A Relational Study Of International General Certificate Of Secondary Education (IGCSE) Scores To The American College Test (ACT) Scores In A Mississippi Innovative High School

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A RELATIONAL STUDY OF INTERNATIONAL GENERAL CERTIFICATE OF SECONDARY EDUCATION (IGCSE) SCORES TO THE AMERICAN COLLEGE TEST (ACT) SCORES IN A MISSISSIPPI INNOVATIVE HIGH SCHOOL

A Dissertation

Presented for the

Doctor of Philosophy Degree

Department of Educational Leadership

The University of Mississippi

Dane N. Aubé

May 2018
ABSTRACT

The purpose of the quantitative, correlational study of expo/facto data was to determine if a relationship exists between the Cambridge International General Certificate of Secondary Education college and career readiness PUM scores and the corresponding ACT subsection scores of eleventh graders at a municipal public high school in a southern state. The degree of correlation between the two assessment results illustrated the effectiveness of the Cambridge curriculum in preparing students for the college and achievement on the ACT. The research is particularly important to Mississippi because Cambridge is a pilot program for the state. Performance data from Corinth School District, a municipal public high school in Mississippi, was utilized from archived score reports of eleventh grade students who took both the ACT and corresponding IGSCE assessments. Test results from the 2015, 2016, and 2017 Spring ACT administrations and the IGSCE PUM scores of those same students filtered from preceding years were used in the research.

Using the Pearson r correlation coefficient, a significant linear relationship was shown to exist between the ACT subsection scores in English, reading, science, and mathematics and the Cambridge IGSCE PUM scores on the First Language English, English Literature, Mathematics, Biology, Chemistry, World History, and American History exams. Measures of central tendency were used to compare college readiness thresholds set for the two assessment programs. Also, linear regression equations were generated to find future ACT subject area outcomes using the
Cambridge IGSCE subject exam PUM scores. The research results indicate Cambridge IGCSE performance to be a valid predictor of success on the ACT subscores.
ACKNOWLEDGEMENTS

The guidance and instruction provided to me by Dr. Dennis Bunch, Associate Professor of Leadership and Counselor Education and Program Coordinator, were immeasurable during my entire experience at the University of Mississippi. Thank you does not begin to express my gratitude for your encouragement and advice. Additionally, I appreciate the valuable time you and my dissertation committee have extended to me in pursuit of my degree at Ole Miss.

I would also like to thank Dr. Lee Childress, Corinth School District Superintendent of Education, and the Corinth School Board for the special opportunity to conduct my research with the ACT and Cambridge IGCSE data. I sincerely hope the results of my research could benefit the students walking our halls in their quest for learning and lead to the continued professional growth of an exceptional faculty and staff. “We Do School Differently!” Yes, indeed!

Most importantly, I would like to express my deepest love and thanks to my wife, Wendy Aubé. The best decision a man can make is to marry someone who will challenge him intellectually. Without my challenger, proofreader, and rock of support, this journey would not have been possible. We can finally see the light at the end of this long tunnel.
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CHAPTER I: INTRODUCTION

The world of K-12 education is fixated on assessment. It is completely understandable given the public repercussions to both schools and individuals based on published results. This fixation gained traction in the sixties with the Elementary and Secondary Education Act passed as part of President Johnson’s “War on Poverty.” Once the United States Department of Education used the National Assessment of Educational Progress to gauge student achievement in 1969, testing took on new meaning. Then pressure continued to build in 1994 when the President Clinton administration tied federal money to state testing through Title I and required states to develop their own standardized tests. Controversy erupted in 2001 after President G. W. Bush initiated the No Child Left Behind Act in an effort to close the achievement gap. (Alcocer, n.d.; Michigan Associations of State and Federal Program Specialists [MAS/FPS], 2015).

Presently school districts must justify what and how students are being taught, what students are actually learning, how students perform compared to other students, and at what rate students have progressed based on a particular set of growth standards. Adding to the frustration of educators is the ever-moving mark of success. While local school systems across the country prepare to implement one curriculum in preparation for end of year assessments, a different initiative is being devised for implementation over the next three years. This curriculum-du-jour mentality has hindered real strides in education.

In 2009, the Corinth School District, a small-town school in Mississippi, looked into the educational future of their students and did not like what they saw. Like many other districts at the time, they were faced with yet another behemoth national educational initiative titled
Common Core State Standards created under the President Obama administration through the National Governors Association Center for Best Practices and the Council of Chief State School Officers. These standards were being developed for state adoption in an attempt to fill the missing piece of the educational puzzle. The intent was to create a national curriculum focused on preparing students to be college and career ready upon high school graduation (National Conference of State Legislatures [NCSL], 2014).

The possibility of going forward with another mandated curriculum was not palatable to anyone in Corinth; so the Corinth School District Board of Trustees and Dr. Edward Lee Childress, Superintendent of Education for the district, took advantage of a unique opportunity offered by the Mississippi Legislature and State Board of Education. The district applied for and received Innovative School status in 2011 to pilot internationally benchmarked education programs. The Innovative Schools Program was “designed to better prepare students for postsecondary education and direct entry into the workforce” (Mississippi Department of Education [MDE], n.d.b). As a result of being chosen for the Innovative Schools Program, Corinth School District became master of its own destiny with an independent curriculum and assessment program unlike any other in the state, the Cambridge International General Certificate of Secondary Education or IGCSE was chosen (MDE, 2012). Since 2011, Corinth Schools has gained autonomous control of student learning within the district.

All stakeholders, students, families, communities, educational entities, as well as, business and industries, have a vested interest in the sufficient preparation of high school students to either complete college or enter a career upon graduation. Mississippi is experimenting with the adoption of the Cambridge International Examinations (CIE) by the Corinth School District in anticipation of fulfilling these reasonable expectations, but the final
results are yet to be confirmed (Cambridge International Examinations [CIE], 2016). The implementation of an international program of study specifically designed to prepare students for higher learning is an admirable ambition, but which segments are most effective in reaching this lofty goal? Are the curriculum and assessments actually preparing students to meet the demands of college or career?

**Focus of the Study**

One assessment with a proven history of accurately predicting college and career readiness is the American College Test (ACT) (ACT, 2014). In the United States, college readiness is primarily determined by performance on the ACT or Scholastic Aptitude Test (SAT); but in 2011, the ACT surpassed the SAT for the first time in the number of total test takers (Strauss, 2012). The ACT has remained remarkably consistent as a college and career readiness indicator with only slight adjustments over the years. The assessment provides students, parents, and educators with reliable data predictive of student performance in the next phase of their life (ACT, 2013).

Because the ACT has been proven to predict a student’s likelihood of completing college-level work, it can thereby be used as a gauge to measure the effectiveness of other curriculums in preparing students for higher learning. Since Cambridge IGCSE has been chosen as one of the pilot programs to improve student outcomes in Mississippi, it would be beneficial to know how well the Cambridge curriculum actually prepares students for college. Therefore, the focus of this study will be to compare IGCSE assessment results of students who have been educated through the Cambridge curriculum with the ACT results of those same students. If a relationship is determined to exist between the IGCSE college ready qualification PUM scores and the ACT college readiness benchmarks, the degree of correlation between the two
assessment results will illustrate the effectiveness of the Cambridge curriculum in preparing students for college.

Four skill areas covered by the ACT are the subtests of English, mathematics, reading, and science. An ACT composite score is an average of the subtests and represents a student’s overall performance on a scale of one to 36 (ACT, 2014). Each of these subtests has a benchmark score representing the required knowledge for success in the corresponding entry-level college courses. English Composition, College Algebra, and Biology are the most common credit bearing courses taken by college freshmen. Based on course placement data, the reading subtest most closely aligns with achievement in social studies courses. ACT sets the college readiness benchmarks and applicable courses as part of their Course Placement Service. This research service provides information to colleges for the purpose of registering students in the appropriate courses (ACT, 2013). In this study, the ACT benchmarks found in Table 1 will be compared to the appropriate IGCSE subject area college-ready qualification scores found in Table 2.

Table 1.

*ACT College Readiness Benchmarks*

<table>
<thead>
<tr>
<th>College Course or Course Area</th>
<th>ACT Subject-Area Test</th>
<th>ACT Test College Readiness Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Composition</td>
<td>English</td>
<td>18</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>Reading</td>
<td>22</td>
</tr>
<tr>
<td>College Algebra</td>
<td>Mathematics</td>
<td>22</td>
</tr>
<tr>
<td>Biology</td>
<td>Science</td>
<td>23</td>
</tr>
</tbody>
</table>

*Note: Adapted from ACT website.*
Unlike the ACT, which combines sub scores for an overall ACT composite score, IGSCE subject area examinations are entirely separate. There is no cumulative or aggregate IGSCE score. Therefore test results must be compared by subject area. When students finish an IGCSE course and take a Cambridge exam, a statement of results is issued in return with a grade indicating the test taker's overall achievement in the subject (CIE, n.d.). In some countries, including the United States, a percentage uniform mark or PUM also appears on the statement (CIE, 2017a).

For this study, the PUM scores in seven core IGCSE courses taken by students at Corinth Academic and Performing Arts High School (CHS) will be relationally evaluated to the ACT sub scores of those same students. The seven Cambridge IGCSE core-subjects required for all students at CHS are Biology, Chemistry, Mathematics, English First Language, English Literature, World History, and American History. The college and career readiness ACT sub score related to each subject will be compared to the designated college and career readiness threshold for each IGCSE subject on the PUM scale found in Table 2.
Table 2.

*Cambridge IGCSE College Readiness Thresholds*

<table>
<thead>
<tr>
<th>Cambridge IGCSE Subject Exams</th>
<th>IGCSE College-Ready Qualification PUM Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Language English</td>
<td>70</td>
</tr>
<tr>
<td>English Literature</td>
<td>65</td>
</tr>
<tr>
<td>Mathematics</td>
<td>65</td>
</tr>
<tr>
<td>Biology</td>
<td>60</td>
</tr>
<tr>
<td>Chemistry</td>
<td>60</td>
</tr>
<tr>
<td>World History</td>
<td>60</td>
</tr>
<tr>
<td>American History</td>
<td>60</td>
</tr>
</tbody>
</table>

*Note:* Adapted from NCEE website Technical Advisory Committee’s white analysis papers (National Center on Education and the Economy [NCEE], 2012; NCEE, 2013; NCEE, n.d.)

The heart of this relational study is to ascertain whether use of Cambridge International Examinations educational program is a viable option in the quest for a curriculum to prepare students for either college or a career, and to either prove or disprove its correspondence to the ACT college and career readiness standards. This requires a basic understanding of an educational model unfamiliar to most Americans. Not only is the structure of the Cambridge program different, the curriculum is also unlike typical high school courses. Mathematics, for instance, is not divided into traditional subjects, such as algebra and geometry; instead, math subjects are blended together and taught in levels. This study may show differences in student performance as it correlates to the ACT in various IGCSE subjects.

**Background of the Study**

The English school system serves as a foundation for the Cambridge International Examinations (Clark, 2014b, para. 4). Unlike the United States where students graduate with a
high school diploma after twelve grades, British students finish school with different certificate levels based on the number of successfully completed exams. The International General Certificate of Secondary Education (IGCSE) is a program offering certificated examinations from the University of Cambridge in subjects such as English Language, Mathematics and Science. “The IGCSE is not a certificate of education, rather it is a qualification based on examinations in individual subjects of study, with IGCSE qualifications and grades issued for each subject taken, much like Advanced Placement examinations in the United States” (Clark, 2014a, para. 8). The Cambridge International Examinations curriculum offers over seventy IGCSE courses, primarily taught to students in the eighth, ninth, and tenth grades in the U.S. (CIE, 2017b).

In the year 2017-18 school year (SY), Corinth School District is the only school district in the United States offering a seamless transition of the Cambridge programs and qualifications from the beginning of a student’s Kindergarten year to the conclusion of high school. The Cambridge programs include curriculum frameworks, teacher support materials, and benchmark checkpoint tests. The programs are divided into four categories. Cambridge Primary is for five to eleven year old students. Cambridge Secondary 1 is for middle schools and students ages eleven to fourteen. The high school program is divided. Cambridge Secondary 2 is for students in the ninth and tenth grade or fourteen to sixteen years of age, and the Cambridge Advanced is for students who have moved ahead academically in the sixteen to nineteen year age range (CIE, 2017b).

At the end of each IGCSE course within the Cambridge framework, are multi-faceted assessments commonly referred to as “papers.” These papers have some typical multiple-choice questions, but the similarities with other state assessments end there. For each of the science
courses, students are required to complete a paper for seven laboratory experiences, as well as, a paper for short answer or extended response, all of this in addition to the multiple-choice assessment. In each of the English and history courses there is a multiple-choice test paper, extended response paper, and a paper referred to as “course work.” Course work is a research paper of significant length delving into a particular aspect of the subject requiring justification with cited reference material (CIE, n.d.).

Each of these papers is subsequently marked by Cambridge. Afterwards, each student’s scored papers are combined, by course, to display their overall performance or their Percentage Uniform Mark (PUM). The PUM is based on the candidate’s grade set by Cambridge after the marking and gives an indicator of where on a common scale of 100 the candidate performed (CIE, 2017a). Table 3 shows the PUM range for grades A* through UG, which stands for ungraded.
One of the key differences in the Cambridge assessment package and curriculum and the other 51 state assessment programs in the U.S. and District of Columbia is the broader spectrum of evaluation techniques (Gewertz, 2017). Academic performance should not be judged strictly by one assessment in a particular moment of time. Although the ACT is a single examination session, it can be taken multiple times; and each evaluation provides quality feedback to the student. If the student uses the information provided from their ACT score report, they can seek focused remediation. An increase in academic performance can be reasonably achieved from the increased exposure to the academic content (Camara & Mann, 2017).

Under the current Mississippi assessment system, students take an Algebra I, Biology I, American History, and English II subject area test at the end of each of these core courses in high school. The results are used to determine the student’s grade point average (GPA) and overall academic performance. The grading system is based on a letter grade scale, where A* indicates the highest performance and F indicates the lowest. The table below provides the Percentage Uniform Mark (PUM) range for each grade.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage Uniform Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>A*</td>
<td>90-100</td>
</tr>
<tr>
<td>A</td>
<td>80-89</td>
</tr>
<tr>
<td>B</td>
<td>70-79</td>
</tr>
<tr>
<td>C</td>
<td>60-69</td>
</tr>
<tr>
<td>D</td>
<td>50-59</td>
</tr>
<tr>
<td>E</td>
<td>40-49</td>
</tr>
<tr>
<td>F</td>
<td>30-39</td>
</tr>
<tr>
<td>G</td>
<td>20-29</td>
</tr>
<tr>
<td>UG</td>
<td>0-19</td>
</tr>
</tbody>
</table>

*Note: No PUM is provided for ungraded UG (CIE, 2017a).*
school. The tests are primarily one format, multiple choice, and the results can determine a student’s graduation status. This type of high-stakes testing is another reason Mississippi is piloting other programs, the Cambridge International Examinations in Corinth and the ACT Quality Core in Gulfport (MDE, n.d.b).

Statement of the Problem

When it comes to curriculum, Mississippi, like most states, has operated under a “one size fits all” mentality, offering either a traditional diploma or certificate of study. Although Mississippi is attempting to remedy the situation by proposing academic or career and technical endorsements for the graduating class of 2022. This is in addition to the Cambridge AICE and early exit diplomas already in place at Corinth High School (Harris, 2017). If districts, schools, students, parents, teachers, and administrators were all of one size, the one size philosophy would work effectively, but as we all know, the fundamental components comprising education do not come in one size. Teaching to different intelligence levels, academic abilities, socioeconomic classes, and cultures requires a more malleable approach. The United States continues to lag behind other industrialized countries in academic achievement. In 2015 the Programme for International Students Assessment (PISA) placed the U.S. 38th out of 71 countries in math and 24th in science (Desilver, 2017).

Although the struggle by educators and educational institutions has been exasperated by the tendency of government agencies to alter standards of expected student performance, often due to political pressures or in response to societal demands, high school graduation rates have increased (Wong, 2016). Unfortunately, both college enrollment and college graduation rates have decreased. Nationally, college and university attendance has dropped every year since it’s peak in 2010 (Long, 2016). “In 2014, more than 42 percent of students in the state's community
college system and 17 percent attending Mississippi's public universities required remediation, according to an analysis by The Hechinger Report” (Harris, 2017, para. 4).

In response, many states, including Mississippi, adopted common core or other college and career readiness standards. These increased standards have potential to be beneficial to both schools and individual students. Lower-income students have access to high education through Pell grants, but billions of dollars go to students who never graduate (Butrymowicz, 2015). Increasing college readiness will prepare students for the rigors of college, as well as, assist median income families in paying for college. Merit scholarships, which are largely based on grades and college entrance exams, can help decrease the amount of student loans for the middle class. In the past twenty years, merit based financial aid has tripled (Clark, 2014).

Mississippi is aiming to help more students cash in on these available resources and finish college through the newly adopted Mississippi College and Career Standards (MDE, n.d.a). Initially, the state adopted the Partnership for Assessment of Readiness for College and Careers or PARCC assessment to align with the new standards, but in the 2015-16 SY, Mississippi replaced PARCC with the Mississippi Assessment Program or MAP (MDE, n.d.b).

Although MAP testing will be used in Mississippi’s new accountability model for other public school districts, the assessment for Corinth School District will be based on the Cambridge International General Certificate of Secondary Education or IGCSE curriculum. The Cambridge curriculum offers more flexibility to students and parents with diploma options ranging from basic to rigorous (MDE, 2012; MDE, n.d.b). But, evidence and evaluation of an effective curriculum takes time. Without students who have finished an entire program, the academic results are insufficient for a complete evaluation of the curriculum. Because the Cambridge curriculum is relatively new to the United States there has not been an evaluation of
the PUM scores on IGCSE courses in relation to the ACT results of students who have taken both exams.

Purpose of the Study

The purpose of this study is to examine if a relationship exist between the IGCSE college ready qualification PUM scores and the corresponding ACT college readiness benchmarks from the 2015, 2016, and 2017 ACT test administrations of Corinth High School students in their eleventh grade year. This analysis will help determine if a relationship exist between Cambridge IGCSE exams and the ACT. Because Cambridge is a pilot program for the state, policy makers could and should consider this information when selecting alternative curriculums and assessment models. Improving ACT scores and college readiness in Mississippi will allow an increased number of students to enter, afford, and successfully complete challenging college programs.

If the Cambridge assessments closely align with the ACT subtests, it would demonstrate the effectiveness of a Cambridge International Examinations education in preparing students for college. Cambridge can be used to bridge the socio-economic gap by giving more students the opportunity to access higher education. Strong correlations would substantiate the use of IGCSE in predicting student performance on future ACT exams. Administrators could also use the accumulation of IGCSE scores as groundwork for ACT prep. Higher ACT scores leads to more scholarships and signifies better preparation for higher learning.

Purpose Statement

The purpose of the quantitative, correlational study of expo/facto data is to determine if a relationship exists between the Cambridge International General Certificate of Secondary Education college and career readiness PUM scores and the corresponding ACT subsection
scores of eleventh graders at a municipal public high school in a southern state. The examination of relationships will include the English, mathematics, reading, and science subsections of the ACT and the Biology, Mathematics, English First Language, English Literature, World History, and American History IGCSE exams for these same Corinth High School students, where the Cambridge International Examinations has been fully implemented.

**Significance of the Study**

The stakes are high for the Corinth School District, as well as, the state of Mississippi. Massive amounts of resources have been invested in this quest for school improvement, not to mention the learning of thousands of students. As the Mississippi Board of Education continues to struggle in its mission to provide a quality education for all students, a template is being formed for the future of education in the state. A different educational model will eventually evolve from the pilot programs, and other school districts in Mississippi will be obliged to follow the standards instituted as a result. If the Cambridge program at Corinth School District proves to be the most effectual curriculum, it could have long lasting consequences on millions of students (MDE, 2017; Sibley & Jordan, 2014).

Families, students, schools, and communities have a tremendous investment in the outcome of both the Cambridge and ACT examinations. ACT scores can be a determining factor in selecting an undergraduate major, college acceptance, scholarship amounts, school rankings, and community evaluation. Connecting educational practices and objectives to performance levels on college readiness assessments is challenging for k-12 institutions, yet essential for students to gain an edge in the competition for limited higher-education funds designated for student financial aid.
In 2011 Dr. Lynn House, Interim Superintendent of Education for the Mississippi Department of Education well understood the challenge before families and educators, “We all recognize the current high school model does not work for all students. It is critically important to prepare our students for a global economy. The Mississippi Legislature understands that offering curriculum that challenges the thinking of our students will benefit the state and our country. In fact, the legislature has prioritized funding to help implement the *Excellence for All* program for additional school districts for the 2012-2013 school year,” (MDE, 2012, press release). Schools must prepare students to be responsible citizens in an international community and to complete in a global job market. Today world connectivity and technological advances have forced adolescents into navigating a global society. “Mass communications and the global economy have brought us into a relationship with the world. We are all united in global web of economic, environmental, and cultural interdependence” (Allen, Stelzner, & Wielkiewicz, 1998, p. 1).

**Null Hypotheses**

The overarching research interest is to consider whether a significant relationship exists in levels of college readiness as measured by the ACT and the Cambridge IGCSE exams. Clearly, each student possesses a singular level of college readiness, but the two assessment instruments measure the learning of particular objectives. Therefore, if a significant relationship does exist, the research will examine the level of coherence between the IGCSE college ready qualification PUM scores and the ACT college readiness benchmarks as an indication of consistency of college ready objectives used within the two assessments to prepare student for higher learning. The Methodology Overview section will outline the details regarding the instrument and methodology. Research interests are stated below as null hypotheses.
$H_{01}$: There is no significant relationship in the performance outcomes of eleventh grade students in high school who have taken the Cambridge IGCSE Mathematics exam and the mathematics subsection of the ACT.

$H_{02}$: There is no significant difference in the relationship outcomes of eleventh grade students in high school who have taken the Cambridge IGCSE First Language English exam and the English subsection of the ACT.

$H_{03}$: There is no significant difference in the relationship outcomes of eleventh grade students in high school who have taken the Cambridge IGCSE English Literature exam and the reading subsection of the ACT.

$H_{04}$: There is no significant difference in the relationship outcomes of eleventh grade students in high school who have taken the Cambridge IGCSE World History exam and the reading subsection of the ACT.

$H_{05}$: There is no significant difference in the relationship outcomes of eleventh grade students in high school who have taken the Cambridge IGCSE American History exam and the reading subsection of the ACT.

$H_{06}$: There is no significant difference in the relationship outcomes of eleventh grade students in high school who have taken the Cambridge IGCSE Biology exam and the science subsection of the ACT.

$H_{07}$: There is no significant difference in the relationship outcomes of eleventh grade students in high school who have taken the Cambridge IGCSE Chemistry exam and the science subsection of the ACT.
CHAPTER II: REVIEW OF THE LITERATURE

Recent headlines reveal a rising momentum pursuant to the modernization of public schools. Our society has evolved over time, but our school systems have altered very little, which has created a push for the latest technologies, new curriculums, altered schedules, different assessments, and accountability measures (Adams, 2015; Backes & Hansen, 2015; Hancock, 2011; Hansen, 2015; Medina, 2015; Osborne, 2016; The White House Office of the Press Secretary [White House], 2015; XQ The Super School Project [XQ], n.d.). Public education cannot linger in the throes of nostalgia. New values, attitudes, and behaviors are needed (Allen, Stelzner, & Wielkiewicz, 1999). “Too many students arrive at college unprepared to do college-level work, putting them on a path to join the now 41 percent of four-year college students who fail to graduate within six years” (Cohen, 2016, para. 2).

Educators must bravely meet the demands of a new high-tech and universal civilization by preparing young people to prosper in these changing times (XQ, n.d.). Yet, the primary responsibility of public schools has not changed, which is to provide students with the academic knowledge and skills necessary to successfully function in the society in which they operate. The literature review for this study will discuss three entities committed to this endeavor; the first being a state initiative called the Innovative School Program, the second a curriculum and assessment package, known as Cambridge, and the third a college readiness exam, the ACT.

The Innovative Schools Program for the state of Mississippi came to existence through the shared ideologies of national, state, and local branches of government. In today’s diversified and progressive world, cooperative solutions are essential to the attainment and sustainability of
a high quality education (Allen et al., 1999). The beginning of the literature review gives a broad overview of the conception of the program through the National Center on Education and the Economy (NCEE) and the Mississippi Department of Education (MDE). The review then examines Cambridge and the adoption of the curriculum and assessment program. The implementation of the Cambridge program by the Corinth School District through the help of Excellence for All is analyzed. Closer inspection is given to the problems and issues faced in the enactment of the curriculum and the significance of various Cambridge diplomas. Results of the curriculum are then scrutinized in conjunction with the ACT. The final section of the literature review looks at the evolution of ACT and its utilization by colleges and K-12 schools in light of state deficiencies.

**Innovative Schools Program**

**National Center on Education and the Economy.** The National Center on Education and the Economy (NCEE) is attempting to answer the call of the future by introducing new curriculums outside of the traditional educational framework. NCEE was created in 1988 to redesign education systems for higher performance and provides research on the world’s best-performing education systems to states and school districts (National Center on Education and the Economy website, 2017). Excellence for All was sculpted by NCEE as a high school design enterprise to align instruction of U.S. schools to national standards incorporating practices of leading international instructional systems. It promotes a shift from the conventional seat-time model of scholastic attainment to competency-based learning (National Center on Education and the Economy [NCEE], 2017).

NCEE identified school assessment and board examination course system providers with curriculums matching the goals of the Excellence for All initiative and aligned with Common
Core Standards. Arizona, Connecticut, Kentucky, and Mississippi became the first states to pilot the program in 2011. The recommended board examination systems allowed students to exit high school if they master ninth and tenth grade core content and stand prepared to enter the workforce or community college. Many students enroll in community college before attending four-year institutions of higher learning because they have lower admission requirements. Students who graduate early under the program are not mandated to meet the higher university standards. Mastery of this lower-level content, however, would avert students from remedial prerequisite post-secondary courses, saving both the student and the government money. Students who continue their high school education have an option of upper-level academic courses or a career and technical route (Sibley & Jordan, 2014).

Mississippi has good reason to be the first state on the bandwagon. Unfortunately, Mississippi is one of the least educated states, second only to West Virginia. A mere 20.8 percent of Mississippians have at least a bachelor’s degree and only 83.5 percent of the state’s adults have a high school diploma ("America’s Most Educated," 2016; Strauss, 2017). The Mississippi State Board of Education approved Excellence for All to assist in rectifying the situation, enabling school districts to implement comprehensive school reform and provide students with optional paths to graduation. The Mississippi Legislature funded Excellence For All to pilot alternative educational programs in selected school districts in a bid to improve public education and graduation rates. Clarksdale, Corinth, and Gulfport were the three school districts chosen to deliver the new innovative alternative programs (Mississippi Department of Education [MDE], 2012).

Role of Legislature. In 2011, the Mississippi Department of Education, through the Mississippi legislature instituted the Innovative Schools Program to address, among many topics,
college and career readiness (Sibley & Jordan, 2014). The rules and procedures of for implementation of District of Innovation were passed by the legislature in Senate Bill 2191 (State Board of Education, 2016). The three selected districts were allowed to choose the endorsed program best suited to their needs (Sibley & Jordan, 2014). The Corinth School District superintendent and Board of Trustees formed a task force of key administrators and teachers to study the choices in their transition from the state mandated program to a more advantageous curriculum and assessment process. Consideration was given to the Cambridge International Examinations, the International Baccalaureate, and the ACT Quality Core curriculum.

After reviewing the sparse amount of literature available on each prospect and visiting multiple schools across the Southeastern United States, the Cambridge International Examinations (CIE) was unanimously adopted by the Corinth School District. The selection task force for the Corinth School District was impressed with the lofty expectations and breadth of writing across the CIE curriculum in history, science, and language arts. Corinth and Clarksdale volunteered to pilot Cambridge International Examinations, an Excellence for All program (Keiffer, 2013). Gulfport School District chose to audition the ACT Quality Core (ACTQC) curriculum (Mississippi Department of Education [MDE], n.d.). The depth of knowledge and higher order thinking skills built into each IGCSE subject was also notable. The comprehensiveness and rigorous standards of Cambridge beginning with elementary, through middle school, and concluding in high school made the difference for the committee (Beavers, 2013).
**Background and Infrastructure.** Cambridge Assessment is a department of the University of Cambridge and is a not-for-profit organization employing over 2,500 people in 170 countries. It was established as the University of Cambridge Local Examinations Syndicate in 1858 with the aim of raising standards in education (Cambridge Assessment, 2017). Cambridge Assessment offers test design, curriculum development, benchmarking, quality assurance evaluations, and teacher training. Three exam boards manage the development and delivery of assessment products and services, the University of Cambridge English for Speaker of Other Languages (ESOL), the Oxford Cambridge and Royal Society of Arts Examinations (OCR), and the Cambridge International Examinations (CIE) (Cambridge Assessment, n.d.). “The largest curriculum provider for international programs modeled on the English school system is Cambridge International Examinations, offering qualifications and programs for 5 to 19 year olds across the world” (Clark, 2014c, para. 4).

According to Simon Lebus, Group Chief Executive, “Cambridge Assessment was established to promote educational excellence and high quality learning through the use of assessment. In order to achieve this it is committed to ensuring that all its assessments are fair, have sound ethical underpinning, and operate according to the highest technical standards” (Oates, 2017, p. 3). Most seasoned educators, who have been through multiple assessment programs, would chalk this statement up to good marketing techniques, but evidence would show those doubts of insincerity would be unfounded. Item Response Theory or Rasch Analysis is used in the development of test items and the minimum mark for each grade (Cambridge International Examinations [CIE], 2015; Oates, 2017; University of Cambridge International Examinations, 2008).
A Group Chief Executive and other senior managers who form a corporate board manage Cambridge Assessment, and a syndicate of accomplished individuals appointed by the University oversees this board. The most rapidly growing division of the organization is the Assessment Research and Development Division (Cambridge Assessment, 2017a; Cambridge Assessment, 2017b). Perhaps this is due to the dearth of external academic studies involving Cambridge or simply expansion of the program.

The concepts of fairness, ethics, and high standards are dictums of the organization, however, there is little empirical research on the effect of the Cambridge IGCSE curriculum on student performance. One study in 2014 showed IGCSE to have a pervasive effect on students, teachers, and school administrators and to fulfill the pragmatic needs of international schools (Corlu 2014). The study also found IGCSE had an instrumental role in predicting student proficiency levels in math and science. If this research had been available at the time Corinth School District was considering the adoption of Cambridge, it may have placated some of the detractors. Although the selection committee, school board, and superintendent chose the curriculum unanimously, it is impossible to please every school employee, parent, and student.

**History of Implementation and Excellence for All.** As expected with the implementation of any new program, there are skeptics. It is easy for teachers and administrators to become comfortable with the status quo and resist necessary changes. One of the critical concerns was the linking of objectives between the old and new curriculums, particularly in math grade level sequencing. It is difficult for students to succeed in math without the necessary pre-requisite skills. To assuage these concerns, the district hired interventionists to bridge the gap. (Sibley & Jordan, 2014). *Excellence for All* met a wide variety of teacher needs through experts in the fields of English, history, mathematics, and science.
As part of *Excellence for All*, teachers received high-quality professional development to enhance their skills both in content knowledge and effective content delivery (Sibley & Jordan, 2014). Addressing educator weaknesses is a necessary part of successful curriculum implementation. Some teachers may have trouble with content driven inquires or labs. Others may struggle with appropriate course work or assessments. Most of the instructional focus at Corinth High School was IGCSE subjects in the ninth and tenth grade.

The technical support provided to the district included reimbursement for travel, housing, food, and materials for training. NCEE representatives worked with teachers in their rooms, during their planning periods, before school, and after school on an individual basis. They offered strand analysis on student test scores and school level performance studies. Content specialists helped teachers and administrators understand how to use test scores to improve instruction and what scores indicate about specific teacher achievements and shortcomings.

Strong administrative leadership with fidelity is important when putting new programs into action. Without it, in most cases, the enactment of different teaching methods or objectives would never come to pass. The two key components of the “Cambridge Way” are an effective systematic process and a high quality teaching and learning experience. It was necessary for course requirements and regulations, including those for assessment and coursework activities, to be followed in order to promote and enhance learner achievement as students advance through each school year. Administrators were advised to make amendments in their practices, systems, and processes. Cambridge recommended principals carefully monitor the effectiveness of schools’ instructional procedures to ensure the highest quality of teaching is achieved (Cambridge International Examinations [CIE], n.d.).
Reasons for the Curriculum. One contributing factor to the selection of Cambridge was the flexibility of the program. Although both Corinth and Clarksdale adopted Cambridge, each school implemented it differently. From the onset, Corinth High School included all students in IGCSE courses, whereas, Clarksdale made the decision to initiate a cohort group of high performing students (Sibley & Jordan, 2014). Administrators from Corinth School District who attended the International Cambridge Conference in England learned much of the world educates in a similar manner (Cambridge Assessment International Education, 2015). Many nations do not educate all students equally. Some countries offer Cambridge higher examinations to an exclusive group of students through selective schooling, escaping the challenge of equally educating the masses (Gorard, 2016). Whether this is accomplished in the United States is debatable, but American schools are required by law to provide an equal education to students (American Civil Liberties Union [ACLU], 2017).

When the Corinth School District implemented the Cambridge curriculum, it was enacted for every student, not just the top-level students. Sometimes however, when it comes to educating the masses, the wrong steps are taken. According to the MDE 2010-11 School Year (SY) accountability report, the graduation rate for Corinth School District at the time of the inception of the program was a mere 76.1 percent (Mississippi Department of Education [MDE], 2011). As often happens, suggestions were made to pour resources into programs for low-functioning students to the detriment of high-functioning students. Education dollars are limited and districts must chose wisely in spending.

The district knew it had students falling through the cracks, but capping the rise of top students was not the answer to bridging the gap. Instead, bringing the bottom students up will fill the disparity. Researchers in twenty-three studies detected significant benefits for high-
performing students in accelerated or enriched curriculums. Students in enriched classes gained over four-tenths of a standard deviation compared to similar students in regular classes and students in accelerated classes outpaced similar pupils by nearly nine-tenths of a standard deviation (Loveless, 2009). Many educators believe the only way to improve accountability ratings is to completely focus on low performing students. This is not true; raising the bar for top performers can be just as effectual. Improvement measures are necessary for all students. When any segment of the student body is ignored, it begins to wither. Misguided conclusions and solutions based on accountability results have pushed numerous families into private schools searching for amelioration. Corinth School District does not have a private school within driving distance to draw resources and attract students. The district hopes to maintain this benefit by offering multiple tracks to high school completion in lieu of limiting the possibilities for high performing students.

Research has shown, “parents desire a curriculum that closely matches their child’s needs and interest” (Loveless, 2009, p. 27). Cambridge is designed for customization. The pliancy to personalize instruction to the interest, plans, and abilities of students is critical to the successful modification of an educational program. As stated by Dr. Tristian Stobie, Director of Education for Cambridge International Examinations, “Schools have the responsibility to develop and implement a curriculum which is suitable for their context, culture and ethos, and which is tailored to their students’ needs…We do not believe that a common prescription is suitable for all” (CIE, n.d., foreword). Even though Cambridge is a program used worldwide, the curriculum becomes unique to each school once in action. The impact, teaching approaches, learning environment, and co-curricular activities work together forming a distinct instructional situation for individual schools, even through the written curricula may be identical (CIE, n.d.).
Adapting an International Curriculum. Tweaking Cambridge to fit within the public education system of Mississippi was one of the greatest challenges in the implementation of the program. Initially, Excellence for All provided most of the technical support needed to create change in the Mississippi innovative schools on behalf of MDE. Overtime, however, the set-up support receded and the districts were left to their own devices. Adopting a curriculum on paper is one thing, but making change happen in the classroom is another altogether. Without previous patterns of implementation, the barriers faced while putting Cambridge into practice were overcome mostly through trial and error. The lack of examples to follow made the curriculum experienced at the Corinth School District one of a kind.

Although, two additional school districts received the Excellence for All Innovative High School Awards grant in 2013 bringing the total to five schools, Corinth and Clarksdale remained the only two Cambridge schools. Lamar County and Columbia both introduced the ACT Quality Core program as part of their high school curriculum joining Gulfport for a total of three ACTQC schools (Sibley & Jordan, 2014). While each of these districts chose programs in an expectation of overcoming problems specific to their circumstances, Corinth was the only school system to completely embrace the changes by implementing the curriculum throughout the entire district, from beginning to end.

At the Corinth School District under the Innovative Program, students start Kindergarten at Corinth Elementary School with foundational skills in Cambridge Primary. Corinth Middle School then builds on the English, math, and science in Cambridge Secondary 1 and offers three IGSE subjects leading to qualifications. The Cambridge Secondary program is sometimes called the Cambridge Checkpoint program because progression exams are used to check student progress. At the end of eighth grade, students take the Cambridge Checkpoint exam, which is
graded by Cambridge examiners to determine if students are learning according to international standards (Corinth School District [CSD], n.d.). By the time students finish Cambridge Secondary 2 as a tenth grader at Corinth High School, pupils will have access to seventy more IGCSE subjects with optional qualifications. Students are allowed to choose these subjects based on their interests and ambition. Table 4 demonstrates the number of minimum required courses in each subject to graduate from the Corinth School District.

**IGCSE.** The framework of the Cambridge program was foreign to most parents, educators, and students at Corinth. Students earn qualifications to finish high school with different degrees instead of simply completing a grade. In the British school and examination system, which serves as a basis for the program, students normally complete their General Certificate of Secondary Education (GCSE) examinations by age 16, which is a certificate comparable to the high school diploma. These GCSE examinations are taken in a range of subjects; afterward, students could choose apprenticeships, employment, or a continuation of higher studies to end their education or training by the age of eighteen. Students who wish to further their education academically are required to make certain exam grades in specific subjects. “Earning five or more A* – C grades in GCSE examinations, including English and mathematics, is often a requirement for students wishing to continue their studies at the GCE Advanced Level” (Clark, 2014b, para. 18). More selective schools will require A’s and B’s in at least six key subjects (Clark, 2014b).

Cambridge International General Certificate of Secondary Education (IGCSE) is a branded curriculum used in different countries. There are various mandates on the number of IGCSE exams students must take depending on location. Usually, there is a set of required courses, such as English, mathematics, and science, and students choose other subjects as
electives. Then exams, testing the proficiency in each course, are taken. Most IGCSE subjects offer a choice of tiered examinations. The Advanced Level (A Level) is usually taken after two years of study, or students can take the Advanced Subsidiary qualification (AS Level) after studying about half of an A Level course (Clark, 2014a; Clark, 2014b). The qualification exams are weighted with points leading to various diploma levels demonstrated later in Table 5. The A Level qualification exam is weighted heavier and normally given after two years in a subject. As a rough similarity to the A Level, suppose a student were taking a weighted subject area exam at the end of Chemistry II after completing both Chemistry I and Chemistry II. In contrast, if the student decided to end the course of study for some reason after one year, the AS Level qualification exams could be taken. In our fictitious example, the student could decide Chemistry is too difficult after finishing Chemistry I and choose to take a less weighty subject area exam. Students may take the A Level or AS Level qualification exam in a subject.

The General Certificate of Secondary Education (GCSE) is considered the equivalent to a United States high school diploma, but most United Kingdom universities will not accept a United States diploma alone, nor will they accept an Ordinary Level (O Level) GCSE alone. The more rigorous A Level qualifications are typically required for university admission in the U.K., and American educated students may only receive entrance with additional honors, such as AP credits, SAT subject tests, or A-level exams (Chavagnes International College, n.d.). This makes sense in comparison to IHL requirements in the United States. Students may graduate high school and still not meet the qualifications to enter directly into a university based on ACT, GPA, and prerequisite courses.

As part of the Cambridge program at the Corinth Academic and Performing Arts High School, all ninth and tenth graders take classes in the core subjects of English, math, science, and
history. At the end of each year, students take Cambridge IGCSE exams, which are graded by Cambridge examiners. It is possible for students to receive an IGCSE diploma upon the completion of the tenth grade based on performance and qualifications, but most students at Corinth High School opt to prepare themselves for career or college by taking more classes (CSD, n.d.). Also, some students at CHS do not want to miss out on senior festivities and traditions. MDE refers to this diploma preceding the traditional senior year as the Mississippi Early Exit Exam Option, and it applies only to students in State Board of Education approved Innovative Programs (Mississippi Department of Education [MDE], 2013; State Board of Education, 2013).

In order to qualify for the Early Exit diploma, students must complete two years of high school; meet the college readiness benchmark on the ACT; meet the college and career qualification scores in English, mathematics, science, and history; and earn an abbreviated list of Carnegie Units. Students who meet the qualifications for a Mississippi Early Exit Diploma should be ready to do basic freshman college-level work without remediation or begin a career pathway beyond high school (State Board of Education, 2013). Students are required to successfully complete 17 and a half units of high school coursework and meet the subject area and PUM score requirements in the IGCSE classes to graduate precipitously. The PUM simply shows whether the students’ performance is close to the top, middle, or bottom of the grade (Cambridge Assessment International Education, 2015; Cambridge International Examinations [CIE], 2017a). The PUM scores required for Early Exit are closer to the top, and the mandatory ACT benchmark is at least a 25. The qualification scores in the core content areas approved for the Early Exit diploma by the Mississippi Department of Education Commission on School Accreditation for the Cambridge Innovative Schools program are indicated on Table 4.
Table 4.
Mississippi Early Exit Diploma Requirements

<table>
<thead>
<tr>
<th>Curriculum Area</th>
<th>Carnegie Units</th>
<th>Required Subject &amp; PUM Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>2</td>
<td>IGCSE English Language-70% PUM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IGCSE English Literature-65% PUM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(English II Equivalent Course)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3</td>
<td>IGSCE Math I &amp; IGCSE Math II-65% PUM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(These Math Courses will count as 3 units)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Algebra I Equivalent Course)</td>
</tr>
<tr>
<td>Science</td>
<td>2</td>
<td>IGCES Biology-60% PUM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IGCSE Chemistry or Physics-60% PUM</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>2.5</td>
<td>IGCSE World History-60% PUM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IGCSE American History-60% PUM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.5 Mississippi Studies or Economics</td>
</tr>
<tr>
<td>Health &amp; P.E.</td>
<td>1</td>
<td>Any Combination of Health &amp; P.E.</td>
</tr>
<tr>
<td>Business &amp; Technology</td>
<td>1</td>
<td>ICT II / STEM / Research Using Tech Tools</td>
</tr>
<tr>
<td>The Arts</td>
<td>1</td>
<td>Any Approved 500.000 Course or Completion of the 2-Course Sequence for Computer Graphics Technology I &amp; II</td>
</tr>
<tr>
<td>Electives</td>
<td>5</td>
<td>Courses Should Focus on College Admission or National Certification Requirements</td>
</tr>
</tbody>
</table>

*Note: Adapted from Mississippi Early Exit Diploma Requirements EXCEL 1 MDE spreadsheet*
**AICE Diploma.** For students in the eleventh and twelfth grade at Corinth High School who want to prepare themselves for a rigorous college and university workload, the Advanced International Certificate of Education (AICE) is offered. The Advanced program allows students to take research-based learning classes and earn AICE credits. These credits are awarded by the score made on the AICE exams, instead of the grade made in the classroom (CSD, n.d.). One credit is awarded for an AS Level exam and two credits are awarded for an A Level exam. The Cambridge AICE Diploma requires learners to study Cambridge AS and A Level subjects drawn from three different curriculum areas groups. Students must achieve a minimum of seven credits from the subject groups mathematics and science (Group 1), languages (Group 2), and arts and humanities (Group 3). At least one credit has to come from each subject group and the remainder may be derived from any combination of qualifying subjects. (Cambridge International Examinations [CIE], 2017b).

The AICE diploma is awarded on a points system. One of the goals of Cambridge is to produce well-rounded students, and the diversification of required subjects in three distinct academic areas reflects this ideology. Learning the “Cambridge Way” puts more responsibility on the individual pupil for their decisions. Students are allowed to make choices to sustain their specific aspirations. To earn the AICE diploma, learners must first choose their subjects; then decide the exam level; and lastly they must make grades high enough to earn the required points to reach their goal.

At Corinth High School, scholars in the Cambridge Advanced program have an option of over fifteen AICE subjects to match their interests. At the end of the course, they take the AS Level or A Level exam, with the A Level being more difficult and longer. Although learners may choose either exam, most students take the Cambridge International AS Level first, and then
determine whether to progress to the A Level later if they need the points. This gives students the opportunity to identify their own strengths and weaknesses before attempting the full Cambridge A Level exam (Cambridge Assessment International Examinations, 2017b). Of course, some of the more ambitious students aiming for the Ivy League, confident in their academic knowledge, take as many A Level exams as possible to generate more points.

**AICE Diploma Levels.** There are three echelons of the Cambridge AICE Diploma – Pass, Merit, or Distinction; and the stratum is determined by the amount of points earned. Each grade a student receives is converted to a certain number of points as illustrated in Table 5 (Cambridge Assessment International Examinations, 2017).

Table 5.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Two credits study – A Level</th>
<th>One credit study – AS Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>A*</td>
<td>140</td>
<td>−</td>
</tr>
<tr>
<td>A</td>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>B</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>C</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>D</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>E</td>
<td>40</td>
<td>20</td>
</tr>
</tbody>
</table>


The Cambridge AICE Diploma with Distinction is the highest honor possible, and it requires a score of 360 points or above. The AICE Diploma with Merit is the second highest ranking, and students must garner between 250 and 359 points. In order to receive an AICE Diploma with a Pass classification, students must score at least 140 points (Cambridge
Assessment International Examinations, 2017). Any level of AICE Diploma is quiet an academic achievement; but the Merit Diploma, and the Distinction Diploma in particular, are highly regarded at selective colleges.

Ivy League schools and distinguished universities from other countries know the worthiness of the AICE Diploma, but some colleges and universities in the United States have yet to recognize the credentials. In the state of Mississippi, both the University of Mississippi and Mississippi State University offer specific scholarships for AICE graduates ranging from $6,000 to $10,000 distributed over four scholastic years. The majority of students seeking an undergraduate degree from Corinth High School attend one of these universities. Currently, however, Mississippi State University is the only university in Mississippi to give college course credit for the IGSCE qualifications based on AICE subject passing scores, similar to college AP credits (Mississippi State University [MSU], 2012). This is an important benefit for students and parents hoping to save money at the next level of higher learning as a result of the extra work put into earning an AICE Diploma.

**AICE Diploma Results.** Studies comparing freshman GPAs of college students who graduate from accelerated programs in high school confirms the successful academic preparation of Cambridge International Examinations AICE graduates. Florida was the first state to offer Cambridge programs and qualifications in the U.S., and the Center for Advancement of Learning and Assessment conducted research in the state comparing the AICE Diploma to the International Baccalaureate (King, Rohani, Hemenway, & Waltonen, 2001). The data report from Bill Kolb, University of Florida Director of Admissions shows overall student performance results. The report included thirty students who graduated from a Florida high school AICE program. The average GPA of AICE students in their first year at the university exceeded the
The difference was significant. The average GPA for all first year students at the University of Florida was a 2.9; the AP freshman average was 3.12; the IB freshman average was 3.10; and the DE freshman average was 2.75. The average GPA for freshmen AICE graduates at the University of Florida was 3.46, and three of the thirty AICE students had a 4.0 after their first year. (Kolb, n.d.).

The data by Kolb was collected at the launch of AICE programs in Florida as the first group of graduating AICE students entered institutions of higher learning. A larger study at Florida State University explored the link between high school educational programs and first-year university academic achievement showing similar results. The research uses information collected over a three-year period from Florida State University. The size of the data set was over 8,500 students with a subset of 144 Cambridge AICE students, 1188 Advanced Placement students, and 806 International Baccalaureate students. Because of the smaller proportion of the Cambridge AICE cohort, factors affecting outcome were narrowed and controls for selection bias were used for more accurate and reliable results. The study revealed no evidence of any statistical difference between Cambridge AICE and AP students on any of the tests. But on all of the tests, including controls for gender, race and SAT score, Cambridge AICE students achieve a higher GPA compared to both IB students and students from no acceleration program (Shaw & Bailey, 2011).

Results from these studies corroborate the experience of educators at Corinth High School where veteran teachers noticed a distinct positive change in student performance as the years with Cambridge progressed (Beavers, 2013). The first group of students with the advantage of a Cambridge education throughout middle school entered the ninth grade in the
2015-16 School Year (SY). The majority of Corinth community members, parents, and students have indicated approval of the changes. Corinth School District conducted a survey for the Leadership for Learning Project done in conjunction with Cambridge University. According to the results, 68 percent of parents, students, and teachers reported being satisfied or better with the Cambridge program as it is conducted in the district. This finding coincides with research comparing AICE to IB in Florida, where 82 percent of AICE respondents felt participation in the program helped them get a college scholarship and 74 percent agreed the program challenged them to do their best work. (King et al., 2001).

These studies show Cambridge International Examinations can be an attractive option for the revitalization of American K-12 school systems. The unique instructional program seems to be fulfilling the original goals of NCEE at Corinth School District with an upswing in graduation rates and ACT scores. Corinth ranks among the top ten districts with the highest graduation rates in Mississippi, boasting 91.8 percent of students completing high school (Vanderford, 2017).

Since the introduction of Cambridge at Corinth High School, there has been an increase in the number of students taking the ACT, as well as raising their performance level. “In 2013, 30 percent more Corinth students took the ACT than did in 2009; the statewide increase was only three percent...It is also worth noting that the average ACT score in 2013 increased in all four ACT sub scores and the percent of students that met all ACT readiness benchmarks increased by 40% compared to 2009” (Sibley & Jordan, 2014, p. 4).

**ACT**

**History and Development.** Approximately 2.1 million students took the ACT in 2016, amounting to two-thirds of graduating seniors (ACT, 2016). This is a significant increase in test takers compared to the 75,460 students who took the first ACT in 1959. The American College
Test was originally created to assess the information students actually learned during school. Ted McCarrel and Everett Franklin Lindquist, a professor at the University of Iowa, based the ACT on the Iowa Tests of Educational Development (ITED). The ACT was founded as a competitor to the Scholastic Aptitude Test (SAT), which tested cognitive reasoning. At the time, only discerning colleges and universities in the Northeast used SAT, and ACT provided an entrance exam for other institutions of higher learning (Fletcher, 2009; Jacobsen, n.d.; Lindsay, 2015).

The test was developed as an achievement test, not solely meant for admission, but also as a placement guide. The first ACT used four sections, English, Mathematics, Social Studies, and Natural Science, each lasting 45 minutes. The entire exam was three hours long and each subsection, as well as, the whole test was scored on a scale from zero to 36. Computers used optical mark recognition to score the multiple-choice questions, which is still used today. Lindquist initially developed the optical mark reader machines in 1955 to score the ITED. Although computers have always been used to score the ACT, today’s internet version didn’t hit the scene until 2013, after the creation of the world wide web (Jacobsen, n.d.; Lindsay, 2015). The test later included questions to guide career choices, introducing the first ACT interest inventory in 1971 (ACT, 2009; Fletcher, 2009).

In 1989, a new version of the ACT was introduced, referred to as the enhanced ACT. The Natural Science section was replaced with Science Reasoning to move the focus from specific scientific knowledge to test analytical and problem solving skills. Social studies, which tested history learning, was replaced with reading to test reading ability and comprehension. The Math portion added trigonometry and pre-algebra material, and the English subsection moved from a grammar emphasis to writing skills. The new enhanced ACT was not directly
comparable to the old version of the test. The scale moved from zero-36 to one-36. As a result of these changes, the average composite score increased from 18.6 to 20.6, and colleges began using recentered subscores for placement of students who took the ACT before October 28, 1989 ("ACT recentered," n.d.; Jacobsen, n.d.; Lindsay, 2015).

In 1996, the nonprofit company changed its name to ACT, instead of the American College Test, and allowed students to use a calculator for the first time on the math portion of the test. Later in 2005, the optional 30 minute writing section was added to compete with the SAT essay requirement. The total test time with writing increased to three hours and 25 minutes. By 2007, every college and university in the U.S. accepted the ACT, with Harvey Mudd College being the last hold out (Fletcher, 2009; Jacobsen, n.d.).

**Modern Utilization.** ACT continues to be the most popular admissions test, holding a ten to one advantage in test usage over SAT in nineteen states, Alabama, Arkansas, Illinois, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, Tennessee, Utah, Wisconsin, and Wyoming. In ten of those states, including Mississippi, ACT is used twenty times more often (Anderson, 2014).

Most international students, however, still take the SAT, partly because the entire ACT assessment is in English. Students’ fluency in the language would affect every section of the test. ACT also doesn’t focus on marketing abroad, even though the company has over 400 test centers worldwide (Hopkins, 2012).

To the contrary, domestic marketing efforts in the United States are paying off. The East and West Coast are now taking the ACT in greater numbers, but the Northeast and California have a disproportionate share of the top scores (Eufinger, n.d.). Some ACT prep professionals contend the test is becoming gradually more difficult for higher-scoring students by making it
harder to finish (Eufinger, n.d.). In response to the allegation, ACT claims the way it measures college and career readiness is consistent with the past. “The ACT is designed to reflect the knowledge and skills that are taught in schools and deemed necessary for success in first-year college courses and workforce training courses. When those skills and constructs become more complicated and difficult over time, the ACT reflects that” (Eufinger, n.d., para. 32).

Nevertheless, ACT, Inc. acknowledges the decline in achievement levels on the test. In 2016, the average ACT composite score dropped to 20.8, representing a five-year low (Jaschik, 2016). Among those tested, 34 percent did not meet any of the four core subject area college readiness benchmarks. ACT attributes the drop to an increased number and percentage of students who took the exam (ACT, 2016).

According to ACT, a third of the increase in test takers is due to new state wide testing programs. Currently, twenty states fund ACT testing (Adams, 2014). Some states desiring to minimize testing are hoping college admissions test could do double duty for accountability purposes or high school exit exams (Adams, 2014). In the 2014-15 school year, all 35,000 high school junior in Mississippi were administered the ACT because of a legislative appropriation at a cost of $1.3 million or $34 per student. Students still have to take state exit exams, even though ACT results are tied to school accountability. (Mississippi Department of Education [MDE], 2012a; Adams, 2014) Some have reservations about the college-admission test being used for evaluation purposes because the exams were written for access to higher education. Paul J. Weeks, vice president of client relations for ACT agrees the test should only be one factor in evaluation or accountability or graduation requirements, but not as the sole criterion (Adams, 2014).
Although high school standards, modern curriculums, assessments, and accountability system are all being similarly aligned the intent of ACT and other college admission tests is to predict freshman year college performance in core subjects. To use this assessment for high school evaluation purposes is unfair to students and educators because the course sequence students take during high school largely influence performance on the ACT. A student on a career technical route may not perform as well as a student taking advanced classes on a college preparatory route (Bleyaert, 2010). Still, college admission exams, such as ACT, are valuable to high schools if used correctly. “These exams can provide information to high school students about their readiness for credit-bearing, first-year college courses and allow teachers to work with students to address learning gaps in their senior year” (Achieve, Inc., 2007, p. 4).

**Rationale for Improvement.** An educated workforce is necessary for any state to prosper. In light of the $1.3 trillion of student loan debt accumulated by over 44 million borrowers, preparing learners for college and career success has become more critical to students, families, and taxpayers (Cohen, 2016; Friedman 2017). The state of Mississippi has one of the highest average student loan default rates, ranking 48th out of 51 (Cloud, 2017). This statistic confirms research showing the more dependent universities are on Title IV, which provides financial aid to low-income students, the higher its student loan default rate and the lower its student completion and placement rates (U.S. General Accounting Office, 1997). Succinctly, universities with poor students have more college dropouts, leading to higher default rates. This makes college preparation and readiness particularly important for states with a high poverty rate. Therefore, as the poorest state in the union, Mississippi has an uphill battle (Stebbins, Sauter, & Cameron, 2017).
Mississippi colleges and universities like most other institutions of higher learning in the United States, use the ACT or SAT as part of the IHL admission standards. The ACT is also used to place students in regular or developmental classes (Mississippi Institution of Higher Learning [IHL], 2010). Hence, a curriculum aligning with ACT college and career readiness standards is of vital importance to the world of education. Students who enter college prepared for freshman curricula can bypass remedial courses, thereby saving money. Credits required for remediation are not counted towards an undergraduate degree. Therefore, establishing curriculums and assessment programs to increase coherence between what is taught in K-12 education and what is tested for college readiness could save taxpayer funded Pell grant money, individual tuition fees, and student loan bailouts.

As revealed in this literature review, sufficient college and career readiness improves the welfare of students, schools, and governments. The review shows steps taken by one state, Mississippi, to address the issue by implementing an Innovative School Program in the Corinth School District. The selection process of Cambridge, followed by its implementation, was examined in the literature review, leading to a look at the effectiveness of IGCSE classes and the AICE diploma. Studies highlighting the GPA results of freshman students who graduated from a Cambridge school with an AICE diploma signify the curriculum as a possible option in preparing students for higher learning. The review shows ACT to be the primary measure of college readiness in the United States. Yet, there is no research proving the coherence of the ACT and Cambridge IGCSE college readiness measures. Chapter III will describe the research methodology used in response to this ambiguity. The sample selection and procedures used to analyze the data will be explained.
CHAPTER III: METHODOLOGY

Introduction

To maximize the effectiveness of a curriculum and assessment program, educators must know the relationship between what is taught, what is tested, and what is required. At Corinth School District specifically, the connection between student performance on the Cambridge IGCSE exams and the correlating subsection scores of the ACT is essential to identify the level of success Cambridge curriculum and assessments have in producing the desired result of college readiness. Chapter III describes the methodology in this quantitative, ex post facto, correlational study comparing college readiness threshold scores of the American College Test (ACT) and the International General Certificate of Secondary Education (IGCSE) examinations. Phase one of the study will establish the relationship between the two assessments. If the scores between the ACT subsections and IGCSE courses correlate sufficiently, then Phase two will determine to what degree the Cambridge IGCSE PUM scores can be used to predict ACT scores. The resulting analysis will assist students in preparing to maximize performance on the ACT and assist teachers in preparing students for college where the Cambridge IGCSE curriculum is being used by identifying potential gaps in instruction.

Research Design

This correlational research will seek relationships between the Cambridge IGSCE subject area assessment PUM score and the corresponding ACT sub-score using the Pearson $r$ or product-moment correlation coefficient. “A correlation is a statistical test to determine the tendency or for two or more variables or two sets of data to vary consistently” (Creswell, 2015,
It will be used in this study to discover if the ACT subscores and IGCSE PUM subject scores fluctuate together demonstrating a connection between the assessments. A predictive design will then be used to determine alignment of the Cambridge IGSCE subject area curriculums’ college readiness threshold scores with those measured by the ACT based on assessment outcomes for the purpose of guaranteeing a full and robust curriculum. The IGSCE PUM scores will be the predictor variable, which is “a variable used to make a forecast about an outcome in correlational research,” and the ACT scores will be the criterion variable, which is “the outcome being predicted in correlational research” (Creswell, 2015, pg. 342).

Determining the relationship between these two assessment instruments will help illustrate to what degree the Cambridge curriculum prepares students for achievement on the ACT. The subsection scores of the ACT, the dependent variable, will be paired with the corresponding Cambridge IGSCE subject PUM scores, the independent variable, to determine whether a relationship exists between the results of two instruments. This relationship between two variables will be determined using a statistical procedure. The degree of association between the two sets of scores will determine the level of alignment between the college readiness standards set by ACT and the scores from the Cambridge IGSCE qualifications.

Threats to internal validity are minimal because both tests are administered through standardized procedures and graded by external agencies. The results of both tests are sent directly to the school. The research, however, will not identify other factors possibly influencing ACT or Cambridge exam results, such as academic motivation. “Because all variables cannot be tightly controlled in a correlational study, the researcher cannot make claims about causation” (Creswell, 2015, pg. 357). This inferential design will not prove, for instance, minimal effort in
a Cambridge IGSCE course causes poor performance on the corresponding subsection of the ACT. Causation remains elusive.

**Research Questions**

As educators strive to pinpoint what curriculum is to be taught and assessments given, to know the certainty of both the curriculum and assessments effectiveness for student learning, the Corinth School District must establish a relationship of student performance between the Cambridge IGCSE assessments and the related subsection scores from the ACT. Is there a significant relationship between the Cambridge IGCSE course specific assessments and correlating subsection scores from the ACT for eleventh grade students at Corinth High School? This driving question is broken down into component inquiries:

1. Is there a relationship between Cambridge IGCSE Mathematics assessment and mathematics subsection score from the ACT?
2. Is there a relationship between Cambridge IGCSE First Language English assessment and English subsection score from the ACT?
3. Is there a relationship between Cambridge IGCSE English Literature assessment and English subsection score from the ACT?
4. Is there a relationship between Cambridge IGCSE World History assessment and reading subsection score from the ACT?
5. Is there a relationship between Cambridge IGCSE American History assessment and reading subsection score from the ACT?
6. Is there a relationship between Cambridge IGCSE Biology assessment and science subsection score from the ACT?
7. Is there a relationship between Cambridge IGCSE Chemistry assessment and science subsection score from the ACT?

Academic expectations as well as quality and timely feedback are essential for student growth. Similar to providing students with the formula to successfully hand calculate grade point average, a student should have the ability to gauge their future achievement on the ACT based on the past IGCSE Cambridge examinations performance. If the student has reached a Percentage Uniform Mark (PUM) for college and career readiness on the IGCSE Cambridge examination, the student should feel confident of accomplishing a similar result on the ACT. If the PUM is lower than the college and career readiness mark, the student should be equipped with the information to address his or her deficiencies. Therefore, a relationship between ACT subtest scores and Cambridge IGCSE scores are essential in both students and school personnel being able to accurately predict ACT composite scores.

Population and Sample

Population. The population of Cambridge students in the United States aggregates from over three hundred schools sprawling over fifteen states, Alabama, Arizona, Florida, Illinois, Louisiana, Massachusetts, Michigan, Mississippi, New Jersey, New York, North Carolina, South Carolina, Tennessee, Texas, Virginia, and Washington. Educational institutions in these states offer the Cambridge curriculum and assessments to varying extents, contingent upon the grade level and type of school system, such as private, parochial, public, charter, homeschool, or international exchange (Cambridge Assessment International Education, 2017). The total number of Cambridge students in the United States is currently unavailable. The sampling frame is comprised of students from the only public school district in the United States using the Cambridge curriculum and assessment program from Kindergarten through the twelfth grade.
Sample. Data used in the research sample are test results of eleventh grade students from the 2015, 2016, and 2017 Spring ACT administrations and the IGSCE PUM scores of those same students. Over this three-year span, 389 juniors from Corinth High School (CHS) completed the April ACT test administration as shown in Table 4.

Table 6.

<table>
<thead>
<tr>
<th>ACT Spring Administration Test Takers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
</tr>
<tr>
<td>130</td>
</tr>
</tbody>
</table>

Note: Adapted from Corinth School District ACT High School Report for each year.

A total of 2,865 Cambridge IGSCE exams were administered to students at CHS in the subjects of first language English, English literature, Mathematics, Biology, Chemistry, World History, and American History before the 2017 Spring ACT testing. Students complete these courses prior to the second semester of their eleventh grade year. The IGSCE exams are administered at the end of each course. Therefore, the PUM scores of the 389 students who also took the ACT used in the research were filtered from preceding years of school performance data. Available PUM scores originated in 2013 when the first Cambridge IGSCE exams were administered at Corinth High School. Hence, the 2015 eleventh grade ACT scores would be indicative of knowledge attained by students who started Cambridge courses as ninth graders in 2013 and continued the Cambridge curriculum throughout their high school careers. ACT scores for each subsequent year will consequently reflect additional years of Cambridge learning. To illustrate this sequencing, students who took the ACT in 2017 were likely seventh graders when
the Cambridge curriculum launched. See Table 5 for detail regarding the research sample.

Table 7.

*Research Sample Number of ACT and IGCSE Test Takers*

<table>
<thead>
<tr>
<th>Cambridge IGCSE Course</th>
<th>Completed IGCSE Exam</th>
<th>Both IGCSE &amp; ACT Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Language English</td>
<td>444</td>
<td>391</td>
</tr>
<tr>
<td>English Literature</td>
<td>372</td>
<td>319</td>
</tr>
<tr>
<td>Mathematics</td>
<td>474</td>
<td>421</td>
</tr>
<tr>
<td>Biology</td>
<td>318</td>
<td>265</td>
</tr>
<tr>
<td>Chemistry</td>
<td>333</td>
<td>280</td>
</tr>
<tr>
<td>World History</td>
<td>466</td>
<td>413</td>
</tr>
<tr>
<td>American History</td>
<td>458</td>
<td>405</td>
</tr>
</tbody>
</table>

*Note:* Adapted from CIE Direct Corinth School District login and ACT High School Reports.

**Limitations and Delimitations**

**Limitations.** Limitations of the study include the seclusion of research to one public school in Northeast Mississippi, Corinth High School, because it is the only fully functioning Cambridge program in the state of Mississippi. The initial MDE approval of three Excellence For All Cambridge Schools has now been reduced to just the Corinth School District, with Clarksdale and Gulfport School Districts opting to forgo the Cambridge program and head in other directions. Therefore Cambridge and ACT data will only be gathered and utilized from Corinth High School.

**Delimitations.** Delimitations of this study include the restriction of ACT data to the eleventh grade students of Corinth High School. The utilized scores will be confined to the state mandated Spring ACT assessment in order to minimize the impact of influential factors, such as
student maturity, course completion, and test preparation resulting in an inconsistent testing experience among students. Students are allowed to take the ACT according to their own volition, and some begin taking the ACT in junior high school. Because the researcher is also the school leader, student names will be replaced with number codes, and blind analysis using the Statistical Package for the Social Sciences (SPSS), Version 23 computer program will be used to avoid confirmation bias.

Additionally, removing inaccurate IGCSE mathematics data from the data set due to the discovery of a personnel issue shortly after the Cambridge examination was administered in 2013 is a delimitation of the study. According to school district personnel, the teacher told classes effort was not required because students would not be held accountable for performance on the exam. In August of the following year, all 107 of this particular teacher’s students received a No Grade (NG) on their IGCSE mathematics assessment. These NG scores will be removed from the sample due to the inaccurate measure as well as the potential for skewing the statistical outcomes.

The final delimitation is incomplete data sets from the IGCSE Cambridge courses. Students may not have tested in a specific IGCSE course, but would have an ACT subscore in the subject. The two delimitations would result in a substantial deviance of scores for the Cambridge tests and the ACT subsections being compared.

Data Collection

Subject area scores from the ACT and IGCSE exams of Corinth School District students will be used in the study. A release for relevant data and approval for research from the Corinth School District is included in Appendix A. Data provided to Corinth School District by ACT and CIE will be utilized for eleventh grade students who took both the ACT and corresponding
IGSCE assessments during the 2014-15, 2015-16, and 2016-17 school years. Archived ACT score reports consist of each student’s overall ACT score and subsection scores in English, reading, science, and mathematics. Archived Cambridge IGSCE score reports consist of each student’s PUM scores on the First Language English, English Literature, Mathematics, Biology, Chemistry, World History, and American History exams.

The assessment instruments were administered according to the guidelines set by ACT and CIE, following all test security procedures. ACT and CIE graded the assessment instruments with scored data reports sent directly to the school district. The researcher will obtain data sets through the administrator login for the ACT and IGSCE assessments. Subjects will be number coded in the research to prevent the identification of individual students.

**Data Analysis**

Correlational data analysis will be conducted to inquire as to any relationship between the Cambridge IGCSE subject PUM scores with the ACT subscores. Descriptive analysis of central tendency, mean, median, and mode will take place for each subject area data set to summarize the sample. Student ACT and IGCSE exam data will be imported into the Statistical Package for the Social Sciences (SPSS), Version 23, which is an IBM product designed for statistical analysis. The Pearson product-moment correlation coefficient $r$ and linear regression will be used to test the hypothesis for each subject. If a significant linear relationship is proven to exist by the creation and examination of scatter plots with the SPSS, the correlation coefficient will then be used to indicate the degree of alignment between the ACT English, mathematics, reading, and science subject area scores and their corresponding IGCSE subject PUM scores on a scale of zero to one.
Scatter plots will use the x-axis to represent ACT scores and the y-axis to represent IGCSE scores. After a correlation coefficient is produced and scores are graphed, an interpretation of the association will be made with a simple regression line for each IGSCE subject. The correlation coefficient between two variables will result in indications of no correlation with a 0 coefficient, a low correlation with .1 to .3, a medium correlation with .3 to .5, and a high correlation with .5 to 1. Quantitative data will be analyzed to determine the level of coherence between college readiness thresholds for each IGCSE subject on the PUM scale and each ACT subject area score as found in Table 6.

Table 8.

*Comparison of IGCSE and ACT College Readiness Thresholds*

<table>
<thead>
<tr>
<th>IGCSE Subject Exams</th>
<th>IGCSE College-Ready PUM Score Thresholds</th>
<th>ACT Subject-Area</th>
<th>ACT College-Ready Subscore Thresholds</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Language English</td>
<td>≥ 70</td>
<td>English</td>
<td>≥ 18</td>
</tr>
<tr>
<td>English Literature</td>
<td>≥ 65</td>
<td>Reading</td>
<td>≥ 22</td>
</tr>
<tr>
<td>Mathematics</td>
<td>≥ 65</td>
<td>Mathematics</td>
<td>≥ 22</td>
</tr>
<tr>
<td>Biology</td>
<td>≥ 60</td>
<td>Science</td>
<td>≥ 23</td>
</tr>
<tr>
<td>Chemistry</td>
<td>≥ 60</td>
<td>Science</td>
<td>≥ 23</td>
</tr>
<tr>
<td>World History</td>
<td>≥ 60</td>
<td>Reading</td>
<td>≥ 22</td>
</tr>
<tr>
<td>American History</td>
<td>≥ 60</td>
<td>Reading</td>
<td>≥ 22</td>
</tr>
</tbody>
</table>

*Note:* Adapted from ACT website and NCEE website Technical Advisory Committee’s white analysis papers (National Center on Education and the Economy [NCEE], 2012; NCEE, 2013; NCEE, n.d.)

**Summary**

Should a link between Cambridge IGCSE and ACT be ascertained, educators could then use exam results to improve academic performance and correct deficiencies based on the degree of coherence between the assessments. If students were able to gauge future performance on the
ACT by previous IGCSE PUM scores, precise test preparation steps could be taken to strengthen academic weaknesses. Study time could be divided more efficiently and remediation could target specific objectives. The purpose of this study and the significance of the results are highlighted in the first chapter. The conceptions of the study, as well as, the background of the two assessments used are described in the second chapter. The third and final chapter of this prospectus profiles the methods to be used in the research.

The prospect of advancing scholastic growth leads to compelling questions, which beckon to be answered through this proposed research. Is there a relationship between ACT subtest scores and Cambridge IGCSE scores? Can the Cambridge curriculum sufficiently prepare students for college or careers? Can Cambridge IGCSE PUM scores accurately predict performance ranges on the ACT? Is the Cambridge International Assessment and Examinations a viable curriculum option for the state of Mississippi? Answers await investigation and will be reported in Chapter Four while discussion of the findings will be discussed further in Chapter Five.
CHAPTER IV: RESULTS

Introduction

Quantitative analysis was performed in this correlational study to determine the relationship between the Cambridge International General Certificate of Secondary Education (IGCSE) college and career readiness percentage uniform marks (PUM) scores and the corresponding American College Test (ACT) subsection scores of eleventh grade students at Corinth High School, a municipal, public school in Mississippi. The Statistical Package for the Social Sciences (SPSS), Version 23 was used to test the null hypothesis of there being no relationship existing between the performance outcomes of the English, mathematics, reading, and science subsections of the ACT in regard to the Biology, Mathematics, English First Language, English Literature, World History, and American History IGCSE exams of those same students who have been taught through the Cambridge International Examinations curriculum. Ex post facto data from the 2015, 2016, and 2017 Spring administrations of the ACT for 376 CHS students along with the IGSCE PUM scores of those same students composed the research sample.

Pearson Product-Moment correlation coefficients were computed between the variables; ACT subject sub-scores (English, mathematics, reading, and science) and the corresponding Cambridge IGCSE PUM scores (Biology, Mathematics, English First Language, English Literature, World History, and American History). A regression analysis was performed to investigate the predictive relationship between the Cambridge IGCSE PUM scores and the
corresponding ACT subject area scores. Also, descriptive statistics measuring central tendency and variability were used to summarize the ACT and IGCSE PUM score variables.

**Correlation**

Preliminary analysis showed the relationship to be linear with both variables normally distributed, as assessed by the Shapiro-Wilk normality test. No outliers were identified using the box and whiskers test. SPSS Version 23 Bivariate Correlation Test of Significance was used to determine the statistical significance of the relationship addressing the null hypotheses.

H₀₁: There is no significant relationship in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE Mathematics exam and the mathematics subsection of the ACT.

H₀₂: There is no significant relationship in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE First Language English exam and the English subsection of the ACT.

H₀₃: There is no significant relationship in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE English Literature exam and the reading subsection of the ACT.

H₀₄: There is no significant relationship in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE World History exam and the reading subsection of the ACT.

H₀₅: There is no significant relationship in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE American History exam and the reading subsection of the ACT.
H₀⁶: There is no significant relationship in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE Biology exam and the science subsection of the ACT.

H₀⁷: There is no significant relationship in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE Chemistry exam and the science subsection of the ACT.

Table 9 demonstrates the strong positive correlation between IGSCE PUM scores and ACT subject area scores as indicated by the Pearson Product-moment correlation coefficient and the statistical significance level.

Table 9.

*Summary of Normality and Correlations Results*

<table>
<thead>
<tr>
<th>IGCSE Subject Exams</th>
<th>ACT Subject-Area</th>
<th>Pearson Correlation</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>Mathematics</td>
<td>.670</td>
<td>.000</td>
</tr>
<tr>
<td>First Language English</td>
<td>English</td>
<td>.656</td>
<td>.000</td>
</tr>
<tr>
<td>English Literature</td>
<td>Reading</td>
<td>.583</td>
<td>.000</td>
</tr>
<tr>
<td>World History</td>
<td>Reading</td>
<td>.681</td>
<td>.000</td>
</tr>
<tr>
<td>American History</td>
<td>Reading</td>
<td>.573</td>
<td>.000</td>
</tr>
<tr>
<td>Biology</td>
<td>Science</td>
<td>.664</td>
<td>.000</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Science</td>
<td>.651</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note: Test is significant at .05 (p < .05) indicates a violation of normal distribution.

A Pearson Product-Moment correlation was produced in SPSS Version 23 to answer the primary research questions. According to Laerd Statistics (2018), the Pearson correlation coefficient is denoted by r, and measures the strength and direction (positive or negative) of a
linear association between two variables. In the following generated results, the number in parenthesis indicates the sample size of the predictor IGCSE subject PUM score.

The first hypothesis sought to address any relationship between Cambridge IGCSE Mathematics exam scores and ACT mathematics subscores. There was a strong positive correlation coefficient in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE Mathematics exam and their performance on the mathematics subsection of the ACT ($r [n=167] = .670, p < .001$).

The second hypothesis sought to address any relationship between Cambridge IGCSE First Language English exam scores and ACT English subscores. There was a strong positive correlation in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE First Language English exam and their performance on the English subsection of the ACT ($r [n=307] = .656, p < .001$).

The third hypothesis sought to address any relationship between Cambridge IGCSE English Literature exam scores and ACT reading subscores. There was a strong positive correlation in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE English Literature exam and their performance on the reading subsection of the ACT ($r [n=319] = .583, p < .001$).

The fourth hypothesis sought to address any relationship between Cambridge IGCSE World History exam scores and ACT reading subscores. There was a strong positive correlation in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE World History exam and their performance on the reading subsection of the ACT ($r [n=318] = .681, p < .001$).
The fifth hypothesis sought to address any relationship between Cambridge IGCSE American History exam scores and ACT reading subscores. There was a strong positive correlation in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE American History exam and their performance on the reading subsection of the ACT ($r \ [n=299] = .573, p < .001$).

The sixth hypothesis sought to address any relationship between Cambridge IGCSE Biology exam scores and ACT science subscores. There was a strong positive correlation in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE Biology exam and their performance on the science subsection of the ACT ($r \ [n=240] = .664, p < .001$).

The seventh hypothesis sought to address any relationship between Cambridge IGCSE Chemistry exam scores and ACT science subscores. There was a strong positive correlation in the performance outcomes of eleventh grade students at Corinth High School who have taken the Cambridge IGCSE Chemistry exam and their performance on the science subsection of the ACT ($r \ [n=220] = .651, p < .001$).

The two-tailed significance level ($p$-value) of the correlation coefficient for all seven calculations far exceeds the educational standard of .05. Each correlation was significant at the .001 level. This shows a statistically significant relationship between the ACT English, mathematics, reading, and science subsection scores and the IGCSE exams in Biology, Mathematics, English First Language, English Literature, World History, and American History. Therefore, there is sufficient evidence to reject the null hypotheses of no relationship and to further accept an alternative hypothesis of an existing significant relationship between the two assessments.
Regression

The primary reason for running a regression analysis is to make predictions and determine how well the predictor variables can determine a future outcome (Laerd, 2018). This research was initiated to determine if a student’s Cambridge IGCSE PUM score can be used as a predictor for the student’s future performance on the ACT subject area tests. Because a sufficiently strong correlation exists between ACT subject area scores, the dependent variable, and IGCSE PUM scores, the independent variable, a linear regression can be used to project future values. R Square, denoted as $R^2$, is the correlation coefficient squared, and it describes how well the data fits the regression line. It explains the proportion of variance in the ACT scores, which can be predicted from the IGCSE scores. The Adjusted $R^2$ is altered to account for the number of predictor variables in relation to the sample size. $R^2$ and Adjusted $R^2$ should be close to the same; if they are not, it indicates a problem with the number of variables or the size of the sample (Laerd, 2018). The regression model is summarized in Table 10 and provides fit measures.
### Table 10.

**Regression Model Summary**

<table>
<thead>
<tr>
<th>IGCSE Subject Exams</th>
<th>ACT Subject Area</th>
<th>$r$</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>Mathematics</td>
<td>.670</td>
<td>.449</td>
<td>.446</td>
</tr>
<tr>
<td>First Language English</td>
<td>English</td>
<td>.656</td>
<td>.430</td>
<td>.428</td>
</tr>
<tr>
<td>English Literature</td>
<td>Reading</td>
<td>.583</td>
<td>.340</td>
<td>.338</td>
</tr>
<tr>
<td>World History</td>
<td>Reading</td>
<td>.681</td>
<td>.464</td>
<td>.462</td>
</tr>
<tr>
<td>American History</td>
<td>Reading</td>
<td>.573</td>
<td>.328</td>
<td>.326</td>
</tr>
<tr>
<td>Biology</td>
<td>Science</td>
<td>.664</td>
<td>.441</td>
<td>.439</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Science</td>
<td>.651</td>
<td>.424</td>
<td>.421</td>
</tr>
</tbody>
</table>

Note: The predictor variable is IGCSE PUM scores. The dependent variable is ACT scores.

The scatter plots in Appendix A illustrate the development of $R^2$ and provides a visual summary of the linear distribution of data. There are seven regression lines in Appendix A showing the line of best fit for all of the scores on the graph for each subject area. “The $R^2$ value expresses the magnitude of association between two sets of variables or sets of scores” (Creswell, 2015, p. 348).

- About 45 percent of the variation in the ACT Mathematics subject area scores can be attributed to the Cambridge IGCSE Mathematics PUM scores.
- About 43 percent of the variation in the ACT English subject area scores can be attributed to the Cambridge IGCSE First Language English PUM scores.
- About 34 percent of the variation in the ACT Reading subject area scores can be attributed to the Cambridge IGCSE English Literature PUM scores.
• About 46 percent of the variation in the ACT Reading subject area scores can be attributed to the Cambridge IGCSE World History PUM scores.

• About 32 percent of the variation in the ACT Reading subject area scores can be attributed to the Cambridge IGCSE American History PUM scores.

• About 44 percent of the variation in the ACT Science subject area scores can be attributed to the Cambridge IGCSE Biology PUM scores.

• About 42 percent of the variation in the ACT Science subject area scores can be attributed to the Cambridge IGCSE Chemistry PUM scores.

Based on the results produced by SPSS, Version23, the Cambridge IGCSE subject area exam PUM scores in this research proved to be significant predictors for the corresponding ACT subject area scores. After computing the regression statistics for this research, the data sets were combined into an overall correlation matrix, exhibited in Appendix B. The coefficients and constants shown in Table 11 were used to create regression equations for each subject area.
Table 11.

Coefficient of Determination Model Summary

<table>
<thead>
<tr>
<th>IGCSE Subject Exams</th>
<th>ACT Subject Area</th>
<th>Coefficient</th>
<th>Constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>Mathematics</td>
<td>.232</td>
<td>9.669</td>
</tr>
<tr>
<td>First Language English</td>
<td>English</td>
<td>.355</td>
<td>-.417</td>
</tr>
<tr>
<td>English Literature</td>
<td>Reading</td>
<td>.281</td>
<td>7.005</td>
</tr>
<tr>
<td>World History</td>
<td>Reading</td>
<td>.277</td>
<td>7.859</td>
</tr>
<tr>
<td>American History</td>
<td>Reading</td>
<td>.235</td>
<td>7.985</td>
</tr>
<tr>
<td>Biology</td>
<td>Science</td>
<td>.249</td>
<td>9.467</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Science</td>
<td>.280</td>
<td>8.413</td>
</tr>
</tbody>
</table>

Note: The predictor variable is IGCSE PUM scores. The dependent variable is ACT scores.

Using the slope formula, simple linear regressions equations were formed by multiplying the IGCSE PUM exam score by the coefficient of determination, then adding the constant, which produces the predicted ACT subject area score. Two of the four ACT subject areas, math and English, were simple regression equations, but the other two subject areas, reading and science, were extended to multiple regression equations.

**Mathematics.** The simple regression equation generated to find the predicted outcome for mathematics is \( \text{ACT math} = .232 \times (\text{PUM math}) + 9.669 \), where ACT math represents the ACT mathematics subscore, the dependent variable, and PUM math represents the Cambridge IGCSE mathematics exam PUM score, the independent variable. This linear regression equation can be used to make predictions about future ACT mathematics subject area scores.

**English.** The other simple linear equation used to predict future ACT subscores is the English subject area. The regression equation generated to find the predicted outcome for
English is ACT English = .355 (PUM English) + (-.417), where ACT English represents the predicted ACT English subject area score, the dependent variable, and PUM English represents the Cambridge IGCSE First Language English exam PUM score, the independent variable.

**Reading.** Three Cambridge IGCSE PUM exams, English literature, world history, and American history, were used in the prediction equation for ACT reading. First, each Cambridge IGCSE subject was used to create a simple linear regression. The equation using English literature was ACT reading = .281 (PUM lit) + 7.005, where ACT reading represents the ACT subject area score in reading, the dependent variable, and PUM lit represents the Cambridge IGCSE English literature exam PUM score, the independent variable. The second simple regression equation for the reading subject area was ACT reading = .277 (PUM WH) + 7.859, where PUM WH represent the Cambridge IGCSE World history exam PUM score. The third simple regression equation to predict reading was ACT reading = .235 (PUM AH) + 7.985, where PUM AH represents the Cambridge IGCSE American history exam PUM score.

Multiple regressions are used to predict the value of a dependent variable based on the value of two or more other independent variables. The relative contribution of each of the predictors allows for the best overall fit, using each independent variable in explaining variance (Laerd, 2018). The mixture of the three independent variables, English literature, world history, and American history, generated different constants and coefficients of determination, forming the following multiple linear regression equation for ACT reading:

\[
\text{ACT reading} = 0.062 \times \text{PUM lit} + 0.181 \times \text{PUM WH} + 0.089 \times \text{PUM AH} + 4.776
\]

**Science.** Like reading, the multiple regression equation for ACT science was formed by multiplying the related IGCSE PUM exam scores by the coefficient of determination for each contributing independent variable, plus the constants generated for those subject areas. In this
research, Cambridge IGCSE biology and chemistry are the two subject areas affecting ACT science. The simple linear regression equation involving IGCSE biology subject area scores was

\[
\text{ACT science} = .249 \ (\text{PUM biology}) + 9.467,
\]

where ACT science represents the ACT subject area score in science, the dependent variable, and PUM biology represents the Cambridge IGCSE biology exam PUM score, the independent variable. The other simple linear regression for science was

\[
\text{ACT science} = .280 \ (\text{PUM chem}) + 8.413,
\]

where PUM chem represents the Cambridge IGCSE chemistry exam PUM score. These two simple regression equations were extended to form the following multiple linear regression equation for science:

\[
\text{ACT science} = .175 \ (\text{PUM biology}) + .147 \ (\text{PUM chem}) + 6.556
\]

After using the simple regression equations to predict ACT scores for randomly chosen students out of the research sample, the multiple regression equation for reading and science was found to be more accurate. As an example, student number 14 was randomly chosen from the research sample. This student made an IGCSE Biology PUM score of 68 and a Chemistry PUM score of 51. The prediction results using both the simple regressions equations are:

\[
\begin{align*}
\text{ACT science} & = .249 \ (68) + 9.467 \\
& = 26.399
\end{align*}
\]

\[
\begin{align*}
\text{ACT science} & = .280 \ (51) + 8.413 \\
& = 22.693
\end{align*}
\]

Using the multiple linear regressions for science led to the following results:

\[
\begin{align*}
\text{ACT science} & = .175 \ (68) + .147 \ (51) + 6.556 \\
& = 25.953
\end{align*}
\]

The actual score student number 14 made on the ACT science section was a 26. As evident by the example, the multiple regression equation predicted a 25.953, which was the closest to the actual score with a difference of only .047.
Descriptive Statistics

The mean, median, and mode are obtained for a measure of central tendency to analyze the distribution of scores/values among the variables (Laerd, 2018). This information provides a snapshot of the typical CHS student performance level achieved on the Cambridge IGCSE and ACT assessments. These descriptive statistics are summarized in Table 12 for the Cambridge IGCSE exam PUM scores. As previously discussed in chapter one, Cambridge IGCSE PUM scores are graded on a scale of 20-100 (Table 3).

Table 12.

*Cambridge IGCSE Subject Area Exam PUM Score Descriptive Statistics*

<table>
<thead>
<tr>
<th>IGCSE Subject</th>
<th>Number</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>167</td>
<td>55.2814</td>
<td>55</td>
<td>48</td>
</tr>
<tr>
<td>First Lang English</td>
<td>307</td>
<td>57.1466</td>
<td>56</td>
<td>53</td>
</tr>
<tr>
<td>English Literature</td>
<td>319</td>
<td>43.0878</td>
<td>41</td>
<td>36</td>
</tr>
<tr>
<td>World History</td>
<td>318</td>
<td>43.6164</td>
<td>41</td>
<td>40</td>
</tr>
<tr>
<td>American History</td>
<td>299</td>
<td>45.9933</td>
<td>46</td>
<td>43</td>
</tr>
<tr>
<td>Biology</td>
<td>240</td>
<td>47.4083</td>
<td>46</td>
<td>45</td>
</tr>
<tr>
<td>Chemistry</td>
<td>220</td>
<td>44.5773</td>
<td>45</td>
<td>47</td>
</tr>
</tbody>
</table>

The mode is the score appearing the most often in the data set, and the median is the middle score in the distribution. The mean is the arithmetic average of the scores. The mean produces the lowest amount of error in prediction data, but it is drawn in the direction of the extremities (Laerd, 2018). ACT scores are disaggregated in Table 13. These measurements are included in the research for comparison to state and national ACT averages, which will be discussed in Chapter five.
Table 13.

*ACT Subject Area Test Score Descriptive Statistics*

<table>
<thead>
<tr>
<th>ACT Subject</th>
<th>Number</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>376</td>
<td>19.4149</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Reading</td>
<td>376</td>
<td>19.5346</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Mathematics</td>
<td>376</td>
<td>19.4681</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Science</td>
<td>376</td>
<td>19.8697</td>
<td>19</td>
<td>18</td>
</tr>
</tbody>
</table>

**College Readiness**

As previously discussed in chapter one, the ACT college and career readiness benchmarks, found in Table 1, will be compared to the Cambridge IGCSE college readiness thresholds, found in Table 2, to analyze curriculum effectiveness. The total number of CHS student ACT scores used in this research are shown in Table 14, along with the number and percent of those students who reached college readiness benchmarks set forth by ACT for each subject area.

Table 14.

*ACT Subject Area College Readiness Benchmark Achievers*

<table>
<thead>
<tr>
<th>ACT Subject</th>
<th>Number Tested</th>
<th>Number Met Threshold</th>
<th>Percent Met Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>376</td>
<td>221</td>
<td>58.8%</td>
</tr>
<tr>
<td>Reading</td>
<td>376</td>
<td>121</td>
<td>32.2%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>376</td>
<td>118</td>
<td>31.4%</td>
</tr>
<tr>
<td>Science</td>
<td>376</td>
<td>103</td>
<td>27.4%</td>
</tr>
</tbody>
</table>
The number of tested students achieving Cambridge IGCSE college ready qualification PUM scores established by the Technical Advisory Committee for the National Center on Education and the Economy (NCEE) are presented in Table 15, as well as, the total number of CHS students who took each Cambridge IGCSE exam and the percent of those tested students meeting college readiness thresholds.

Table 15.

*Cambridge IGCSE Subject Area College Readiness Threshold Achievers*

<table>
<thead>
<tr>
<th>IGCSE Subject</th>
<th>Number Tested</th>
<th>Number Met Benchmark</th>
<th>Percent Met Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>167</td>
<td>31</td>
<td>18.6%</td>
</tr>
<tr>
<td>First Language English</td>
<td>307</td>
<td>41</td>
<td>13.4%</td>
</tr>
<tr>
<td>English Literature</td>
<td>319</td>
<td>21</td>
<td>6.6%</td>
</tr>
<tr>
<td>World History</td>
<td>318</td>
<td>51</td>
<td>16%</td>
</tr>
<tr>
<td>American History</td>
<td>299</td>
<td>51</td>
<td>17%</td>
</tr>
<tr>
<td>Biology</td>
<td>240</td>
<td>49</td>
<td>20.4%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>220</td>
<td>24</td>
<td>10.9%</td>
</tr>
</tbody>
</table>

Of the students who made the Cambridge IGCSE college readiness PUM score for each subject, the number of those same students who also reached the corresponding ACT subject college readiness benchmark are counted. These statistics are provided in Table 16, along with the percentage of college ready IGCSE students according to PUM subject scores who also achieved the ACT college readiness benchmark in the corresponding ACT subject area.
Table 16.

*College Readiness Achievers for both Cambridge IGCSE and ACT by Subject*

<table>
<thead>
<tr>
<th>IGCSE Subject Exams</th>
<th>ACT Subject Area</th>
<th>Number met IGCSE &amp; ACT subject CR</th>
<th>Number met IGCSE, but not ACT subject CR</th>
<th>Percent of IGCSE CR who are also ACT CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>Mathematics</td>
<td>31</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>First Language English</td>
<td>English</td>
<td>41</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>English Literature</td>
<td>Reading</td>
<td>17</td>
<td>4</td>
<td>80%</td>
</tr>
<tr>
<td>World History</td>
<td>Reading</td>
<td>45</td>
<td>6</td>
<td>88%</td>
</tr>
<tr>
<td>American History</td>
<td>Reading</td>
<td>36</td>
<td>15</td>
<td>71%</td>
</tr>
<tr>
<td>Biology</td>
<td>Science</td>
<td>44</td>
<td>5</td>
<td>90%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Science</td>
<td>24</td>
<td>0</td>
<td>100%</td>
</tr>
</tbody>
</table>

The results discovered in this chapter of the research have been used to compare the Cambridge IGCSE subject area exams college ready baselines to the well established ACT college and career readiness benchmarks. In the next chapter, the findings will be interpreted, and the implication of the research will be analyzed as it pertains to students, schools, and states. An elaboration of the IGCSE curriculum effectiveness in preparing students for college and as an innovative alternative for Mississippi schools will also be examined. Suggestions for future research will be made stemming from the evidence gathered on the performance of CHS student on the ACT and Cambridge IGCSE exams. Chapter five will present a full discussion of the research results and their practical application for practice.
CHAPTER V: DISCUSSION

The overall purpose of this study was to determine if a relationship exists between the Cambridge International General Certificate of Secondary Education (IGCSE) subject area exam results and the corresponding ACT subjects area scores, focusing on the college ready qualification PUM score thresholds and the ACT college readiness benchmarks. Once the existence of a relationship was determined in chapter four, research was directed toward the degree of association between scores, which could reveal the effectiveness of Cambridge IGCSE in preparing students for higher learning and indicate the level of predictiveness between college readiness measurements of the paired assessments. The initial subject area comparisons were split into seven research questions.

1. Is there a relationship between Cambridge IGCSE Mathematics assessment and mathematics subsection score from the ACT?

2. Is there a relationship between Cambridge IGCSE First Language English assessment and English subsection score from the ACT?

3. Is there a relationship between Cambridge IGCSE English Literature assessment and English subsection score from the ACT?

4. Is there a relationship between Cambridge IGCSE World History assessment and reading subsection score from the ACT?

5. Is there a relationship between Cambridge IGCSE American History assessment and reading subsection score from the ACT?
6. Is there a relationship between Cambridge IGCSE Biology assessment and science subsection score from the ACT?

7. Is there a relationship between Cambridge IGCSE Chemistry assessment and science subsection score from the ACT?

**Summary of Findings**

The scatter plots in Appendix A demonstrate the distribution of the variables and elaborate $R$ squared ($R^2$), which is the proportion of variance shared by both variables (Laerd, 2018). For the seven comparisons in this research, the amount of variation, which can be explained by the correlation, ranges from 32 to 46 percent. Thus, in answer to the seven original research questions, a sufficient relationship does exist between the performance outcomes of the English, mathematics, reading, and science subsections of the ACT in regard to the Biology, Mathematics, English First Language, English Literature, World History, and American History IGCSE exams. More specifically, a strong positive correlation exists; based on the guidelines provided by Laerd Statistics (2018), a strong correlation exists between variables when the Pearson correlation coefficient ($r$) measures between .5 and 1.0. All seven correlations in this research were positive ($r > 0$), which means the variables increase together. Furthermore, all seven correlations easily fell into the strong correlation category. In general, as the Cambridge IGCSE subject exam PUM scores go up, the ACT subject area scores go up.

The ex post facto data from the 2015, 2016, and 2017 Spring administrations of the ACT for 376 Corinth High School (CHS) students along with the IGSCE PUM scores of those same students comprising the research sample indicated the strongest positive correlation between the ACT reading subject area test and the Cambridge IGCSE World History exam with a coefficient of .681, while the weakest correlation, American History, was only .573. Although both history
courses demonstrated a great degree of coherence to reading, the World History was exceptionally close-fitted, even above English Literature with a .583 coefficient. This was somewhat surprising since reading is the foundation of literature. As expected, the Cambridge IGCSE First Language English aligned very closely to the ACT English \((r = .656)\), but not as tightly as the Mathematics exam scores aligned \((r = .670)\). Likewise, the science subsection of the ACT correlated slightly stronger to the IGCSE Biology with a .664, in preference to the Chemistry with a .651. This information can be found in Tables 9 and 10.

ACT scores showed a significant positive correlation to Cambridge IGCSE scores accounting for a given percent of the variance. Typically, \(R^2\) is less than 50 percent for research involving the prediction of human behavior, unlike precise technical numeric fields (Cohen, 1988). Statisticians differ in their opinion of \(R^2\) values adequate for prediction. Falk and Miller (1992) considered 0.10 or more to be acceptable in the explanation of variance, but according to Chin (1998), 0.19 or less represents weak explaining power, with 0.33 to be moderate, and 0.67 or more to be substantial. Cohen (1988) suggested 0.13 to be moderately explanatory, 0.02 or less as inadequate, and 0.26 to be highly explanatory. Based on these numbers, Cambridge IGCSE subject area exam PUM scores are moderately to highly predictive of future ACT student performance with \(R^2\) accounting for a range of 32 to 46 percent of the variation. Scholars agree, however, criterion on acceptable \(R^2\) is relevant to the complexity of the research and should be taken into consideration with significant coefficients and other relevant statistics.

**Implications and Interpretation**

The exceptional degree of correlation between the two assessment results illustrates the effective use of the Cambridge curriculum in preparing students for the ACT and college or career success. Although human beings are not completely predictable, due to the immeasurable
conditions affecting the human psyche, correlation results in Table 9, regression analysis summarized in Table 10, and the linear distribution of data in Figures 3 through 9, located in Appendix A, provide evidence for the potential use of Cambridge IGCSE exam PUM scores in the general prediction of future ACT subject area achievement.

The comparison of the percentage of students reaching college readiness benchmarks set by ACT (Table 14) verses Cambridge IGCSE (Table 15) college readiness thresholds brought an anomaly to light. Approximately one third of the students tested scored well enough to be considered college ready in reading, mathematics, and science according to the ACT benchmarks, and well above half of the English scores met the college readiness standards. When compared to the Cambridge IGCSE college readiness threshold in Figure 1 below, the results are rather stunning.

![Figure 1. Percent of students achieving College Readiness marks set by assessments](image)

As shown in Table 15, as well as Figure 1, only 20 percent of the IGCSE Biology PUM scores reached the college ready threshold set for Cambridge. The percentage of scores for five
of the seven IGCSE subjects achieving college readiness was in the teens, while the percentage of college-readiness fell below ten percent in English Literature. The two most dramatic contrasts between ACT and Cambridge college readiness measures was in the IGCSE First Language English compared to ACT English and IGCSE English Literature subject exams compared to ACT Reading. According to ACT standards, 32 percent of students reached college readiness in reading; meaning, they are prepared for reading based college courses, which includes literature, world history, and American history. Yet, only 6.6 percent of students reached Cambridge IGCSE English Literature college readiness thresholds. Similarly, 58.8 percent of students are ready for freshman college English according to ACT standards, whereas only 13.4 percent of students scored high enough to be considered college ready by Cambridge IGCSE thresholds. The Cambridge IGCSE thresholds suggest fewer students are ready for college in comparison to the ACT benchmarks. This discrepancy might imply the college readiness thresholds set for Cambridge IGCSE subjects are more stringent than those for ACT. This does not contradict the strong correlation of the scores, however, they still fluctuate up and down together; but the college readiness thresholds set for Cambridge keeps the percentage of students marked college-ready low by the set standards. Because Cambridge college readiness thresholds are lower than ACT college readiness benchmarks, almost all of the students considered ready for college by Cambridge ICSE also reach the college ready mark for ACT as presented in Table 16.

Regardless of the preset college readiness scores set for both the ACT and Cambridge IGCSE assessments, analysis of the descriptive statistics in Table 13 shows a strong academic preparation for collegiate level courses. In 2017, Mississippi’s average ACT English subscore was 18.2, while the CHS sample group averaged 19.4 on the same measure. The mathematics
mean for the state was 18.1, but the study district reached 19.5. In reading, Mississippi averaged 18.8 while CHS averaged 19.5. The mean score for the state’s science scores was also 18.8, whereas the district mean reached 19.9 (ACT, 2017c). The comparison of district, state, and national ACT subject area averages in Figure 2 provides visual evidence of the effectiveness of the Cambridge curriculum in the setting at Corinth High School.

![Figure 2. ACT Mean Score Comparisons](image)

Although the district hasn’t reached national ACT averages, it is far closer than the majority of other districts in the state of Mississippi. The analysis shows the overall mean of ACT subject scores attained by students educated under the Cambridge curriculum exceeds the state average of Mississippi students in all four subtest areas. Before the mandated Spring 2015 ACT statewide testing for juniors in Mississippi, overall district ACT averages for a grade were not made available. Also, taking the ACT was voluntary. Now, students are required to take the ACT as part of the state assessment program, which can lead to skewed results compared to previous testing.
**Limitations**

This study was limited to the spring administration of the ACT taken by eleventh grade students at Corinth High School in 2015, 2016, and 2017. Students are required to take the ACT at CHS, but there are no individual consequences for poor performance. The previous state testing program for Mississippi required students to pass four subject area assessments in order to graduate high school. For the Cambridge and ACT assessments, results are contingent upon students putting forth their best effort. Ambitious students working for a college scholarship or the Advanced International Certificate of Education (AICE) diploma normally put forth their best effort. Some students taking IGCSE exams receive a NG (No Grade), which is an upgradeable score below 20. This lack of initiative could be due to little incentive to achieve, a low level of persistence by students, or a lack of commitment by students or possibly teachers. Also, students who transfer into Corinth are enrolling in a completely different curriculum and may not perform as well as students with multiple years of Cambridge exposure. This is particularly true for math because Cambridge mathematics is not divided into subjects, such as Algebra, Geometry, etc. It is a continuous, merged curriculum.

The current research does not explore the influence of various Cambridge IGCSE courses or the number of years in which students participate in the curriculum. Data is limited to one innovative high school in Northeast Mississippi. Therefore, it cannot compare the effects of the Cambridge curriculum verses school climate or other instructional practices. The current research sample is also limited on the number of years students received a Cambridge education. Research results could be different in twelve years, after students have been enrolled in a Cambridge school since kindergarten.
Future Research Directions

AICE. This study only compared the Spring ACT subscores of juniors to seven Cambridge IGCSE subjects taken beforehand. Perhaps the scores of senior level AICE students more closely aligns to their ACT subscores than their freshman level PUM scores. A study of ACT scores in relationship to honor students separated by AICE diploma levels (distinction, merit, or pass level) would be particularly valuable to innovative schools attempting to set diploma tracks. Also, it would be interesting to compare the PUM scores of students at different grade levels.

Longitudinal. Students’ coursework, achievement, and experiences throughout their school years can influence scores, and students mature with each passing year in high school. In this research, students were taking the ACT and the Cambridge IGCSE courses prior to their senior year. A longitudinal study may render pertinent results.

Timing. Although composite scores were not used for this particular study; correlating composite scores through consecutive years may provide information on the effects of the Cambridge curriculum over time on a student’s academic performance. Questions might abound concerning the “time” issue such as: Does the time frame when students take a course make a difference in ACT performance? Is the distance from subject area exams and college entrance exams too far apart to sway results? To what level do eighth or ninth grade courses impact ACT scores? Are senior level courses taken too late to impact ACT scores? Could there be a potential timeline or course sequence bearing influence over college entrance exam results? Academic interventions obviously need to happen at the correct time to be most useful, and future research could determine the most effective timing.
Repeted efforts. Students with financial constraints often take the ACT only once or twice beginning their junior year in Mississippi because they are allowed fee-waivers, but the majority of students take the ACT multiple times in pursuit of a higher score. Research using the highest ACT score achieved in comparison to Cambridge IGCSE scores would provide noteworthy information and possibly more comprehensive results. The state-mandated ACT testing of eleventh graders in Mississippi created a homogenous setting for the research sample, but it would be intriguing to compare the students top ACT score to Cambridge PUM scores to determine if there is a closer correlation for high achieving students. Cambridge could be more favorable or more predictive for upper level students.

Ability level comparison. An untapped area of research is whether high and low ability students are achieving similarly on both assessments, or are they achieving the same level of performance on the ACT as they are on the IGCSE exams? An analysis of success with regard to race, gender, and socioeconomic status could also provide thought provoking results. How students envision themselves, parental influence, social background, and college aspirations can affect ACT performance and college readiness. Can Cambridge overcome these influences?

Additional correlations. Future research may focus on identifying which subjects are the best predictors for overall ACT performance. In the current study, the Cambridge IGCSE courses were matched with the ACT subject areas most closely aligned with college freshman courses according to ACT, as formerly addressed. It would be interesting, however, to research various ACT/IGCSE subject area alignments. Perhaps, Cambridge IGCSE English Literature may correlate more closely with ACT English than reading. It is likely the important role of language proficiency would show a significant correlation with most subject areas. Different IGCSE courses may better predict ACT success in different subject areas scores more effectively.
or have more influence on the composite score. Questions such as, “Which Cambridge IGCSE subject is the best overall predictor of ACT performance?” and “Can a common scale connecting Cambridge scores and objectives to predicted ACT scores and objectives be made for future reference?” should be asked. Research into specific relationships and course completion could allow educators to intervene with academically weak students more precisely. Research could extend into determining if long-term interventions, include a recommended course sequence, to produce greater increases ACT performance.

**Beyond college readiness.** A comparison of actual and predicted college performance based on Cambridge IGCSE college readiness thresholds would be valuable. There is a substantial amount of research on ACT college ready benchmarks and related accomplishment, but comparing actual college success based on the IGCSE PUM scores, rather than the ACT scores, could produce surprising results. The IGCSE scores could be a better college readiness marker than ACT scores, which were designed as a predictor of college performance. The two assessments measure academic ability differently, but correlate strongly. Research in the future should examine if Cambridge IGCSE exams are predictive of subsequent college performance. Examples of questions guiding this research could include: How well does Cambridge educated students perform in college? Are they more successful in college academics than those who did not participate in Cambridge?

**Qualitative research.** In the current research, Pearson’s $r$ indicates a sound degree of relationship between the Cambridge Assessments and the ACT. The Cambridge high school model is effective, as evidenced by this study. Future qualitative research determining the features of Cambridge leading to these positive results or research identifying the overlapping
content standards in order to extend improved ACT outcomes would help the state of Mississippi.

**Other models of innovation.** A comparison of ACT scores from other Mississippi innovative pilot programs could also benefit schools in the state. It would be particularly interesting to compare the Cambridge IGCSE pilot program to the ACT Career and College Readiness pilot program in Mississippi to see which curriculum demonstrates the greatest improvement in ACT scores and future college performance. Research might focus on determining whether the broader curriculum of Cambridge IGCSE can actually increase ACT scores more than the ACT produced curriculum specifically designed for that purpose. Additionally, new research might determine how students educated under different pilot programs compare later in actual college performance.

**Practical Applications**

Government, both federal and state, plays a significant role in the current state of K-12 education. Curricula chosen by the state affects the ACT outcomes of most schools. Expansion of the Cambridge IGCSE pilot program is warranted based on the outcomes of the current research. Cambridge IGCSE PUM scores at CHS were assessed as prospective predictors of ACT subscores. The four subscores of the ACT and Cambridge IGCSE PUM scores were collected for students taking Cambridge First Language English, English Literature, Mathematics, Biology, Chemistry, World History, and American History. The results from the descriptive analysis show differences in the means across subject areas, at the school level, and these results are compared to the state level in Figure 2. CHS had higher average ACT scores in all four subject-areas ranging from a 0.7 point increase in reading to a 1.4 point increase in math. This may seem insignificant, but the affects of a similar increase for the state of Mississippi
could be huge. “ACT research estimates that an increase of 0.1 in state average ACT composite scores for the 2017 graduating class would result in: 79 more students enrolling in college; 94 more students persisting to year two; 84 fewer students needing remedial English; 161 fewer students needing remedial math; 104 more students persisting to year four; and 109 more students earning a postsecondary degree within six year” (ACT, 2017c, p.2). Those numbers are based on an increase of only 0.1 point on the ACT score. When multiplied by the increased mean of ACT scores for the sample in this study, ranging from seven-tenths of a point to 1.4 points, the impact on college access and opportunity for the state of Mississippi would be tremendous. These outcomes suggest students educated under the Cambridge IGCSE pilot program are likely to achieve higher ACT scores, thus improved college opportunities and attainment than their peers attending traditional schools in Mississippi.

Preparing students for their academic or employment future is a primary goal for K-12 schools. The Cambridge IGCSE subject exam PUM scores may be used to identify students who could encounter future problems on the ACT. A comprehensive intervention program, specifically for ACT content knowledge, based on IGCSE scores could provide feasible and targeted academic strategies for improvement. If struggling students are identified early, educators can be proactive in their remediation. The impact of remediation may not be as effective if schools wait until the eleventh grade ACT test to start. The sooner inadequate college readiness skills are identified, the more time there is to develop and improve students academically before taking the ACT.

Based on the evidence in the current research, schools and administrators could use IGCSE PUM scores to evaluate and flag students who are falling behind on college readiness after each Cambridge IGCSE exam. Professional development connecting Cambridge objectives
to ACT objectives could further provide teachers the opportunity to increase ACT scores through individualized ACT prep material. Using Cambridge IGCSE exam data to detect impending college or career readiness issues without costing students or parents additional money for ACT test prep books or ACT prep courses would also benefit parents and students. Educators could notify parents of potential problems and use Cambridge exam results to preemptively fill in the learning blanks before the ACT assessment. Ideally, interventions should begin in middle school, beginning with the first Cambridge IGCSE exam.

**Conclusion**

The current research provides validation of the positive effect of the Cambridge IGCSE curriculum in preparing students for the ACT and the rigors of college. The findings are relevant to students, parents, schools in the Cambridge education communities, and the state of Mississippi in the selection of alternative curricula. The students in this research sample are typical Mississippi students, and their achievements could be replicated in other districts throughout the state. Corinth School District has received many benefits from the Cambridge program, including an increase in the number of Mississippi Eminent Scholars, which requires a minimum of a 29 on the ACT, and in turn an increase in academic scholarships for students (Mississippi Institutions of Higher Learning, 2017).

This study provides hope to schools in Mississippi, many facing demoralizing challenges and disadvantages. Students attending Corinth High School under the Cambridge IGCSE pilot program for the state of Mississippi achieved a performance boost in the mean of all ACT subtests. If the Cambridge curriculum can be effective in preparing students for their academic future in Corinth, it can be done elsewhere in the state. As evidenced by the regression equations presented in this study, Cambridge IGCSE PUM scores were proven highly predictive of ACT
performance. This leads to the use of Cambridge IGCSE exams to diagnose and guide instruction by identifying students who are not progressing and adjusting to instructional practices accordingly. This immediate help and tailored instruction from Cambridge IGCSE exam data can increase the accountability ratings for low performing schools. Improving ACT scores give Cambridge schools an advantage in meeting the revised accountability standards in Mississippi.

Since ACT is an established determinant of college readiness, using Cambridge as a diagnostic assessment to improve ACT scores will theoretically lead to improved student achievement in institutions of higher learning. This is good news for Mississippi in its attempt to overcome college attendance barriers. If the Cambridge program were adopted and successfully implemented by more schools in Mississippi, there would be an increase in the number of students prepared for college and perhaps increase the number of college graduates.

All students in Mississippi take the ACT. This research provides a broad sketch for the state of effectiveness of a Cambridge IGCSE education in preparation for the ACT. Students attending CHS exhibited a greater degree of college and career readiness than their peers, giving them a marked advantage of success in institutions of higher learning and in the workforce. Based on evidence in the current research, students educated under the Cambridge program, and the schools they attend, receive the additional benefit of higher performance on the ACT. ACT scores are used in Mississippi’s accountability model, which ties school ranking to student performance. It is in the best interest of the state, the schools, and the students, to implement curricula to better prepare students for college and build a strong educational foundation for their academic future or career. The Cambridge program has exhibited these traits through the high correlation to ACT subject area scores in this research.
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LIST OF APPENDICES
Figure 3. Scatter Plot with Fit Line of IGCSE Mathematics by ACT Mathematics.

\[ R^2 \text{ Linear} = 0.449. \]

Figure 4. Scatter Plot with Fit Line of IGCSE First Language English by ACT English.

\[ R^2 \text{ Linear} = 0.430. \]
Figure 5. Scatter Plot with Fit Line of IGCSE English Literature by ACT Reading.

$R^2$ Linear = 0.340.

Figure 6. Scatter Plot with Fit Line of IGCSE World History by ACT Reading.

$R^2$ Linear = 0.464.
Figure 7. Scatter Plot with Fit Line of IGCSE American History by ACT Reading.

\[ R^2 \text{ Linear} = 0.328. \]

Figure 8. Scatter Plot with Fit Line of IGCSE Biology by ACT Science.

\[ R^2 \text{ Linear} = 0.441. \]
Figure 9. Scatter Plot with Fit Line of IGCSE Chemistry by ACT Science.

$R^2$ Linear = .424
APPENDIX B
Table 17.

Correlation Matrix

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VITA

DANE N. AUBÉ

EDUCATION

Harvard Graduate School of Education, Cambridge, MA
Principal Center Summer Institute: The Art & Craft of the Principalship, 1998

University of Southern Mississippi, Hattiesburg, MS
M.Ed., Education Administration, 1998

University of Southern Mississippi, Hattiesburg, MS

Pearl River Community College, Poplarville, MS
A.A., Computer Science, 1987

PROFESSIONAL EXPERIENCE

Corinth School District, Corinth, MS
Corinth High School Principal, 2014-present
University of Mississippi, Oxford, MS
Principal Corp Graduate Assistant, Summer 2014

Hancock County School District, Kiln, MS
H Hancock County Middle School Principal, 2008-2014

Covington County School District, Collins, MS
Special Education Director, Testing, Curriculum, & Special Programs, 2003-2008
Alternative School Principal & District Test Coordinator, 2000-2003
Collins High School Assistant Principal, 1997-2000

HONORS

4th Congressional Administrator of the Year, 2013
Hancock County Administrator of the Year, 2012-13
Seminary STAR Teacher of the Year, 1998
Collins Teacher of the Year, 1997
MS Forensics League Coach of the Year, 1997
Phi Rho Pi Award, 1985 & 1987

PRESENTATIONS

Mississippi Counselors Association, 2017
Mississippi School Board Association Annual Conference, 2017
World Schools Conference, University of Cambridge England, 2015
Cambridge Leadership for Learners, 2015

MAMLE State Conference, 2011 & 2012