matching of ability levels so as to decrease the chance of data being skewed by a mismatch of mathematical abilities.

Each student who receives Algebra I credit via credit recovery will have their score in the subsequent Geometry class recorded. The students will be stratified by grade received within the credit recovery Algebra I class. This will allow for an individual assessment of the amount of mathematical understanding reached by grade received by measuring the rate in which each grade received within Algebra I passes Geometry.

Planned Data Collection

This study will utilize students who have completed a credit recovery program within Billings Public Schools during the ten years; if the data from such a time period is available otherwise data will be pulled from as far back as possible to create as longitudinal of a study as possible. Each identified student, in each type of class, to include the randomly created control group, will be assigned a number for tracking of their data. Those students will be primarily 9th or 10th grade students and must have gone on to take the subsequent class, Geometry, within the following academic year.

The students who will be subject to this research will be identified by examining the class rosters of the students who took a credit recovery class within the last ten years within Billings Public Schools. Upon that initial identification, the students who are found on those rosters will have their records pulled from the permanent database. Each student record will be reviewed in a secure manner and will be evaluated for inclusion with the study. The evaluation process will include the following criteria:

- They must have earned credit for Algebra I via a recovery class.
- They must have received credit for Algebra I prior to being placed into Geometry.

Concurrent enrollment is not the focus of this study.
Credit Recovery Research Prospectus

SHAWN JOSEPH BOWMAN - CREIGHTON UNIVERSITY DOCTORAL CANDIDATE

- They must have been continuously enrolled for the duration of Algebra I and Geometry.
- They must not have missed more than 15 days in the term in which they are recovering credit.

Those students who meet the criteria for inclusion in the study will have the following items recorded upon review of their academic records:
- Grade in the credit recovery class.
- Grade in Geometry.
- NWEA RIT score to include growth scores from the spring of the year that they failed Algebra I.
- NWEA RIT score to include growth scores from the fall of the year that they take Geometry.

The data that will be gathered for the control group will be based upon the \( n \) value of students that recover credit within each group that is stratified by grade received in the credit recovery classroom and by cohort. These students will be selected using a proportional stratified random sampling method.

The data that will be subject to review is numerical or will be recorded in a numerical nature. No data will be recorded with any identifying characteristics and all data will be kept in a secure location that will utilize password protection. Any hard copies of student records that are created from an electronic medium will be destroyed immediately following data collection. For the duration of this study all connected parties will ensure that no data is viewed by anyone not in direct connection with the study. Ultimately, this study shall take all precautions necessary to ensure the privacy of the student subjects is maintained.

Expected Outcomes and Distribution of Results

This research is needed, as there is an absence of quantitative analysis of credit recovery programs, especially those that utilize a computer based learning methodology. This addition to the knowledge base is intended for use by school districts in the creation of informed decisions when creating and maintaining credit recovery. As the author is an employee of \( \text{___________} \), a unique opportunity to aid in program design is being presented with this research. Ultimately, the goal of this research is to inform school districts of the efficacy regarding credit recovery design.

As this research is intended for the purpose of completion of dissertation requirements of the doctoral candidate author, the results will be subject to publication at such time in which publication becomes available. While the data comes from \( \text{___________} \), the school district will not be identified. Instead the term: a Montana
Credit Recovery Research Prospectus

SHAWN JOSEPH BOWMAN - CREIGHTON UNIVERSITY DOCTORAL CANDIDATE

school district will be used throughout all documents and at which time publication occurs, that nomenclature will remain in use throughout the document.

Expected Timetable

It is my intention to complete all review of records within the month of June 2015. I will then take the following two months to complete my analysis of the data and complete a formal write up of my findings and dissertation. Prior to the beginning of the 2015-2016 school year I should have completed a working document that I will be able format into a full report of findings for perusal by the district or district affiliated parties. Upon completion of my dissertation I will be happy to share all results of my study and present those findings to the school district or any school district affiliated parties at which time such occurrence is desired.
Appendix C

School District __

STUDENTS

Student Records

Maintenance of School Student Records
The District maintains two (2) sets of school records for each student, a permanent record and a cumulative record.

The permanent record includes:
- the name and address of the student;
- the name and address of the student’s parent or guardian;
- the student’s birth date; the student’s academic work completed;
- the student’s level of achievement (grades, standardized achievement tests);
- the student’s immunization records as per 20-5-506, MCA; and
- a record of any disciplinary action taken against the student that is educationally related.

For the purposes of this procedure, a disciplinary action that is educationally related is an action that results in the expulsion or out of school suspension of the student.

The cumulative record may include:

- intelligence and aptitude scores;
- psychological reports;
- achievement test results;
- participation in extracurricular activities;
- honors and awards;
- teacher anecdotal records;
- verified reports or information from non-staff persons;
- verified information of clear relevance to a student’s education;
- information pertaining to release of this record; and
- disciplinary information.

The District requires information in a permanent record to indicate authorship and date. The District will maintain in perpetuity a permanent record for every student who has been enrolled in the District. The District will maintain cumulative records for eight (8) years after a student graduates or leaves the District permanently. After five (5) years, the District may transfer cumulative records that may be of continued assistance to a student with disabilities who graduates or permanently withdraws from the District to parents or to a student if a student has succeeded to the rights of the parents.
A building principal is responsible for maintenance, retention, or destruction of a student’s permanent or cumulative records, in accordance with District procedure established by the Superintendent.

Access to Student Records

The District will grant access to student records as set forth below.

1. Neither the District nor any District employee will release, disclose, or grant access to information found in any student record, unless the conditions set forth in this policy are met.

2. Parents of a student under eighteen (18) years of age are entitled to inspect and to copy information in their child’s school records. A parental request to view or to copy records must be made in writing and must be directed to the Superintendent. The District will grant access to records within fifteen (15) days of receipt of such a request. When parents are divorced or separated, the District will permit both parents to inspect and to copy a student’s school records unless a court order indicates otherwise. The District will send copies of the following to both parents at the request of either parent, unless a court order indicates otherwise:

   - academic progress reports or records
   - health reports
   - notices of parent-teacher conferences
   - school calendars distributed to parents/guardians
   - notices about open houses and other major school events, including pupil-parent interaction

   When a student reaches eighteen (18) years of age, graduates from high school, marries, or enters military service, the District observes that all rights and privileges accorded to a parent become exclusively those of a student.

   When a student has waived his or her right of access, after being advised of the right to obtain names of all persons making such confidential letters or statements, the District will not grant access to a parent or a student to confidential letters and recommendations concerning admission to a postsecondary educational institution, application for employment, or receipt of an honor or award.

3. The District may grant access to or release information from student records without prior written consent to school officials with a legitimate educational interest in the information. A school official is a person employed by the District in an administrative, supervisory, academic, or support staff position (including, but not limited to administrators, teachers, counselors, paraprofessionals, and coaches), and the board of trustees. A school official may also include a volunteer or contractor not employed by the District but who performs an educational service or function for which the District would otherwise use its own employees and who is under the direct control of the District with respect to the use and maintenance of personally
identifying information from education records, or such other third parties under contract with the District to provide professional services related to the District’s educational mission, including, but not limited to, attorneys and auditors. A school official has a legitimate educational interest in student education information when the official needs the information in order to fulfill his or her professional responsibilities for the District. Access by school officials to student education information will be restricted the portion of a student’s records necessary for the school official to perform or accomplish their official or professional duties.

4. The District may grant access to or release information from student records without parental consent or notification to any person, for purposes of research, statistical reporting, or planning provided that no student or parent can be identified from the information released and the person to whom information is released signs an affidavit agreeing to comply with all applicable statutes and rules pertaining to school student records.

5. The District will grant access to or release information from a student’s records pursuant to a court order, provided that a parent is given prompt written notice, on receipt of such order, of its terms, the nature and substance of information proposed to be released and is given opportunity to inspect and copy such records and to challenge their contents.

6. The District will grant access to or release information from any student record, as specifically required by federal or state statute.

7. The District will grant access to or release information from student records to any person possessing a written, dated consent, signed by a parent or eligible student with particularity as to whom records may be released, information or record to be released, and reasons for a release. The District will keep one (1) copy of a consent form in a student’s records, and the Superintendent will mail one (1) copy to a parent or eligible student. Whenever the District requests a consent to release certain records, the Superintendent will inform a parent or an eligible student of the right to limit such consent to specific portions of information in the records.

8. The District may release student records to a superintendent or an official with similar responsibilities in a school in which a student has enrolled or intends to enroll, on written request from such official. School officials may also include those listed in #3 above.

9. Before release of any records or information under items 5, 6, 7, and 8 above, the District will provide prompt written notice to parents or an eligible student of the intended action. This notification will include a statement concerning the nature and substance of records to be released and the right to inspect, copy, and challenge the contents.
10. The District may release student records or information in connection with an emergency, without parental consent, if knowledge of such information is necessary to protect the health or safety of a student or other persons. The Superintendent will make this decision, taking into consideration the nature of an emergency, the seriousness of a threat to the health and safety of a student or other persons, the need for such records to address an emergency, and whether a person to whom such records are to be released is in a position to deal with an emergency. The District will notify parents or an eligible student, as soon as possible, of the information released, date of release, the person, agency, or organization to whom a release was made, and the purpose of a release.

11. The District may disclose, without parental consent, student records or information to the youth court and to law enforcement authorities pertaining to violations of the Montana Youth Court Act or criminal laws by a student.

12. The District may charge a nominal fee for copying information in a student’s records; however, no parent or student will be precluded from copying information because of financial hardship.

13. The District will assure that a record of all releases of information from student records (including all instances of access granted, whether or not records were copied) is kept and is maintained as part of such records. The District will maintain this record for the life of a student record and will assure it to be accessible only to a parent or an eligible student, the Superintendent, or other designated person. The record of release will include:

- information released or made accessible
- name and signature of the Superintendent
- name and position of the person obtaining the release or access
- date of release or grant of access
- copy of any consent to such release

Directory Information

The District may release certain directory information regarding students, unless parents prohibit such a release. Directory information will be limited to the student’s:

- name;
- address;
- telephone number;
- photograph, image or likeness (individually or in a group) in pictures, videotape, film, or other medium;
- gender;
- grade level;
- birth date and place;
- names and addresses of parents or guardians;
- academic and other school-related awards, degrees, and honors;
information related to school-sponsored activities, organizations, and athletics, including
weight and height;
major field of study; and
dates of attendance in school,

The Superintendent will notify parents and students of their right to object to release of directory information.

Student Record Challenges

Parents may challenge accuracy, relevancy, or propriety of records, except for (1) grades and (2) references to expulsions or out-of-school suspensions, if a challenge is made when a student’s school records are being forwarded to another school. Parents have a right to request a hearing at which each party has the right:

- To present evidence and to call witnesses to cross-examine witnesses
to counsel
to a written statement of any decision and the reasons therefor;
to appeal an adverse decision to an administrative tribunal or official, established or designated by the Board of Public Education.

Parents may insert a written statement of reasonable length describing their position on disputed information; the Superintendent will include that statement in any release of information in dispute.
## Appendix D

### Credit Recovery Students

<table>
<thead>
<tr>
<th>Student Number</th>
<th>Last Name</th>
<th>NWEA Score</th>
<th>NWEA Score</th>
<th>Recovery Grade</th>
<th>Subsequent Geometry Grade</th>
<th>Year Failed</th>
<th>Year Graduated</th>
</tr>
</thead>
</table>

### Algebra I Students Who Passed During the School Year

<table>
<thead>
<tr>
<th>Student Number</th>
<th>Last Name</th>
<th>NWEA Score</th>
<th>NWEA Score</th>
<th>Algebra I Grade</th>
<th>Subsequent Class Grade</th>
</tr>
</thead>
</table>

---

Pre-2001 | 01-02 Year | 03-04 Year | 04-05 Year | 06-07 Year | 07-08 Year | 08-09 Year | 09-10 Year | 10-11 Year | 11-12 Year | 12-13 Year | 13-14 Year | Sample |
Appendix E

Social Behavioral Institutional Review Board
2500 California Plaza • Omaha, Nebraska 68178
phone: 402.280.2126 • fax: 402.280.4766 • email: irb@creighton.edu

DATE: June 18, 2015
TO: Shawn Bowman
FROM: Creighton University IRB-02 Social Behavioral
REFERENCE #: Exempt 4
SUBMISSION TYPE: New Project
ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: June 18, 2015
REVIEW CATEGORY: Exemption category # 4

Thank you for submitting the above mentioned proposal to the Institutional Review Board office for review. An IRB administrator has determined this project is exempt from Federal Policy for Protection of Human Subjects as per 45CFR46.101 (b) 4. The project and exemption is approved is for a 3 year period. The following documents have been reviewed as part of this submission:

- Application Form - 114.1C Application for Determination of Exempt Status (UPDATED: 06/2/2015)
- Creighton - IRB Application Form - Creighton - IRB Application Form (UPDATED: 05/26/2015)
- Data Collection - Billings Public Schools Policy on Data Collection (UPDATED: 06/7/2015)
- Data Collection - Data Collection Spreadsheet (UPDATED: 06/2/2015)
- Investigator Agreement - Copy of the signed agreement with Public Schools / Original was emailed directly to IRB (UPDATED: 06/17/2015)
- Protocol - Study Design for Application of Exempt Status (UPDATED: 06/16/2015)

Continued approval is conditional upon your compliance with the following requirements:

1. Compliance with the Creighton University IRB policies and procedures
2. Problems must be reported using the Reporting Form for Reportable New Information. Problems requiring report can be found in the IRB Policy 134 “Reportable New Information”
3. All protocol amendments and changes to approved research must be submitted to the IRB and not be implemented until approved by the IRB. Please use the modification form when submitting changes to protocol or consent documents.
4. You are required to submit a renewal/termination prior to this date. If you wish to continue the project, the renewal must be in the IRB office on week prior to the expiration date.

If you have any questions, please contact Christine Scheuring at 402-280-3364 or christinescheuring@creighton.edu. Please include your project title and reference number in all correspondence with this committee.
Appendix F

Completely Online NWEA ANCOVA Tests

Assumption of Linearity for NWEA RIT score Completely Online

<table>
<thead>
<tr>
<th></th>
<th>Tests of Normality</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group</td>
<td>Kolmogorov-Smirnov(^a)</td>
<td>Shaprio-Wilk</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Statistic</td>
<td>df</td>
<td>Sig.</td>
</tr>
<tr>
<td>Standardized</td>
<td>CR</td>
<td>.068</td>
<td>34</td>
<td>.200*</td>
</tr>
<tr>
<td>Residual for NWEAPOST</td>
<td>REG</td>
<td>.102</td>
<td>35</td>
<td>.200*</td>
</tr>
</tbody>
</table>

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction
Assumption of Normality

Histogram
for Group= CR

Mean = 2.645-15
Std. Dev. = .932
N = 54

Histogram
for Group= REG

Mean = -9.125-15
Std. Dev. = 1.048
N = 35
Assumption of homoscedasticity

Normal Q-Q Plot of Standardized Residual for NWEAPOST
for Group=CR

Normal Q-Q Plot of Standardized Residual for NWEAPOST
for Group=REG
CREDIT RECOVERY IN SECONDARY SCHOOLS

Blended NWEA ANCOVA Tests

Graph 1:
- Standardized Residual for NWEAPOST
- Predicted Value for NWEAPOST

Graph 2:
- PostTest
- PreTest
- Linear regression equations:
  - Credit Recovery: $y = -8.4 + 1.05x$
  - Regular: $y = 41.79 + 0.84x$
- Group comparison:
  - Credit Recovery: $R^2$ Linear = 0.462
  - Regular: $R^2$ Linear = 0.592
Assumption of Linearity for NWEA RIT score Blended

<table>
<thead>
<tr>
<th>Tests of Normality</th>
<th>Kolmogorov-Smirnov&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Standardized Residual for PostTest</td>
<td>Credit</td>
<td>.143</td>
</tr>
<tr>
<td>PostTest</td>
<td>Regular</td>
<td>.114</td>
</tr>
</tbody>
</table>

* This is a lower bound of the true significance.

<sup>a</sup> Lilliefors Significance Correction

Assumption of Normality
Assumption of homoscedasticity

Normal Q–Q Plot of Standardized Residual for PostTest
for Group= Credit Recovery

Normal Q–Q Plot of Standardized Residual for PostTest
for Group= Regular
Comparison Between Online and Blended
Ensuring Normal Distribution

Histogram for RecoveryStyle= Blended

Histogram for RecoveryStyle= Online

Mean = 3.4755
Std. Dev. = 7.9810
N = 28
<table>
<thead>
<tr>
<th>RecoveryStyle</th>
<th>Kolmogorov-Smirnov</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>ChangeInRIT</td>
<td>Blended</td>
<td>.148</td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td>.093</td>
</tr>
</tbody>
</table>

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

**Grades Comparison**

**Check for Outliers**

![Boxplot comparison of Average Geometry Grade between Credit Recovery and Regular Student Type]
Check for Normalcy

Histogram
for StudentType = Credit Recovery

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Average Geometry Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>0.00</td>
</tr>
<tr>
<td>40</td>
<td>1.00</td>
</tr>
<tr>
<td>30</td>
<td>2.00</td>
</tr>
<tr>
<td>20</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Mean = 0.95
Std. Dev. = .739
N = 156

Histogram
for StudentType = Regular

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Average Geometry Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>1.00</td>
</tr>
<tr>
<td>30</td>
<td>2.00</td>
</tr>
<tr>
<td>20</td>
<td>3.00</td>
</tr>
<tr>
<td>10</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Mean = 2.21
Std. Dev. = .82
N = 155