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Walden University
2016

Abstract

The Relationship Between the APEX Program for

Instruction and High School Student Academic Success

by

David Krosner

MA, Georgia State University, 2002

BME, Jacksonville University, 1996

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

August 2016

Abstract

An alternative high school campus in the State of Georgia introduced a new program to support academic growth and engagement among at-risk students. This program, the APEX program, merges technology with content to provide students with self-paced learning facilitated by teachers with the objective of improving test scores, course completion, and graduation. The purpose of this goals-based evaluation was to examine the relationship between APEX program usage and the academic success measures of EOCT scores, course credit accrual, and graduation; it was grounded in the behavior objectives approach. The study followed a cohort of students who were enrolled in Grade 9 in 2010-2011. Data sources were archival test scores and preexisting APEX data. This APEX data included accrued credit hours, completion rate, and documentation of mastery learning outcomes for the enrolled students in Grades 9-12. Analysis of the quantitative data sets entailed the use of ANOVA, Chi-Square, and *t* tests. The study findings showed that students using the hybrid APEX instructional model accrued significantly more credit hours, were more likely to graduate, and have higher end of course grades than students using the APEX-only model. These results suggest that a broader use of APEX labs for students identified as at-risk in both alternative and traditional schools provides a flexibility in instructional settings that helps more students succeed. This study suggests the most effective use of resources with the implementation of APEX to reach the largest number of students. This study promotes positive social change by confirming the efficacy of a tool for reaching more students to improve higher district-level graduation rate, course accrual, and end-of-course test scores.

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Dedication

When I was 18 years old, in the same weekend I graduated from high school, I saw my brother graduate from college, and my dad got his PhD. Dad started his doctorate when I was in the first grade. For 12 years, I watched my dad come home after work, coaching my soccer team, taking my brother to swim practice, and all of the other tedium involved in adult life, and work on furthering his education. As I sat in Bobby Dodd stadium watching the final of three graduations that weekend, I planned my own future. I saw my dad walk across the stage and receive his degree. He was in his early 50s at the time and a lifelong learner. My plan was to go straight through undergraduate, graduate, and doctoral studies and be finished by the time I was 26.

It didn't quite happen that way. I went to college, finished a Bachelor's degree, and decided to begin working. I was four years into my career as a middle school band director when I shared my plans with my then girlfriend Yudit. Through the course of my Master's program, Yudit became my wife. We found out right around the time of my graduation that she was pregnant with our first child. A few years went by. Yudit and I had two children and both of them started school. When my youngest started first grade, I recalled those many years ago when I was in first grade and longed for the goal I had set when I was 18. I sat my family down and told them of my plans to pursue a doctorate at Walden.

This study is dedicated to family. Before everything else, family was the inspiration to begin, the desire to continue, and the fortitude to complete.

Acknowledgments

Many warm and heartfelt thanks go out to my doctoral committee. Dr. Michelle Powell-Leake has been a beacon of hope and optimism in the journey of scholarship. Her support and mentorship kept me going when I thought I could not do any more.

In addition, the rest of my committee, Dr. Dannette Babb, and Dr. Michelle Brown have guided me with insight through action and compassion.

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Section 1: The Problem

Introduction

The means of curriculum delivery and instruction is changing in the U.S. K-12 public school educational system (APEX Learning, 2012). The evolution of a new technology-based paradigm shift in the instruction and assessment process is changing the landscape of schooling for potential drop out students (APEX Learning, 2012). Practices in the traditional school system such as social promotion allow students to move on to the next standards based on age and not a mastery of the material (Carifio & Carey, 2010). However, some students who move forward without the proper foundation in some subject areas are either failing out or dropping out of school (Carifio & Carey, 2010, p. 220). A small percentage of these students move to the alternative schooling programs (Carifio & Carey, 2010, p. 223). This outcomes-based assessment is an examination of the effectiveness of a hybrid technology and instruction-based model where mastery is required for promotion that is currently being used in a local alternative school.

The alternative school in this study (hereafter referred to as the project study school) is located in the southeastern United States. The unique hybrid between technology and traditional instruction has been credited as setting the project study alternative school apart from other alternative programs, and has shown progress since its inception through the APEX learning system (Forsyth County Schools, 2012; Jinger Davison, personal communication, 2013). The Community in Schools (CIS) program, which is similar to the alternative school used in this project study, initiated a curriculum

that has shown success in alternative school environments (Communities in Schools, 2012). One of the major components of the CIS program is the APEX learning system software. The APEX learning program is a hybrid-learning environment that melds instruction and assessment (Davis, 2010). As a result of the research target alternative school piloting the APEX learning system, one of the traditional high schools in the project study school district has instituted APEX labs for credit recovery as part of the school day (Queen, Lewis, & National Center for Education Statistics, 2011).

Students who attend the project study school need flexibility not available in the traditional setting. Some students are minor league professional athletes, actors, and musicians, thus requiring a flexible learning situation. Other students are enrolled in this alternative school because their schedules include long workdays to financially support a family (Forsyth County Schools, 2012).

The purpose of this outcomes-based assessment is to identify the factors that are making the project study school successful in the local school district. The APEX lab will be evaluated for its impact on student success factors. Within this study, the mastery learning component of the APEX lab as defined by an 85% success requirement will be explored through quantitative examination of three consecutive years of student End-of-Course test scores, high school completion, and credit accrual.

Definition of the Problem

The APEX program was implemented at an alternative school in Georgia to improve academic success among at-risk students. This program merges technology with content to provide students with self-paced learning; however, this program has never been evaluated for outcomes within the context of implementation (Forsyth County

Schools 2012). At the time of this study, APEX learning labs were used in two different ways:

- An APEX immersion program at Forsyth Academy, an alternative high school.
- A second implementation in a traditional school setting and designed solely for credit recovery.

In the traditional high schools where APEX is used solely for credit recovery in local school system, only one teacher is assigned to APEX lab (Forsyth County Schools, 2012). The teacher in charge of overseeing APEX in each of the four schools is not highly qualified in all content areas offered in the lab (Forsyth County Schools, 2012).

In the local school system under study, students who fail classes have the choice of repeating the classes in summer school or night school (Forsyth County Schools, 2012). Students who are not successful in the district's traditional high schools have a third option of attending the alternative school (Forsyth County Schools, 2012). The alternative school has shown significant success in the promotion of student achievement, course completion, and graduation (Forsyth County Schools, 2012). Despite these successes, an outcomes-based assessment has never been conducted.

Description of the Research Site Alternative School

Given the nontraditional needs of the students served at the project study school, a high technology approach promotes a student-centered approach to learning. At the project study school, the APEX lab provides the primary form of curriculum delivery and assessment (APEX Learning, 2012). The instruction and assessment practices in the project study school require an 85% mastery of each standard before moving to the next standard (APEX Learning, 2012). Though the concept of mastery learning dates back to

the 1920s and Bloom's groundbreaking studies on mastery learning began in the 1970s, the APEX program uses technology as a piece of the mastery component that makes the delivery accessible to a broader group of learners in less time (Block, 1971; APEX Learning, 2012). Through the use of high technology, instruction and assessment are individualized to the needs of each student in the APEX lab. High technology is characterized by a 1:1 ratio of computer-to-student in an interactive learning environment that is further enhanced by Smart Boards for teacher presentation (Drayton, Falk, Stroud, Hobbs, & Hammerman, 2010). The project study school uses a high technology teaching and learning approach that individualizes instruction for the alternative school students.

Since the introduction of APEX to the school district in 2009, all five of the classrooms at the project study school have served as APEX labs for Grades 9 through 12. All five teachers have classrooms outfitted with computer workstations for every student. At any given time, between 15 and 17 students are enrolled in each of these classes (Forsyth County Schools, 2012). Each of the five classrooms has a different content-specific focus with a content area specialist present to facilitate the hybrid learning experience. There are separate labs/classrooms for math, science, social studies, language arts, and humanities. The content area specialists are all certified teachers with 10 or more years of experience teaching within their fields of expertise. Each class period is 50 minutes long, with five class periods per day (Forsyth County Schools, 2012). At the end of each class, students travel to the next class.

Function of APEX Software

Students at the study site log in to the APEX software for computer-based instruction. In addition, students have access to both synchronous and asynchronous chat

groups within the APEX lab to share any information or relevant questions pertaining to the content. The software keeps a running record of how much time each student spends on each question in a formative or summative assessment and each standard in the instructional phase. The program intuitively works through adaptive assessments that spend more time on problems that students are struggling with and less time on ones they have mastered (APEX Learning, 2012). Teachers have the ability to monitor when and for how long the software was accessed.

The students at the study site start with access to the lesson, followed by a formative quiz and ultimately, a summative assessment. The software allows students to move quickly through the instructional part of the modules and skip to the quizzes. If students do not pass the quizzes, they may retake the quizzes up to two more times in different forms. After three failed attempts at a quiz, the student is locked out of the module until the teacher provides remediation. At the end of each module, each student takes a summative assessment. If the student does not pass the summative assessment at 85% the first time, the student must repeat the entire module. The 85% mastery requirement of content in APEX equates passing the course to content mastery (APEX Learning, 2012).

The required content mastery feature of the APEX lab removes the problem of social promotion (Communities in Schools, 2012). The APEX labs track student progress in content mastery by showing the amount of time it takes a student to complete a task, the specific skill that is being addressed, and the percentage correct that the student earned. With APEX, it is possible for two students to have similar scores overall, but

show different levels of progress based on the amount of time required for completion (APEX Learning, 2012).

Implementation and Practical Application of APEX

The average amount of time for students to complete an APEX module varies based on the subject. Each subject has a pacing guide that gives students an idea of where the teachers think that they should be at any given time. Some courses have as many as 12 small modules that can be completed on average in 2 weeks each. Other courses have as few as four modules and can take an average of six weeks to complete each module (Jinger Davison, personal communication, 2014).

The software generates color-coded reports for teachers to see how each student is progressing through the module. Color codes that teachers see on the modules: blue for completed, green for on track, yellow for behind, and red for failing. Teachers can quickly view the color-coded report and differentiate instruction to suit each individual (APEX Learning, 2012).

A unique feature of the APEX software is that it provides ongoing authentic feedback both to the student and the teacher. Authentic feedback is feedback that is purposeful and offers insight to student growth (Economides, 2009). If a student gets a question wrong, the APEX software shows exactly where the student made a mistake and explains why the correct answer is the most correct. In doing so, the APEX software also shows why other choices were not correct. Teachers have the ability to run reports on students' progress in the APEX lab and see the feedback that students have already received. The reports give the teachers opportunities to further expound or remediate where needed (APEX Learning, 2012).

Rationale

Most students enter the project study alternative school with failing grades in multiple subject areas (Forsyth County Schools, 2012). Through the use of the APEX labs, every student in the alternative school program must demonstrate a mastery score of 85% or higher in order to move on to the next standard in every assessment for every content area (Hurson & Sedigh, 2010). Although 2010 U.S. Department of Education data shows that content mastery is a systemic problem across the United States, it is also a local problem (Hurson & Sedigh, 2010). The technology and tools are in place at the project study alternative school and follow a research base. The local problem is a gap in practice. To date, there has not been an outcomes-based assessment of the alternative school program at the project study school (Jinger Davison, personal communication, 2014). The purpose of this outcomes evaluation is to examine the relationship between APEX program usage in two different settings and the academic success measures of EOCT scores, course credit accrual, and graduation as compared with traditional high schools.

The APEX software is used in programs throughout the United States, with its mastery learning component used as a solution for content mastery deficiencies (APEX Learning, 2012). In the local school system, the local problem of content mastery is realized through examining performance on end of course tests, credit accrual, and high school completion.

The teachers at the project study alternative school employ a hybrid of traditional instruction integrated with technology. The role of the teacher at the project study alternative school is first facilitator, then instructor. This project study will include a

focus on the mastery requirement from the APEX labs its direct impact on students in alternative schools. One implication is that if students who are left behind due to social promotion in the public schools could achieve success at an alternative program, the same initiatives could be in place in public schools. Other implications are the potential for student success in traditional public schools that could exist by replicating instructional strategies utilized in the alternative school.

Evidence of the Problem at the Local Level

The APEX program is used at the study site in a flexible instructional setting in order to improve academic success among high school students, but has never been subject to an outcomes evaluation to determine its effectiveness compared to the traditional setting. The context of the quantitative outcomes-based assessment is that the local school system currently has a working system in the APEX labs. The majority of high schools in the local school system do not offer the solution to students until the traditional school has failed them and they are referred to the alternative school (Jinger Davison, personal communication, 2012).

In the local school district, students attend high school based on residence zones. Due to overcrowding, permission to attend an out-of-district school is often more difficult to obtain than permission to enroll in an alternative program. The highest achieving school in the district at the time of this study was one of the district's five traditional high schools; this school implemented the APEX labs in a similar format to the project study alternative school and is currently the highest achieving school in the district (Forsyth County Schools, 2012). The hybrid APEX instructional model used in the alternative

school has yet to have a formal outcomes-based assessment since moving to the hybrid model (Forsyth County Schools, 2012).

Evidence of the Problem From the Professional Literature

Online learning environments and other forms of interactive technologies are changing the landscape of instruction and assessment (Jacobs, 2010). Because the integration of online learning technologies is a newer phenomenon, most research on this topic is current. Many school systems utilize online learning environments for credit recovery, either through total online delivery or through a hybrid program, like the APEX labs (Jacobs, 2010). The teacher's involvement as facilitator and remedial support specialist is a unique feature that makes content delivery a hybrid program. Although there is not a standardized format for online learning environments (OLEs), there are many commonalities in academic goals. The mastery requirement of the APEX labs is a common thread in many OLEs (Palmer & Holt, 2008).

The APEX labs at the project study alternative school use adaptive assessments. With adaptive assessment, students move through testing based on achievement level. Concepts are mapped out using Bloom's Taxonomy and applied in the test questions. If a student demonstrates mastery early on, further questioning is not needed. If a student has inconsistencies in responses, more questions are available for the assessment (Chatzapoulou & Economides, 2010). Economides (2009) described the benefits of conative feedback through computer assessment. According to Economides, students perform better with feedback even if it is computer generated. The term *conative feedback* comes from the medical term *conation*, which means a purposeful action or drive (Economides, 2009). The study found that the quicker and more authentic the

feedback, the greater the benefit to the student (Chatzapoulou & Economides, 2010). The APEX learning software in the CIS schools uses the practices of conative feedback through computer assessment. In addition to the more flexible schedule, the interaction and quick feedback given through APEX labs could be a factor in student success at the project study alternative school. This research explores student progress as identified through the use of APEX labs. Review of the ongoing feedback may also provide insight to the higher or lower EOCT scores.

Students at Deakin University in Australia provided perspective on online learning environments' (OLEs) enhancement of the learning experience through interaction with other students, faculty, and quick feedback (Palmer & Holt, 2008). Asynchronous and synchronous chat groups provide feedback quickly and create a log that can be referred to by students in reflection (Palmer & Holt, 2008). In an asynchronous chat, the transcript of dialogue remains posted so students can either comment or reply to other comments at any time. The reflection piece of asynchronous chat comes in when students go back and re-read what has been said during the chat.

The purpose of this outcomes evaluation is to examine the relationship between APEX program usage and the academic success measures of EOCT scores, course credit accrual, and graduation. The evaluation will focus on elements including the mastery learning component of APEX, the amount of time students take to complete a course, the amount of credits accrued, high school completion and the integration of technology. The current situation of student success represents a gap in professional practice because something is different at the project study alternative school that is helping students succeed where the traditional school did not (Forsyth County Schools, 2012).

Definitions

End of course tests (EOCTs). State-created tests given at the end of a course, given statewide in the spring, and required for promotion to the next class (Forsyth County Schools, 2012).

High technology. Software that has been designed to work intuitively with limitless variety of outcomes for each input (Davis, 2010).

Hybrid classroom. A classroom where curricular delivery and assessment happen through the use of technology and is facilitated by a curriculum specific highly qualified educator (Corcoran & Silander, 2009).

Mastery learning. Students' ability to demonstrate mastery of material is required before they are permitted to move to the next standard (Block, 1971).

Online learning environments (OLEs). Course modules that have been developed to meet specific standards of the Common Core curriculum (Clayton, 2011).

Social promotion. A school based decision that allows students to move forward without demonstrating mastery in a previously evaluated skill set (Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011).

Significance

For this project study, there are three instructional settings. The first setting is the traditional high school. The second and third settings use APEX as an instructional tool. The second setting uses APEX as a part of the traditional high school for credit recovery. The third instructional setting is an alternative high school where APEX is the method of delivery accompanied by content specific highly qualified certified teachers (Forsyth County Public Schools, 2012). The third setting though more removed than the traditional

high school, is more like the traditional high school in terms of student success as defined by end of course test scores, credit accrual, and graduation/completion rate.

The study aims to identify where there are settings in which APEX is more useful and if APEX is an effective substitution of the traditional setting. There are differences between the two APEX settings that could inform district leaders as to how to use the software. The findings of this study are useful in advising district leaders as to whether they should continue to use APEX in the traditional and immersion settings. The project study alternative school uses technology-based instruction, which puts the standards in module form with enrichment opportunities and remediation that is differentiated for the individual student. Students start at whatever level is appropriate, as identified through the use of the APEX software. Students work at self-paced progress through the software, but are evaluated with the same End of course tests at the end of each year. Students who have not mastered all of the requirements of a course by its end still take the EOCT. Many students working at a self-pace make enormous strides in progress throughout the courses and can complete coursework more rapidly than they could in the traditional setting (Forsyth County Schools, 2012).

At the project study alternative school, APEX is available for math, language arts, science, and social studies. Within each subgroup of those core areas, there are courses in algebra, geometry, trigonometry, calculus, US history, world history, humanities, economics, biology, chemistry, physics, earth science, astronomy, as well as other courses. In addition to the required mastery, students receive ongoing authentic feedback throughout each course module from both the instructor and the software. There are a variety of reasons why students are unsuccessful in the traditional setting, including

social emotional, and physical (O'Brien & Curry, 2008). In the larger educational setting, there are students who may never enroll in an alternative program, but would excel if some of the alternative practices were available in their traditional schools (Communities in Schools, 2012).

The building level administrators and district level administrators will benefit most from receiving the white paper on this outcomes-based assessment. In addition, the local school advisory committees and the school board would benefit from a results only version of the outcomes-based assessment.

Guiding/Research Question

The purpose of this outcomes evaluation is to examine the relationship between APEX program usage and the academic success measures of EOCT scores, course credit accrual, and graduation.

RQ 1: What is the difference in student achievement on EOCT scores among students using APEX, students using a hybrid approach, and students in the traditional instruction group?

H_{01}: There is no difference in student achievement on EOCT scores among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

H_1: There is a difference in student achievement on EOCT scores among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

RQ 2: What is the difference in student achievement as measured by course credit accrual among students using APEX, students using a hybrid approach, and students in the traditional instruction group?

H_{02}: There is no difference in student achievement as measured by course credit accrual among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

H_2: There is a difference in student achievement as measured by course credit accrual among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

RQ 3: What is the difference in student achievement as measured by high school completion and/or graduation among students using APEX, students using a hybrid approach, and students in the traditional instruction group?

H_{03}: There is no difference in student achievement as measured by high school completion and/or graduation among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

H_3: There is a difference in student achievement as measured by high school completion and/or graduation among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

Review of the Literature

The purpose of this literature review is to present an overview of how online learning works. Guided by an outcomes-based theoretical foundation, this literature review examines online learning, student engagement both in traditional and virtual environments, and assessment in multiple instructional settings. In the review of the

broader problem, a critical analysis of relevant literature provides a saturation of peer-reviewed sources relating to online learning, instruction and assessment in various instructional settings. The Boolean searches for literature were done with Education Research Complete, ERIC, Thoreau, EBSCO books, Database of Reviews of Effects (DARE), and Google Scholar. The search terms used for Boolean searches were *instruction*, *assessment*, *technology*; *online learning communities*; *virtual assessment*, *education*; *alternative school*, *technology*; *instructional design*; *Maslow*, *assessment*, *instruction*; *Bloom*, *mastery learning*; *Carroll*, *mastery learning*; *Gagne*, *outcomes-based assessment*, *theories*; and *Communities in Schools (CIS)*.

A disconnect between the alternative school and the traditional school occurs when there is a lack of understanding of function and purpose (D'Angelo & Zemanick, 2009). There are reasons that alternative programs work, many of which are well documented (D'Angelo & Zemanick, 2009, p. 212). The purpose of this outcomes-based assessment is to identify any components of the alternative school that could be transferable to the traditional school. For this outcomes-based assessment, an integration of both Maslow's (1943) Hierarchy of Needs and Gagne's (1985) model of instructional design into the basis for data organization and analysis is appropriate. The study also applied weave in Bloom (1940) and Carroll's mastery learning theory as an application of Gagne's model for instructional design.

Similar Program Evaluations Using Hybrid Model for Learning Communities

One of the founding principles of the CIS program is the hybrid of face-to-face interaction combined with technology. The efficacy of this approach is supported by the findings of a qualitative study of science teachers using a hybrid model of face-to-face

meetings with synchronous audio conferencing and asynchronous threaded discussion (Annetta, Cook, Dickerson, & Minogu, 2011). This study showed that a synchronous online experience is more engaging and supportive than an asynchronous (Annetta et al., 2011). When an identity presence is created for learners, a rapport is established within the online learning community that fosters more collaboration and academic success (Ke, Chavez, Pei-Ni, & Causarano, 2010).

Project based learning, learning communities, and adaptive learning are the most successful methods of curriculum delivery in U.S. high schools (Corcoran & Silander, 2009). Even though most Americans claim to be happy with their local high school, the schools' performance differs based on the instructional methods employed (Corcoran & Silander, 2009). The e-Tutors project in Taiwan created a database of tutoring topics for university students to engage in with adaptive learning modules (Shih, Tseng, Yang & Liang, 2011). The e-Tutors project is an early incarnation of the APEX learning software with less hands-on interaction. The success of the e-Tutors project led to more e-learning programs that have evolved into the APEX learning system (Shih, Tseng, Yang & Liang, 2011).

When schools tried to match learning styles with students, the results were less successful than when a scaffolding approach was used to focus on learners' cognitive abilities (Zheng, Flygare, & Dahl, 2009). The flipped classroom has been found to be one of the most effective methods of adaptive instruction (Yeh & Yang, 2010). Through the flipped classroom, the teacher is able to use technology to see what the student does not know, giving the teacher the opportunity to tailor the instruction specifically to the students' weaknesses. The hybrid model of instruction is similar to the flipped classroom

in that the teacher assumes the role of facilitator and the accountability for learning becomes more dependent on the student.

In an online learning environment (OLE) survey, the data gathered from 284 respondents concluded that students perceive OLEs to be efficient and economical (Clayton, 2011). Tee and Karney (2010) found that when students are encouraged to share and construct knowledge, the collaborative efforts along with the teachers creates a strong potential for success in facilitating online learning environments. Participants in a recent study reported that multiuser virtual environments (MUVEs) used in synchronous collaboration online were engaging and enjoyable (Sullivan et al., 2010). The GoNorth! Adventure Learning (AL) system stated that integrating curriculum into an experiential real world virtual environment yielded the highest results of emotional and intellectual engagement (Koseoglu & Doering, 2011). The OLE survey study, the MUVE online collaboration study, and the GoNorth! Adventure Learning System each show how student engagement through technology is motivational.

Carnegie Mellon University started an open learning initiative (OLI) and developed courses for students to explore virtual lab environments. The student experiences were flexible and provided authentic feedback. The result of the OLI was the collaborative efforts of many contributors to new virtual experiences (Thille & Smith, 2011). Thille and Smith (2011) suggest that educators should shift the attention from the process and learning objectives, to the outcomes of instruction. Shifting the attention from the process to the outcome allows for a variety of experiences. In the hybrid setting, students have the freedom to sit in a math class with 10 other math students working at different levels. The instruction is guided by the technology, but facilitated by a math

teacher. Students have the opportunity to have more individualized instruction that is tailored to their needs by both technology and an educator. The differentiated nature of OLI meets the needs of various learning styles (Thille & Smith, 2011).

Each of the previously stated studies of online learning environments, virtual experiences, and authentic digital feedback show how the needs of the student can be met in new and different ways. As students become disillusioned with their school experiences, the traditional and technology hybrid instructional model bridges the gap (Jacobs, 2010). A study on computer-based instruction in alternative schools of economically disadvantaged students found that with technology, nontraditional students were performing as much as 60% higher on end of course post-tests than before attending the alternative school in math, science, reading, language arts, and social studies (Watson & Watson, 2011). The Plato software used in the Watson & Watson (2011) study had a very similar format to the APEX software used at the research target alternative school. Plato is a learner-centered computer based instruction that is used for credit recovery and at-level students (Watson & Watson, 2011). The hybrid model with Plato also uses both technology driven and traditional instruction. The teacher in a classroom is a facilitator to all students in the same core subject areas that are learning at a variety of levels (Watson & Watson, 2011).

Related Studies on Hybrid Technology Based Instruction for Self-Efficacy

Current research shows that student self-efficacy is a major predictor of student achievement for high school students (Caprara, Vechione, Alessandri, Gerbino, & Barbaranelli, 2011). The Twilight Academy program is a similar program to the project study alternative school. Twilight has 60 students, four teachers, one administrator, and a

school secretary (D'Angelo & Zemanick, 2009). The technology component in Twilight works in the same way for hybrid instruction as the APEX lab. The program evaluation on Twilight Academy found that making the campus of the alternative school part of the traditional high school made a difference in the success of completion (D'Angelo & Zemanick, 2009). The program evaluation found that students at Twilight Academy were less truant, had fewer discipline issues, and made better grades than they had before attending the alternative program (D'Angelo & Zemanick, 2009).

The Alternative Schools Project (ASP) study reported that students commonly shared in interviews that the flexibility within the learning environment gave them more accountability for their success along with mutual respect with their teachers (Quinn & Poirier, 2007). ASP conducted a 5-year study beginning in 2001 that attempted to identify the range and diversity of learners in alternative schools from Texas and California (Quinn & Poirier, 2007). Through observations, interviews, questionnaires, and historical data analyses, the researchers found that alternative school students performed better in the alternative setting because they felt more intellectually challenged. The ability to demonstrate mastery at a defined level and move on to the next standard was shown to be highly motivational for alternative school students (Quinn & Poirier, 2007). Without the defined timeline of a set semester, many students moved through courses quickly, obtained the required credit for successful completion of each course, and ultimately completed high school in an average of approximately 2 years upon entry into the alternative program (Quinn & Poirier, 2007).

Standards for e-Learning

The British Standards Institution (BSI) formed a committee in 2002 to evaluate computer-assisted instruction. In its model, the BSI formed a panel of experts representing government, business, education and exam boards (Shephard, Warburton, Maier, & Warren, 2006). The BSI panel designed a code of practice, translated it into language accessible to educators, and implanted the code. In the next 4 years after the BSI code of practice, other learning environments such as Blackboard and WebCT became popular, even though they did not meet the security requirements (Shephard et al., 2006). Over time, the strict rules of the BSI were relaxed to make way for an evolving technology-driven instructional base found in software suites like the APEX lab.

In their outcomes-based assessment on technology driven instruction, Martinez, Liu, Watson, and Bichelmeyer (2006) followed a similar methodology to the proposed research about APEX labs. In the study, Martinez et al. used an online survey and interviews. The quantitative data gathered from the survey were used in the creation of the interview questions. The qualitative data gathered from the interviews were coded into three categories. Themes addressed from the coded data were teaching online, administration, and technology (Martinez et al., 2006). A quantitative study on evaluating learning management systems stated the indicators of success in an e-learning program: the way the instruction was managed, the design of the screen (visual), the level of interactivity, and the way that student work was evaluated (Kim & Lee, 2007).

An outcomes-based assessment of courses taught in three formats at the University of Hawaii led to an eight-step process for identifying quality instruction and assessment (Menchaca & Hoffman, 2009). The evaluation examined three instructional

settings: instruction done only in the classroom, online instruction done in conjunction with the traditional classroom, and online only (Menchaca & Hoffman, 2009). Menchaca and Hoffman (2009) identified eight steps as necessary in order for online learning to be comparable to the level of quality in traditional classroom instruction:

1. The program should have a mission and an instructional plan.
2. The program should consider the characteristics of the student population.
3. The program should identify the value of a distance approach to meet the instructional plan and student needs.
4. The program should establish both program and evaluation requirements.
5. The program should obtain the appropriate university approval.
6. The program should identify any outside agency accreditation that is needed to validate the coursework.
7. The program should develop an overall evaluation plan.
8. The program should conduct formative assessment through analyses of available data and modify as needed on an ongoing basis.

As a result of the outcomes-based assessment done by Menchaca and Hoffman (2009), the online program has grown and thrived. The hybrid model has become increasingly popular in universities around the world. Finally, the hybrid model studied by Menchaca and Hoffman is the same instructional model used by the APEX labs at the project study alternative school (Menchaca & Hoffman, 2009).

Technology in Education Program Evaluations

In recent years, there have been a number of program evaluations involving technology in education. A mixed methods study on the effectiveness of a distance

learning masters' program found several ties to the traditional college classroom (Martinez, Liu, Watson, & Bichelmeyer, 2006). The study found that the rigor of the curriculum and quality of instruction online to be comparable to the traditional 4-year university (Martinez et al., 2006). In 2005, approximately 66% of universities had a distance learning option in the form of online coursework (Molenda & Bichelmeyer, 2005).

A mixed methods study on the predictive qualities of triangulation used techniques in analyzing data that went beyond the efficacy survey (Hung, Hsu, & Rice, 2008). The study took the student end-of-course survey data and cross-referenced with the teacher report data (Hung et al., 2008). The triangulation took place when the researchers went further into the class participation logs and compared how much time was spent using the software with the student and teacher perspective results. The finding was that students who participated more frequently had a higher opinion of the quality of the course and performed better (Hung et al., 2008). The finding is relevant to the proposed project study in that it was the frequency of time, rather than the duration, that made the biggest difference in student efficacy.

Hybrid Technology/Instruction Blended Learning Studies

The hybrid technology classroom was explored in a learning environment study focusing on middle and high school science classes (Doppelt, 2006). In a mixed methods study about hybrid technology, a group of teachers was given extensive professional development on the integration of technology as a learning objective for their science classes. A separate control group did not receive any professional development. The study found that over time, the strategies used in the professional development were

making their way into the classroom. Teacher perspectives on the professional development were positive, and students took ownership over their collaborative science learning (Doppelt, 2006).

Researchers from King's College in England conducted a mixed methods study that measured the quality of e-learning. Concept mapping was found as a useful tool to predict student success (Hay et al., 2008). Though concept mapping is not a defined model in the content delivery of APEX, concept mapping is present in the design of each of the modules by standard. Using a pre- and posttest model, the researchers were able to identify the preconceived concept map and the fully realized concept map (Hay et al., 2008). Delft University of Technology in the Netherlands was the context of a research study on blended learning models. The outcomes-based assessment at Delft University focused on four dimensions of blended learning. The dimensions studied were structured/unstructured, individual/group, face-to-face/at-a-distance, and self/teacher directed (Verkroost, Meijerink, Linsten, & Veen, 2008). Verkroost et al. (2008) found that the blended learning model was the most successful of the different technology-based instruction and assessment.

In a study on the perceptions of online learning with pre-service teachers, researchers found that students interacted with each other and the instructor as more of a community than they would have in a traditional classroom (Altun, Gulbahar, & Madran, 2008). The virtual learning community is a constantly changing landscape that cannot be navigated by a single lone student (Altun et al., 2008). Universities use electronic formative assessment of classroom teaching (eFACT) for ongoing performance evaluation of a learning environment in real time (Berridge, Penney, & Wells, 2012).

With eFACT, students provide anonymous feedback of both their personal progress and teacher effectiveness throughout the course of the semester (Berridge et al., 2012).

Because of the varied course curriculum, the capacity of engagement in technology-based instruction varies by subject area. This is addressed in APEX by the length of the course modules and the breakdown of individual standards that each module addresses (APEX Learning, 2012). A study on learning objects stated that students responded more favorably to the technology by the way it was presented in science, compared with math (Turel & Gurol, 2011). Turel and Gurol (2011) found that the exploratory and investigative nature of a science class was more engaging than the concrete aspects of a math class.

Technology has become an integral tool in education (Doppelt, 2006). In the past 10 years, different trends have emerged in technology integration with education (Quinn & Poirier, 2007). The educational technology trends have resulted in standards for delivery and assessment (Menchaca & Hoffman, 2009). APEX uniquely defines content mastery at 85%. The traditional schools and state-regulated tests allow students to move forward with 70% mastery (Georgia Department of Education, n.d.). APEX keeps the students on the same standards used by the state in the traditional schools until they can demonstrate a level of mastery that is 15% higher (Forsyth County Schools, 2012). The hybrid model of technology and instruction has shown improvements in student achievement in both alternative schools and traditional schools (Sullivan et al., 2010). Motivation through feedback has been identified as a contributing factor to the hybrid model (Clayton, 2010).

In an evaluation of learning environments, Clayton (2010) argued that the quantitative data alone do not give a full picture of the program. Using the Lewinian formula, B=f(P,E), Clayton includes the qualitative elements of perception and interaction as equally important measurable traits for outcomes-based assessment (Clayton, 2010). In the Lewinian formula, B (behavior) is equal to the function (f) of the person (P) in the environment (E) (p.22). According to Clayton (2010), the perceptions that students have of their learning environment are direct reflections of their motivation to achieve academic success. In addition, students in the Clayton study cited both written and oral feedback from teachers and peers as highly motivational elements to the learning environment (Clayton, 2010).

Classical Theories of Instructional Design

This outcomes-based assessment will draw on theories of Maslow, Bloom, and Gagne. More specifically, the motivational theory of Maslow's (1943) hierarchy of needs will be used to explore the social implications of the alternative school program. Bloom's (1971) mastery learning theory will help solidify the theoretical base of student improvement through repetition and authentic feedback. Gagne's (1998) instructional framework will add further depth to the practical application of Bloom's mastery learning theory in action.

Maslow's hierarchy of needs.

One of the elements on the pyramid in Maslow's (1943) hierarchy of needs is the need for belonging. The experiences provided from online learning environments meet those needs by increasing skill levels of everyone within a social group (Clayton, 2010). The students in the project study alternative school comprise the social group structure. In

the online learning environment, collaboration and belonging are rewarded (Johnson & Levine, 2008). Students are rewarded through authentic feedback from the software, the facilitator, and the social group, building the self-esteem level of Maslow's Hierarchy of Needs (Johnson & Levine, 2008). Anonymity provided through technology allows students to be more forthcoming with their feedback in both in both synchronous and asynchronous chat, revealing a positive aspect of the OLE (Jacobs, 2010). Before attending the project study alternative school, many of the students are either too shy or anti-social to meet face-to-face with teachers and other students (Jinger Davison, personal communication, 2012).

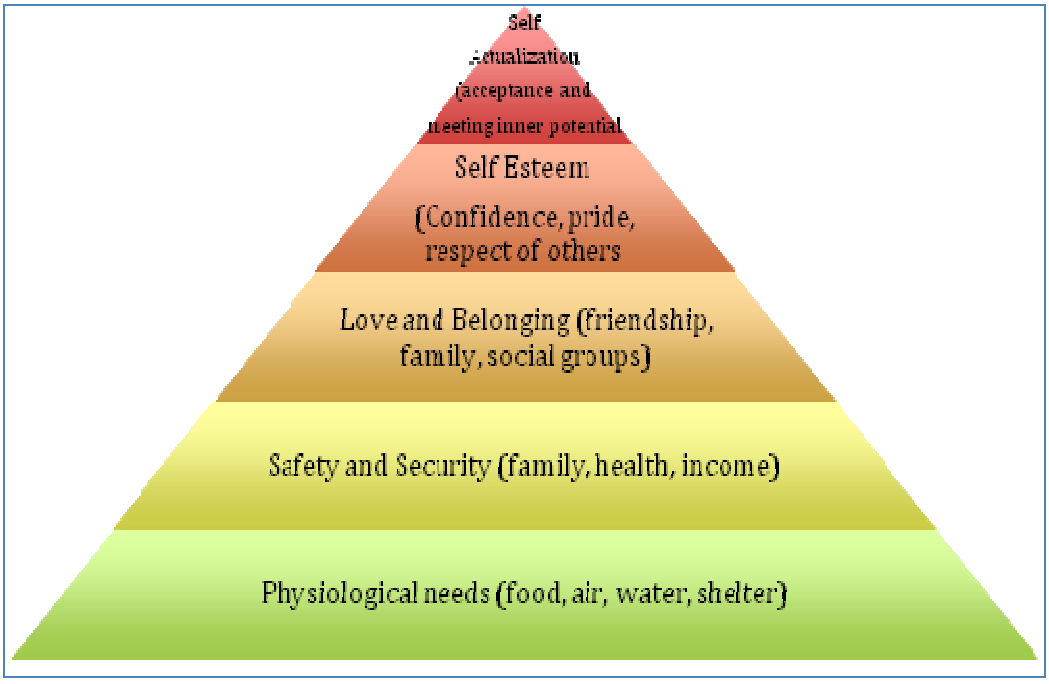

Figure 1. **A pyramid showing Maslow's hierarchy of needs**.

Maslow's hierarchy of needs shows how student motivation moves students up the hierarchy from the most basic of needs to self-actualization (Gobin, Teeroovengadum, Becceea, & Teeroovengadum, 2012). Hatziapostolou and Parakakis

(2010) explained the relationship between feedback and motivation, stating that students are more likely to work with an attainable goal in front of them. The guidance of authentic feedback keeps students on track toward meeting their goals and further up the hierarchy (Gobin et al., 2012).

The social need is an entry point for many students at the project study alternative school (Johnson, 2003). The intrinsic motivation comes from the accomplishment of moving through each of the standards with an 85% or higher level of mastery (Johnson, 2003). The extrinsic motivation comes from the passing grades, completion of courses, and ultimately, graduation. Current research studies have shown positive correlations between student interactions with technology-based instruction and student motivation (Hatziapostolou, & Paraskakis, 2010). According to the learning theories of Hawe, Bond, and Butler (2009), in outcomes-based assessment, the foreground is more noticeable than the background. The foreground in the study is the technology and software in action. The background consists of the material that is determined to be included in the curriculum (Hawe et al., 2009). Feedback offered through technology-based instruction and assessment in the foreground represents the level of engagement, which is a growing trend in education (Sullivan et al., 2011). Through the use of multiple types of feedback, adaptive assessments, and the unique high technology components in place at the project study alternative school, students move through Maslow's Hierarchy.

Gagne's Model for Instructional Design

In addition to Maslow's (1943) hierarchy of needs, the project study uses Gagne's (1998) model of instructional design to compare the technology-assisted instruction of the APEX system with traditional forms of instruction (Khadjooi, Rostami, & Ishaaq,

2011). Since the APEX system requires students to achieve 85% or higher before moving on to the next skill within the curriculum, Gagne's theories of scaffolding can be clearly met in conjunction with Bloom's theory of mastery learning. Gagne's model of instructional design is a nine-step process:

1. *Gets the attention of the learner.* With the technology and novelty of an online learning environment, the attention is present.
2. *Informs the learner of the objectives*. The discussion topic or virtual experience explains the objectives to the learner.
3. *Stimulates recall of previous learning.* Recall is the point when the required mastery makes the online learning environment superior to the traditional model.
4. *Presents the new material.* In the online environment, the learning community shares experience and insight to develop skills collectively. For some in the environment, the recall section will be new material.
5. *Learning guidance.* Learning guidance works with the dynamic of the community within the online learning environment giving the teacher the opportunity to facilitate or instruct as needed.
6. *Eliciting the performance.* In the online learning environment, eliciting the performance is the stage where the learners demonstrate the learning through experiential role-playing or social interaction. The role of the teacher as facilitator is present in the social interaction piece of the APEX lab because the teacher is present to guide student progress as well as remediate when necessary.

7. *Feedback.* The other members of the community and the instructor can provide feedback. The feedback responses should be authentic and ongoing.
8. *Appraise performance.* Students can assess their performance at the completion of a stage in the online learning environment and compare their assessments with other members of the community that participated. By tracking their progress, students can see through color-coded charts how far along they are in the module as compared to other students. This report feature in APEX is available to the instructor, and can be used as a motivational tool.
9. *Building for transfer.* To enhance the retention and build for transfer, the learners explain how they completed the task and synthesize the purpose of the activity. Through reflection upon completed tasks, students identify the skills mastered and build toward the next text (Gagne, Briggs, & Wager, 1998).

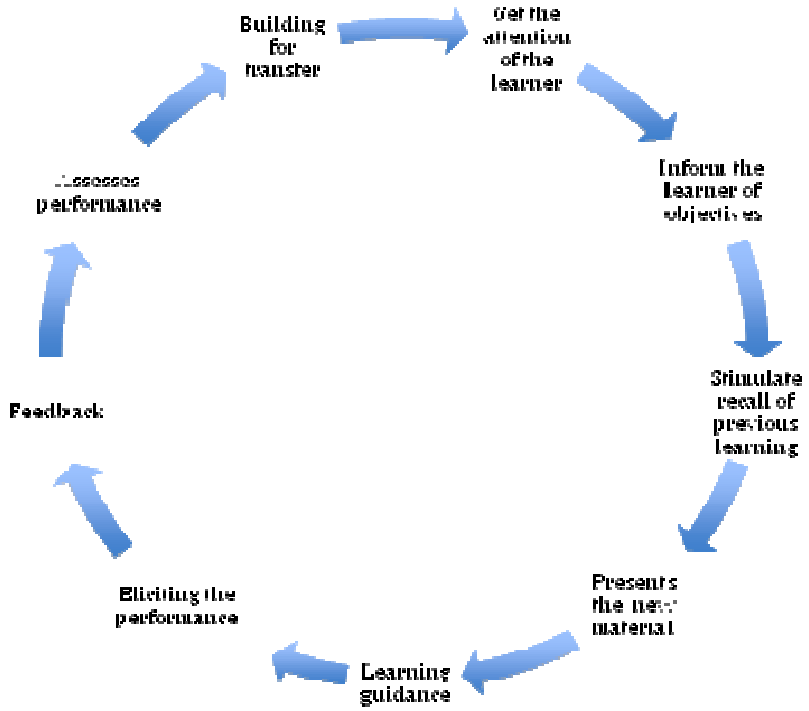

Figure 2. **A flowchart showing Gagne et al.'s (1998) model of instructional design.**

Within the nine steps of instructional design, the project study will synthesize Bloom's (1971) mastery learning model. With mastery learning, students first receive instruction, which falls under the first four levels of Gagne's instructional design. The second level of Bloom's mastery learning model is to have a formative assessment, which covers levels five and six of Gagne's model. Upon completion of the quiz (formative assessment), students move to the feedback and performance assessment sections of Gagne's instructional design. During these steps, if additional instruction, remediation, or enrichment is needed, it is provided. The Mastery stage (summative-test) of Bloom's fits with what Gagne called *building for transfer* (Gagne, Briggs, & Wager, 1998). In APEX, if a student does not demonstrate a mastery of 85% or higher on the formative (Gagne levels 5 and 6), they go back to the instructional phase for remediation. The APEX

software is intuitive and will provide different examples and a variety of strategies to students to differentiate the instructions for adaptive assessment (Apex Learning, 2012). If, after three attempts, the student still has less than 85%, the teacher intervenes and offers personal remediation for the student before allowing them to return to the module (Apex Learning, 2012).

The nine steps of instructional design provide a theoretical framework to define teacher perspectives. A qualitative case study on the effectiveness of formative feedback through online learning found that the students who benefit most from the APEX labs are the students who were disillusioned with the traditional school setting because of the lack of authentic feedback (Hatziapostolou & Paraskakis, 2010). The timeliness and diversity of types of feedback available in APEX were described by students in the study as "meaningful" and "motivational" (Hatziapostolou & Paraskakis, 2010). The data analysis will identify how students' needs are being met and which student needs are not being met through the APEX lab program in accordance to Maslow's hierarchy, and identify the instructional design of the lab, as outlined by Gagne.

Theoretical Framework

The theoretical framework that will be used in the outcomes-based assessment is the behavioral objectives approach (Preskill & Russ-Eft, 2005). The behavioral objectives approach will be used as a means to identify how the APEX hybrid model of instruction and assessment is achieving its objectives as compared to the APEX only model of instruction and assessment and the traditional teacher-led model that is used in high schools throughout the school district.

Program Goals

The initial goals of APEX were to reach students with Advanced Placement courses that did not otherwise have access (Moore & Baer, 2010). The distance learning option with APEX provided thousands of students' opportunities to take courses that were not previously available in their schools because they were either too specialized or would be too expensive to offer due to limited site enrollment (Moore & Baer, 2010). As the APEX program expanded, it included baseline curriculum for credit recovery purposes. The goals APEX software evolved into a platform that includes both instruction and assessment in an online format with a mastery learning component at 85% (Moore & Baer, 2010).

The hybrid model of APEX takes the instruction piece a step further. In the hybrid model, the delivery of instruction is supported by a highly qualified certified teacher in a facilitator role (D'Angelo & Zemanick, 2009). The goal of the hybrid model is to provide the additional resource of human interaction as a further step in remediation or enrichment.

Indicators of Success

APEX measures a variety of items that can be used pedagogically as indictors of success. For each user, the teacher has the ability to pull a report that tells how much time a student spent on a module, how frequently the module was accessed, how many attempts were made on the formative assessments before 85% mastery, and what types of questions students answer correctly. Using the time feature and the number of times a module is accessed feature, teachers can determine a class average as a measure of prediction for successful course completion. An examination of the attempts at a

formative assessment for 85% mastery provides the teacher with necessary data to evaluate the effectiveness of the module.

Resources

The project study alternative school uses APEX in the hybrid format. A typical APEX lab in the local school system has 14 to 18 computer workstations running the APEX software. In the APEX only schools, there is a certified teacher in the lab. A fundamental difference between the hybrid and the APEX only models is that the hybrid has a certified teacher that is content specific. The APEX only labs do not require the teacher to be highly qualified. In the hybrid model, there is a content specific highly qualified teacher in a lab that is also content specific containing 14 to 18 workstations.

Activities

Students interact with APEX software both in and out of the classroom. Each school day, there are five classes. Students attend class in an actual classroom lab and log in to APEX. During the allotted class time, there is a highly qualified teacher present to address any questions or concerns that students may have regarding the content of the curriculum. The role of the APEX hybrid teacher during class is that of a facilitator that can offer enrichment or remediation immediately. The intuitive APEX software provides specific authentic feedback for students in an ongoing real-time fashion. Students have the ability to leave questions in an asynchronous manner for teachers within the software. In both the hybrid and the APEX only models, students and teachers can communicate feedback in either synchronous or asynchronous ways. Students have the ability to log in remotely to do part of the course module, to check asynchronous feedback, or to message

the instructors. Students do not have the ability to take formative or summative assessments remotely.

Purpose of Outcomes-based assessment

The purpose of this outcomes-based assessment study is to evaluate the effectiveness of hybrid classrooms (Hurson & Sedigh, 2010). Using the behavioral objectives approach (Preskill & Russ-Eft, 2005), this outcomes-based assessment will focus on how the program goals of the hybrid model of APEX are being achieved using the given resources and following the designated activities (Centers for Disease Control and Prevention, 1999). The intent of this outcomes-based assessment is to identify how significant the differences are between the hybrid form of instruction with APEX, the APEX only, and the traditional class without APEX. If one of the APEX related models can show significant positive differences, the chi-square will help identify if the model is replicable for similar students within the local school system.

Implications

The potential results will show stakeholders in the local school district an alternative that melds instruction and assessment, provides authentic feedback instantly, and can be done within the walls of the school either for enrichment or credit recovery. The faculty knowledge domain for teaching and learning will need to be updated to meet the needs of the technology driven instruction and assessment model (Alsofyani, Aris, Eynon, Majid, 2012). Through the integration of the APEX labs, the role of the educator becomes divergent between instructor and facilitator. The potential social change that could arise from this project study is the implication that a hybrid model of instruction and assessment reaches more students in different ways, therefore potentially decreasing

dropout rates and improving class attendance. The results of this study will be shared in the form of a project study report for the administrative teams of the five traditional high schools and one nontraditional high school in the local school district.

In the local school district, the same high technology used at the alternative school is available in the traditional schools. Currently, only one high school is using the same technology that is being used in the alternative school. The project study report will also identify ways that Online Learning environments (OLEs) like the APEX learning lab are intuitively adapting to the learning styles of students in need.

The study will contribute to an understanding of instruction and assessment through the use of high technology. If the results show that the APEX labs are a significant source of student improvement, the report to the local high schools will describe the benefits of including APEX labs in the traditional high school for credit recovery. If this research finds that the APEX labs are not effective, the program report will be presented to the alternative school as a research-based document to call for a change in the instruction and assessment practices currently in place. If the program is found to be effective, the alternative school will still receive a report with recommendations for improvement.

Summary

The same students who are excelling at the project study alternative school were previously students enrolled in a traditional school. The local school district has embraced the hybrid model and has used it to extend the classroom outside of the walls of the school building. Students have access to courses both in the building and remotely.

This access allows students an opportunity to keep discussions and engagement going at any time of day.

Section 2 provides the methodology used for the project study. Within the methodology in Section 2 are descriptions of the outcomes-based assessment design, the setting and sample, the data collection, the data analysis, and the results of the study. Each of the three research questions are further defined, and hypotheses tested. Data in Section 2 is represented with both tables and narrative.

Section 3 provides an explanation of the project that was done for the project study. In Section 3, there is a description and goals of the study and the rationale. Section 3 also presents a scholarly review of literature that is more specific to the instructional settings and outcomes-based evaluation that was conducted for the project study. There is an interconnected analysis between the research conducted and the literature reviewed as well as the discussion of findings in Section 2.

Section 4 covers reflections and conclusions from the point of view of the researcher. Section 4 gives reflections on the importance of the work, the contributions to lead social change, as well as implications, applications, and directions for future research.

Section 2: The Methodology

Introduction

A behavioral objectives-/goal-based evaluation was chosen for this study because it uses the program goals and collects evidence to determine whether the goals have been reached. The data gathered in the study were analyzed, synthesized, and presented by high school completion/graduation rates, credit accrual, and the increase or decrease in end of course test (EOCT) scores. I used quantitative data obtained from the study site's parent county's website and that I obtained from the local school district through a public records request.

Three groups were compared for this study. Each group consisted of students that were in ninth grade in the 2010-2011 school year that graduated in 2013- 2014. The first group was the treatment program. The treatment program was the project study alternative school where the hybrid model of instruction and assessment was being used with the APEX lab. The second group consisted of all students who were involved in APEX in the traditional school where APEX was only used for credit recovery and was not a hybrid model. The third group was all other students district wide who were in ninth grade in the 2010-2011 school year and graduated in 2013-2014 who were not in the treatment group and had no experience with APEX.

To determine the effect that the APEX lab had on student achievement when introduced in the alternative school, the quantitative historical data were analyzed using ANOVA to measure trends in student achievement over time through yearly end of course tests and credit accrual over three consecutive years; I used chi-square analysis to explore different-than-expected graduation rates between the three instructional settings.

Success in student achievement was defined by high school completion or graduation, credit accrual, and upward trends in EOCT scores. Statistics were used to identify the percentage of students at or above grade level measured by the end of course test in each subject area. The percent of students in 10th grade at or above grade level within each of the three cohort groups were identified over three years to infer either positive or negative growth trends in student achievement.

The material in the APEX lab was the same material offered in the traditional school (APEX Learning, 2012). Traditional schools in the local school district that were not using APEX taught the same content without the integrated technology components used in APEX for both instruction and assessment (Forsyth County Schools, 2012). The difference in the APEX lab was the delivery. The project study alternative school had a subject area specialist facilitating each class. Four of the five high schools in the local school district used APEX as a form of credit recovery, rather than the sole form of instruction and assessment (Forsyth County Schools, 2012). These four schools had one certified teacher that covered the APEX lab for all subjects. This research took these various quantitative data points and synthesized them into a report of the findings.

Design

The outcomes-based assessment focused on the hybrid instruction and assessment delivery in the alternative school program where the APEX software was being used, as described in Zhang et al. (2011). It was designed to evaluate the Apex labs hybrid delivery models used in an alternative Georgian high school as the vehicle for instruction and assessment, as compared with the software only method of APEX delivery used in traditional high schools (c.f., Forsyth County Schools, 2012). The context of the

evaluation was the project study alternative school and the traditional setting that used APEX for credit recovery. As a constant, there was a third group consisting of students who had no experience with APEX, either hybrid or otherwise, throughout high school. Through exploration of the project study alternative school and comparison the evaluation determined the comparable effectiveness of APEX in two instructional settings with regard to performance on EOCT, credit accrual, and graduation.

While ANOVA was initially planned for examining the differences in EOCT scores among the three instructional settings, the data failed to meet the assumptions of both homogeneity of variance and normality of distribution, leading to a nonparametric alternative to measure whether the instructional setting produced significantly different effects on student scores. The data for credit accrual were sufficiently normally distributed to use ANOVA to measure differences in credit accrual. Graduation/completion rates were examined using chi-square to view rates for each instructional setting in light of expected achievement for all students; *t* tests further delineated whether there were significant differences in rates between the two APEX settings. The input of the research came from identifying the needs of the APEX learner and matching the needs with the offerings of the APEX learning system (Zhang et al., 2011).

This outcomes-based assessment is summative in nature, in alignment with Rossi, Lipsey, and Freeman (2003). Summative evaluation permitted an examination of the program after a period of implementation. It also provided insight into whether the program as it was implemented created positive, intended outcomes in the case of this

evaluation, whether the program led to student growth in test scores, to credit accrual, and to increased graduation/completion.

The purpose of this outcomes evaluation is to examine the relationship between APEX program usage and the academic success measures of EOCT scores, course credit accrual, and graduation/completion. The overall research goals were to show the strengths and weaknesses of the APEX learning labs in practice and to present the findings to the staff of the alternative school and to schools that were not utilizing the available APEX technology in the same way as the research target alternative school.

Setting and Sample

The study included a discussion of instruction and assessment practices at the project study alternative school. The research provided evidence of high technology used for individualized instruction for alternative schooling and determined if the methods can be transferable to a traditional high school. No students were directly observed or interviewed for the purpose of the study due to the use of archival data.

The student population of the research target alternative school was 78% white and 22% Hispanic, Black, American Indian, or multi-racial (Forsyth County Schools, 2012). The 22% statistic lacks specificity because each of the ethnic groups in the "other" category had less than 10 students. Forty-eight percent of the students at the project study alternative school were female, and 52 percent were male. Twenty-six percent of the project study alternative school's students qualified for free lunch (Forsyth County Schools, 2012). The special needs population at the project study alternative school consisted of learning disabilities, other health impaired, and speech/language impaired (Forsyth County Schools, 2012). None of the special needs populations represented at the

project study alternative school had more than 10 representatives. Special needs student data were broken out in subgroups following the procedures used by the state education agency. Defined disabilities did not have an effect on the data.

Three groups of student data were used for comparative purposes. All students at the project study alternative school had experience with the hybrid instructional model in the APEX lab. Within the project study alternative school cohort, there were approximately 20 students. The second cohort consisted of approximately 500 students in the traditional high school who entered the 9th grade in 2010 with exposure to the APEX software for instruction and assessment but not the hybrid model. The third group consisted of approximately 2,500 students in the five traditional high schools who entered the 9th grade in 2010 that had no exposure to APEX though their high school experience.

About the School

The school staff at the study site was comprised of a principal, a school counselor, five teachers, and an administrative assistant. The project study alternative school used technology-based instruction putting the standards in module form with enrichment opportunities and remediation that was differentiated for the individual student (APEX Learning 2012). APEX labs divide the curriculum into skill based pieces in multi-tiered levels, and require that students achieve a minimum of 85% mastery before the student could move on to the next level (Forsyth County Schools, 2012).

Data Collection and Analysis

The first step in the actual project was obtaining IRB approval for securing the archival data. After receiving IRB approval, a request to the local school system for permission to collect specified historical data was submitted. Data collection and analyses

of the end of course test (EOCT) score, class grades, and high school completion/graduation data followed approvals. I collected historical data from the 2010-2011, 2011-2012, 2012-2013, and 2013-2014 school years at the individual student level for the three groups of students compared.

Quantitative Data Collection

The historical quantitative data from EOCT scores was presented visually by use of tables showing means and standard deviations. The most recent student data (2011-2014) were utilized. No individual student level data were reported, in accordance with FERPA.

End-of-course test data were maintained both online and at the project study alternative school. Students who came to the project study alternative school from other school systems had records available at the project study alternative school that were available for research purposes. All student data requested through a records request were masked for individual student identification, but included student demographics, such as gender, ethnicity, socioeconomic status (free/reduced lunch), special education, limited English proficiency, and state at-risk status.

The data collection included historical data from student EOCT scores, class grades, credit accrual data, and high school completion and graduation data. Although not originally a part of the study, the district also provided class grades for content areas for which there were EOC tests. Collection of historical data began in the spring of 2015, after I received IRB approval.

Quantitative Data Analysis

The three separate groups used in the study were compared as they progressed over three years with an attempt to determine if the treatment group using the hybrid instructional model in the APEX lab at the project study alternative school was making significant gain over the students in traditional schools that only used APEX and over students who had no exposure to APEX.

The first research question examines end of course test (EOCT) scores among the three instructional settings. To examine whether students in each of the three settings performed differently, a nonparametric equivalent to ANOVA, Kruskal-Wallis, distinguished whether there were significant differences between instructional settings with regard to performance on EOCTs.

The second research question examined whether there were differences in credit accrual rates based upon instructional setting. ANOVA was used to compare whether there were significant differences in overall credit accrual rate between the three instructional settings, and *t* tests compared APEX specific credit accrual rates to see if there were differences between the two APEX settings.

For the third research question, graduation or completion rates were compared by instructional setting. Chi-square was used to determine whether students graduated or completed at rates different than expected within each instructional setting. ANOVA was used to compare whether there were significant differences by instructional setting in the rate of graduation/completion.

The archival quantitative data were presented visually by use of tables showing *t*-tests, ANOVA/Kruskal-Wallis, and chi-square comparing a cohort of students that were

in Grade 9 in 2011. The study examined student growth between the three groups of students. EOCT data collected included scores in literature, mathematics, science, social studies, and composition earned over the four-year period. The statistical analysis was done by subject area.

Since raw data were available upon IRB approval, the data set included numeric test scores. With the district provided information, the number of credits attempted and the number of credits earned in both APEX and overall by students were used to calculate credit accrual rates. From these data, two credit accrual rates were calculated: one for APEX and one for overall credit accrual.

The product of the goals-based evaluation was a white paper for stakeholders. The quantitative data gathered through the evaluation provided insight into the use of the use of the APEX system for remediation, and student achievement outcomes at this site including EOCT, credit accrual, and graduation/completion rates. The report was broken into three parts. Each part corresponded to findings for one of the research questions and described the population. Consumers of the research were able to look at the population and pick out which areas of the findings and recommendations most applied to their instructional setting. Some of the elements in the context section were not as transferable because they were more dependent on the population served.

Protection of Human Subjects

I had no personal and professional ties to the project study alternative school other than teaching in the same school system. Due to the nature of the APEX lab, not all students in the same classroom were taking the same level class. Because of this, students were only compared to themselves. Students taking 9th grade level courses one year,

were compared to students taking 10th grade level the next year. The scores that were used did not have any student names attached to them to protect the rights of minors. Student data used were archival data.

Results

Using a data set provided by the school district, 28,526 academic observations were calculated, cross-tabulated, and compared. Student data provided in the data set included instructional setting, year of enrollment, identifier (masked student number) race, gender, grade level, end status (graduate or not), eligibility for free/reduced lunch, and final end of course test score. Additional data provided that were not originally asked for will be discussed in the results section.

Students outcomes were grouped by the instructional setting that they received. Group 1 had no experience with APEX and consisted of students in a traditional high school setting for their entire high school experience. Group 2 consisted of students within the traditional high school that had experience with APEX for credit recovery. Students in Group 2 may have only had one class in APEX, but were separated for Group 1 for the purpose of this study. Students in Group 3 were part of Forsyth Academy and used the hybrid model of APEX with a highly qualified teacher that served as a facilitator in the APEX classroom.

Due to identifier duplicates in the provided data set, each identifier was coded based on the following:

- If a student had only 1 for instructional setting, they were placed in Group 1.
- If a student was ever in Group 2, but was also listed in Group 1 as a duplicate in instructional setting, they were placed in Group 2.

- If a student was ever in Group 3 for instructional setting, they were placed in Group 3.

Research Question 1

The first research question was, "What is the difference in student achievement on EOCT scores among students using APEX, students using a hybrid approach, and students in the traditional instruction group?" The hypothesis was that students using the hybrid APEX at Forsyth Academy would show greater increases than similar students using the credit recovery model in the traditional high schools. Initial ANOVA testing to see if there were differences in achievement based on instructional settings showed that the data violated the assumption of homogeneity of variance. To validate the assumption of normality of the data, a Kolmogorov-Smirnov test of normality was conducted, which showed the data did violate the assumption of normal distribution: Kolmogorov-Smirnov = 0.409, with $p = 0.000$ (Table B1).

The nonnormal distribution and unequal variance of students in groups led to utilizing a nonparametric test, Kruskal-Wallis, to see if differences in instructional setting were associated with significant differences in end-of-course scores. The Kruskal-Wallis statistic has an asymptotic, chi-square distribution.

Figures B.2-B.9, located in Appendix B, show the test statistics of the median scores for the individual EOCTs the median, not mean was used because the means are not normally distributed. Table 1 shows the number of observations (*N*) and the median score (Md) in each instructional setting for each subject's end of course test.

Table 1
End of Course Tests by Subject

	End of Course Tests by Subject					
	APEX for Credit Recovery (2)		APEX Hybrid (3)		Traditional School (1)	
	N	Md	*N*	Md	*N*	Md
American Literature	39	79	47	84	1476	84
Biology	48	72	11	81	2551	82
Economics	26	69	59	81	1749	85
Math 1	4	68	12	75	2004	77
Math 2	11	73	27	71	2069	77
Ninth Grade	33	78	5	80	2444	86
Physical Science	34	81	26	83	1554	86
U.S. History	18	69	47	74	1867	81

With the exception of Math 1, all of the other end of course test scores showed a significant difference in student achievement between students at the traditional school with APEX and the APEX-only Forsyth Academy. Out of the 2,020 students who took the Math 1 end of course test in the district, this was the only test that had a group with no significant differences between the median scores in the three instructional settings $H(2) = 4.931$, $p = 0.085$. The traditional school with APEX group had no significant differences on the lower end of score on the Math 1 test, making it the only instance of where the null hypothesis is accepted.

Research Question 2

The second research question was, "What is the difference in student achievement as measured by course credit accrual among students using APEX, students using a hybrid approach, and students in the traditional instruction group?" All three instructional settings were compared to determine whether there were significant differences in rate of total credit accrual based on instructional setting. Table 2 shows the descriptive statistics of all students in the district for credit accrual.

Due to the violation of homogeneity of variance, the Brown-Forsyth statistics was used instead of ANOVA to determine whether significant differences in credit accrual rates existed between settings. The Brown-Forsyth test established that there were significant differences between the three instructional settings of robust differences (Table 3). The post hoc, Games-Howell showed that students in APEX for credit recovery scored significantly lower in credit accrual than the other two groups (Table 4). There were no significant differences in the APEX hybrid and the traditional programs.

Table 2
Descriptive Statistics of Credit Accrual for All Students

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
traditional	16114	.9346	.15422	.00121	.9322	.9370	0.00	1.00
traditional with APEX	1004	.8622	.17973	.00567	.8511	.8733	.07	1.00
APEX school	164	.9559	.11625	.00908	.9380	.9739	.43	1.00
Total	17282	.9306	.15643	.00119	.9283	.9329	0.00	1.00

Table 3
Brown-Forsyth Differences in Credit Accrual Between Instructional Settings

		Sum of Squares	df	Mean Square	F	Sig.
Credits earned	Between Groups	2754.941	2	1377.471	344.161	.000
	Within Groups	69157.547	17279	4.002		
	Total	71912.488	17281			

Table 4
Games-Howell For Credit Accrual Comparison

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Credits attempted	Traditional (1)	Trad.w/APEX (2)	.44463*	.10016	.000	.2096	.6797
		APEX School (3)	3.60295*	.21817	.000	3.0869	4.1190

	Traditional with APEX (2)	Traditional (1)	-.44463*	.10016	.000	-.6797	-.2096
		APEX School (3)	3.15832*	.23917	.000	2.5942	3.7224
	APEX School (3)	Traditional(1)	-3.60295*	.21817	.000	-4.1190	-3.0869
		Trad.w/APEX (2)	-3.15832*	.23917	.000	-3.7224	-2.5942
Credits earned	Traditional (1)	Trad.w/APEX (2)	1.01839*	.09589	.000	.7934	1.2434
		APEX School (3)	3.36507*	.22608	.000	2.8304	3.8998
	Traditional with APEX (2)	Traditional (1)	-1.01839*	.09589	.000	-1.2434	-.7934
		APEX School (3)	2.34667*	.24465	.000	1.7695	2.9239
	APEX School (3)	Traditional (1)	-3.36507*	.22608	.000	-3.8998	-2.8304
		Trad.w/APEX (2)	-2.34667*	.24465	.000	-2.9239	-1.7695

Credits Accrued Only Through APEX

To determine if instructional setting made a difference between students at Forsyth Academy (APEX hybrid) and the traditional school with APEX used for credit recovery, a t-test was used, t (307.528) = -6.461, p = 0.000 (Table 5). Because the Levene's test for Equality of Variances is significant, equal variance cannot be assumed. Table 6 shows students who attended a traditional school with APEX for credit recovery only earned 86% of attempted credits while students at Forsyth Academy on average earned 96% of attempted credits throughout their high school experience.

Table 5

Descriptive Statistics for Credits Attempted Versus Earned Between Traditional With APEX (2) and APEX-Only (3)

	Group Statistics Instructional Setting	*N*	*M*	*SD*	*SEM*
Total Credit Rate	Traditional with APEX (2)	1004	.8622	.17973	.00567
	APEX School (3)	164	.9559	.11625	.00908

Table 6

t Test for Independent Samples Between Traditional With APEX (2) and APEX-Only (3)

	t	*df*	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
APEX Credit Rate	-8.758	307.528	.000	-.09374	.01070	-.11480	-.07268

Research Question 3

What is the difference in student achievement as measured by high school completion and/or graduation among students using APEX, students using a hybrid approach, and students in the traditional instruction group?

The graduation rate was tabulated by assigning either a 1 or a 0 to each student eligible for graduation. A chi-square cross-tabulation comparing graduation rate by

instructional setting was calculated. The crosstabulation between the three groups showed that in the traditional school without APEX, more students graduated than expected and fewer students did not graduate than expected (Table D2). In the traditional school with APEX, fewer students graduated than expected and more students did not graduate than expected. In the APEX hybrid program at Forsyth Academy, fewer students graduated than expected and more students did not graduate than expected. A comparison of the two programs using APEX shows a significant difference in graduation rate (Table D1). Students attending the APEX hybrid program were more likely to graduate than students using APEX for credit recovery. Students using the APEX hybrid program at Forsyth Academy have more in common academically with the traditional students than with the traditional with APEX students.

Additional Findings

Instructional setting and course grades. It should also be noted that the APEX school (group 3) consistently showed higher grades in each class, compared with both traditional with APEX and traditional, except for social studies classes. Because a grade is more subjective to factors such as the instructional setting, teacher, class size, etc., both the course average and the end of course grade were included. Table 7 shows the median final course grades (Md) in each subject based on instructional setting and number of observations (*N*). The end-of-course tests are standardized throughout the state, making the scores a more reliable form of data.

Table 7

Final Course Grade By Subject

Final Course Grade by Subject	APEX for Credit Recovery (2)		APEX Hybrid (3)		Traditional School (1)	
	n	Md	*n*	Md	*n*	Md
American Literature	42	81	47	88	1522	81
Biology	53	78	11	87	2631	80
Economics	27	78	59	86	1750	85
Math 1	8	59	12	81	2052	77
Math 2	12	72	27	84	2112	77
Ninth Grade	40	80	5	86	2506	83
Physical Science	36	80	28	86	1596	80
U.S. History	21	80	47	86	1910	83

Demographic differences within instructional settings. The makeup of students in each instructional setting varies slightly. In the traditional school, 79% are white with the next largest ethnicity being Hispanic at 12%. 48% of traditional students are female while 52% are male. Eligibility is defined by students qualifying for free or reduced lunch. In the traditional school, 10% qualify for free lunch, 2.5% qualify for reduced lunch, 87.5% did not qualify. APEX for credit recovery students are 19% Hispanic and 68% white. Eligibility in the APEX for credit recovery students is 20% free, 4% reduced, and 86% did not qualify. The APEX for credit recovery students are 38% female and 62% male. The APEX hybrid school is 80% white, 6% Hispanic and 10% mixed race. Students at the APEX hybrid school are 53% female and 47% male. The hybrid APEX program eligibility makeup is 9% free, and 91% did not qualify. The differences in race, gender, and eligibility may have had an effect on the factors but it was very small. Even though the students in the three groups looked different, race, gender, and socioeconomic status had a significant but small effect in each instructional setting on EOCT, credit

accrual, and graduation rate. Tables E.1, E.2, and E.3 depict the makeup of the student population in each instructional setting.

Validity and Reliability

The validity and reliability measures came from the uniformity of the end of course test (EOCT) that was compared system-wide as a measure for student progress. All students in the local school district took end of course tests at the same time. Students who were receiving remediation took the EOCT that was appropriate for the course in which they were enrolled. ANOVA showed variance in EOCT data among different instructional settings. Because of the obvious differences in group sizes, that the homogeneity of variance assumption was violated, and that further testing found that the data were not normally distributed, a Kruskal-Wallis test was also used. As such, I had to rely on nonparametric measures that looked at the median values, rather than the mean values, for looking at between group differences.

The assumption of the homogeneity of variance was violated throughout the study. However, the data were not normally distributed only in the case of the end of course tests. For credit accrual and graduation, robust and parametric measures were used.

Limitations

Although I addressed limitations throughout the proposal, this sub-section provides a summary of the major issues that limit my research outcomes. As a formal outcomes-based assessment, my research does include limitations such as student maturation, history, and setting. The school in the study is an alternative school that uses a hybrid of technology instruction and teacher driven instruction. The project study

alternative school students that used the hybrid APEX with highly qualified instruction were unique because the population and results more closely resembled the traditional school than the APEX for credit recovery students. Since one group of students in the project study were enrolled in a unique alternative campus, generalizations to all students in alternative settings are limited. Further experimental research is necessary to provide conclusive evidence about the impact of the program upon student test scores. Of course, such research is not included in this study.

The technology used at the project study alternative school had to be continually updated to keep the software current. A limitation of constantly updating hardware and software was that the instruction and assessment measured by EOCT scores was constantly evolving, but the test was not. The quantitative data were based on test scores that were uniquely gathered in evolving technology. Over a three-year period, maturation was a threat to validity because I was comparing groups over time. Another limitation of the data set was attrition. Students in the traditional school that used APEX for credit recovery and not completed the grade were taken out of the group. Students who graduated early were also taken out of the treatment group.

An additional barrier was the restrictions of the data set. There were only a specific number of years that were comparable because APEX had only been in the schools for a few years and Georgia ended the practice of using standardized End of Course Tests in the spring of 2013. Due to the nature of the data requested, I did not have control over the data set. The data requested was given from the school district already masked. There were multiple replications of data that had to be reconciled before they could be analyzed.

A final limitation was the size of the APEX only school. Because of the other variables, and the APEX only data set being so small, varied characteristics were limited. As a result, students and settings were treated as equal.

Role of the Researcher

As someone who is familiar with the setting, program, and learning community, I am aware of my potential biases. Even though I am not a teacher at the project study alternative school, I am a teacher in the local school district. The project study alternative school is an alternative high school. I teach at a public elementary school on the other end of the county. This is a common limitation in outcomes-based assessment.

Conclusion

An outcomes-based assessment was conducted using quantitative data on the effectiveness of APEX labs in an alternative school. The study focused on data from the alternative school program. The results of the research were presented in an evaluation report that was shared with the administrative leadership of the traditional high schools and the alternative school. The report provided an overview of the ways that APEX labs have been both successful and unsuccessful in the alternative school with characteristics of the program that had implications for applicability in the traditional high schools as well as suggestions for improvement in the alternative setting.

The high-level findings of the study showed that the credit accrual, graduation rate, and end of course test scores were significantly higher in the APEX hybrid program than in the traditional with APEX. In its most current uses, school success in the APEX hybrid program is closer to the traditional setting school than to the traditional school with APEX for credit recovery. A suggestion for further study might be to evaluate the

conditions of the instructional setting. Students in the hybrid APEX school are the only kind of students present, where students using APEX for credit recovery are intermingled with the traditional students in the traditional setting.

Since it was shown through this study that APEX labs had a significant effect on student progress, as identified by significant increases in EOCT scores, credit accrual, and graduation/completion rate, the evaluation report focused on the reasons why traditional schools should consider implementing the hybrid APEX labs as an option for credit recovery or enrichment as an option in the traditional school.

The reason for including the assessment data in this study was that the quantitative data showed trends in EOCT score growth or decline, graduation/completion increase or decrease and credit accruals that appeared over three years (Creswell, 2012). The collection of historical data began in the spring of 2015 after IRB approval.

The summative impact quantitative outcomes-based assessment provided an organization that allowed consumers to identify specific elements of the findings, increasing the likelihood of more applications of transferability and external validity (Stufflebeam & Shinkfield, 2007). The overall research goals were to show the strengths and weaknesses of the APEX learning labs in practice and presented the findings to schools that were not currently utilizing the available APEX technology to potentially raise the bottom quotient of student achievement in the traditional high schools as identified by EOCT scores and graduation rate. The potential implication for positive social change was that with the implementation of APEX labs in traditional schools, students could be redirected before transferring to the alternative school. In addition, the

outcomes-based assessment identified areas of improvement that could be made in the alternative school.

Section 3: The Project

Introduction

The project associated with this research study was an evaluation report based on historical data of observations in three different settings. The problem identified inconsistencies in delivery of APEX between different academic settings. This chapter covers the research findings and summaries of descriptive statistics used in the study with explanations and narratives on the findings directly related to the hypotheses. This section includes a detailed narrative explaining the evaluation report found in Appendix A. The evaluation report explains the purpose, criteria, and major outcomes of the outcomes based evaluation as well as addressing the local need for the evaluation.

Description and Goals

The goal of the project was to examine the data provided by three different academic settings that used the same curriculum with the same standardized end of course test to see if the inconsistencies in practice made a difference. The three different academic settings compared in the project study were a traditional high school where no APEX was used, a traditional high school where APEX was used for credit recovery, and a nontraditional alternative school that used APEX with a highly qualified content specialist for every class. Because there are three distinct ways currently used in the school system for utilizing the same software for curriculum, instruction, and assessment, the goal of the study was to examine the different results that students achieved. The results observed in the study were graduation rate, end of course test scores, and credit accrual.

Rationale

This project addresses the problem by identifying the similarities and differences in the results of three groups of students. The outcomes-based evaluation was chosen for this study because an evaluation had not been done since the implementation of the APEX program. The two versions of APEX currently being implemented in Forsyth County Schools are examined in Section 2 and findings are presented in the project described earlier in Section 3. The white paper that was written for the outcomes-based evaluation is intended to be shared with stakeholders including administrators, school board members, and community leaders to better inform and suggest the most effective methods for implementation of a program that the district already owns. The data analysis described in Section 2 was completed and showed significant differences in the traditional with APEX model and the hybrid APEX at Forsyth Academy model.

The project genre of outcomes-based assessment was chosen for this study because the APEX program is being used in multiple ways. A case study of one single program would not have provided the same level of depth as an outcomes-based assessment covering the multiple differing uses of the same content delivery system. Through the content of the project, the problem of inconsistencies of practice was addressed using chi-square, ANOVA, *t* tests, and Kruskal-Wallis for nonparametric measures of consistency and analysis between the three separate groups. The project study is not a solution to the problem. The project study identifies which methods were most effective for each subject within three groups in cohorts using historical data.

Review of the Literature

The outcomes-based assessment is appropriate to the problem because it provides a thorough examination of what is and is not effective in the APEX program. Based on a preliminary analysis of the data, the ANOVA, Chi Square, and *t* test were the most appropriate measures for comparing student groups in the outcomes-based assessment, as suggested by Preskill and Russ (2005).

The outcomes-based assessment draws on the Context, Input, Process, Product (CIPP) design envisioned by Stufflebeam (Zhang et al., 2011). The CIPP model falls into the improvement/accountability category of outcomes-based assessment (Zhang et al., 2011). Some of the positive characteristics of the CIPP model are that it is an active evaluation—meaning that it documents *learning-by-doing* (Alkin, 2004). Stufflebeam and Shinkfield (2007) described the CIPP model by saying that it aims to improve rather than to prove. An active evaluation is appropriate to the problem of content mastery because it shows multiple uses of the same software and the results obtained through each.

Outcome-Based Evaluation: Test Scores as Measures of Program Effectiveness

In order to determine effectiveness measures for a thorough investigation of student success, multiple data sources need to be included (Zhang, 2011). The dependent variables used in the outcomes based assessment on APEX learning in Forsyth county schools were end of course test scores, credit accrual, and graduation/completion rate. The strength of using end of course test scores as a dependent variable is that they are standardized throughout the state and can provide data that are reflections of the instruction with minimal bias (Levin, 2012). Levin (2012) stated that test scores alone

cannot be the only measure for a strong study because they are a snapshot of a single point in time and not an ongoing measure of achievement. I therefore chose to add the additional variables of credit recovery and graduation/completion rate, in alignment with Levin's (2012) guidelines.

Outcomes-Based Evaluation: Credit Recovery as a Measure of Program Effectiveness

Following the CIPP model (Zhang et al., 2011), successful outcomes-based evaluation includes outcomes that are related to either processes or products. Credit recovery, with its direct relation to the purpose of APEX, is an example of a product-related outcome. An outcomes-based evaluation in the Midwest targeted 9th grade students who failed one course and had them take an online course for credit recovery (Franco & Patel, 2011). The study found that students who did online credit recovery were more likely to graduate from high school and fail fewer classes as they progressed through high school (Franco & Patel, 2011). The success identified by Franco and Patel (2011) is encouraging for a similar outcomes based evaluation of the implementation of APEX in Forsyth County Schools. Franco and Patel's (2011) finding provides further evidence that credit recovery is an appropriate measure for outcomes based evaluation, supporting its use as the dependent variable in this study.

A study of online learning for credit recovery in Florida found that students taking classes online were more likely to earn a grade of C or higher then students taking the same course face-to-face (Hughes, Zhou, & Petscher, 2015). Although not in the original research design, access to course grades aligned my study to best practices in utilizing a recognized product (grades) associated with the software, the purpose of which was to

instruct students in coursework (Zhang et al., 2011). My outcomes-based assessment yielded similar results, showing that students at Forsyth Academy earned higher grades in the course than students taking credit recovery only.

Students have found success in online credit recovery where traditional schools have let them fall behind (Carr, 2014). Even though the numbers of students completing credit recovery through APEX was not as high as those earning initial credits through APEX hybrid, the fact that the option was present, gave an 86% success through giving students a second chance. The credit recovery option through APEX alone, though not as ideal as the hybrid program, still shows significant strengths over accepting failure (Carr, 2014). The best practice behind using credit recovery in outcomes based assessment is that it provides relevant data to student achievement.

Heppen and Sorensen (2014) found that Algebra failure was a key commonality for high-school dropouts. In a discussion about credit recovery using online courses, Heppen and Sorensen (2014) stated that the evidence of success was thin. In Georgia, rather than taking Algebra in 9th grade, students took Math 1. My study showed that Math 1 was the only subject offered through APEX that did not show any significant differences in median scores regardless of how it was taught, supporting the work of (Heppen and Sorensen, 2014).

A pilot credit recovery program for high school students in the Midwest concluded that the virtual learning programs that were most effective were taught by highly qualified content specialist with the pedagogical skills required to teach online (Franco & Patel, 2011). My study also found significant differences in student

achievement between students using the hybrid APEX program at Forsyth Academy and those using APEX for credit recovery in the traditional high schools.

One of the benefits of virtual instruction is that it can be tailored to the student (Eno & Heppen, 2014). In an online environment, differentiation can be done in a variety of ways to meet a variety of learning styles (Eno & Heppen, 2014). Evidence of this success can be found in my outcomes-based assessment through examination of the facilitation of the different uses of APEX. Students in the hybrid model were shown to be the most successful, while students using the APEX only credit recovery model were still academically successful, but significantly less so than the other students.

Outcomes-Based Evaluation: Graduation Rate as a Measure of Program Effectiveness

Graduation rate as an indicator of program effectiveness for secondary and post-secondary educational programs has been well established, including in recent literature (see Bettinger & Baker, 2011; Cowen, Fleming, Witte, Wolf, & Kisida, 2013; Carey, Harrington, Martin, & Stevenson, 2012). From about 1970 to 2000, the graduation rates in high schools across America showed little to no growth (Murname & Hoffman, 2013). Part of the problem was students that were getting off track in 9th grade never fully recovered the needed credits to graduate on time (Hartman et al., 2011). With the mastery learning components available in APEX combined with the availability for students to work at their own pace, technology has made getting on track possible. From 2000 to 2010 the nationwide average of graduation rate increased by 6% (Murname & Hoffman, 2013). Technology-based programs like APEX makes graduation possible for more students in the past 15 years because it allows new opportunities to learn that were not

available before (Murname & Hoffman, 2013). Using graduation rate as a dependent variable in an outcomes-based assessment of APEX learning in Forsyth County schools follows the best practices set forth by expert studies such as Murname and Hoffman.

A 2014 outcomes based evaluation in Canadian High Schools stated that students who felt valued at school and had ownership of their education were more likely to graduate (Nadirova & Burger, 2014). Students participating in the APEX program are likely to have a similar feeling of value and ownership of their education. Though the data used in my outcomes-based assessment were entirely quantitative, the 95% graduation rate compared with the state average of 70% shows that Forsyth County Schools are making a difference in high school graduations (Stillwell & Sable, 2013).

A movement of school reform in New York is taking large failing high schools and turning them into small schools of choice within the larger school (Bloom & Unterman, 2014). The school of choice program increased graduation rates by 9.5 percentage points in the participating programs (Bloom & Unterman, 2014). The concept of small schools of choice is being done within the Forsyth school system using APEX. Students have the option of Forsyth Academy which is a small school that utilizes hybrid instruction or the school-within-a-school concept of using APEX for credit recovery. The significant difference in Forsyth County graduation rate from the state and national average is evidence of the small school concept working.

Outcomes-Based Evaluation: Alternative Schools as Instructional Settings

For the past 30 years, eight urban school districts in Philadelphia and California have used career academies as alternative school options for students (Clearinghouse, 2006). The findings of the career academies are that students are more likely to graduate

from high school with the motivation of career training as a part of the education (Clearinghouse, 2006). The element of choice to attend the alternative program is the same option that students at Forsyth Academy have. The career academies in Philadelphia and California have seen an 11% increase in graduation rate compared to other alternative programs (Clearinghouse, 2006).

Deeper Learning Schools were the result of an outcomes-based evaluation funded by the William and Flora Hewlett Foundation (Taylor & Society for Research on Educational Effectiveness, 2014). The concept behind deeper learning schools was to use mastery learning theory along with multi-step problem solving, increased rigor, and multiple depth of knowledge exemplars (Taylor & Society for Research on Educational Effectiveness, 2014). APEX uses the same components described in deeper learning schools. In the deeper learning schools study, students scored significantly higher than similar schools that did not use the same method of curricular delivery (Taylor & Society for Research on Educational Effectiveness, 2014). The same is true for the APEX schools in Forsyth County. An analysis of alternative school practices as a dependent variable in the Forsyth County APEX learning program indicates that there is a significant difference in the multi-method hybrid approach to APEX that is used in Forsyth Academy compared to the credit recovery version of APEX used in the traditional high schools.

In a qualitative study focusing on perceptions of mandatory alternative school assignment, Tracy Capenter-Aeby and Victor Aeby (2012) found that despite the initial apprehension of mandatory alternative school, students felt that they benefited from the experience and 98.5% believed that they would graduate. The families in the study state that small class size, low student: teacher ratio, and family involvement were elements of

the alternative school that made a difference in the success of their children (Carpenter-Aeby & Aeby, 2012). Forsyth Academy has small class size and low student: teacher ratio and a high graduation rate.

The ability to choose and have an active accountability for an education builds capacity (Lind, 2013). Lind (2013) describes capacity building as "empowering" and a process to promote ability within students by giving them opportunities to feel capable. Every step in the process, including the selection of schools for building capacity gave students ownership over the choices that they made academically (Lind, 2013). Forsyth Academy has similar methods for building capacity in students. Students who attend Forsyth Academy apply to the alternative school and are admitted. Once accepted to Forsyth Academy, students choose classes that are self-paced (APEX Learning, 2012). The mastery learning component of APEX adds a dynamic of rigor and credibility to the curriculum (APEX Learning, 2012). The combination of mastery learning, capacity building, class size, student: teacher ratio, highly qualified content specialists, and technology assistance make the alternative program at Forsyth Academy successful.

Project Evaluation

After analyzing the data, the next steps were to determine any changes that could be made for improvement in the implementation of the APEX program. The comparison of three groups in three different instructional settings provided evidence of how well APEX worked for credit accrual in each subject, End of Course Tests in each subject, and high school completion/graduation rate. After completing the project, a white paper or evaluation report was created to share with stakeholders explaining the findings of the study and suggestions for improvement. Stakeholders included were all administrators in

the school district that use APEX in their schools, the district teaching and learning department, and the office of accountability.

Implications Including Social Change

Local Community

This project addresses the needs of learners in the local community by offering alternatives for academic success without sacrificing curriculum or instruction. The importance to students, families, instructors, administrators, and community partners is that with an alternative, different types of learner can be met and achieve a comparable level of academic success to traditional students. Further educational options and opportunities can reach diverse learners that may not have succeeded in the traditional system. With alternative programs, more students have the opportunity to graduate and further their education.

Far-Reaching

In the larger context, the findings of this outcomes-based assessment can be useful to other school systems that are looking for alternatives in education. A study of the data analyzed in this outcomes-based assessment could guide other school systems in making decisions for the most appropriate use of hybrid online learning for student success. Further replication of the hybrid version of APEX currently found at Forsyth Academy in different settings will yield more data that can refine the program and streamline APEX instruction as an even more viable alternative.

Conclusion

The evaluation report, generated from this project study, provided a summative of the APEX program and three different implementations of the software. The use of

APEX for credit recovery showed to be the least effective of the three groups in the outcomes-based assessment. The hybrid program of APEX with highly qualified content specific instruction was comparable to the traditional high school in all areas. The goal identifying the most effective use of APEX was completed with the outcomes-based assessment. The data collected and analyzed for the outcomes-based assessment reflected what was and can still be accomplished for meeting the needs of diverse learners and alternative students in Forsyth County Schools.

Section 4: Reflections and Conclusions

Introduction

The practices of instruction and assessment are evolving with the rise and increase of digital content delivery platforms such as APEX. The analysis of comparative data demonstrates that although the APEX program at Forsyth Academy is not better than the traditional setting school, it is comparable and a viable alternative. The use of APEX in other instructional settings such as that of credit recovery when a highly qualified content specialist is not available are also effective, but still significantly less effective than the model used at Forsyth Academy. This chapter reflects on the strengths and limitations of the outcomes-based assessment.

Project Strengths and Limitations

Determining program effectiveness among participants in a given instructional setting, the school district in this case, is best understood by isolating differences in treatment (Campbell & Stanley, 2015). While the gold standard for isolating treatment effects is through random selection and assignment, that was not possible in this case, since students self-selected into the APEX school, for the most part. Since post hoc data were used, isolating the treatment by way of associated outcome, product variables that were standardized across all treatments, as suggested by Zhang (2011), served to strengthen the evaluation design.

The strengths of the project are that it uses historical data from three different groups in comparison and contrast. Heppen and Sorenson (2014) stated that multiple data points are required to indicate student achievement. The end of course tests are standardized and follow the same curriculum that taught in three different instructional

settings. The limitations of the end of course tests are that they represent one singular point in time and are not the strongest indicators of ongoing achievement (Levin, 2012). Following Franco and Patel (2011), the use of credit accrual statistics provide depth into the rigor of the program in each instructional setting. Graduation rate is a powerful element that shows two additional options to the traditional school setting for graduation, as Murname and Hoffman (2013) utilized in their review of the impact of technology on graduation rates.

In the project study, the findings indicated that of the two different implementations of instructional setting with APEX, the hybrid approach used at Forsyth Academy is the most effective in the areas of end of test scores, credit accrual, and graduation/completion rate. The findings showed that students at Forsyth Academy using the hybrid model had more in common with the students in the traditional school that had no experience with APEX. Students in the traditional school that used APEX for credit recovery did not achieve at the same levels (almost 10% lower in most cases) than students in the Forsyth Academy instructional setting.

Recommendations for Alternative Approaches

The biggest limitation the outcomes-based assessment has in addressing the problem is the size of the student sample from Forsyth Academy. Using the Kruskal-Wallis test helped with the analysis of varied group sizes. Additional programs using APEX the same way as the Forsyth Academy would allow a larger sample of student data. For future research, the addition of qualitative data such as efficacy surveys, interviews and observations could address the problem differently and offer a further layer of depth to the study.

Scholarship

Throughout my program at Walden, I learned that perseverance is the greatest untold element to scholarship. Though research, rigor, and writing ability are necessary for scholarship; patience, humility, and empathy are even bigger requirements.

Project Development and Evaluation

In the process of developing this project I learned to value collaboration and to advocate for my ideas. There were times in the study that I allowed criticism of my work that lacked the authenticity to make me a better scholar. From beginning to end, the project evolved into an outcomes-based assessment on APEX. The goals of the study stayed consistent throughout, but the methods changed slightly to make a stronger, more cohesive study.

In the exploratory phase of my data analysis, I ran *t* tests and ANOVAs because I wanted to see where the differences were. As seen in Tables 6 and 7, the *t* test showed differences in data in a way that other tests could not. In the cases where there was a homogeneity of variance, I used more robust measures including the Games-Howell and the Brown-Forsyth tests. The easiest tests to interpret in the exploratory phase of data analysis were the cross tabulations.

Leadership and Change

Though this outcomes-based assessment I learned that change in academia is a constant thing. I had to reduce the data pool from a proposed four years of data to three years of data because the changes that had taken place within the school system's implementations and assessments were only comparable over three years. The leadership changes at the local level did not make a significant difference in the progress of the

study. The leadership element that did present a challenge was the communication between the university and the school system. Both sides were agreeable and shared a desire to reach the same goals. The challenge in leadership was finding the common ground that would allow the study to be credible while meeting all of the requirements to appease both sides. Some of the data that were provided was outside of the scope of my initial IRB approval. After seeing how valuable the data could be in showing the typical student makeup shown in Appendix E, I went back and amended the IRB application. The data covering gender, race, and eligibility was the final contribution to the study. The data gave a clearer picture of the similarities of the students in the three different instructional settings which helped establish validity to the samples

Analysis of Self as Scholar

I learned that as a scholar, I enjoy research. Finding applicable articles in a review of literature is a rewarding and enlightening experience. I learned through scholarship that many answers to questions in academia can be answered by looking to the existing literature. I found that for each point of view, with enough research I could find a differing point of view. By using peer-reviewed literature, I was able to determine which articles were more credible based on the number of citations that each received.

For the project study, I found articles that I included in an extra section titled *Additional Information*. The additional articles serve the purpose of providing extra insight to the intended audience that wanted more information with specifics to different areas of the study such as credit accrual, graduation rate, end of course scores, online learning, and alternative schooling.

Analysis of Self as Practitioner

As a practitioner, I learned that patience and creativity were necessary in achieving my goals. The data set that I received from the school district had to be gone through by hand to eliminate duplications and to identify specific applicable data. The patience and persistence required to sift through thousands of data points multiple times was rewarded with a clean, usable data set that was ready for analysis. A collaborative use of SPSS guided by my committee chair and mentor required creativity to determine the right nonparametric tests of data to accurately portray the population of students in the project study.

The combination of narrative with visuals in the project study required a deeper synthesis of the data. The deeper part of the synthesis came from creating a narrative in the project that was both comprehensive and informative without being overly academic. The flow of the project needed to suit the appropriate audience.

Analysis of Self as Project Developer

I learned that as a project developer, there are many ways to accomplish a goal. A successful doctoral study takes input from more than one scholar practitioner. Open discourse is acceptable as well as informed compromise. Ultimately, project development needs to have a purpose, vision, and a group willing to work together.

As I developed this project study, the support of the Forsyth County district office in cooperation with Walden University made the research possible. The Forsyth County educational research and accountability department bought in to the value of the study and was willing to help by providing data and permission. Through collegial conversations and a study of well-designed Forsyth County web resources, I was able to

create a framework for a project study that the school system and the university deemed as valuable.

The Project's Potential Impact on Social Change

The outcomes-based assessment on different implementations of APEX software identified that there are significant differences in student achievement depending on which academic setting is used. The students at Forsyth Academy more closely resembled the students in the traditional school than the APEX for credit recovery students. The potential impact on social change at the local level is a possible difference in the application of APEX in traditional schools modeled after the success at Forsyth Academy. The larger impact on social change could be a paradigm shift in the way educators differentiate instruction and offer equally rigorous, relevant alternatives to the traditional brick and mortar schools.

Implications, Applications, and Directions for Future Research

Although the students at Forsyth Academy were closer in achievement to students in the traditional school, there was still room for improvement. Of the three groups studied, APEX for credit recovery was the weakest in terms of student success. Moving forward, the recommendation locally would be to model the credit recovery classes after the hybrid APEX classes at Forsyth Academy.

The success of APEX for credit recovery was that the program was still able to reach a large percentage of students that may have otherwise failed. In a resource rich school system, multiple uses of resources can show which alternatives are most viable. Forsyth is a resource rich system that has been able to utilize APEX in different way to

determine the best uses for students. For smaller school systems, even the least successful implementation of APEX resulted in an 86% graduation rate.

For future research, a larger, more diverse sample could be used. Other suggestions for future research would be to include perception data from students, staff, and community members.

Conclusion

The project study began with identifying that there is a lack of consistency in the use of APEX labs as an academic alternative. An in-depth analysis of the applications of APEX in different instructional settings concluded that the most successful implementation of the program utilized a hybrid approach of instruction facilitated by a content area specialist who guided the mastery learning components of the software with additional instruction as needed. The comparisons between programs revealed that while the hybrid program is closer to the traditional school model than the credit recovery model, neither version of APEX was superior. Certain subjects such as Math 1 showed little difference based on instructional setting. Students in the alternative program at Forsyth Academy scored significantly higher in course averages than in the other two instructional settings. Having alternative programs has increased the graduation rate of the school district (Forsyth County Schools, 2012).

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Appendix A: Evaluation Report

White Paper

The Relationship Between Using the APEX Program for Instruction and High School Student Academic Success by

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Introduction

Forsyth Academy in Georgia introduced a new program to support academic growth and engagement among at-risk students. This program, the APEX program, merged technology with content to provide students with self-paced learning facilitated by teachers with the objective of improving test scores, course completion, and graduation. Grounded by the behavior objectives approach, the purpose of this goals-based evaluation was to examine the relationship between APEX program usage and the academic success measures of EOCT scores, course credit accrual, and graduation. The study followed students who were enrolled in Grade 9 in 2010- 2011 as a cohort. Data sources were archival test scores and existing data from APEX. Existing APEX data included accrued credit hours, completion rate, and documentation of mastery learning outcomes for the enrolled students in Grades 9-12.

Findings of the study showed that students using the hybrid APEX instructional model accrued significantly more credit hours, were more likely to graduate, and have higher end of course grades than students using the APEX only model. The implications of the study show how a broader use of APEX labs for students identified as at-risk in both alternative and traditional schools will provide the flexibility in instructional settings to help more students succeed. This study suggests the most effective use of resources with the implementation of APEX to reach the largest number of students. By reaching more students, potential for social change includes higher district level graduation rate, course accrual, and end of course test scores.

In the current U.S. K-12 public school educational system, the means of curriculum delivery and instruction is changing (APEX Learning, 2012). The evolution of a new technology-based paradigm shift in the instruction and assessment process is changing the landscape of schooling for potential drop out students (APEX Learning, 2012). Practices in the traditional school such as social promotion allow students to move on to the next standards, based on age and not a mastery of the material (Carifio & Carey, 2010). The students who are moving forward without the proper foundation in subject areas are either failing out or dropping out of school (Carifio & Carey, 2010, p. 220). A small percentage of these students move to the alternative schooling programs (Carifio & Carey, 2010, p. 223). This outcomes-based assessment is an examination of the effectiveness of a hybrid technology and instruction-based model where mastery is required for promotion that is currently being used in a local alternative school.

Forsyth Academy has a unique hybrid between technology and traditional instruction. The hybrid form of instruction and assessment used at Forsyth Academy has been credited as setting the alternative school apart from other alternative programs, and has shown progress since its inception through the APEX learning system (Forsyth County Schools, 2012; Jinger Davison, personal communication, 2013). Similar to the alternative school used in this project study, The Community in Schools (CIS; 2012) program initiated a curriculum that has shown success in alternative school environments. One of the major components of the CIS program is the APEX learning system software. The APEX learning program is a hybrid-learning environment that melds instruction and assessment (Davis, 2010).

Students who attend Forsyth Academy need flexibility not available in the traditional setting. Some students are minor league professional athletes, actors, and musicians, thus requiring a flexible learning situation. Other students are enrolled in this alternative school because their schedules include long workdays to financially support a family (Forsyth County Schools, 2012).

The purpose of this outcomes-based assessment is to identify the factors that are making the project study school successful in the local school district. The APEX program will be evaluated for its impact on student success factors. Within this study, the mastery learning component of the APEX program as defined by an 85% success requirement will be explored through quantitative examination of 3 consecutive years of student End-of-Course test scores, high school completion, and credit accrual.

Definition of the Problem

The problem is to improve academic success among at-risk students in an alternative school in Georgia, the APEX program, which merges technology with content to provide students with self-paced learning, was implemented. However, this program has never been evaluated for outcomes within the context of implementation. In addition to the traditional setting, APEX learning labs are used in two different ways. There is an APEX immersion program at Forsyth Academy, which is an alternative high school. The second implementation occurs within the traditional school setting and is purposed solely for credit recovery. In the traditional high schools where APEX is used solely for credit recovery in local school system, only one teacher is assigned to APEX lab (Forsyth County Schools 2012). The teacher in charge of overseeing APEX in each of the four

schools is not highly qualified in all content areas offered in the lab (Forsyth County Schools, 2012).

In the local school system, students who fail classes have the choice of repeating the classes in summer school or night school (Forsyth County Schools, 2012). Students who are not successful in the traditional high schools have a third option of attending the alternative school (Forsyth County Schools, 2012). The alternative school has shown significant success in the promotion of student achievement, course completion, and graduation (Forsyth County Schools, 2012). Despite these successes, an outcomes-based assessment has never been conducted.

Rationale

Most students enter Forsyth Academy with failing grades in multiple subject areas (Forsyth County Schools, 2012). Through the use of the APEX labs, every student in the alternative school program must demonstrate a mastery score of 85% or higher in order to move on to the next standard in every assessment for every content area (Hurson & Sedigh, 2010). Although content mastery appears to be a systemic problem across the United States, based on 2010 U.S. Department of Education data, it is also a local problem (Hurson & Sedigh, 2010). The technology and tools are in place at Forsyth Academy and follow a research base. The local problem is a gap in practice. To date, there has not been an outcomes-based assessment of the alternative school program at the project study school (Jinger Davison, personal communication, 2014). The purpose of this outcomes evaluation is to examine the relationship between APEX program usage in two different settings and the academic success measures of EOCT scores, course credit accrual, and graduation as compared with traditional high schools.

The APEX software is used in programs throughout the country with its mastery-learning component as a solution for content mastery deficiencies (APEX Learning, 2012). In the local school system, the local problem of content mastery is realized through examining performance on end of course tests, credit accrual, and high school completion.

The teachers at Forsyth Academy employ a hybrid of traditional instruction integrated with technology. The role of the teacher at Forsyth Academy is first facilitator, then instructor. This project study will include a focus on the mastery requirement from the APEX labs its direct impact on students in alternative schools. One implication is that if students who are left behind due to social promotion in the public schools could achieve success at an alternative program, the same initiatives could be in place in public schools. Other implications are the potential for student success in traditional public schools that could exist by replicating instructional strategies utilized in the alternative school.

Significance

For this project study, there are three instructional settings. The first setting is the traditional high school. The second and third settings use APEX as an instructional tool. The second setting uses APEX as a part of the traditional high school for credit recovery. The third instructional setting is an alternative high school where APEX is the method of delivery accompanied by content specific highly qualified certified teachers (Forsyth County Public Schools, 2012). The third setting though more removed than the traditional high school, is more like the traditional high school in terms of student success as defined by end of course test scores, credit accrual, and graduation/completion rate.

The study aims to identify where there are settings in which APEX is more useful and if APEX is an effective substitution of the traditional setting. There are differences between the two APEX settings that could inform district leaders as to how to use the software. The findings of this study are useful in advising district leaders as to whether they should continue to use APEX in the traditional and immersion settings. Forsyth Academy uses technology-based instruction, which puts the standards in module form with enrichment opportunities and remediation that is differentiated for the individual student. Students start at whatever level is appropriate, as identified through the use of the APEX software. Students work at self-paced progress through the software, but are evaluated with the same End of course tests at the end of each year. Students who have not mastered all of the requirements of a course by its end still take the EOCT. Many students working at a self-pace make enormous strides in progress throughout the courses and can complete coursework more rapidly than they could in the traditional setting (Forsyth County Schools, 2012).

At Forsyth Academy, APEX is available for math, language arts, science, and social studies. Within each subgroup of those core areas, there are courses in algebra, geometry, trigonometry, calculus, US history, world history, humanities, economics, biology, chemistry, physics, earth science, astronomy, as well as other courses. In addition to the required mastery, students receive ongoing authentic feedback throughout each course module from both the instructor and the software. There are a variety of reasons why students are unsuccessful in the traditional setting, including social emotional, and physical (O'Brien & Curry, 2008). In the larger educational setting, there are students who may never enroll in an alternative program, but would excel if some of

the alternative practices were available in their traditional schools (Communities in Schools, 2012).

Guiding/Research Question

The purpose of this outcomes evaluation is to examine the relationship between APEX program usage and the academic success measures of EOCT scores, course credit accrual, and graduation.

RQ 1: What is the difference in student achievement on EOCT scores among students using APEX, students using a hybrid approach, and students in the traditional instruction group?

H_{01}: There is no difference in student achievement on EOCT scores among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

H_1: There is a difference in student achievement on EOCT scores among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

RQ 2: What is the difference in student achievement as measured by course credit accrual among students using APEX, students using a hybrid approach, and students in the traditional instruction group?

H_{02}: There is no difference in student achievement as measured by course credit accrual among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

H_2: There is a difference in student achievement as measured by course credit accrual among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

RQ 3: What is the difference in student achievement as measured by high school completion and/or graduation among students using APEX, students using a hybrid approach, and students in the traditional instruction group?

H_{03}: There is no difference in student achievement as measured by high school completion and/or graduation among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

H_3: There is a difference in student achievement as measured by high school completion and/or graduation among students using APEX, students using a hybrid approach, and students in the traditional instruction group.

About the Student Sample

There are three groups that were compared for this study. Each group consisted of students that were in ninth grade in the 2010-2011 school year that graduated in 2013-2014. The first group was the treatment program. The treatment program was Forsyth Academy where the hybrid model of instruction and assessment was being used with the APEX lab. The second group consisted of all students who were involved in APEX in the traditional school where APEX was only used for credit recovery and was not a hybrid model. The third group was all other students district wide who were in ninth grade in the 2010-2011 school year and graduated in 2013-2014 that were not in the treatment group and had no experience with APEX.

To determine the effect that the APEX lab had on student achievement when introduced in the alternative school, the quantitative historical data were analyzed using *t*-tests, ANOVA, and chi-square to measure trends in student achievement over time through yearly end of course tests over 3 consecutive years. Success in student achievement was defined by high school completion or graduation, credit accrual, and upward trends in EOCT scores. Statistics were used to identify the percentage of students at or above grade level measured by the end of course test in each subject area. The percent of students in 10^{th} grade at or above grade level within each of the three cohort groups were identified over three years to infer either positive or negative growth trends in student achievement.

The material in the APEX lab was the same material offered in the traditional school (APEX Learning, 2012). Traditional schools in the local school district that were not using APEX taught the same content without the integrated technology components used in APEX for both instruction and assessment (Forsyth County Schools, 2012). The difference in the APEX lab was the delivery. Forsyth Academy had a subject area specialist facilitating each class. Four of the five high schools in the local school district used APEX as a form of credit recovery, rather than the sole form of instruction and assessment (Forsyth County Schools, 2012). These four schools had one certified teacher that covered the APEX lab for all subjects. The research took the various quantitative data points and synthesized them into a report of the findings.

No students were directly observed or interviewed for the purpose of the study. At the time of this study, the student population of Forsyth Academy was 78% white and 22% Hispanic, Black, American Indian, or multi-racial (Forsyth County Schools, 2012).

The 22% statistic lacks specificity because each of the ethnic groups in the "other" category had less than 10 students. Forty-eight percent of the students at Forsyth Academy were female, and 52 percent were male. Twenty-six percent of the Forsyth Academy's students qualified for free lunch (Forsyth County Schools 2012). The special needs population at Forsyth Academy consisted of learning disabilities, other health impaired, and speech/language impaired (Forsyth County Schools, 2012). None of the special needs populations represented at Forsyth Academy had more than 10 representatives. Special needs student data were broken out in subgroups following the procedures used by the state education agency. Defined disabilities did not have an effect on the data. All students at Forsyth Academy had experience with the hybrid instructional model in the APEX lab. Within the Forsyth Academy cohort, there were approximately 20 students. The second cohort consisted of approximately 500 students in the traditional high school that entered the 9th grade in 2010 with exposure to the APEX software for instruction and assessment but not the hybrid model. The third group consisted of approximately 2,500 students in the five traditional high schools that entered the 9th grade in 2010 that had no exposure to APEX though their high school experience.

Quantitative Data Collection

The historical quantitative data from EOCT scores was presented visually by use of tables showing means and standard deviations. The most recent student data (2011-2014) were utilized. No individual student level data were reported, in accordance with FERPA.

End of course test data were maintained both online and at Forsyth Academy. Students who came to Forsyth Academy from other school systems had records available at Forsyth Academy that were available for research purposes. All student data requested through a records request were masked for individual student identification, but included student demographics, such as gender, ethnicity, socioeconomic status (free/reduced lunch), special education, limited English proficiency, and state at-risk status.

The data collection included historical data from student EOCT scores, class grades, credit accrual data, and high school completion and graduation data. Although not originally a part of the study, the district also provided class grades for content areas for which there were EOC tests. Collection of historical data began in the spring of 2015, after IRB approval.

Quantitative Data Analysis

The three separate groups used in the study were compared as they progressed over three years with an attempt to determine if the treatment group using the hybrid instructional model in the APEX lab at Forsyth Academy was making significant gains over the students in traditional schools that only used APEX and over students who had no exposure to APEX.

The archival quantitative data were presented visually by use of tables comparing a cohort of students that were in Grade 9 in 2011. The study examined student growth between the three groups of students. EOCT data collected included scores in literature, mathematics, science, social studies, and composition earned over the four-year period. The statistical analysis was done by subject area.

Since raw data were available upon IRB approval, the data set included numeric test scores. With the district provided information, the number of credits attempted and the number of credits earned in both APEX and overall by students were used to calculate credit accrual rates. From these data, two credit accrual rates were calculated: one for APEX and one for overall credit accrual.

Table A1
End of Course Tests by Subject

	End of Course Tests by Subject					
	APEX for Credit Recovery (2)		APEX Hybrid (3)		Traditional School (1)	
	N	Md	N	Md	N	Md
American Literature	39	79	47	84	1476	84
Biology	48	72	11	81	2551	82
Economics	26	69	59	81	1749	85
Math 1	4	68	12	75	2004	77
Math 2	11	73	27	71	2069	77
Ninth Grade	33	78	5	80	2444	86
Physical Science	34	81	26	83	1554	86
U.S. History	18	69	47	74	1867	81

With the exception of Math 1, all of the other end of course test scores showed a significant difference in student achievement between students at the traditional school with APEX and the APEX-only Forsyth Academy. Out of the 2,020 students who took the Math 1 end of course test in the district; this was the only test that had a group with no significant differences between the median scores in the three instructional settings. The traditional school with APEX group had no significant differences on the lower end of score on the Math 1 test, making it the only instance of where the null hypothesis is accepted.

It should also be noted that the APEX school (group 3) consistently showed higher grades in each class, compared with both traditional with APEX and traditional,

except for social studies classes. Because a grade is more subjective to factors such as the instructional setting, teacher, class size, etc., both the course average and the end of course grade were included. Table A2 shows the median final course grades (Md) in each subject based on instructional setting and number of observations (*N*). The end-of-course tests are standardized throughout the state, making the scores a more reliable form of data.

The credit accrual of students using APEX was measured using a cross tabulation of credits attempted with credits earned. The cross tabulation shows a comparison between the two instructional settings that are using APEX.

Table A2
Cross-tabulation of Credit Accrual vs. Expected

Instructional Setting-Total Credit Rate Cross tabulation

			Total Credit Rate						
			.00	.07	.11	.12	.14	.15	.20
Instructional Setting	Traditional (1)	Count	12	20	4	0	68	1	8
		Expected	11.2	19.6	3.7	1.9	69.0	.9	12.1
	Traditional with APEX (2)	Count	0	1	0	2	6	0	5
		Expected	.7	1.2	.2	.1	4.3	.1	.8
	APEX school (3)	Count	0	0	0	0	0	0	0
		Expected	.1	.2	.0	.0	.7	.0	.1
Total		Count	12	21	4	2	74	1	13
		Expected	12.0	21.0	4.0	2.0	74.0	1.0	13.0

Instructional Setting-Total Credit Rate Cross tabulation continued

			Total Credit Rate			Total
			.94	.95	1.00	
Instructional Setting	Traditional (1)	Count	4	0	12548	16114
		Expected	8.4	8.4	12251.0	16114.0
	Traditional with APEX (2)	Count	5	5	462	1004
		Expected	.5	.5	763.3	1004.0
	APEX school (3)	Count	0	4	129	164
		Expected	.1	.1	124.7	164.0

The *t* test (Table A3) shows that 93% of credits attempted through APEX in the traditional school with APEX are earned while 99% of credits attempted through APEX in APEX-only Forsyth Academy are earned. In addition, Table 5 shows that students who attended a traditional school with APEX for credit recovery only earned 86% of attempted credits while students at Forsyth Academy on average earned 96% of attempted credits throughout their high school experience.

Table A3-t-test for Independent Samples Between Traditional with APEX (2) and APEX only (3)

	Independent Samples Test *t*-test for Equality of Means						
						95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
APEX Credit Rate	-8.758	307.528	.000	-.09374	.01070	-.11480	-.07268

Table A4

t Test of Credits Attempted vs. Earned Between Traditional With APEX (2) and APEX-Only (3)

	Group Statistics Instructional Setting	*n*	*M*	*SD*	*SEM*
Total Credit Rate	Traditional with APEX (2)	1004	.8622	.17973	.00567
	APEX School (3)	164	.9559	.11625	.00908

The crosstabulation between the three groups showed that in the traditional school without APEX, more students graduated than expected and fewer students did not graduate than expected (Table A5). In the traditional school with APEX, fewer students graduated than expected and more students did not graduate than expected. In the APEX hybrid program at Forsyth Academy, fewer students graduated than expected and more students did not graduate than expected. A comparison of the two programs using APEX shows a significant difference in graduation rate. Students attending the APEX hybrid

program were more likely to graduate than students using APEX for credit recovery. Students using the APEX hybrid program at Forsyth Academy have more in common academically with the traditional students than with the traditional with APEX students. Assigning either a 1.0 or a .0 to each student eligible for graduation tabulated the graduation rate shown in Table A5.

Table A5

Instructional Setting: Graduate Crosstabulation

			Graduate	
			No	Y
Instructional Setting	1	Count	106	19
		Expected Count	116.7	196
	2	Count	10	
		Expected Count	4.6	7
	3	Count	9	
		Expected Count	3.7	6
Total		Count	125	21
		Expected Count	125.0	210

Conclusion

An outcomes-based assessment was conducted using quantitative data on the effectiveness of APEX labs in two instructional settings. The study focused on data from students using APEX and students not using APEX. The high-level findings of the study showed that the credit accrual, graduation rate, and end of course test scores were significantly higher in the APEX hybrid program than in the traditional with APEX.

In its most current uses, school success in the APEX hybrid program is closer to the traditional setting school than to the traditional school with APEX for credit recovery.

A suggestion for further study might be to evaluate the conditions of the instructional setting. Students in the hybrid APEX school are the only kind of students present, where students using APEX for credit recovery are intermingled with the traditional students in the traditional setting.

Since it was shown through this study that APEX labs had a significant effect on student progress, as identified by significant increases in EOCT scores, credit accrual, and graduation/completion rate, the evaluation report focused on the reasons why traditional schools should consider implementing the hybrid APEX labs as an option for credit recovery or enrichment as an option in the traditional school.

The reason for including the assessment data in this study was that the quantitative data showed trends in EOCT score growth or decline, graduation/completion increase or decrease and credit accruals that appeared over three years (Creswell, 2012). The collection of historical data began in the spring of 2015 after IRB approval.

The summative impact quantitative outcomes-based assessment provided an organization that allowed consumers to identify specific elements of the findings, increasing the likelihood of more applications of transferability and external validity (Stufflebeam & Shinkfield, 2007). The overall research goals were to show the strengths and weaknesses of the APEX learning labs in practice and presented the findings to schools that were not currently utilizing the available APEX technology to potentially raise the bottom quotient of student achievement in the traditional high schools as identified by EOCT scores and graduation rate. The potential implication for positive social change was that with the implementation of APEX labs in traditional schools, students could be redirected before transferring to the alternative school. In addition, the

outcomes-based assessment identified areas of improvement that could be made in the alternative school.

The Project's Potential Impact on Social Change

The outcomes-based assessment on different implementations of APEX software identified that there are significant differences in student achievement depending on which academic setting is used. The students at Forsyth Academy more closely resembled the students in the traditional school than the APEX for credit recovery students. The potential impact on social change at the local level is a possible difference in the application of APEX in traditional schools modeled after the success at Forsyth Academy. The larger impact on social change could be a paradigm shift in the way educators differentiate instruction and offer equally rigorous, relevant alternatives to the traditional brick and mortar schools.

Implications, Applications, and Directions for Future Research

Although the students at Forsyth Academy were closer in achievement to students in the traditional school, there is room for improvement. Of the three groups studied, APEX for credit recovery was the weakest in terms of student success. Moving forward, the recommendation locally would be to model the credit recovery classes after the hybrid APEX classes at Forsyth Academy.

The success of APEX for credit recovery was that the program was still able to reach a large percentage of students that may have otherwise failed. In a resource rich school system, multiple uses of resources can show which alternatives are most viable. Forsyth is a resource rich system that has been able to utilize APEX in different way to

determine the best uses for students. For smaller school systems, even the least successful implementation of APEX resulted in an 86% graduation rate.

For future research, a larger, more diverse sample could be used. Other suggestions for future research would be to include perception data from students, staff, and community members.

Conclusion

The project study began with identifying that there is a lack of consistency in the use of APEX labs as an academic alternative. An in-depth analysis of the applications of APEX in different instructional settings concluded that the most successful implementation of the program utilized a hybrid approach of instruction facilitated by a content area specialist who guided the mastery learning components of the software with additional instruction as needed. The comparisons between programs revealed that while the hybrid program is closer to the traditional school model than the credit recovery model, neither version of APEX was superior. Certain subjects such as Math 1 showed little difference based on instructional setting. Students in the alternative program at Forsyth Academy scored significantly higher in course averages than in the other two instructional settings. Having alternative programs has increased the graduation rate of the school district (Forsyth County Schools, 2012).

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Appendix B: End of Course Tests and End of Course Grades by Subject

Figure B1- ***Kolmogorov- Smirnov Tests of Normality***

Tests of Normality			
	Kolmogorov-Smirnov[a]		
	Statistic	*df*	Sig.
Instructional Setting	.409	28526	.000

a. Lilliefors Significance Correction

Figure B2- ***Ninth Grade End of Course Test***

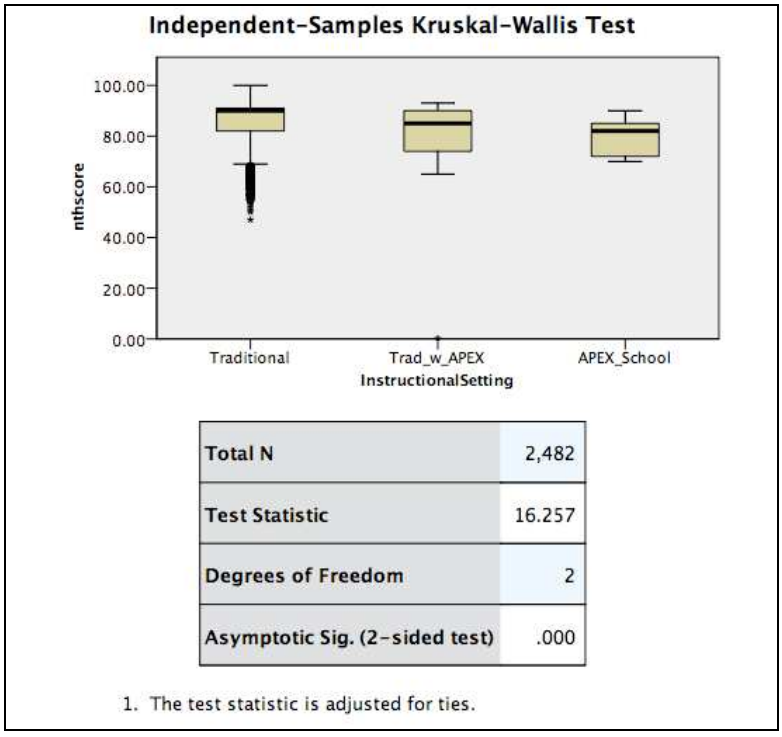
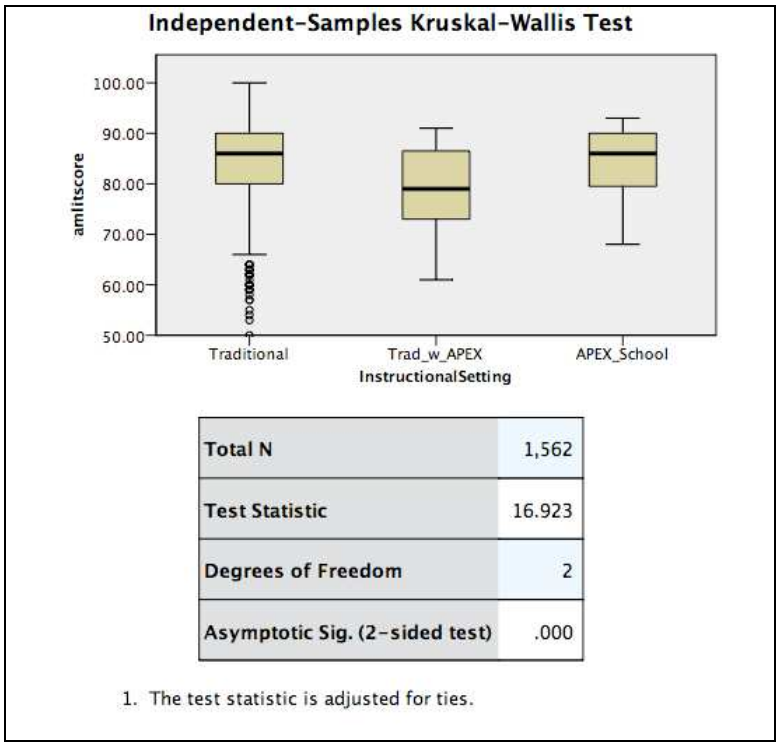


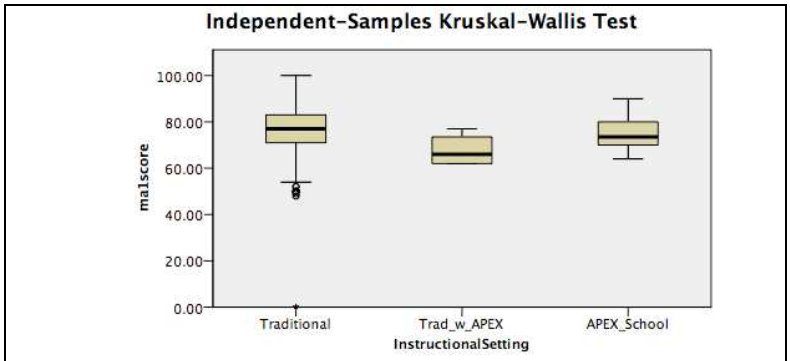
Figure B3- ***American Literature End of Course Test***



Total N	1,562
Test Statistic	16.923
Degrees of Freedom	2
Asymptotic Sig. (2-sided test)	.000

1. The test statistic is adjusted for ties.

Figure B4- ***Math 1 End of Course Test***



Total N	2,020
Test Statistic	4.931
Degrees of Freedom	2
Asymptotic Sig. (2-sided test)	.085

1. The test statistic is adjusted for ties.
2. Multiple comparisons are not performed because the overall test does not show significant differences across samples.

Figure B5- ***Math 2 End of Course Test***

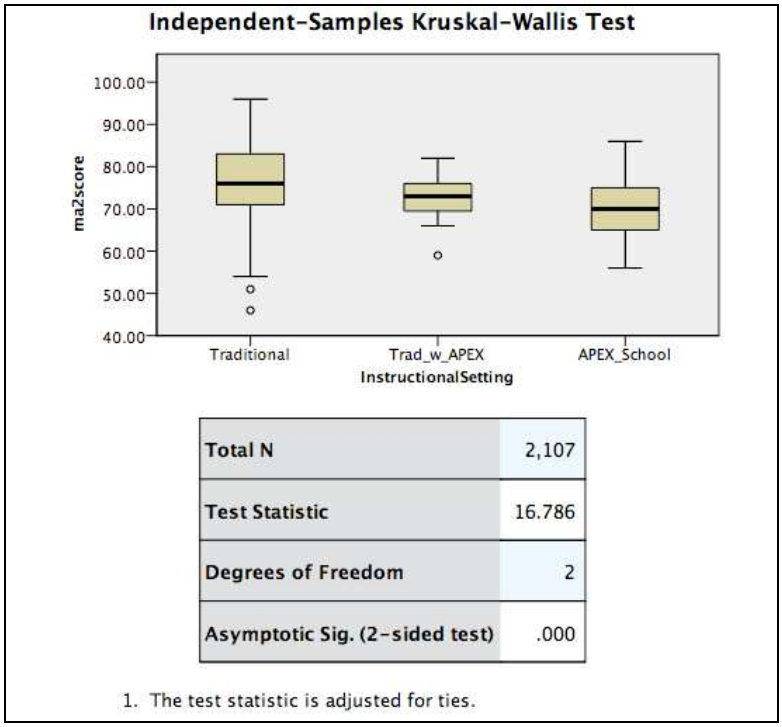


Figure B6- ***Biology End of Course Test***

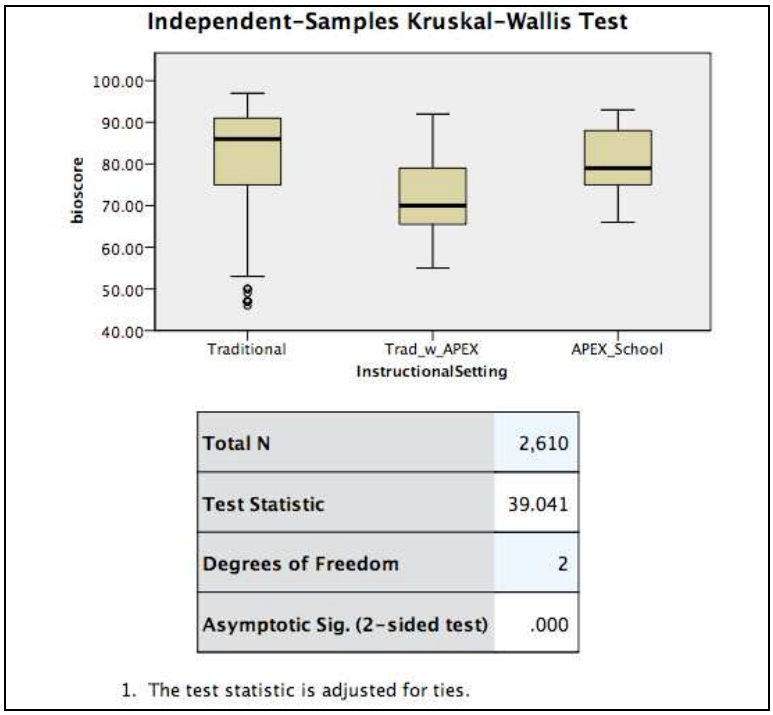
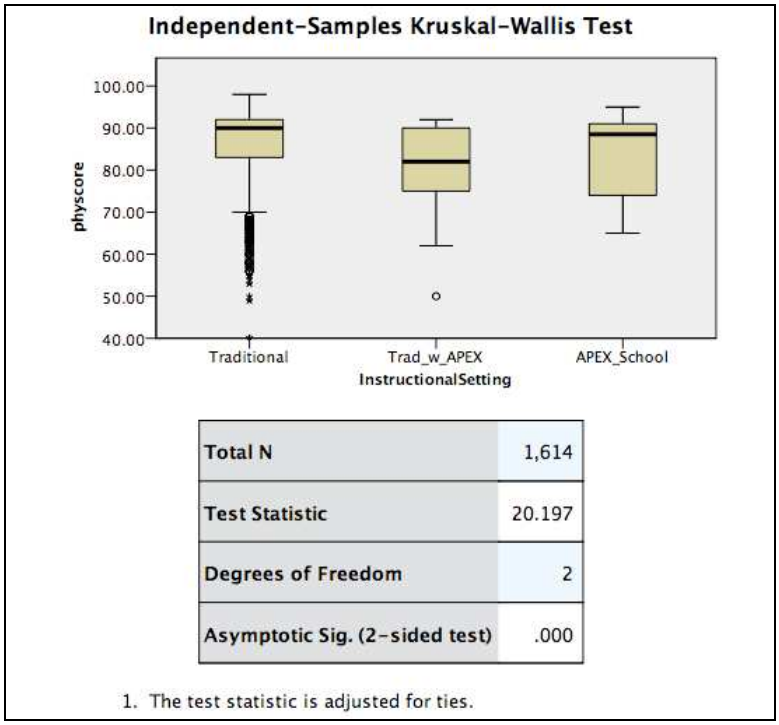


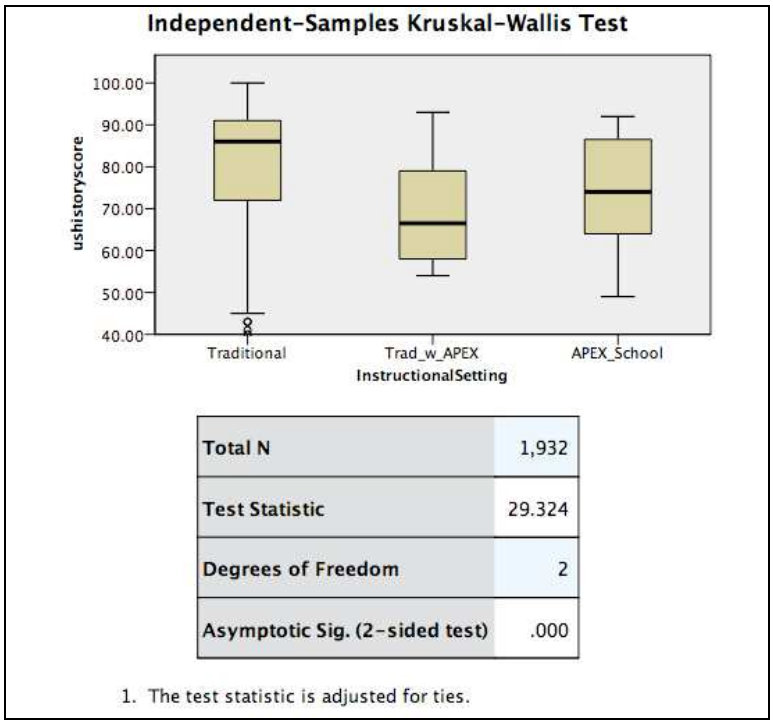
Figure B7- ***Physical Science End of Course Test***



Total N	1,614
Test Statistic	20.197
Degrees of Freedom	2
Asymptotic Sig. (2-sided test)	.000

1. The test statistic is adjusted for ties.

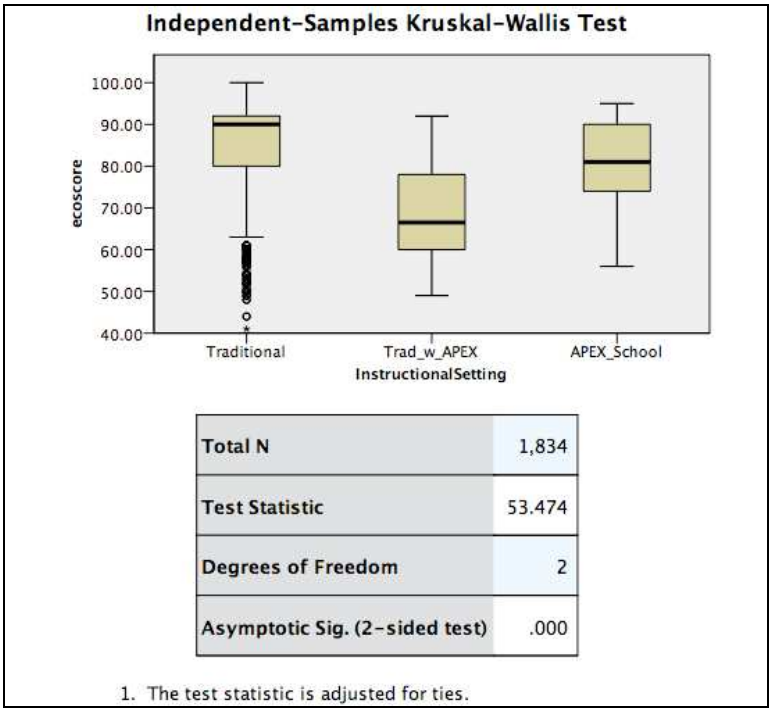
Figure B8- ***U.S.History End of Course Test***



Total N	1,932
Test Statistic	29.324
Degrees of Freedom	2
Asymptotic Sig. (2-sided test)	.000

1. The test statistic is adjusted for ties.

Figure B9. **Economics End of Course Test**



Total N	1,834
Test Statistic	53.474
Degrees of Freedom	2
Asymptotic Sig. (2-sided test)	.000

1. The test statistic is adjusted for ties.

Appendix C: Graduation Rate

Table C1

Pearson Chi-Square Statistic for Graduation Rate by Instructional Setting

Chi-Square Tests			
	Value	*df*	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.654[a]	2	.000
Likelihood Ratio	11.952	2	.003
Linear-by-Linear Association	14.790	1	.000
N of Valid Cases	2234		

Table C2

Crosstabulation of Expected Outcomes of Graduation Rate in Three Settings

Instructional Setting -Graduate Unique Crosstabulation					
			Graduated		
			No	Yes	Total
Instructional Setting	1	Count	106	1979	2085
		Expected Count	116.7	1968.3	2085.0
	2	Count	10	73	83
		Expected Count	4.6	78.4	83.0
	3	Count	9	57	66
		Expected Count	3.7	62.3	66.0
Total		Count	125	2109	2234
		Expected Count	125.0	2109.0	2234.0

Appendix D: Cross-tabulations by Race, Gender, and Eligibility

Table D1

Instructional Setting Crosstabulation by Race

			instructional setting			
			traditional	traditional with APEX	APEX school	Total
Race	1	Count	3187	188	10	3385
		% within race	94.2%	5.6%	.3%	100.0%
		% within instructional setting	11.7%	18.7%	5.5%	11.9%
	2	Count	210	7	3	220
		% within race	95.5%	3.2%	1.4%	100.0%
		% within instructional setting	.8%	.7%	1.6%	.8%
	3	Count	1276	23	0	1299
		% within race	98.2%	1.8%	0.0%	100.0%
		% within instructional setting	4.7%	2.3%	0.0%	4.6%
	4	Count	785	87	5	877
		% within race	89.5%	9.9%	.6%	100.0%
		% within instructional setting	2.9%	8.7%	2.7%	3.1%
	5	Count	31	0	0	31
		% within race	100.0%	0.0%	0.0%	100.0%
		% within instructional setting	.1%	0.0%	0.0%	.1%
	6	Count	21280	683	146	22109
		% within race	96.3%	3.1%	.7%	100.0%
		% within instructional setting	77.8%	68.0%	80.2%	77.5%
	7	Count	571	16	18	605
		% within race	94.4%	2.6%	3.0%	100.0%
		% within instructional setting	2.1%	1.6%	9.9%	2.1%
Total		Count	27340	1004	182	28526

Table D2

Instructional Setting by Gender

			Instructional Setting			
			traditional	traditional with APEX	APEX school	Total
Gender	F	Count	13050	380	97	13527
		% within gender	96.5%	2.8%	.7%	100.0%
		% within ins. setting	47.7%	37.8%	53.3%	47.4%
	M	Count	14290	624	85	14999
		% within gender	95.3%	4.2%	.6%	100.0%
		% within ins. setting	52.3%	62.2%	46.7%	52.6%
Total		Count	27340	1004	182	28526

Table D3

Instructional Setting by Free/Reduced Lunch Eligibility

			Instructional Setting			
			traditional	traditional with APEX	APEX school	Total
Eligibility	F	Count	2734	197	17	2948
		% within F/RL num	92.7%	6.7%	.6%	100.0%
		% within instructional setting	10.0%	19.6%	9.3%	10.3%
	R	Count	697	41	0	738
		% within F/RL num	94.4%	5.6%	0.0%	100.0%
		% within instructional setting	2.5%	4.1%	0.0%	2.6%
	S	Count	23909	766	165	24840
		% within F/RL num	96.3%	3.1%	.7%	100.0%
		% within instructional setting	87.5%	76.3%	90.7%	87.1%
Total		Count	27340	1004	182	28526
		% within F/RL num	95.8%	3.5%	.6%	100.0%
		% within instructional setting	100.0%	100.0%	100.0%	100.0%