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Students' Performance on Institutional Learning Outcomes

Cheryl R. Norman
St. Cloud State University, crnorman@stcloudstate.edu

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Students’ Performance on Institutional Learning Outcomes

by

Cheryl Ruth Norman

A Dissertation

Submitted to the Graduate Faculty of

St. Cloud State University

in Partial Fulfillment of the Requirements

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Doctor of Education

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Dissertation Committee:
Michael Mills, Chairperson
Frances Kayona
Steven McCullar
Krista Soria
Abstract

In response to increased attention within higher education to develop essential learning outcomes, faculty and administrators have worked to measure students’ performance in relation to these outcomes. Students’ learning is often measured through standardized tests or students’ perception of their learning, rather than authentic learning that is connected to the curriculum. This study incorporated results from one institution’s involvement in the Association of American Colleges and Universities (AAC&U) project to assess learning outcomes using the Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics. The learning outcomes assessed included critical thinking, quantitative literacy, and written communication. The purpose of this quantitative study was to identify relationships between students’ demographic background characteristics, collegiate experiences, and performance on three learning outcomes. The independent variables included race/ethnicity, age, gender, socioeconomic status, program of study, credit hours and degree level. Astin’s I-E-O model was used as a framework for my study to determine whether students grow or change differently based on the characteristics students bring to college and what they experience in college, and compared these variables with their performances on outcomes after exposure to the environment. The institution was a Midwestern 2-year public community college. Data collected were analyzed using multiple linear regressions to determine which independent variables had statistically significant relationships with higher scores on the three learning outcomes. The findings suggested that health majors and students’ increase in age scored higher in critical thinking, African American students and business and math majors scored higher in quantitative literacy, and females and Asian students scored lower in critical thinking.
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Chapter I: Introduction

Students’ learning is often measured through standardized tests, students’ self-reported evaluation of their learning, or the grades that instructors apply to the assignments students complete that culminates in final semester grades (Berrett, 2016). Those measures of learning are often faulty because standardized tests are not connected to the curriculum, self-reported attitudes regarding learning may not be accurate, and grades do not always reflect how much a student has learned. For decades, higher education has been accused of having a lack of accountability in measuring student learning. The public places pressure upon higher education institutions to carry out assessments of what, and how much, students are learning and to ensure that students are progressing in their learning from point of entry to exit in college (Blaich & Wise, 2011). Yet, even with this focus on student learning, evidence regarding the factors that have a positive impact on student learning remains scarce (Stes, Maeyer, Gijbels, & Petegem, 2012).

In response to public pressures and accreditation requirements, higher education administrators and faculty have worked to establish student learning outcomes—and systems of assessment for those outcomes—at their institutions. Student learning outcomes assessment in higher education is designed to evaluate the effectiveness of teaching, while gaining an understanding of the outcomes students have learned. The assessment and evaluation of teaching and learning is potentially unclear; therefore, it is beneficial to define assessment of learning outcomes, consider why we assess learning outcomes, and understand how to use assessment on college campuses. Accrediting bodies have required higher education institutions to assess student learning to be accountable in collecting data and transparent in reporting information regarding student performance on institutional learning outcomes (Blaich & Wise, 2011).
According to Berrett (2016), accountability requires proof beyond grade-point averages, that students have learned something. However, with all of these measures in place, there remains a gap in the literature regarding evidence of what, and how much, students are actually learning while enrolled in higher education (Berrett, 2016; Harward, 2007; Kuh, Ilkenberry, Ewell, Hutchings, & Kinzie, 2015).

According to Astin, “outcomes refers to the student’s characteristics after exposure to the environment” (1993, p. 7). Types of outcomes include intellective and affective domains and consist of higher-order reasoning and logic as well as student’s attitudes, values, and behaviors (Astin, 1993). Identifying essential learning outcomes in higher education has developed over the last three decades (Kuh et al., 2015). The Association of American Colleges & Universities (2017) has developed essential learning outcomes for liberal education that includes knowledge of human cultures and the physical natural world, intellectual and practical skills, personal and social responsibility, and integrative and applied learning. The Wabash National Study of Liberal Arts Education (2006) included the following outcomes in their study of liberal education: integration of learning, inclination to inquire and lifelong learning, effective reasoning and problem solving, moral character, intercultural effectiveness, leadership, and well-being. The Bringing Theory to Practice Project focuses on deeper levels of framing and describing outcomes to understand the core purposes of liberal education to determine whether students are achieving those core outcomes (Harward, 2007). Harward argues that there is a need in undergraduate learning to assess real learning and development of students in the areas of argument, critical skills, and analytical and synthetic thinking and expression.

Recent work in the assessment of student learning outcomes has moved from standardized tests or students’ self-reported evaluation of their learning to the use of rubrics to
assess authentic student work (Kuh et al., 2015). Rubrics measure authentic student work evidenced in homework and papers that students regularly produce to make a fundamental connection to the daily work of education (Berrett, 2016). The rubric tool offers an approach that is closer to the action of teaching to assess learning outcomes (Kuh et al.).

According to Kuh et al. (2015), “the process of assessment has taken precedence over the use of its findings to improve student success and educational effectiveness” (para. 5). To make any kind of impact on learning, assessment needs to be actionable, concentrated on the use of its findings, and focused on the needs and interests of its end users. The lack of data analysis of learning outcomes leads to an absence of actions that would lead to an increase in student learning (Wabash National Study, 2011). What this implies is that institutions of higher education are collecting data and not using results to make informed decisions about how students are learning or what can lead to improvements in learning. A deeper level of attending to outcomes might involve and lead to a deeper understanding of what, and how much, students are learning in higher education (Ewell, 2010; Harward, 2007).

My study analyzed previously collected data that assessed three specific institutional learning outcomes of critical thinking, quantitative literacy and written communication using the Association of American Colleges and Universities (AAC&U) Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics. Faculty from this particular institution submitted student samples taken from class assignments. The VALUE rubrics contain a common definition and set of criteria, used to score the student samples. My analysis used the raw data collected to make informed decisions on how student demographics and other characteristics influence performance on institutional learning outcomes. Results from this study include implications for theory, practice, and future research.
Statement of the Problem

One issue facing student performance on learning outcomes is the fact that individuals within higher education do not have a clear picture of how to pinpoint how much (or how well) students learn, and do not use assessment information to improve students’ success (Blaich & Wise, 2011; Ewell, 2010; Harward, 2007; Tremblay, Lalancette, & Roseveare, 2012). College and university faculty and administrators are looking for effective ways to support students’ success; however, in the past few decades, the focus has been on retention and completion initiatives (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2011). The Obama administration pushed the completion agenda to increase the number of Americans who hold a postsecondary credential, including an increase in the focus on certificate and associate degrees obtained from community colleges (Fain, 2016). Despite all this focus, retention rates have not improved over the years.

According to Tremblay et al. (2012), while it would appear that learning outcomes in systems of higher education would be important to track and analyze, the data remains scarce in many higher education institutions. Relatively few college and university personnel are using assessment data information to communicate the findings to their campus communities, and rarer still are institutions that are using the information to lead to an increase in student success (Blaich & Wise, 2011). Meaningful and valuable assessments produce a level of transparency that allow students to work toward outcome attainment because of attending a particular institution.

There may be a similar set of institutional learning outcomes across colleges and universities, but there is not a common definition or set of criterion assigned to institutional learning outcomes. The nonexistence of common institutional learning outcome definitions and
criteria leads to difficulty in comparing data on the assessment of institutional learning outcomes across institutions. To provide baseline standards for institutions, AAC&U developed the VALUE rubrics to create common definitions and criteria to measure and compare institutional learning outcomes across colleges and universities (AAC&U, 2014). The implementation of the VALUE rubrics across higher educational settings is in its infancy; therefore, there is a lack of research on the use of this tool to measure student learning. To my knowledge, this is the first dissertation conducted that reviews student performance on institutional learning outcomes using the AAC&U VALUE rubrics.

**Description and Scope of the Research**

Assessment is a means of answering questions about educational best practice, and how to achieve our educational intentions about what—and how well—students learn (Maki, 2004). According to Maki (2004), “a systemic and systematic process of examining student work against our standards of judgment enables us to determine the fit between what we expect our students to be able to demonstrate or represent and what they actually do demonstrate” (p. 2). Learning is the foundational knowledge, abilities, values, and attitudes that an institution desires to develop in students (Maki, 2004). The scope of this research is to identify student performance represented in authentic student work (identified as artifacts), and scored using the AAC&U VALUE rubrics. The AAC&U VALUE rubrics create a systematic process to define what students should be able to demonstrate and to score artifacts to identify students’ performance on learning outcomes.

The study used three learning outcomes that are central to the values and integral to the work at the institution and includes critical thinking, quantitative literacy, and written communication. Two of the three learning outcomes, critical thinking and written
communication, were core general education competency areas the institution recognized as institutional learning outcomes. Quantitative literacy, the third learning outcome under study, was an area of struggle for students at this, and many other, two-year community colleges. In fact, according to placement testing, 10% of students enter college prepared to enroll in college-level math courses and 90% test into developmental levels of math (Office of Strategy, Planning & Accountability, 2016). One of the institution’s strategic priorities, chosen to improve the quality of education it offers students, was instruction in mathematics. The study was a starting point in evaluating data to demonstrate how students perform on institutional learning outcomes, and evaluated significant findings from the data.

Learning is multi-dimensional, revealed in performance over time, and is affected by a number of demographic and collegiate variables. The study analyzed existing data taken from a collaborative project that includes five public and five private colleges and universities that used the AAC&U VALUE rubrics to assess institutional learning outcomes. The rubrics are assessment tools that include definitions and criteria that involve not only knowledge, but also values, attitudes, and habits of mind. Student performance measures the “benchmark” starting point for learning, “milestones” progress accomplished performance, and the “capstone” culminating level of achievement (Rhodes & Finley, 2013).

According to Goodrich-Andrade (2000), rubrics are easy to use, make sense at a glance, include clear expectations, and provides student feedback about their strengths and areas of needed improvement. Instructors use rubrics to evaluate learning outcomes, develop effective coursework to help students gain knowledge in the intended learning outcome, and provide students with feedback on specific criteria.
The existing data used in the study is from a collaborative project using the AAC&U VALUE rubrics. It is worth clarifying the distinctions between the AAC&U multi-state project, the work of the institution, and the significance of my study.

**Association of American Colleges and Universities Multi-State Project**

The AAC&U Multi-State Collaborative to Advance Quality Student Learning was an acronym-laden project measuring outcomes to provide insight into student learning (Berrett, 2016). The project included a large-scale, novel approach, with strong faculty support intended to make a large impact on understanding student performance on important learning outcomes of a college education (Berrett, 2016). Faculty members from over 100 institutions in 2009 developed the VALUE rubrics under guidance of AAC&U (Berrett, 2016). Rubrics have a scale ranging from 0-4 to evaluate how students demonstrate various criteria of each outcome. The project involved 900 faculty members at 80 public two- and four-year institutions in 13 states. The pilot study assessed 7,000 samples of student work (Carnahan, 2015). According to Carnahan, the multi-state collaborative in its pilot year “tested the feasibility of cross-state and cross-institutional efforts to document student achievement without using standardized tests and without requiring students to do any additional work or testing outside their regular curricular requirements” (2015, para 5). Data about student achievement of key learning outcomes used a common rubric-based assessment approach. The data generated has shown limited use in making decisions that lead to an increase in students’ performance on these learning outcomes. This project produced the rubrics and outcome criteria used to evaluate the student assignment artifacts included in this study to assess the three institutional learning outcomes.

**State Collaborative Project**
AAC&U decided to implement a collaborative project within one state. The two-year community college used in my study was included in a specific pilot endeavor focused on five private and five public two- and four-year institutions. The institution committed to measure six outcomes over three years to obtain data on the assessment of student learning. Faculty members and staff from the ten institutions received training in scoring student work samples. Faculty members across disciplines at this two-year institution submitted student work samples (artifacts) that focused on the institutional learning outcomes of critical thinking, quantitative literacy, and written communication. Artifact submission into TaskStream, a nationwide database, led to scoring by individuals trained in applying the AAC&U VALUE rubrics. Faculty members from the institution who submitted student artifacts, received raw scores produced from the rubric scores tabulated by the trained and calibrated assessors involved in the national study. It was up to individuals from the institution to analyze the data to determine significant findings that could lead to improvement of students’ performance on the chosen learning outcomes.
This Study

I performed an analysis of how students perform on institutional learning outcomes using the AAC&U data collected from a Midwestern urban two-year community college. My study included an analysis of the data to determine significant findings in the relationships between students’ demographic background characteristics, collegiate experiences, and performance on three learning outcomes. The three learning outcomes assessed include critical thinking, quantitative literacy, and written communication. The institution under study participated in a collaborative project and received raw data through the previously described score attainment. My study analyzed this raw data. My study included implications for theory, practice, and future research, found in chapter five.

Conceptual Framework

The American Association for Higher Education (AAHE) developed nine principles of good practice for assessing student learning (New Leadership Alliance for Student Learning and Accountability, 2012). These nine principles include:

1. The assessment of student learning begins with educational values.
2. Assessment is most effective when it reflects an understanding of learning as multidimensional, integrated, and revealed in performance over time.
3. Assessment works best when the programs it seeks to improve have clear, explicitly stated purposes.
4. Assessment requires attention to outcomes but also, and equally, to the experiences that lead to those outcomes.
5. Assessment works best when it is ongoing, not episodic.
6. Assessment fosters wider improvement when representatives from across the educational community are involved.

7. Assessment makes a difference when it begins with issues of use and illuminates questions that people really care about and work toward.

8. Assessment is most likely to lead to improvement when it is part of a larger set of conditions that promote change.

9. Through assessment, educators meet responsibilities to students and to the public.

(New Leadership Alliance for Student Learning and Accountability, 2012, pp. 10-11)

I worked to be mindful of these nine principles in the conceptual framework, which included the construction and execution of the study.

The concepts used to guide this discussion included the I-E-O model developed by Astin (1993), and the research findings of Arum and Roksa (2011), and the Wabash National Study of Liberal Arts Education (2007), and a number of other recent studies that focused on students’ performance on learning outcomes in higher education. Astin’s I-E-O model formed the backbone of my study. Astin’s model emphasizes the relationship between inputs (I), environment (E), and outcomes (O) and is based upon elements designed as far back as 1962. The basic elements have remained the same over the years and remain relevant today (Astin, 1993). According to Astin (1993), the model takes into account student characteristics as they enter college (I), the educational experiences to which the student is exposed (E), and student responses after exposure to the college environment (O). Astin’s I-E-O model worked as a framework for my study to determine whether students grow or change differently based on the characteristics students bring to college and what they experience in college, and compare these variables with their performances on outcomes after exposure to the environment (Astin, 1993).
Arum and Roksa (2011), took higher education institutions to task because their research suggested that students in higher education did not demonstrate significant improvements on learning outcomes throughout the four-semester span of their study. Arum and Roksa’s (2011) work served as a framework for components of this study, including the duration of study (as shown in credits earned) and performance on the AAC&U VALUE rubrics criteria. The Wabash Study, in their overview of the findings, were surprised and disappointed by the lack of increase in student’s performance on many outcome measures, and actually observed small declines in some of the outcomes (Blaich & Wise, 2007). Elements of Wabash Study were used to analyze students’ performance on three outcome measures, to determine whether or not there is an alignment in the findings of their study and mine.

**Research Question**

Booth, Colomb, and Williams (2008) encouraged researchers to identify a research question by constructing a research topic, question, and significance statements. I developed the research question for this study through this three-step formula statement: I studied the assessment of student learning (topic) because I wanted to evaluate the characteristics of the independent variables (question) in order to evaluate differences in performance in higher education outcomes (significance). I investigated the following research question:

**RQ1.** Is there a relationship between students’ background characteristics, collegiate experiences, and learning outcome scores in critical thinking, quantitative literacy, and written communication?

Demographic background characteristics included the following variables: race/ethnicity, age, gender, and socioeconomic status. Collegiate experiences included the following variables:
program of study, credit hours and degree level. The inclusion of these variables allowed for an exploratory study using the AAC&U VALUE rubrics.

Purpose of the Study

The purpose of this study was to examine how students perform on institutional learning outcomes using the AAC&U VALUE rubrics to determine whether there are significant differences in students’ performance based upon their background characteristics and collegiate experiences. The study is significant in that there is little-to-no research on the performance of students on institutional outcomes using the AAC&U VALUE rubrics to assess learning.

Interest in the topic of student learning outcomes assessment came from the desire to create an atmosphere around assessment that is valuable, meaningful, and positively impactful on students’ success. These desires were conceptual desires, rather than evidence-based. Student acquisition of learning outcomes, intended in coursework, program, and institutional level competencies, leads to their eventual success (Morante, 2003). The likely result of making changes based on efforts to improve student learning could lead to successful course completion, degree completion, transfer to another program or institution, or preparation for the desired field of employment (Suskie, 2009, pp. 58-59). Meaningful assessment occurs when individuals in higher education are intentional in how they assess the evidence of student learning (Maki, 2004). The climate and culture around assessment influences the attitude and awareness students, faculty, staff, and administration develop around assessment practices (Maki, 2004; Maki, 2015). All of these factors contribute to the value of assessment and the creation of meaningful assessment practices.

There are several facets of the assessment of student learning that are worth reviewing. Each faculty member in the program, department or discipline within a higher educational
institution collects evidence on how students are performing in that program. Programs gather evidence in multiple ways. Because there is not a standard for what constitutes evidence of student learning, it is difficult to compare student learning across disciplines—and especially difficult to compare across institutions. Often, the focus is on students’ grades as a proxy for what or how much students’ learn.

This study is significant because the data and findings add to the limited quantitative data that exists on the assessment of student performance on institutional learning outcomes in higher education using the AAC&U VALUE rubrics. I drew information from existing data to look at specific demographics to develop conclusions on significant differences in performance on institutional learning outcomes. This study represented a deeper investigation into the use of the VALUE rubrics to assess student learning and add relevant information to the findings developed by researchers such as Astin (1993), Arum and Roksa (2011), and the Wabash Study (2007). Additionally, in this study, I determined whether students are showing significant progress in learning throughout their experience in higher education.

Assumptions of the Study

There are certain factors assumed true for the study; for instance, I assumed that:

1. Instructors followed the procedures set forth by AAC&U in what types of student work samples (artifacts) were included in the study.

2. Artifact submission reflected authentic student work taken from classroom assignments, and as a result were a real representation of student learning.

3. A representative sample of student work reflected the population of this Midwestern urban community college.
4. As individuals in this institution brought stakeholders within the campus community together to participate in implementing the AAC&U VALUE rubrics, the focus was on intentional assignment design that led to students having the opportunity to learn and succeed in these learning outcomes.

**Delimitations**

I conducted this study in one community college located in a Midwestern urban area. My focus was to gain more knowledge regarding the performance of students on institutional learning outcomes. There were limitations in the data. This study was based on research at one institution, selected for its participation in the AAC&U project participation. Similarly, the students’ artifacts evaluated in this study were selected based on specific criteria. Neither institutional selection nor assignment selection represented random assignments, and the results of the study had limited generalizability.

The results may not reflect the demographics of other institutions and may not be generalizable to other higher education institutions. Work samples drawn from disciplines across this community college were not necessarily representative of the disciplines found in other higher education settings. This data analysis may not be comparable to other higher education institutions that have not implemented critical thinking, quantitative literacy, or written communication as their institutional learning outcomes.

The demographics of this study included variables such as race/ethnicity. It is unrealistic to view all students within a race/ethnicity as having similar characteristics and experiences within higher education, and yet the data combined these large student demographic categories. Large categorical data limits the analysis of results. African American students could include both individuals born in the United States as well as those born outside the United States. This
study did not differentiate Native-born and foreign-born African Americans. Asian Americans were categorized together even though that may mean individuals were Native Hawaiian, Samoan American, Korean American, Cambodian American, Hmong American, Vietnamese American, Indian American, Chinese American, or Filipino American (Poon, Squire, Kodama, Byrd, Chan, Manzano, Furr, Bushandat, 2016).

Summary

As higher education continues its focus on the development and improvement of student learning, there is a continued accountability to measure institutional learning outcomes. There is a problem across institutions nationally in defining learning outcomes, developing criteria to measure learning outcomes, and collecting data to reflect what and how much students are learning. The lack of information on student performance on institutional learning outcomes, combined with Arum and Roksa’s (2011) and Wabash (2007) findings that students do not show significant gains in learning, leads to the importance of this study to not only measure learning, but to also determine whether or not students are making gains in their learning.

In the literature review, I address the historical impact and current trends in the assessment of learning, examine the assessment tools used in higher education to evaluate student learning, and review each of the demographic variables under research. A review of the literature provided me with a glimpse into the framing of the problem and a foundation to understand the breadth of the study and possible implications of the findings. In chapter two, I include a review of Astin’s I-E-O model (1993), Arum and Roksa’s (2011) findings, the Wabash National Study (2007), and a number of additional studies to compare the results found in the studies regarding the progress of student learning.
Chapter II: Literature Review

The practice of evaluating student learning has been around countless years and, while evaluation has transformed from oral recitation and tests to multidimensional, holistic measures of students’ learning, the assessment of learning outcomes as a movement continues to expand (Bresciani, Gardner, & Hickmott, 2009; Erwin, 1991; Ewell, 2002; Saunders, 2011). Instructors in higher education have traditionally evaluated student learning within the confines of their courses to make judgments on student learning, usually to assign a grade to reflect the level of knowledge acquired. There has been a shift in higher education to incorporate not only course learning outcomes, but also institutional learning outcomes that students should attain in higher education (Erwin, 1991; Ewell, 2002). A review of the impact of the assessment of institutional learning outcomes requires a definition of assessment, a review of how students learn in higher education, the current findings related to demographic differences in students’ learning, and research into theories related to student learning outcomes that inform my study and bring insights to assessment practitioners.

Institutions, employers, and students themselves may prefer different sets of learning outcomes they feel are essential as a result of attending college. Faculty members, within the parameters set by their higher educational institution, decide what is meaningful and valuable in their coursework (Gray, 2002). The outcomes employers like to see students demonstrate may lie in sharp contrast with what students entering the workforce are prepared to demonstrate (Jankowski, Hutchings, Ewell, Kinzie, & Kuh, 2013). More than 75% of employers call for emphasis in critical thinking, complex problem-solving, written and oral communication, and applied knowledge in real-world settings (Hart Research Associates, 2013). In fact, Hart Research Associates (2013) found that nearly all employers, 93%, agreed that the capacity to
think critically, communicate clearly, and solve problems was more important than an undergraduate degree. Outcomes for students may include the social aspects of life in college and have nothing to do with the knowledge and skills learned in the classroom. This diverse and differing view of elements essential in higher education has led to the adoption of institutional learning outcomes to help bring clarity to what students can expect to learn in their higher education experience.

According to Arum and Roksa (2011), stakeholders in higher education include students, parents of students, and administrators in higher education; business leaders and future employers; faculty and staff at higher education institutions; and legislators, among others. The stakeholders are concerned over undergraduate learning; specifically, the return on their investment in higher education, and whether graduates have acquired the necessary skills to be competitive in the workplace (Arum & Roksa, 2011). According to the Secretary of Education’s Commission on the Future of Higher Education, known as the Spellings Commission, “unacceptable numbers of college graduates enter the workforce without the skills employers say they need in an economy where, as the truism holds correctly, knowledge matters more than ever” (2006, p. x).

Institutional learning outcomes draw from an institution’s mission, purpose, and values to provide meaningful experiences for students as they complete a degree (Maki, 2004). Astin’s I-E-O model considers student inputs, the educational environment, and student outcomes after exposure to the environment. Researchers study the impact of college attendance on the development of the individual, and critics question whether students are actually learning from their collegiate experiences (Astin, 1993). Arum and Roksa (2011) examined students’ learning in higher education, from the beginning of their first year college experience through the end of
their second year of college, and drew conclusions that students complete their degrees not really having learned much from their experience. Before exploring a theoretical framework, it is beneficial to define learning outcomes and assessment, examine the history of assessment of student learning to better understand current issues of today, and consider the change in demographics in higher education and the impact demographics have on student learning.

**Definition of the Assessment of Learning Outcomes**

Individuals in higher learning institutions develop learning outcome statements that “describe what students should demonstrate, represent, or produce in relation to how and what they have learned” (Maki, 2004, p. 60). According to Shireman (2016), student outcomes are “quantifiable indicators of knowledge acquired, skills learned, and degrees attained, and so on” (para. 6). Institutional learning outcomes are developed across an institution, collectively accepted, and quantitatively and/or qualitatively assessed during a student’s educational experience (Maki, 2004). The most beneficial evidence of learning comes from authentic student coursework found in papers, written examinations, projects, and presentations, rather than fabricated outcome measures obtained through standardized tests or student surveys not directly connected to the curriculum (Shireman, 2016).

The definition of the assessment of learning has taken on many forms. According to Ewell (2002), assessment can refer to “processes used to determine an individual’s mastery of complex abilities, generally through observed performance” or “large scale assessment used to benchmark school and district performance in the name of accountability,” or “program evaluation to gather evidence to improve curricula or pedagogy” (p. 9). These definitions of the assessment of student learning speak to the process of accountability and improvement of the student or program performance. Baker (2004) defined assessment from an accreditation
viewpoint stating that “institutions are evaluated with regard to the manner and degree to which they fulfill their missions and goals…a determination of the institution’s success and quality in achieving its intended educational and institutional outcomes” (p. 8). Erwin (1991) preferred a more general definition of the assessment of student learning, stating that it is “undertaken so that institutions can document students’ progress in higher education – in other words, the ‘outcome’ after their exposure to college” (p. 2). Erwin (1991) does go on to a more specific definition of the assessment of student learning as “the process of defining, selecting, designing, collecting, analyzing, interpreting, and using information to increase students’ learning and development” (p. 15). Bresciani et al. (2009) express the importance of establishing common terminology and define assessment of learning in higher education as “outcomes-based assessment is about improving student success and informing improvements in the practice of student services and programming” (p. 15).

For the purposes of this study, the American Association of Colleges and Universities (AAC&U) Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics define critical thinking, quantitative literacy, and written communication. The VALUE rubrics include criteria that will outline what students should demonstrate in relation to how and what they have learned. The outcomes data used for this study was collected through scoring of student artifacts using the VALUE rubrics to evaluate student performance. The study reflected Erwin’s general definition of the assessment of learning in higher education to reveal student performance on institutional learning outcomes undertaken to document student learning to replicate Astin’s I-E-O model, the outcome after exposure to college.

**Historical Impact of the Assessment of Learning Outcomes in Higher Education**
The history of how student learning has been assessed in higher education has an impact on the current trends and future direction of the assessment of learning. Assessment of learning is not a new idea. As far back as Plato and Aristotle, oral recitation has been used to demonstrate learning and “as early as 1063 CE, the University of Bologna used ‘juried reviews’ to demonstrate student learning” (Bresciani et al., 2009, p. 3). Bresciani et al. found that in the colonial era, learning assessment remained within the classroom environment. Throughout history, the most common assessments of learning were oral reports and written exams, often followed by immediate and critical feedback (Thelin, 2011). Assessment of learning in the United States in the 1930s and 1940s focused on traditionally aged college students who lived in campus dormitories and evaluated how students were motivated to learn (Bresciani et al.).

Reaction to concerns in the K-12 educational setting spurred assessment of learning in higher education in the 1980s. The U.S. Department of Education was concerned over a lack of success in K-12 education and a key group of stakeholders wrote a report, *A Nation at Risk*, to call for more accountability to evaluate student performance and address weaknesses in our schools (Ewell, 2002). The policy reports *Time for Results* and *Involvement in Learning* represented the response in higher education to the K-12 concerns and centered on examining learning outcomes and improvement of teaching and learning (Bresciani et al., 2009; Ewell, 2002; Kuh, 2011; Wright, 2002). Reports concerning educational assessment and accountability encouraged institutions to learn from assessment and use the feedback to make institutional changes leading to student success.

Mandates calling for assessment of learning, thought to be a passing fad in higher education, were largely ignored (Bresciani et al., 2009). The directives of the 1980s demanding accountability turned into assessment as a movement in the 1990s, now embedded into the
framework of higher education (Bresciani et al.; Erwin, 1991; Saunders, 2011). Policymakers and legislators became involved and both the state and federal legislators demanded greater accountability within higher education and began asking for evidence of learning in higher education (Bresciani et al.). Accredit ing agencies in the new millennium renewed efforts demanding proof of outcomes-based assessment, standards embedded in instruction to map coursework to learning outcomes, a process for defining learning inside and outside the classroom, and methods and tools that would provide tangible and useful results (Bresciani et al.).

Although assessment and evaluation of student learning has been around for centuries, the First National Conference on Assessment in Higher Education, sponsored by the National Institute of Education and the American Association for Higher Education, was not held until 1985 in Columbia, South Carolina (Bresciani et al., 2009; Ewell, 2002). This conference resulted in a recommendation that “high expectations be established for students, that students be involved in active learning environments, and that students be provided with prompt and useful feedback” (Ewell, 2002, p. 7). The first assessment conference was just the beginning. The conference initiated a greater involvement of accrediting agencies as the vehicle that demanded institutions to show evidence of learning outcomes assessment, and a plan of action to improve learning at the course, program, and institutional levels. The review of program assessment was a natural result of this conference (Ewell, 2002).

According to Black and Kline (2002), program review has been in existence, in a variety of forms, over a century prior to the first assessment conference in 1985. As far back as the 1800s, Horace Mann evaluated curriculum in the teacher-training program that is the first model, now referred to as program review (Black & Kline, 2002). Mann submitted annual reports
between 1838 and 1850 that were not what we would classify as learning outcomes, but contained information on issues such as “geographic distribution of schools, teacher training, financial support for poor students, and selection of an appropriate curriculum,” which don’t sound like learning outcomes (p. 224). As a result of concerns that faculty were not engaging students in an efficient manner, Joseph Rice in 1895-1905 followed Mann’s efforts and developed standardized tests to assess teacher training and student engagement (p. 224). Ralph Tyler, 1932-1940, focused on learning outcomes to review a program and “made some of the first formal linkages between outcomes measures and desired learning outcomes” (p. 226).

Beginning in the 1980s, and continuing on to today, recommendations for key elements in program review include such things as embedding a locally based institutional review of learning linked to the mission statement, having a clear purpose to enhance program quality, involving stakeholders in a way that is systematic and ongoing, and containing a focus on continuous improvement (Black & Kline, 2002). Each state is independent in what it requires of program review, leading to a greater involvement of accrediting agencies in holding institutions accountable for their practices in the assessment of learning.

The First National Conference on Assessment in Higher Education in 1985 required accrediting agencies throughout the United States to revise their procedures to place greater emphasis on assessment as a form of institutional accountability (Wright, 2002). The Southern Association of Colleges and Schools in 1986 took the lead in linking outcomes assessment to institutional effectiveness, and the Western Association of Schools and Colleges followed their lead in the same year (p. 242). In 1989, North Central Association called for a self-study in all of their institutions to assess student achievement (p. 242). The Middle States Association had been asking for “evidence of outcomes since 1953, but enforcement was lax until the word assumed
new importance in the context of the late 1980s” (p. 243). The Northwestern Association adopted a policy on assessment in the early 1990s, and in 1992, the New England Association moved to include a mandate to assess all eleven of its standards (Wright, 2002).

Not only nationally, but globally, higher education institutions have experienced “clearer accountability to governments and society at large to ensure quality and cost-efficient operation” (Tremblay, Lalancette, & Roseveare, 2012, p. 29). Higher education institutions are under pressure to improve the quality of their teaching. A number of countries have some degree of performance-based funding and external quality evaluations (Tremblay et al.). Global ranking tools have led to growing emphasis on transparency and accountability and demands for colleges and universities to engage in the assessment of learning outcomes (Tremblay et al.). While assessment of learning outcomes has previously been internal, and accreditors were content with colleges and universities trying to complete assessment, this is no longer sufficient (Tremblay et al.). According to Sullivan (2015), state and federal policy and governmental entities are “mobilizing to provide metrics about access, affordability, completion, and job-related outcomes such as earnings, but it is clear that these metrics will say nothing significant about student learning” (p.3). Current efforts work to provide metrics that provide data on student learning in higher education.

**Current Trends in the Assessment of Student Learning in Higher Education**

The central emphasis of the assessment of student learning in higher education has changed from a focus on instruction to a focus on learning (Tremblay et al., 2012). Where assessment of learning in higher education previously focused on how students received the means to learn, it now focuses on ways to support the learning process by whatever means work best for the student (Tremblay et al.). This has led to a student-focused approach, rather than an
instructor-focused approach to evaluating learning in the classroom. Assessment of learning is encouraged to evaluate the innovative methods of teaching that involves students as active learners rather than passive receivers of knowledge. This emphasis is to understand teaching and learning to identify effective teaching strategies and test new ideas to enhance learning outcomes (Tremblay et al.).

Globally, there has been a growing focus on the assessment of student learning outcomes. The shift from input-based concepts, such as the number of classes taken and student workload, to outcome-based assessment is seen throughout Europe and the United States today (Tremblay et al., 2012). According to the Bologna Declaration of twenty-nine ministers of education in June of 1999, the charge of these ministers of education resulted in a key commitment for Europe to write all higher education modules and programs in terms of learning outcomes by 2010 (Bologna Secretariat, 1999). According to Tremblay et al., in the 2008 Assessment of Higher Education Learning Outcomes (AHELO) feasibility study, the Organization for Economic Co-operation and Development conducted an initiative to assess whether it is possible to develop international measures of learning outcomes in higher education.

The beginning of the second decade of the 21st century presented a similar shift, to learning outcomes assessment, in the United States as was seen in Europe (Tremblay et al., 2012). Outcome assessment appeared in the new vision of the Association of American Colleges and Universities (AAC&U) Liberal Education and America’s Promise (LEAP) initiative launched to outline “essential learning outcomes that contemporary college students need to master in both general education and the major” (Tremblay et al., p. 36). The Lumina Foundation (2011) presented the Degree Qualification Profiles to encourage implementation of quality assurance, accountability and transparency provisions in the assessment of learning

The identification of the LEAP Essential Learning Outcomes represents a “first” in American higher education. For the first time, faculty and other educational professionals from across representative two-year and four-year colleges and universities collaborated to articulate what contemporary higher education institutions commonly expect students to demonstrate because of a liberal education. Of even greater national significance is the collaborative nature of the development of the aligned VALUE rubrics and the “mainstreaming” of the criteria and standards of judgment. (p. 1)

Local, national, and global accountability in learning outcomes assessment methods previously driven by changing workforce needs, increase engagement in the global economy, and growth of knowledge through technology (Maki, 2015). Employer surveys reflect the complex needs of the workplace with 91% of employers asking employees to take on a broader set of skills, 90% of employers ask employees to coordinate with other departments, and 88% of employers believe that employees need higher levels of learning and knowledge to succeed (Hart Research Associates, 2010). According to the 2013 Hart Research Associates, employers today would like to see an increase in complex learning outcomes such as critical and creative thinking, ethical reasoning, global learning, innovation, and collaboration.

Another trend in higher education is the transparency and accountability of reporting learning outcome assessment. Transparency in student success rates provide a clear picture of
which institutions graduate students and have a greater rate of employment. In reality, the
impact of accreditation has helped to sustain assessment of learning across institutions, but the
assessment of institutional outcomes has also strengthened accrediting agencies (Wright, 2002).
The foundation of the assessment report is to ensure quality at the course, program, and
institutional level through accountability. The report on the assessment of student learning is not
an end in itself. The report is an institution’s opportunity to conduct a self-study as an “ongoing
process that leads to continuous quality improvement in student knowledge, skills and abilities”
(Saunders, 2011, p. 37). The institutional self-study provides a chance for the institution to
reflect on findings from the assessments and implement change that enhances student success.

Assessment of learning involves the evaluation of course, program, and institutional
outcomes; and whether students can demonstrate mastery of the skills outlined in the learning
outcomes. Institutions in higher education ask programs to clarify action steps that lead toward
continuous improvement. These action items include changes in course design to lead to an
increase in student success and completion of a program of study. Participation in the
assessment of learning keeps the power in the hands of the faculty because faculty members
decide what is meaningful and valuable to evaluate in their coursework (Gray, 2002).
Assessment of learning requires a collaborative effort in bringing together faculty across
discipline areas, and sets the tone for administrative involvement to add to the climate and
culture surrounding the assessment of learning outcomes.

Assessment of learning should be conceptual, looking at the assessment of learning as an
instrument of persuasion; in both adding meaning and validity to the success of the students, and
in collecting data to support what has largely been a narrative analysis of program review. The
assessment of learning leads to the central concept, which is foundational in the assessment
process, of ‘assessment as learning’ rather than limiting it to the assessment of learning (Loacker, Cromwell, & O’Brien, 1985, para. 3). Assessment as learning keeps the focus on how the faculty and institution use assessment results to serve the learner.

The difficulty is in taking assessment from a concept or theory to finding evidence that assessment leads to institutional and student learning improvements. Unfortunately, the Wabash Study found that gathering data, even with the complicated longitudinal method employed, was easier than using the information to improve student learning (Blaich & Wise, 2011). According to Blaich and Wise (2011),

Although all nineteen institutions from the first cohort of the Wabash National Study in 2006 worked extraordinarily hard to collect data multiple times from students, nearly 40% of the institutions have yet to communicate the findings of the study to their campus communities, and only about a quarter of the institutions have engaged in any active response to the data. (p. 3)

Researchers from the Wabash National Study of Liberal Arts Education learned that most Institutions had more than enough actionable assessment evidence, that was either well known by individuals or was tucked away unnoticed among data collected previously, to make informed decisions to respond to the findings (Blaich & Wise, 2011). Most institutions have little experience in reviewing and making sense of the learning outcomes assessment data, how to follow-up on findings, and how to make changes that could lead to an increase in learning (Blaich & Wise, 2011).

What can be done to have these important findings rise above the busy environments found in education and move beyond the grading and programming to lead to data driven continuous improvement? According to Blaich and Wise (2011), for assessment to have an
impact, it must rise out of extended conversations across the institution among people wanting to know about their teaching and learning environment and what assessment evidence is revealing about their demographics. According to Blaich and Wise (2011), assessment of learning outcomes, done correctly, is “using assessment to improve student learning in an entirely public process in which people with different levels of experience and different intellectual backgrounds must work together toward a common end” (p. 5).

The current trends in assessment of institutional outcomes are not without issues and challenges. Current assessment issues have implications for students, faculty, administration, and the institution as a whole. Individuals within institutions should demonstrate a commitment to assessment and are accountable by accrediting agencies that seek evidence of institution-wide, program-level, and course-level student learning. Ten years after the Bologna Declaration, the vision of using the assessment of learning outcomes throughout Europe actually occurred in only a few countries, which led to the reaffirmation of the importance of including the attainment of learning outcomes in assessment procedures (Tremblay et al., 2012). According to the Wabash National Study (2011), the lack of using the assessment of learning outcomes in Europe is also prevalent in the United States as demonstrated by the lack of using the assessment results to make informed decisions that would lead to an increase in student learning.

A significant issue found in the current trends in the assessment of learning outcomes can be found in the lack of clarity in how to assess, when to assess, or how the evidence is, or is not, used for improvement in student learning. There can be conflicting ideas of what assessment is and does as well as how to assess for abstract learning concepts. New innovations in the future, like linking graduation requirements to achievement of learning outcomes rather than the credit hour, may demand new forms of assessment (Penn, 2011). There may be factors contributing to
student success, not currently assessed in and out of the classroom. Challenges in assessment include ever-changing institutional, faculty, and student culture. The historical factors, current trends, issues and challenges influence learning outcomes of today and the possibilities of the future. It is necessary to review assessment tools used to collect evidence of student learning.

**Assessment Tools**

Current trends in assessment call for a design of innovative assessment tools with an emphasis on transferable, complex, cross-discipline student learning outcomes (Penn, 2011). According to Sternberg (2011), “hundreds of institutions and entire state systems of higher education now assess learning in college via a standardized test” (para. 2). Some of the approaches used to assess learning outcomes in college today include performance assessments such as capstone projects, licensure exams, student portfolios, field experiences, surveys, interviews and focus groups, and general knowledge and skills measures (Nunley, Bers, and Manning, 2011).

Some of the tools used to assess student learning in higher education include the Collegiate Learning Assessment (CLA), the ACT Collegiate Assessment of Academic Proficiency (CAAP), and the ETS Proficiency Profile (ETS-PP). These standardized instruments provide content developed by external experts, quantitative methods of interpreting student achievement, quick and easy administration and objective scoring, and a history of validity and reliability studies (Maki, 2004). The Association of American Colleges and Universities (AAC&U) Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics were developed as an alternative to standardized tests or student surveys to assess and evaluate student learning.
Although the CLA, CAAP, and ETS-PP have been widely used throughout higher education to assess student learning, there has also been criticism of these assessment instruments. According to Berrett (2016), the CLA, CAAP, and ETS-PP have attracted widespread interest, but disconnect from authentic student coursework and do little to drive improvement of student learning. Critics of the CLA question the validity of standardized testing rather than using authentic student work samples to measure learning in higher education (Arum & Roksa, 2011). The CLA, and standardized testing in general, does not “focus on the specific knowledge taught in particular courses and majors” (Arum & Roksa, 2011, p. 25). The CAAP, an ACT product, measures reading, writing, mathematics, science, and critical thinking (Sternberg, 2011). The ETS-PP (formerly MAPP) measures “critical thinking, reading, writing, and mathematics in the context of the humanities, social sciences, and natural sciences” (Sternberg, 2011, para. 3). The CAAP and ETS-PP, are known to be valid and reliable, but fail to have “sufficient breadth to adequately serve as measures of learning in college” (Sternberg, 2011, para. 4). In other words, any of these tests used alone are too narrow to serve as an institution’s only measure of institutional learning outcomes.

Using standardized tests such as the CAAP or the ETS-PP, fails to measure student learning that is diverse or covers the breadth and depth of discipline-specific knowledge (Lederman, 2013). Standardized instruments do not provide evidence of the strategies and processes students draw upon to apply learning (Maki, 2004). Standardized tests as measures of student learning do not accurately portray student attainment or provide useful and meaningful information (Lederman, 2013). According to Sullivan (2015), “A standardized test of students’ reasoning and communication skills cannot probe their highest skill levels because applied learning takes such different forms in different fields” (p. 4). Standardized tests, used alone to
measure student learning, are inadequate to measure individual or institutional progress (Sullivan, 2015). The Wabash Study uses several different instruments and surveys to measure learning, but admit that these measures are not as authentic as papers, projects, and exams students complete in their work at their institutions (Blaich & Wise, 2007).

The AAC&U VALUE rubric is an alternative assessment tool that uses authentic student work to measure learning outcomes (Lederman, 2013). The AAC&U VALUE rubrics report institutional-level results for outcomes such as critical thinking and written communication. The benefit of the VALUE rubrics is that even though they are not standardized, the results can be reported using a numerical scheme (Lederman, 2013). The AAC&U VALUE rubrics allows for the use of authentic student work that varies from student to student and program to program, yet allows for comparisons between programs and even institutions (Lederman, 2013). Authentic assessment methods provide a representation of integrated learning, alignment with students’ learning experiences, and opportunities to demonstrate learning, as opposed to test-generated occasions (Maki, 2004).

Institutions struggle with how to assess for abstract learning outcomes such as critical thinking or cultural competence (Nunley et al., 2011). AAC&U used a process that examined existing campus rubrics and related documents to develop criteria for each learning outcome (Rhodes, 2010). The AAC&U VALUE rubrics assess abstract learning outcomes such as critical thinking, intercultural competence, teamwork, and global learning. Authentic student work, collected and scored using the AAC&U VALUE rubrics, contain both concrete and abstract outcomes. Criticism of authentic assessment methods for not providing easily quantifiable evidence and efficient scoring methods, are absent in this study using the AAC&U VALUE rubrics to quantify evidence and efficiently score artifacts (Maki, 2004). The assessment of
authentic student work is a viable alternative to standardized tests or the use of surveys that ask
students to self-report what they believe they have learned.

The VALUE rubrics, designed for use at any institution, are not based on institutional size, type, location, or mission. According to Maki (2015), the rubrics monitor progress based on assignments developed that encourage students to apply their learning across their experiences. The performance indicators provide a rating scale from benchmark to milestone to capstone. The advantage of the rubrics is that they can be adapted to the level of the learner and can be used for a wide range of assignments. According to Rhodes (2011),

The VALUE rubrics were developed as broad, institutional level, or “meta” rubrics and we recognize that rubric use at program, disciplinary or even classroom levels requires adapting the rubrics with more specific language and purposes. For example, using rubrics to grade assignments does not necessitate the need for precise, psychometric methods. In developing and testing the rubrics, the faculty and professional staff development teams anchored the demonstrated learning for students at the entry and exit points for degree attainment. To provide signposts that learning was moving in the desired direction, milestones were developed between the benchmark—where rubric developers found their students’ current performance on average—and the capstone—where rubric developers hoped their students would be to attain a baccalaureate degree.

(para. 5)

In summary, a review of the assessment tools used in higher education examined standardized tests such as the CLA, CAAP, and ETS-PP to compare to the VALUE rubrics used in this study. Although widely used, these standardized tests fail to connect to authentic student coursework. The use of the AAC&U VALUE rubrics has the potential to measure authentic
assignments such as papers, projects, and exams students complete in their coursework at their institutions and allow for comparisons between programs and even institutions.
Demographics

The demographics of students enrolled in higher education has become increasingly diverse. There has been a shift in enrollment from the elite to mass, even universal in some countries. Access and participation in higher education in the United States, according to Tremblay et al. (2012), “is the growing heterogeneity of students in terms of their socio-economic background, academic ability and preparedness, career expectations, motivation and engagement” (p. 20). The expanding demographic diversity across most institutions presents new challenges and opportunities. The realities of expanding diversity present itself in areas such as the variability of students’ levels of college readiness or preparation, gaps in postsecondary graduation attainment between certain race/ethnicities, uneven course-taking patterns resulting in financial or personal limitations, and varying levels of English-language fluency (Maki, 2015).

Assessment efforts that focus on creating measures to compare outcomes of students between institutions fail to encompass the complex range of student learning and experiences that occur between demographic groups within institutions. According to Blaich and Wise (2011), “The variation among students within the Wabash National Study institutions is vastly larger than the median differences between institutions” (p. 1). In other words, comparing student performance on institutional learning outcomes within an institution will produce greater variability than results between institutions. Even if an institution has greater than average growth on a particular outcome, such as critical thinking, chances are that many of the students within certain demographics found within an institution will not have grown as much, or may have even declined in their performance on a particular outcome such as critical thinking (Blaich & Wise, 2011).
Cultural diversity is the number of diverse groups represented in an organization; the higher the number of diverse groups result only in an increase in the probability that students from different backgrounds will interact (Gurin, Dey, Hurtado & Gurin, 2002). Structural diversity does not guarantee meaningful interaction or the creation of an equitable environment (Gurin et al., 2002, p. 334). Gurin et al. (2002) found that traditional students are at a critical developmental stage in which diversity has an impact on learning outcomes.

Student demographic variables affect student learning as certain demographics link to lower levels of academic preparedness and success. According to Arum and Roksa (2011), “inequalities at the point of entry into higher education are not surprising, given the pervasive disparities in the K-12 system” (p. 38). Arum and Roksa, in their study using the College Learning Assessment (CLA), found that students whose parents had no college experience lag behind those whose parents had graduate or professional degrees. According to Arum and Roksa, “This pattern suggests that higher education in general reproduces social inequality” (2011, p. 40).

**Race/Ethnicity**

For decades, higher education institutions have struggled to create an equitable environment. The 1954 *Brown v. Board of Education* case, though it addresses admission to elementary and secondary schools, also applies to a protection against discrimination in higher education as well (Kaplin & Lee, 2014). The inequities and injustices of discrimination in higher education are still wrestled with sixty years later in today’s postsecondary setting (Thelin, 2011). According to the National Center for Education Statistics (2013), researchers found that of the first time, full-time bachelor’s degree-seeking students who matriculated in 2006, 62.5% of white students and 70.6% of Asian students completed a bachelor’s degree within six years. In
contrast, 40.2% of black students, and 40.2% of American Indian/Alaska Native students completed a bachelor’s degree within six years (National Center for Education Statistics, 2013).

The Office of Management and Budget (OMB) revised the guidelines on racial/ethnicity used by the federal government to the five categories of American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and White” (Ross, Kena, Rathbun, Kewal-Ramani, Zhang, Kristapovich, & Manning, 2012). According to Ross et al. (2012), “It is important to note that Hispanic origin is an ethnicity rather than a race, and therefore persons of Hispanic origin may be of any race” (p. 1). I will include the following race/ethnicities in my study: Hispanic, African American, Asian, Native American and Caucasian. The rapid increase in student diversity found in colleges and universities has helped to expand the notion that studying these diverse students will lead to better understanding of their learning gains and gaps in higher education (Thelin, 2011).

**Hispanic.** Hispanic-serving colleges may well have begun before 1992, but not designated as Hispanic-serving until then (Schmidt, 2003). According to Schmidt, over two hundred and forty colleges in the United States “have been designated ‘Hispanic-serving institutions’ by the federal government, meaning that at least a quarter of their enrollment is Hispanic” (para. 5). The Hispanic enrollment in higher education has dramatically increased since 2000 (Samuel & Scott, 2014). The Hispanic population first increased in states such as California, Arizona, Texas, and New Mexico, and then migrated across states and represent more than 12% of college enrollments nationwide (Thelin, 2011). Hispanic enrollment in higher education is projected to increase by 46% between 2009 and 2020 (Maki, 2015).

Despite this increase in enrollment, Hispanic students have the lowest chance of completing college of all ethnic groups (Garibaldi, 2014; Samuel & Scott, 2014). The Hispanic
population, and their rising rates of student enrollment and performance in higher education, has become the subject of a growing body of research in the area of minority student performance (Samuel & Scott, 2014).

Hispanic students’ obtain significantly smaller critical thinking scores on standardized tests compared to their White counterparts (Terenzini, Springer, Yaeger, Pascarella, & Nora, 1994). The net disadvantage accruing to Latino students, relative to White students, was about six percentile points (Terenzini et al., 1994). Pascarella and Terenzini (2005), note that the lack of growth in critical thinking skills adversely affect Hispanic students more than in any other student demographic.

According to Schmidt (2003), “By the age of 17, Hispanic high-school students, on average, have the same reading and mathematics skills as white 13-year-olds” (para. 22). Hispanic students are less likely to take college-prep courses, more likely to drop out of school, and less likely to have had a parent who attended college (Schmidt, 2003). Hispanic students are less likely to make it to upper-division courses, earn a bachelor’s degree, and have the lowest rate of graduate-school enrollment (Schmidt, 2003). Hispanic students are far more likely to attend a two-year college, yet not likely reflected in the demographics of college faculty or administrators (Schmidt, 2003).

**African American.** In addition to the rising concern of college access and outcomes for the growing Hispanic population, the ongoing concern regarding African American student success is, and has been, heavily researched. Black students remain underrepresented in the population of American college students (Harper, 2006). Black students have lower graduation rates than White and Asian students (Schmidt, 2003). According to the American Council on Education, at the turn of the century only 40% of eligible Black students went to college, with
only 46% of those who attended colleges or universities graduating within six years (Grier-Reed, 2008).

African American students made significantly smaller gains in standardized scores in critical thinking than did White students (Terenzini et al., 1994). Specifically, the disadvantage for African-American students in critical thinking was about .16 of a standard deviation (six percentile points) in the first year of college and about .18 of a standard deviation (seven percentile points) after three years of college (Terenzini et al., 1994).

According to Flowers (2003), the White student sample self-reported greater gains in science and technology and intellectual and writing skills than African American students. African American students, according to the Flowers study, had a lower level of reading comprehension in standardized measures during the students’ first year of college. These low measures in reading increased in magnitude during the students’ third year of college, when African American students’ scores were attenuated compared to White peers.

A recent edition of the Journal of Blacks in Higher Education (2015) informs institutions of higher learning that the black student graduation rate has increased three percentage points in the last year. However, the current black student graduation rate of 42% remains twenty percentage points below the graduation rate for White students, which is reported at 62% (JBHE Foundation, 2015). According to Garibaldi (2014), two-year colleges enroll more than 40% of all black students, but only 45% of black students complete their degree.

According to Arum and Roksa (2011) in their study using the College Learning Assessment (CLA) tool, “the gap between African-American and white students was particularly stark: African-American students lagged almost one standard deviation (or thirty-four percentile points) behind their white peers when they entered college” (p. 38). Not only do African
American students enter college with lower CLA scores, but they also gain less over time and the
gap between African American and white students widen over time (Arum & Roksa, 2011).
According to Arum and Roksa (2011),

> Although African-American students on average were more likely to attend schools that had 70% or more minority students, took fewer advanced placement courses, and performed less well on college admission tests, these differences only partially explained their lower rate of progress on skills measured by the CLA during the first two years of college. (p. 111)

Other factors that lead to the increase in CLA gap between African American and white students include lower socioeconomic status, lower academic preparation at entry into higher education, and lower faculty expectations and demands (Arum & Roksa, 2011).

A Pascarella, Edison, Nora, Hagedorn, & Terenzini (1995/1996) study did find that attending a two-year institution prior to a four-year institution had positive effects on reading comprehension and mathematics for African American students, but negative effects for white students.

> Overall, a nurturing environment for black students is likely to have a positive impact on black student retention and graduation rates (JBHE Foundation, 2015). Support services are essential in order to lead to higher retention and completion rates. According to Willie, Garibaldi, and Reed (1991), in order for black students to succeed in higher education it is necessary to have resources such as outreach programs, flexible admission requirements, availability of a variety of financial aid packages, and mentoring. Fifteen years later, the charge of Willie, Garibaldi and Reed still holds true today; black students in higher education need wrap
around support to succeed in college. According to Harper (2006), “between 1977 and 2003, black male degree attainment increased by an average of 0.2 percentage points” (p. vii).

African American enrollment in higher education projects an increase of 25% between 2009 and 2020 (Maki, 2015). With this continued increase in enrollment of black students in higher education, colleges have a responsibility to provide academic resources to ensure African American students attain institutional learning outcomes necessary to successfully complete their program of study and receive their degrees.

**Asian.** Asian American populations have changed the complexion of higher education in the United States due to a massive influx of students (Roach, 2001). Asian Americans are twice as likely as African Americans, and two-thirds as likely as Latinos, to have at least a bachelor’s degree (Shireman, 2016). Of all immigrants, both men and women, with a bachelor’s degree only 9% are Hispanic and 30% black, as opposed to 54% white immigrants and 63% Asian (Baum & Flores, 2011). Half of all Hispanic immigrants do not have a high school diploma and that percentage goes down to 5% of Asian and white immigrants who do not have a high school diploma (Baum & Flores, 2011). Asian Pacific Islander enrollment projects an increase by 25% between 2009 and 2020 (Maki, 2015).

The term ‘Asian’ is extremely broad, and there are a number of stereotypes to address. One stereotype classifies Asian Americans and Pacific Islanders (AAPIs) as a hardworking high achieving racial group (Poon et al., 2016). Data such as college entry tests may suggest AAPIs are achieving high levels of educational success, which leads to the misconception that when AAPIs fail it is due to individual deficits (Poon et al.). According to Poon et al., high-test scores of Asian American students lead to inappropriately joining this group with Whites to call attention to the test score achievement gap between Black and Latino students relative to White
students. The stereotype of high performance of Asian Americans completely disregards the Asian Americans experience in higher education and results in the omission of AAPIs in policy discourse on racial inequalities (Poon et al.). Recent research is beginning to present data on deficiencies and disparities of Asian American subgroups, specifically Pacific Islanders and Southeast Asian Americans (Poon et al.). Misconceptions fail to recognize the diversity within the Asian classification.

To complicate the Asian American experience in higher education, this category includes a wide variety of cultures. Asian Americans, typically not regionally situated, attend a wide range of institutions across the United States (Chang, Park, Lin, Poon, & Nakanishi, 2007). Asian Americans are an extremely diverse population with tremendous variations in ethnicity and socioeconomic class (Chang et al.). Some of the categories within the Asian classification may include, but are not limited to, Native Hawaiian, Samoan American, Korean American, Cambodian American, Hmong American, Vietnamese American, Indian American, Chinese American, and Filipino American (Poon et al., 2016). It is unrealistic to view all of these categories as having similar characteristics and experiences within higher education. The trends in college enrollment does not support the claim that Asian Americans find universal success in higher education, as there are a number of obstacles yet to overcome to not only gain access, but to also complete a degree in higher education (Chang et al.).

Even with the increased levels of Asian students – compared with other students of color – in much of the research, the findings of a recent study by Liu and Roohr (2013) found an unexpected decline in performance of Asian students at community colleges. The 10-year study found a decline in reading, math, and critical thinking for Asian students. Liu and Roohr believe that this decline in performance may be due to the fact that there has been an increase of first-
generation immigrants attending community college over the last 10 years. Another reason, as presented above, may be due to the considerable variation among students from different parts of Asia. This incredibly diverse population may find differences in parental education levels, family expectations and value on education, language proficiency, and pre-college achievement levels.

Native American. Native American appears in the literature as American Indian, Alaskan Native, and Native Hawaiian. According to Campbell (2016), Native American students are among ethnic groups with the lowest completion rates, and lowest performance on learning outcomes in higher education, than other ethnic groups except Hispanics. Native American students are more likely than White students to have social risk factors, low academic preparation for college, be first generation enrolled in college, enroll in a community college, come from a lower socioeconomic status, and have lower average SAT and ACT scores (Freeman & Fox, 2005). According to Freeman and Fox (2005), American Indians compose “only about 1 percent of the total college university enrollment in 2002, an increase from 0.7 percent in 1976” (p. 112).

Faculty, staff, and administrators in higher education are unprepared to work with Native American students. The majority of faculty and administrators in higher education are not Native American, and the curriculum and environment are not culturally relevant to meet the needs of Native American students (Campbell, 2016). Community college personnel fail to work with Native American students to develop educational pathways to career, find programs in a field of study that fit their needs, or recognize their educational achievement and success (Campbell, 2016). Campbell’s study (2016), found that performance on learning outcomes would increase by offering a higher number of courses that introduced Native American culture in hopes to
enable Native American students to feel more visible and less singled out. According to Campbell, offering faculty pedagogical training on “issues relevant to Native American students, such as historical trauma and social conventions, would help build an understanding between non-Native American faculty and Native American students” (2016, p. 364).

**Caucasian.** White students are the racial majority in higher education. The rate of employment and degrees earned is higher among white citizens of the United States than any other people group (Ross et al., 2012). Compared to students of color, white students are more likely to have a bachelor’s degree, higher standardized test scores, completed rigorous college-preparatory courses, parents who attended college, attended college full-time, gone on to graduate school, spoken English as their native language, and enrolled in college right after high school (Schmidt, 2003). According to Schmidt (2003), white students are less likely to live in poverty and less likely to be required to enroll in remedial coursework at the college or university level.

Although there is a recognized gap in the college completion rate between students of color and white students, student success is lagging for all low-income students and students with disabilities, regardless of race and ethnicity (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2011). According to Kuh et al. (2011), “It is also possible that White first-generation students – especially those from low-income family backgrounds – experience conflicts and challenges similar to those of first-generation ethnic minority students” (p. 15).

**Age**

Higher education has shown an increase in students aged twenty-five and older and a proportionate decrease in students aged twenty-four and younger (Brock, 2010). The traditional student often refers to an individual that enrolls within a year from high school graduation
The nontraditional mature student is often defined differently by researchers (Fragoso, Goncalves, Ribeiro, Monteiro, Quitas, Bago, Fonseca, & Santos, 2013). Nontraditional mature students often have employment and family responsibilities that influence their college experience (Fragoso et al.). More mature students may struggle with returning to school after spending a number of years away from education. The nontraditional student group is increasing in higher education today and may be changing to become the traditional student (Brock, 2010).

According to Hoskins, Newstead, and Dennis (2006), age was a significant predictor of performance. Sheard (2009) conducted a 2-year correlational study to examine whether age (gender and hardiness were also included in the study) predicted university final degree grade point average. Sheard (2009) tracked data from 134 university undergraduate students and found that mature-age students achieved higher final degree GPA compared to younger undergraduates.

**Gender**

Using demographic information to understand the barriers to success requires consideration of racial and ethnic minorities as well as gender considerations. Male gender is a growing area of disparity and concern, especially within minority student populations. Through examination of the enrollment rates of each racial group, Garibaldi (2014) reports that the number of women attending college in the United States in 2012 was significantly higher than in 2002. The increase in enrollment is modest for Caucasian (7.3%), Asian (16.7%) and American Indian women (4.1%) (Garibaldi, 2014). There are dramatic increases in African American (48.2%) and Hispanic (79.2%) women which represents a trend that, while promising for women, causes concern for the male counterparts in these two racial groups (Garibaldi, 2014).
The percentage of females with immediate postsecondary enrollment was higher than that of males for several race/ethnicities; including White, Hispanic, and Asian students (Ross et al., 2012). There is a disparity of success in higher education between black men and black women. According to Garibaldi (2007), “women of all races are receiving more undergraduate, graduate and first-professional degrees than men” (p. 331). The graduation gap in bachelor’s degrees earned by black men and women grow larger each year (Garibaldi, 2007). Between 1993-1994 and 2003-2004, black women earned a larger number of bachelor’s degrees, with an increase of 62.7% for women compared to 40.6% for men (Garibaldi, 2007). Gender gaps in Black men and women are also becoming larger in elementary, secondary, and postsecondary educational settings (Garibaldi, 2007).

College enrollment of women, between 1959 and 2002, increased 29% for women and only 8% for men (Kuh et al., 2011). The number of bachelor’s degrees were higher for men in 1970, compared to 2001 when women earned a majority of bachelor’s degrees (Kuh et al., 2011). Women score higher on high school grades, and have widened the reading scores and narrowed the gap in math scores on standardized tests (Kuh et al., 2011). Globally, women slightly outnumber men with about 51% of global enrollments in higher education (Tremblay et al., 2012).

Using the CLA to assess learning, women and men demonstrate the same level of skills in learning outcomes such as critical thinking, complex reasoning, and writing skills (Arum & Roksa, 2011). It is interesting to note that in sharp contrast to the inequalities of racial and socioeconomic status in performance on the CLA, gender demonstrated the same level of performance on the CLA at entrance into college and as women and men progress through
college (Arum & Roksa, 2011). Age and gender has an impact on student success, though not as direct a link to performance in higher education as socioeconomic status.

**Pell-Eligibility**

Related to racial and ethnic demographics, socioeconomic status is another important variable of today’s college student. According to Kuh et al. (2011), “Rigorous academic preparation, high educational aspirations, and family support are easier to come by if the family has economic resources” (p. 24). Academic performance increases as family income increases, and is evident directly through resources available in the home and indirectly through social capital needed to succeed in school (Kuh et al., 2011). Family socioeconomic status and funding from property taxes influence access to the type of school and classroom, instructional materials, teacher experience, and teacher-student ratios (Kuh et al., 2011). All of these factors, influenced by families with higher socioeconomic status and school districts with an increase in funding from property taxes, lead to higher performance on learning outcomes.

The American Psychological Association (2015), measures socioeconomic status (SES) through a combination of education, income and occupation. SES is the numerical variable used to indicate the social class of people. Pascarella and Terenzini (2005) identify that even after controlling for race and gender, students’ SES and income background remains significantly related to persistence in college. According to Fowler and Boylan (2010), any non-academic, personal factors including financial and work issues, affect students’ performance and ultimately their ability to persist. For example, students who are struggling financially often decide to take on two or more jobs while studying, to cope with their financial burden. The lack of persistence in college students coming from low socioeconomic status transfers to low performance on institutional learning outcomes for this demographic.
According to Arum and Roksa (2011), the majority of college students receive some sort of financial aid, and 65% of the students in their sample reported working while in college. African-American students, Hispanic students, and students coming from less educated families report working more hours per week than white students coming from more educated families (Arum & Roksa, 2011). African American students rely more heavily on grants and loans to cover college expenses (Arum & Roksa, 2011). Asian students took out the lowest percentage of student loans to cover college expenses (Arum & Roksa, 2011).

Perna and Swail (2001) explained the link between low income and persistence by asserting that those low-income students have a corresponding lower persistence/graduation rates than their higher income counterparts. The link between low income and persistence rates may imply directly that with access to finances, these students would persist at a higher rate, based on the added financial access (Perna & Swail, 2001). However, Heller’s (2002) study found that access to financial aid does not ensure persistence rate for low-income students.

A family with economic resources show an increase in performance in higher education due to the kind of school and classroom environment to which they had access and the number of resources found in the home (Kuh et al., 2011). The proportion of students who attend college is lower for those with a lower income. A low-income student may be worse off financially for having attended a college or university because they are less likely to have earned a degree and, because of attending college have student loans to repay (Kuh et al., 2011). Low-income students are less like to attend a four-year university because they are more expensive to attend than a two-year community college (Kuh et al., 2011). Low-income students are less likely to take the steps necessary, such as college preparation classes and entrance exams, to lead them to enroll in four-year universities (Kuh et al., 2011).
For most low-income students the path to completing their bachelor’s degree is long, indirect and uncertain (Engle & Tinto, 2008). Many low-income students do not complete their degree. Low-income students disproportionately come from lower levels of academic preparation and are from ethnic and racial minority backgrounds (Engle & Tinto, 2008). These students tend to be older and do not receive financial support from parents, have families they support, and work while attending college (Engle & Tinto, 2008). The opportunity to complete a degree has not increased and, unfortunately, the segregation of low-income students has not seen significant changes over time (Engle & Tinto, 2008). Socioeconomic status is interesting to view in light of patterns found in the performance on student learning outcomes. The low results for low-income students found in all areas mentioned reflect in similar low-results for low-income students in the area of performance on institutional learning outcomes. As mentioned, a large indicator of student success centers more on socioeconomic status than any other demographic (Borman & Dowling, 2010). Achievement of learning outcomes for students of all race and ethnicities increase as their income increases (Borman & Dowling, 2010). Socioeconomic status has an impact on a student’s choice of program of study, which can affect performance on student learning outcomes.

According to Lightweis (2014), “there is little research conducted on first-generation white students who come from a working-class background” (p. 461). Similar to all first generation students, low-income white students are just as likely to drop out of college because of their low socioeconomic status (Kuh et al., 2011). Inequalities in education remain. As evidenced in the literature, white students have a higher rate of student success in higher education than students of color have in higher education. Yet, even after taking into account race and ethnicity, a large indicator of student success centers on socioeconomic status (Borman
Achievement outcomes for students of all race and ethnicities increase as their income increases (Borman & Dowling, 2010). This suggests that going to a high poverty school can have a profound impact on a student’s achievement outcomes, which goes beyond minority status (Borman & Dowling, 2010).

**Program of Study**

At the Midwest urban two-year college under study, students declare their field, or program, of study. Arum and Roksa (2011), report notable patterns between program of study and performance on the CLA. Students enrolled in the social sciences, humanities, science and mathematics programs have higher CLA scores than students in other college majors (Arum & Roksa, 2011). Students enrolled in business or education have the lowest performance on the CLA (Arum & Roksa, 2011). Arum and Roksa also note that students in health, social science, humanities, science, and math are more likely to expect to pursue further education, such as doctorate or professional degrees, and score higher in critical thinking and writing. While students in business, education and social service fields do not expect to pursue further education and score lower in critical thinking and writing (Arum & Roksa, 2011).

Pascarella and Terenzini (2005), found it difficult to form any firm conclusion concerning the impact of program of study and scores on standardized critical thinking measures. A number of studies find it is difficult to determine if program of study or other experiences cause the differences in scores on critical thinking (McDonough, 1997; Money, 1997; Sebrell & Erwin, 1998; Spaulding & Kleiner, 1992). Studies have found it difficult to determine if different academic fields of study tend to attract students with different levels of critical thinking skills or if experiences in the major cause the differences in critical thinking skills (Gadzella & Masten, 1998; Gunn, 1993). Pascarella and Terenzini (1991) found that science majors started
out with higher critical thinking scores. Pascarella and Terenzini (2005) found it difficult to define academic major, which may contribute to inconsistent findings.

Students in some programs of study may perform higher on some learning outcomes than others, based on the content emphasis in their discipline areas (Arum & Roksa, 2011). For instance, some programs emphasize oral rather than written communication. Or, we may expect students in math and science courses to score higher than other students in quantitative literacy as opposed to written communication.

Kugelmass and Ready (2011) found, in their study of academic programs, that critical thinking development was more likely a function of practices within each program of study than between majors or fields. Comparing one program of study with another has shown that disciplinary context has a greater influence on critical thinking development than a comparison between disciplines (or programs of study). For instance, a small percent of variance (under 10%) in critical thinking could be explained by students’ program of study. Kim and Sax (2011) found that the relationship of students with faculty members within different programs of study had a greater influence on the development of critical thinking than program of study. For instance, research on student engagement with faculty found increased development of critical thinking with students in the following demographic areas: Latinos, Asian Americans, Whites, males, females, and middle-class and upper-class students (Kim & Sax, 2011). According to studies, increases in critical thinking occurs when faculty members have open channels of communication, treat students more equitably, provide prompt feedback to students, clearly articulate course and program requirements, and support student viewpoints (Kim & Sax, 2011; Pike & Killian, 2001). According to Kim and Sax (2011), it is interactions within programs of study, rather than particular academic programs, that is associated with critical thinking gains.
Credit Hours

Arum and Roksa (2011) found that a significant number of students did not demonstrate much improvement in a number of learning outcomes between their first semester of college enrollment and the end of their second year. Arum and Roksa (2011) used the same students in a longitudinal study.

Pascarella and Terenzini (1991) found that students’ exposure to postsecondary education increased verbal, quantitative, oral, and written skills as well as analytical skills and critical thinking. It is interesting to note that Pascarella and Terenzini (2005), in their second volume of How College Affects Students, uncovered inconsistent findings and conclusions from their previous synthesis of the literature and did not see the same gains from freshmen to senior progress as they did in research presented in their earlier edition. The most recent edition of How College Affects Students, examined the public discourse questioning the value of higher education and students’ development of designated learning outcomes (Pascarella, Mayhew, Rockenbach, Bowman, Seifert, Wolniak, & Terenzini, 2016). The most recent edition found that, even though it was a focus of their research, there are few studies that examine the extent to which students change during college. Where previous research compared students who had attended college with students who had not, current studies focused on the extent students’ progress through their collegiate experience (Pascarella et al., 2016). According to Pascarella et al., “since the previous volume, scholars are asking more questions about why college affects students that if college affects students” (p. 10). The challenge in the most recent volume is that the assumption of student change was followed up with very few longitudinal studies that tracked student progress throughout their college experience (Pascarella et al.).

Degree Levels
Students choose coursework based on individual preference or by a college’s general education requirement, remediation requirements, or program of study in the degree that students are seeking (Arum & Roksa, 2011). Coursework varies in the degree requirements examined by Arum and Roksa (2011). For instance, students in humanities and social sciences reported taking courses with higher reading and writing requirements (Arum & Roksa, 2011). Students in science, mathematics and liberal arts core courses reported low likelihood of taking courses with high reading and writing requirements (Arum & Roksa, 2011). Students in business, education, social work, engineering and computer science courses also reported lower levels of reading and writing requirements (Arum & Roksa, 2011).

Similar to programs of study, this research examined the types of degrees’ students are earning and how this affects performance on institutional learning outcomes. Students who earned an associate’s degree may perform higher on some learning outcomes than students who earned a certificate. As a result, students may score higher on one learning outcome than another. The reading, writing and mathematical requirements found in specific degrees are interesting to note as the learning outcomes measured in this study include Critical Thinking, Quantitative Literacy, and Written Communication.

Summary

In reviewing the variables found in the study, it is clear that higher education has become increasingly diverse. Student access and participation in higher education has led to a growing number of students entering college from diverse race/ethnicities, socioeconomic backgrounds, and ages. Students are entering college with a wide range of options in programs to study and degree levels to obtain. With this increase in diversity comes attention on student success within
demographic categories. Students of color are completing degrees at a lower rate than white students. Achievement in learning outcomes for all students is a growing concern.
Theoretical Framework

The review of the literature by Pascarella and Terenzini (2005), concluded that students made significant gains in subject matter knowledge and became more critical, reflective, and sophisticated thinkers. They found that students’ exposure to postsecondary education appeared to enhance general verbal, quantitative, oral communication, written communication, analytic, critical thinking, and reasoning skills. Pascarella and Terenzini qualified this by stating that it was important to know how students change or grow during the undergraduate years because college graduates did not always perform well. According to Pascarella and Terenzini (2005), “not all students develop(ed) as critical thinkers during college” (p. 158).

The earlier works of Pascarella and Terenzini (1991) and Astin (1977) did not include an assessment of student’s cognitive development measured on standardized tests and surveys, data on the characteristics of each institution’s general education program, measures of student peer groups, and characteristics of the faculty at each institution. Astin’s newer book (1993) assessed how students are affected by their colleges in how to understand how students change, developing a model for studying student outcomes, and designing an analysis of college impact. The issue Astin (1993) explored in his research included “what difference college attendance makes in the development of the individual” (p. 5).

A review of the literature provided an opportunity to see whether research agrees with Pascarella and Terenzini’s (1991) claim that exposure to postsecondary education enhance select student learning outcomes. The first and second volumes of the Pascarella and Terenzini texts (1991, 2005), focused on the impact of college attendance on student outcomes and compared this with students who did not attend college. The current review in volume three focused on the relationship between students’ exposure to college measured in terms of credit hours completed,
class standing, or a comparison between students in their freshman and senior years (Pascarella et al., 2016). According to Pascarella et al., “we found that exposure to postsecondary education had a positive association with student learning and development, controlling for a multitude of potentially confounding influences” (p. 36). The synthesis of the literature presented in volume 3 found: credit hours completed had a small positive relationship with reading comprehension (Bray, Pascarella, and Pierson, 2004); credit hours had a positive association using standardized assessments of reading, writing, math, and critical thinking (Lakin, Elliot, & Liu, 2012); credit hours had a positive impact on students’ ETS Proficiency Profile total scores and all subscores (Liu and Roohr, 2013); and class standing and students’ overall self-reported gains on the NSSE found a consistently larger effect size for sophomores, junior, and seniors when compared to freshmen (Pike, Kuh, & Gonyea, 2003).

My examination of the literature focused on results of learning outcome research found in the VALUE Report 2017, Liu and Roohr’s (2013) learning outcome research at community colleges, the Wabash National Study of Liberal Arts Education, the findings of Arum and Roksa (2011) that students are academically adrift, and Bok’s (2008) findings on underachieving colleges. The theoretical framework used in this study will center on Astin’s I-E-O model.

VALUE Report 2017

It is essential to note that late in my dissertation writing a report came out from AAC&U, On Solid Ground: Value Report 2017, that included results from the first two years of the VALUE rubric initiative. While the report was not published in time to guide this research, it is important to include it here in the review of the literature. The report includes much of what is found in this study: an explanation of the development and testing of the VALUE rubrics, the process of gathering authentic student work samples (artifacts), the scoring of artifacts using the
rubrics, the use of a submission platform called TaskStream to allow scoring of artifacts by nationally calibrated scorers, and the results of the study. The report states that the VALUE rubrics were designed to focus on an assets-based, rather than a deficit-based, approach that builds on what a student can do rather, than determining the skills that a student is lacking (VALUE report, 2017, p. 26). The rubrics work from the assumption that all students have the potential to achieve the capstone level outlined on each of the rubrics.

Results presented in the 2017 report, of artifacts gathered in 2016, involved the following for 2-year institutions: critical thinking included 840 artifacts, quantitative literacy included 576 artifacts, and written communication included 919 artifacts (VALUE report, 2017, p. 36). Data was also available for 4-year institutions, but not reported here. Key findings suggest that the strongest performance was in written communication, yet students had the lowest scores in the use of evidence to support their writing (VALUE report, 2017, p. 4). In critical thinking students demonstrate strength in explaining issues and presenting evidence related to issues, yet struggled to draw conclusion or place issues in a meaningful context (VALUE report, 2017, p. 4). Quantitative literacy skills revealed strength in calculating and interpreting data, but difficulty in applying knowledge (VALUE report, 2017, p. 4).

The report only included artifacts from students who had completed 75% of the credit hours required for their program of study. According to the VALUE report (2017), students at 2-year institutions with 45 credit hours or more had completed 75% of their program of study. The report indicated that the findings suggested that the focus on core learning outcomes supports enhanced levels of higher order achievement across critical thinking, quantitative literacy, and written communication (VALUE report, 2017, p. 4). It is interesting to note that for students who were in the final portion of their 2-year associate’s degree, there remained a high percentage
(8-50%) of the students that were below the benchmark level and received a zero score. This could mean that the student was not asked to demonstrate that particular criterion, or it could mean that the student did not exhibit any evidence of learning for that specific criterion (VALUE report, 2017, p. 9). So we do not know how to accurately interpret that result. It may or may not suggest that students were actually showing proficiency in these learning outcomes.

The VALUE Report (2017) surveyed chief academic officers at institutions involved in the project, and 85% of the respondents reported that their institution had articulated institutional learning outcomes, but only 9% believed that their students know about these learning outcomes. Nearly all respondents believe their institution tracks retention and completion rates, but only 70% report tracking students’ achievement of learning outcomes, and only 17% reported that they disaggregated data based on demographics such as race/ethnicity and socioeconomic status (VALUE report, 2017, p. 49). Nearly a third of the respondents reported having set equity goals for student learning that are aligned with demographic characteristics, yet only 17% disaggregate the data they collect to better understand achievement of learning outcomes across different demographic populations (VALUE report, 2017, p. 49). Even after reporting the lack of institutions to disaggregate the data based on demographics, the VALUE report failed to present data that disaggregated the data based on demographics.
Learning Outcome Research at Community Colleges

Research conducted by Liu and Roohr (2013), focused on evaluating student learning outcomes to see if community colleges are providing adequate training to students. The study investigated students from 13 community colleges over the course of ten years (2001-2010) to assess learning in reading, writing, mathematics, and critical thinking. The study examined students’ number of credit hours to classify students as having completed zero credits, less than 30 credits, 61-90 credits, and greater than 90 credits. According to Liu and Roohr (2013), “For comparison purposes, we also included students from 8 research universities (n = 68,045), 13 comprehensive colleges and universities (n = 120,269), and 11 liberal arts colleges (n = 52,245)” (p. 15). The total number of students included in the study was 286,961; this number compared community college students to students from other colleges and universities (Liu & Roohr, 2013, p. 15).

The study used the ETS Proficiency Profile to assess college-level learning outcomes (Liu & Roohr, 2013). As presented earlier, the ETS-PP has been widely used throughout higher education to assess student learning, but this assessment tool is disconnected from authentic student coursework. The ETS-PP measures critical thinking, reading, writing, and mathematics in the context of the humanities, social sciences, and natural sciences. The standard form, containing 108 questions in each skill area, and the short form, with 27 questions in each skills area was administered in about 2 hours and 40 minutes (Liu & Roohr, 2013, p. 14). A critique of the ETS-PP is that it is known to be valid and reliable, but does not have breadth and depth to adequately serve as measures of authentic student learning in college or provide evidence of how students apply learning.
The researchers conducted an analysis of covariance (ANCOVA) to examine performance between community college and the other institutional types, with the number of credit hours used as an indicator of the amount of college-level experience (Liu & Roohr, 2013, p. 17). The outcome variables were the EPP total and subscale scores examined in three different time periods of 2001, 2005, and 2010 (Liu and Roohr, 2013, p. 17). A stepwise regression analysis was conducted using the total test score as the dependent variable and included a number of predictors (Liu & Roohr, 2013).

Results of both total and subscale scores on the EPP – when controlling for the number of college credit hours – revealed that differences in performance between research universities and community colleges widened during this 10 year span, differences between comprehensive colleges and community colleges narrowed, and community colleges outperformed liberal arts colleges during this 10 year span (Liu & Roohr, 2013, p. 18). Results of the EPP total and subscale scores of student performance within research universities improved, students within both comprehensive and liberal arts colleges resulted in a decrease in performance, and students in community colleges remained stable (Liu & Roohr, 2013, p. 19). The results in relation to performance and number of credit hours completed at research universities revealed that as students completed more credit hours they showed an increase in performance in critical thinking, quantitative literacy, and written communication (Liu & Roohr, 2013). Students at community colleges started at a lower performance level than the other types of colleges, but caught up and even exceeded liberal art students (Liu & Roohr, 2013, p. 20). Female students’ performed higher than males in written communication and lower than males in mathematics.

The researchers attempted to further understand the differences between community colleges and other types of institutions by evaluating ACT and SAT scores and high school GPA.
between 2001 and 2010. What the researchers found was that such data were not available for
community colleges because these types of institutions are all open admission and do not track
this data.

Using White students as the reference group, African American students performed
lowest on the total score, Asian student performance decreased consistently over the 10 years,
and Hispanic student performance increased (Liu & Roohr, 2013, p. 26). Specific subscale
scores found: White and African American students’ performance remained relatively stable
over 10 years in reading and writing with small increases on critical thinking; African American
students declined in mathematics; Asian students declined in reading, mathematics, and critical
thinking, and remained stable in writing; Hispanic students increased in all four subscales with
largest improvement in critical thinking (Liu & Roohr, 2013, p. 26)

In summary, the results of this study revealed that community college students caught up
with, and in some areas, outperformed students from liberal arts colleges (Liu & Roohr, 2013).
Other results indicated that community college students made significant improvements in
critical thinking over the last 10 years, the gender performance gap widened at community
colleges with women performing lower than men, the overall performance gap widened between
white students outperforming students of color at community colleges, and Asian students
showed declining performance in all of the learning outcomes.
Wabash National Study of Liberal Arts Education

The Wabash National Study of Liberal Arts Education (WNSLAE) consisted of a large-scale mixed-methods longitudinal study to investigate factors that affect the outcomes of liberal arts education. The WNSLAE involved 19 campuses, surveyed 4500 students throughout the United States and interviewed 315 students at six institutions of the 19 campuses involved in this study (Blaich & Wise, 2007; Goodman, Baxter, Seifert, & King, 2011; King, Baxter, Barber, Perez, & Taylor, 2012; Pascarella & Blaich, 2013). Surveying over 4,000 students offers the breadth of a quantitative research method and interviewing over 300 students offers the depth of a qualitative research method (Goodman et al.). Many articles have been written in response to the findings from the Wabash Study. Most of the published findings only use findings from the cohort in the sample from 2006, however, two additional cohorts began the study in 2007 and 2008 (King et al., 2012).

This type of mixed methods research approach provided multiple lenses to evaluate student learning. According to Goodman et al., “Two teams of researchers simultaneously gathered qualitative and quantitative data based on different aspects of the same research question: What are the practices and conditions that foster student learning on liberal education outcomes?” (2011, p. 2). Seven outcomes under study include integration of learning, inclination to inquire and lifelong learning, leadership, well-being, intercultural effectiveness, moral character, and effective reasoning and problem solving (Blaich & Wise, 2007). According to King et al. (2012), the outcomes tied to liberal arts education are distinctive because of the connection between outcomes that incorporate cognitive development as well as interpersonal and intrapersonal development.
The quantitative portion included the following instruments: the CAAP Critical Thinking Test, the Defining Issues Test-2, the Ryff Scales of Psychological Well-Being, the Socially Responsible Leadership Scale, the Miville-Guzman Universality-Diversity Scale, the Orientation toward Learning Scale, the Life Goals Scale, and the Need for Cognition Scale (Blaich & Wise, 2007; Goodman et al., 2011; King et al., 2012; Pascarella & Blaich, 2013). The CAAP Critical Thinking test determines improvement on a variety of critical thinking outcomes. The Defining Issues Test-2 measures moral reasoning. The Ryff Scale of Psychological Well-Being and the Socially Responsible Leadership Scale measure well-being and leadership. The Miville-Guzman Universality-Diversity Scale and the Orientation toward Learning Scale measure students’ attitudes about diversity. The Life Goals Scale and the Need for Cognition Scale measure academic motivation, community involvement, and professional success. The quantitative instruments administered to students suggest connections between educational practices associated with outcomes that influence student learning (Goodman et al.).

The qualitative portion involved student interviews to identify educational experiences that foster development of outcomes and explore how students develop because of their collegiate experiences (Blaich & Wise, 2007). Three hundred fifteen students who participated in the quantitative survey component were interviewed in the fall of 2006, 228 were interviewed again in the fall of 2007, 204 in fall of 2008, and 177 in fall of 2009 (King et al., 2012). Interviews lasted 60 to 90 minutes and participants received a $30 stipend per interview. Interviews consisted of an initial portion focused on how students’ entering characteristics influenced achievement and development, a second section explored the educational experiences students’ identified as most significant impacting their experiences, and a third section addressed students’ synthesis and patterns of experiences. Interviewing students offered a forum to add
meaning to the practices students viewed as central to their learning experiences (Goodman et al., 2011).

The 2006 sample consisted of incoming first-year, full-time, undergraduate students at 17 four-year colleges and universities and 2 two-year colleges (King et al., 2012). Students’ at large institutions were randomly selected to participate, and at small institutions the sample was the entire incoming first-year students. Students were invited to participate in a national longitudinal study that included a 90 to 100 minute survey in the fall of 2006, and two follow-up sessions occurred in the spring of 2007 and again in the spring of 2010. The follow-up sessions took about two hours and included the series of instruments listed above. Students were paid a $50 stipend at each of the three data collection points. Of the over 4,000 students in the initial sample, 2,212 participated in the spring 2010 follow-up (52.8% persistence rate).

In contrast to Pascarella and Terenzini (2005), Blaich and Wise (2007), in their overview of the first year findings of the Wabash National Study of Liberal Arts Education (WNSLAE), were surprised and disappointed by the lack of change on many outcome measures. According to Blaich and Wise (2007), “although improvement on the CAAP Critical Thinking test was statistically significant, the change was so small (less than 1% increase) that it was practically meaningless” (p. 2). The Wabash National Study actually saw small declines in the outcomes that measure students’ attitudes about diversity, and larger consistent declines in students’ academic motivation and interest in academic subject matter and community involvement (Blaich & Wise, 2007). Faculty, staff, and administrators at almost every Wabash Study institution have been surprised and concerned that their students seem to experience small growth or even declines on outcomes in the study (Blaich & Wise, 2007).
Pascarella & Blaich (2013) completed a non-experimental analysis of the Wabash National Study and compared their results with initial findings from the study. Pascarella and Blaich acknowledged that the Wabash Study did not uncover compelling evidence that liberal arts college attendance has a direct impact on cognitive development. Pascarella and Blaich’s findings, however, suggest that if students report high levels of clarity and organization in instruction and significant experiences with higher level learning expectations, the implications revealed significant advantages on both critical thinking skills and their need for cognition. Their research also found that students who attended liberal arts colleges, as compared to research universities and regional institutions, reported significantly higher levels of clarity and organization in instruction and higher frequency of deep-learning experiences. According to the researchers, this distinct focus on instruction and learning may positively impact student outcomes if applied at all types of institutions.

According to Blaich and Wise (2007), a statistical technique called factor analysis was used in the quantitative method to examine student responses to survey questions about their college experiences. The factor analysis locates clusters of questions that focused on core elements of student experiences to measure some underlying component using common social science language (Blaich & Wise, 2007). A scale was implemented to predict the extent to which students changed over the course of the study on the following clusters: good teaching and high quality interactions with faculty; academic challenge and high expectations; diversity experiences; frequency of interacting with faculty and staff; interactions with peers; and cooperative learning (Blaich & Wise, 2007). Students’ experienced a positive impact on the experiences of good teaching and high quality interactions with faculty, academic challenge and high expectations, and diverse learning opportunities (Blaich & Wise, 2007; Goodman et al.,
Students’ experienced a weaker or mixed relationship with the outcomes of frequency of interacting with faculty and staff, interactions with peers, and cooperative learning.

According to Blaich and Wise (2007), students change very little on the outcomes measured, but found a set of teaching practices that predict student growth on outcomes. Three teaching practices that influence learning include providing students with academic challenge, diverse experiences, and good teaching (Goodman et al., 2011). According to Blaich and Wise (2007), faculty, staff and administrators in higher education “bear an educational responsibility to find ways to strengthen the impact of their education at our institutions” (p. 10). Individuals in higher education can use the findings from the quantitative and qualitative data from the Wabash Study to guide educators in learning more about practices that foster student learning (Goodman et al.).

**Arum and Roksa, Academically Adrift**

Arum and Roksa in their book *Academically Adrift: Limited Learning on College Campuses*, present their findings from research involving the Collegiate Learning Assessment (CLA) tool, survey responses, and transcript data (Arum & Roksa, 2011). The Collegiate Learning Assessment Longitudinal Project, initiated in the fall of 2005, included a short survey to a group of freshmen students, with a follow-up survey two years later to the same students during the spring of 2007. Institutions in the Arum and Roksa project were located across the United States and included private residential, liberal arts, large research, Historically Black Colleges and Universities (HBCUs), and Hispanic Serving Institutions (HSIs).

Arum and Roksa (2011) conducted extensive research and revealed that a significant number of students do not demonstrate significant improvements in a range of learning outcomes.
between their first semester of college enrollment and the end of their second year. The researchers discuss the lack of external pressure to demonstrate learning and the concern over whether or not institutions are turning out productive workers. Arum and Roksa questioned the lack of transparency and accountability in student learning and wasted resources (2011).

Arum and Roksa (2011), focused on student social background to understand patterns of stratification manifested in learning outcomes in higher education. Arum and Roksa considered the following variables: race/ethnicity, parental occupation and education, language spoken at home, and student attendance at a predominantly non-white high school. The researchers measured the difference in the distribution of scores between 2005 and 2007. Arum and Roksa designed scales to measure students’ perception of the degree of effort invested in the CLA test as well as the importance of doing well. Students from a variety of sociodemographic backgrounds and academic preparations produced similarly distributed scores that did not help to explain differential performance of students engaging in similar learning activities.

The concern over undergraduate learning has led to the necessity to measure “whether students are actually developing capacity for critical thinking and complex reasoning at college” (Arum & Roksa, 2011, p. 2). Even with the concern over undergraduate learning, there is a lack of external pressure to demonstrate learning, which has “contributed to a failure systematically to measure and evaluate students’ gains in higher education” (Arum & Roksa, 2011, p. 17). Globalization and fiscal constraints have brought an awareness to the concerns about learning in higher education and whether the money and resources devoted to a college education has prepared individuals to be productive workers.

Arum and Roksa (2011) used the College Learning Assessment (CLA) survey, designed to measure the learning outcomes of critical thinking, analytical reasoning, problem solving and
writing. The Arum and Roksa (2011) study found that students in higher education are “academically adrift”, by which they meant that they found a prevalent pattern of limited learning, disturbingly low gains in student performance, individual learning characterized by persistent and growing inequality, and a notable variation within and across institutions.

The Arum and Roksa (2011) findings state that what students bring and what students do in college matters, but what faculty members do matters as well. According to Arum and Roksa (2011), “when faculty have high expectations and expect students to read and write reasonable amounts, students learn more” (p. 119). Students in the study who reported having to read more than forty pages a week and write more than twenty pages over the course of a semester, also reported studying more than two hours per week than students who do not have these requirements ($p < 0.01$). When students are required to attend to their coursework, it increases the likelihood they will complete assignments and learn the content presented, which increases their performance on learning outcomes. This is similar to what people like Astin and Pace found back in the 60’s – input and effort matter and make for more successful student learning. According to Arum and Roksa (2011), the collegiate experience today is largely a social experience that encourages students to have fun rather than require that they learn.
Bok’s *Our Underachieving Colleges*

It has become less of a surprise to see yet another text that examines the progress college students make toward outcomes is lacking in higher education. According to former Harvard President Derek Bok (2008), students improve much less than they should in critical thinking, quantitative literacy, written communication, and moral reasoning. Bok states that many students graduate without being able to analyze complex problems, even though critical thinking is an essential learning outcome of a college education. He also believes that most students never take a course in quantitative literacy. Contrary to most of my review of the literature, Bok’s conceptual piece on the state of learning in college today, believes researchers try to discover how much students are learning and what methods help student learn best. He believes research is not translated into implications that lead to trying new methods of teaching to overcome the lack of performance on learning outcomes, and rarely are successful teaching techniques shared with the faculty as a whole.

Bok’s book concludes with ideas that lead to increase in student performance and success. Some of the ideas that Bok encouraged included continued external pressure from accrediting bodies to implement effective plans for outcomes assessment (Bok, 2008, p. 330). Bok believes that all new and continuing faculty members should be assessed on an ongoing basis and money spent to train faculty in teaching and learning techniques (Bok, 2008, p. 317). Higher education institutions should develop rigorous program evaluations and outcomes assessment of speaking, reasoning, writing, and language competencies on a regular and predictable basis. Assessment results should be used to make changes in curricular planning. Doctoral programs should be required to include advanced study of cognitive development and
diverse pedagogies. Bok believes that a commitment to these strategies would result in increase in students’ performance in higher education.

**Astin’s I-E-O Model**

Astin’s I-E-O model provides a basis to determine whether students grow or change differently under varying demographic environmental conditions. According to Astin (1993), “many educators are interested in how students change and develop in college and what might be done to enhance that development” (p. xix). The elements of Astin’s I-E-O model has served as a conceptual guide for studying college student development and has stayed the same since its first introduction in 1962 (Astin, 1993).


Input (I) refers to the characteristics of the student at the time of entry into higher education, environment (E) refers to the environment students are exposed to in college, and outcomes (O) refers to the student’s characteristics after exposure to the college environment (Astin, 1993). Outcomes compare to input to determine growth or change in the student during
According to Astin (1993), “The basic purpose of the model is to assess the impact of various environmental experiences by determining whether students grow or change differently under varying environmental conditions” (p. 7). This model provides a basis for understanding educational outcomes. The learning outcomes relevant to this study included critical thinking, quantitative literacy, and written communication.

Outcomes are measured by the type of outcome, cognitive and affective, and the type of data, psychological and behavioral (Astin, 1993). My study focused on the cognitive and psychological type of outcomes that include knowledge, critical thinking ability, basic skills, special aptitudes and academic achievement (Astin, 1993). My study used student characteristics at entry, such as gender and socioeconomic status, in an effort to identify connections between student characteristics (I), environment (E) and outcomes (O).

According to Astin (1993), the data used in the I-E-O model included multiple indicators composed of ACT or SAT scores, pretests on possible outcome measures, self-predictions about possible future outcomes, and personal characteristics that might affect the propensity to change or to attain certain outcomes. Other data included a follow-up questionnaire, and scores on standardized tests (Graduate Record Examination, Law School Admission Test, Medical College Admission Test, and National Teacher Examination). The sample in Astin’s study included freshmen entering higher education in the fall of 1985 at 309 randomly selected institutions. A total of 27,064 students completed either a normative or expanded survey, representing a 29.7% response rate. Over four thousand students who completed a survey returned a follow-up questionnaire, representing a 24.6% response rate.

The first stage of Astin’s statistical analyses involved a multiple regression analysis to obtain a predicted or expected score on each outcome measure under investigation (Astin, 1993).
Astin compared predicted outcomes with actual outcome measures using input variables, and an “effect is said to occur when an environmental variable adds something to the prediction of the outcome over and above what we can predict from entering freshman characteristics” (p. 25). The rationale is simply that students who have the greatest exposure to the college environment would score higher. Astin’s study approaches this in terms of time of exposure and intensity of exposure. Time of exposure is how long the student has attended college. Astin’s intensity of exposure is the frequency of interaction with other students and with faculty.

Astin’s (1993) study indicated that students change in many ways through their college experience. Women get better grades in college, are more likely to complete a bachelor’s degree and graduate with honors; men become more proficient on verbal and quantitative scales on the GRE test. Astin found that students from high socioeconomic families have the most significant positive outcomes in college than any other indicator: in completion of a bachelor’s degree, satisfaction with the undergraduate experience, a higher grade point average, more likely to enter graduate school, higher retention and completion rates, and significantly higher scores in critical thinking and problem solving skills. Astin provides a model that remains relevant today.

Summary

My examination of the literature revealed more findings than theories regarding what and how much students learn in their time spent in higher education. Liu and Roohr found that students in community colleges caught up with students from liberal arts colleges and made significant improvements in critical thinking, but the overall performance gap widened between white students and students of color at community colleges. The VALUE Report 2017 found the strongest performance in written communication, yet students struggled applying what they learned in writing, critical thinking, and quantitative literacy. Arum and Roksa found that
students are academically adrift; which involved a lack of transparency and accountability in student learning, wasted resources, and a lack of improvements in a range of learning outcomes. The Wabash National Study of Liberal Arts Education also found student gains discouragingly low, to the degree that some of the outcomes in the study actually found declines in outcome measures. Bok found that students show a lack of progress in critical thinking, quantitative literacy, written communication, and moral reasoning. Astin’s I-E-O model provided a theoretical framework that brought together the elements of the findings to explore how students change and develop in college. The model considers student input and the environment to understand how these elements influence outcomes. A synthesis of the relevance of the literature review is offered below.

**Relevance of the Synthesis for the Research Project**

This review of the literature provides a historical perspective and examines current trends in the assessment of learning outcomes, assessment tools used to measure learning, demographics included in the study, and the theoretical framework applied to this study. The historical perspective provided insight into how we arrived today with an emphasis on the assessment of learning outcomes. Today, the current trends offer a variety of assessment tools designed to measure learning in higher education, some of which have come under scrutiny. Many of these assessment tools draw from standardized tests or student surveys to measure learning, rather than authentic evidence of student work drawn from the classroom. The existing data analyzed for this study measured authentic student work samples taken from coursework and scored using rubrics.

The purpose of this study was to examine how students perform on institutional learning outcomes using the AAC&U VALUE rubrics to determine whether or not there are significant
differences in performance between demographic characteristics and collegiate experiences associated with students’ learning outcome scores in critical thinking, quantitative literacy, and written communication. The problem is that individuals within higher education do not have a clear picture of how to pinpoint how much (or how well) students learn, and do not use the use assessment information to improve on factors that may contribute to students’ success (Blaich & Wise, 2011; Ewell, 2010; Harward, 2007, Tremblay, Lalancette, & Roseveare, 2012). The study is significant due to the lack of research on the performance of students on institutional outcomes that use scores obtained using the AAC&U VALUE rubrics to measure authentic student work.

A review of the demographic variables included in this study was important to provide a better understanding of how students have historically performed in higher education. Key differences in performance rates between low socioeconomic students of color and high socioeconomic white students was seen in the literature and may predict how students will perform on the learning outcomes used for this study.

Astin’s I-E-O model (1993), the VALUE Report 2017, Liu and Roohr’s (2013) learning outcome research at community colleges, the Wabash National Study of Liberal Arts Education, the findings of Arum and Roksa (2011) that students are academically adrift, and Bok’s (2008) findings on underachieving colleges provided a framework for understanding student progress after exposure to the learning environment. Astin’s model offered important information on student input and environment to demonstrate the factors that have an impact on student performance on learning outcomes. The studies provided insight into how students have progressed, or have failed to progress, in performance on learning outcomes in higher education.

**Summary**
Institutions in higher education today are focused on student success and ensuring that students are prepared for the future (Nunley, Bers, & Manning, 2011). Effective assessment of learning outcomes in higher education can be a challenge. Measuring and attaining success in learning outcomes in higher education can be an even greater challenge particularly for low-income students and students of color. Chapter 3 presents the research design to measure the three learning outcomes of critical thinking, quantitative literacy, and written communication.
Chapter III: Method

I conducted a quantitative study using existing data for this dissertation research. According to Punch (2009), quantitative researchers conceptualize reality in terms of variables, measure these variables and study relationships between these variables. According to Merriam (2009), characteristics of quantitative research feature a deductive process through a quantitative measurement, a goal to predict or confirm, a predetermined or structured design, and findings that are always numerically expressed. I paid special attention to the demographic groups found in the student body at a two-year community college in the United States. The stratified sample used in the present study reflected the demographics of this institution in the data compiled for review and analysis.

As previously stated, I investigate the following research question:

RQ1. Is there a relationship between students’ background characteristics, collegiate experiences, and learning outcome scores in critical thinking, quantitative literacy, and written communication?

The learning outcomes data included in this study were collected from rubrics used to assess students’ learning in three areas: critical thinking, quantitative literacy, and written communication. These rubrics were developed by the American Association of Colleges & Universities (AAC&U) Multi-State Collaborative to Advance Quality Student Learning, a large-scale initiative intended to measure student performance on learning outcomes in higher education (Berrett, 2016). AAC&U conducted a multi-state collaborative study with faculty and staff from across the United States to score student work samples using the rubrics to measure student performance. These rubrics contain a 4-point scale to measure five to six criteria for each learning outcome to evaluate student assignments. AAC&U replicated this study within
one state. Five private and five public institutions participated, and the two-year community college used in this study was part of the state collaborative project. I analyzed how students perform on institutional learning outcomes using the AAC&U data gathered from this Midwestern urban community college.

Below, I present information on the research design, the data used for my study, the instrument used to collect the data, my data collection procedures, analysis, and the Institutional Review Board (IRB) approval process.

**Research Design**

I conducted linear regressions predicting the three dependent variables of student learning outcomes scores in critical thinking, quantitative literacy, and written communication. The independent variables in the three regressions included race/ethnicity, age, gender, Pell-eligibility, program of study, credit hours, and degree level within a two-year community college. My goal was to provide insight into possible significant differences in students’ performance based upon demographic differences and collegiate experiences.

In conducting a linear regression, if I received a positive correlation that is significant that means that one demographic is more likely than another to score higher (or lower) on that particular learning outcome. Individuals are not isolated by one characteristic at one time. For instance, a student is not just female, or African American, or Pell-eligible, or earning an associate’s degree in the criminal justice program. All of the variables should be examined in the presence of other variables. A student is all of these things at once, and a multiple linear regression can test for whether or not these independent variables matter in comparison to other independent variables. The question is: What is the driving force that impacts performance of student learning outcomes? Does one variable trump all others in this study? This is the benefit
of using multiple linear regressions; it looks at relationships in the presence of other independent variables. The strongest relationships between these independent variables can be evaluated.

Astin’s (1993) I-E-O model suggests the association between college experiences and demographic variables. We know through the literature that demographics have a significant impact on student performance in higher education. Astin’s I-E-O model provides a supportive framework for this study because 1) the input (I) measured include the characteristics of students such as race/ethnicity, age, gender, and socioeconomic status; 2) the collegiate experiences (E) measured include students’ experiences during college and include program of study, credit hours completed, and degree level; and 3) the student outcomes (O) explored include numerical scores on student work samples obtained using the AAC&U VALUE rubrics. Astin’s intensity of student effort is not included in the study due to the variables available to examine, which means there were variables included in Astin’s study that are not measured within this study. This may imply that two-year institutions should consider collecting more data with more potential for explaining their outcomes.

**Description of the Sample**

The dependent variables used in this study are rubric scores provided by faculty in three areas: critical thinking, quantitative literacy, and written communication. Faculty used AAC&U VALUE rubrics to assess students’ learning from samples of 377 students’ work collected (called artifacts) from 38 instructors in 17 disciplines in the participating institution in 2016. Sixty-five artifacts were lost due to lack of information such as the students’ age, Pell-eligibility, or program of study. The institution is a two-year public community and technical college located in an urban area in a Midwestern state of the United States. The institution has a Carnegie classification of associate’s, public urban-serving single campus (Carnegie, 2017).
Faculty members from the institution who submitted artifacts were from a number of discipline areas including accounting, business, chemistry, communication studies, community health, economics, education, English, English to students of other languages, first year student transition, global studies, machine tool technology, math, music, philosophy, political science, and welding. I performed an in-depth analysis of the raw data obtained from national scoring to determine the differences in students’ performance based on independent variables such as race/ethnicity, age, gender, Pell-eligibility, program of study, number of credit hours completed, and degree level.

The institutional population of 10,000 students are 55% female, 43% Pell-eligible, with an average age of 27 (Fact Sheet, 2016). The students at this institution are 39% white, 31% Black or African American, 10% Hispanic, 7% two or more races, 6% Asian, 4% unknown, 2% nonresident alien, and 1% American Indian or Alaskan Native. Table 1 below compares demographics from the data, based on the artifacts collected, with the demographics of this institution, and indicates that the demographics at this institution is comparable to the data collected in this sample. In regard to race and ethnicity, age, gender, and socioeconomic status the data gathered in the sample compares with the demographics found at the institution. In regard to age, the sample appears to be slightly older than the institutional population. There were more females than males in the sample when compared to the institution. Socioeconomic status, measured in terms of Pell-eligibility, found fewer Pell-eligible students at the institution then found in the sample. There were more students in the study who were enrolled in health and medicine programs, technical areas, and in the social sciences. The study found fewer students enrolled in business and math programs as well as criminal justice. The study was comparable with the institution in regards to students enrolled in natural sciences and education.
program. The academic programs involved in the study do not reflect all programs offered at the institution.
Table 1

*Comparison of Population and Sample*

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<th>Independent Variable</th>
<th>Institutional Percentage</th>
<th>Sample Percentage</th>
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<td>3.5</td>
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<tr>
<td>Certificate</td>
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</table>

Campus Fact Sheet (2016)
Researchers determine the number of the sample size based on the population size and confidence levels. Implementing the online Raosoft Sample Size Calculator (2004), with the population of this institution being approximately 10,000 \((N)\) size of population, the margin of error set at 5%, and the confidence level determined to be 95%. With this criterion submitted, the number of artifacts to include in the research sample \((n)\) size of sample, was determined to include 370 artifacts collected for all three outcomes, over one hundred artifacts per learning outcome. The sample size, the number of artifacts collected, was 377, which initially satisfied the number of artifacts to be collected for a representative sample. Sixty-five artifacts, however, were lost due to lack of information available from the institutional research office. The loss of this data decreased the sample size. In reviewing the impact of sample size, with 300 artifacts the margin of error increases from 5% to 5.62% (Raosoft, 2004).

**Instruments for Data Collection**

**Description of VALUE Rubrics**

The VALUE rubrics, developed by AAC&U, use a common definition and set of criteria to measure learning outcomes to assess authentic student work submitted by instructors using samples taken from class assignments. Teams of faculty members and other educational professionals from over 100 private and public, 2- and 4-year, research and liberal arts institutions across the United States between the years 2007-2009 developed the VALUE rubrics (Berrett, 2016). Faculty from over 100 college campuses then tested drafts of each rubric with their own student work samples in the year 2009 (AAC&U, 2017).

The VALUE rubrics include 16 learning outcomes under three general areas of intellectual and practical skills, personal and social responsibility, and integrative and applied learning. Intellectual and practical skills include the following learning outcomes:
• Inquiry and analysis
• Critical thinking
• Creative thinking
• Written communication
• Reading
• Quantitative literacy
• Information literacy
• Teamwork
• Problem solving

Personal and social responsibility skills include the following learning outcomes:
• Civic engagement
• Intercultural knowledge and competence
• Ethical reasoning
• Foundations and skills for lifelong learning
• Global learning

Integrative and applied learning include the following learning outcome:
• Integrative learning

The rubrics have a scale ranging from 0-4 to evaluate how students demonstrate various criteria of each outcome (Berrett, 2016). The performance indicators provide a progression from benchmark to milestone to capstone. Performance indicators include milestones between the benchmark, where rubric developers found their students’ current performance on average, and the capstone, where rubric developers hoped their students would be at the completion of their degree (Rhodes, 2011).
The present study is focusing on three of the outcomes developed by AAC&U: critical thinking, quantitative literacy, and written communication. These three outcomes were analyzed because the data used in the study was aggregated from the state collaborative project in which the institution under study participated. The institution’s administrators and faculty members committed to analyzing these three outcomes as part of the project. The raw data received from AAC&U comes as one general score for each artifact. The specific criteria for each outcome are found in Appendices A, B, and C.

Validity and Reliability of the AAC&U VALUE Rubrics

Validity is an analysis of whether the assessment instrument truly captures the concept and variables it intends to measure. According to Maki (2004), “A valid method enables direct and accurate assessment of the learning described in outcome statements” (p. 93). According to the 2017 VALUE report, the rubrics were created because of a dissatisfaction in higher education with standardized tests having limited validity due to the fact that these tests do not measure authentic student learning that is directly connected to classroom curriculum. The VALUE rubrics, created by national teams of faculty, hold a high degree of face validity because faculty are familiar with outcome assessment on college campuses (Rhodes & Finley, 2013). Validity comes in the level of agreement attained among all the people involved in the development of the rubric. The VALUE rubrics were tested at over one hundred colleges and universities, using authentic student work samples, before the rubrics were made available to the public (VALUE Report, 2017). Establishment of content validity, through the specific employment of faculty and other national experts to populate the development teams, verified that the rubrics criteria cover the full range of concept meaning (Rhodes & Finley, 2013). According to Rhodes and Finley (2013), “because the VALUE rubrics meet at least two specifications for establishing
validity, face validity and content validity, rubric users can have a high degree of confidence that a particular rubric is capturing the specified learning outcome” (p. 15).

Reliability measures how consistently the scorers grade student responses (Maki, 2004). Reliability ensures that the assessment is consistent over time or in different contexts or between raters. According to Rhodes and Finley (2013), “A common method for establishing reliability for rubrics is through inter-coder or inter-rater scoring, a method by which two or more coders evaluate the same work sample, score it according to a common rubric, and calculate a reliability score” (Rhodes & Finley, 2013, p. 16). Inter-rater reliability was developed through calibration sessions when different individual scorers agree in their scoring of sample student work (Maki, 2004).

Researchers seeking to test national reliability estimates for the VALUE rubrics had two objectives: to establish cross-disciplinary scores for each rubric and to establish reliability scores within disciplines to examine similarities and differences across faculty from the different disciplinary backgrounds (Finley, 2011). Forty-two faculty participated in the study including faculty from the broad discipline areas of humanities, natural sciences, social sciences, and professional and applied sciences. Each faculty member scored three samples of student work. The initial round of scoring was to familiarize themselves with the rubric and compare to previously determined calibration scores set by rubric experts employed to establish baseline scores by national representatives already well acquainted with the VALUE rubrics. If the scores were closely aligned with pre-determined calibration scores, the individuals went on to score two more work samples; if there was a divergence in scoring the individual would work with a team to review the discrepancy before moving on to the additional work samples.
Researchers at AAC&U used a multi-rater kappa statistic to establish reliability for the VALUE rubrics. The kappa scores indicate the degree to which raters’ scores are similar, and takes into account the amount of agreement on scores between raters, but also the probability that scorers will agree with each other. Student work samples were analyzed based on the five-point scale used in each rubric. Scores calculated for each criterion were combined into one category. The fullest majority of data points included additional measures of central tendency for consolidation. According to Finley (2011), “if the average was 2.0 but the mode and median were 2.0 and 1.5, ratings of 1 and 2 would be collapsed into a single category” (para 8). The kappa score using the combined average for all rubrics was .18 for perfect agreement, .42 for approximate agreement using four categories, and .69 for approximate agreement using three categories. The kappa scores increased as fewer rating categories were considered.

According to the VALUE Report (2017), Gwet’s AC was used to test reliability using a range of agreement across the dimensions for critical thinking, quantitative literacy, and written communication outcomes. They found the agreement to be described as moderate to strong. Written communication showed the highest levels of inter-rater agreement in scores and quantitative literacy had the lowest levels of inter-rater agreement (VALUE Report, 2017, p. 30).
Data Collection Procedures

Faculty members from the Midwestern urban community college had previously submitted student work products, referred to in this study as artifacts, and these artifacts were assessed by nationally trained scorers using the appropriate VALUE rubrics. The artifact was typically an assignment for a course, which was written to facilitate evaluation of the learning outcome and used to calculate the students’ grades for the course. The artifacts could have come from any discipline area – and be radically different in content – and still be scored by the same rubric. Each student submitted a single artifact, which was scored using the VALUE rubric, and each student record was paired with institutional records about students’ demographic characteristics data. An artifact was only measured using one outcome (either critical thinking, quantitative literacy, or written communication). I had three separate datasets that I analyzed: the critical thinking group had 106 artifacts, the quantitative literacy group had 107 artifacts, and the written communication group had 99 artifacts.

According to AAC&U (2015), faculty were required to complete an assignment coversheet for the artifacts submitted that indicate:

Which criteria of the appropriate VALUE Rubric was their assignment designed to address. Faculty members are encouraged to submit assignments that address as many of the VALUE Rubric dimensions for a specific learning outcome as appropriate to allow for a more comprehensive measure of student proficiency levels for each learning outcomes. Faculty will submit written student work only. Excluded from the study include multiple-choice exams, video, and other alternative modalities. Student work (the “artifact”) included work completed independently. Student work completed as part of a team/group project is not acceptable. Faculty exclude student work that breaches the
confidentiality or anonymity of the student, faculty member, or institution providing the work. For example, students may have referenced their course instructor in their work, which would breach confidentiality and rendered unusable. Institutions decide upon the appropriate protocol for ensuring that submitted student work, after it has been de-identified, and not traced back to the student, instructor, or course. (pp. 1-2)

The assessment committee and institutional research administrator at this Midwest urban community college had previously used a stratified sampling approach to create a sample that reflected the general demographic characteristics of the student population at this institution; with respect to gender, race/ethnicity, major or program of study, Pell-eligibility, and age. To ensure the artifacts submitted reflect the demographics of the general student population at the institution involved in the study, participating faculty submitted work from all students enrolled in their course who completed the assignment. A total of ten student artifacts per faculty member was manually-generated to include in the sample. A purposeful evaluation of the sample was conducted to determine whether or not the selected student artifacts reflected the demographics of the general student population at this institution. A second sample was generated if the artifacts did not reflect the demographics of the general student population.

Individuals in the office of research and assessment at AAC&U (2015) undertook a final review of the campus sampling methods in order to evaluate whether the methods lined up with the predetermined guidelines. Sampling guidelines included drawing only ten artifacts from any one course and collecting a target of over one hundred artifacts per learning outcome (AAC&U, 2015). According to AAC&U (2015), artifacts should include students majoring across a variety of disciplinary areas or programs and taught by a variety of instructors.
AAC&U used an online system developed by Taskstream, called Aqua, to collect and assess artifacts (Carnahan & Rhodes, 2016). Prior to the submission of artifacts to AAC&U, artifact numbers were developed to replace student identifiers. According to Carnahan and Rhodes, rigorous planning and development went into the recruiting and training of faculty and institutions to participate in the AAC&U national calibration sessions. AAC&U personnel worked with Taskstream to develop a platform and database designed to make the collection and scoring of artifacts as smooth as possible (Carnahan & Rhodes, 2016).

Scorers engaged in a pre-scoring exercise by using a specified rubric to score one work sample using the Taskstream system Aqua. Personnel from AAC&U analyzed whether or not the scores were closely aligned with pre-determined calibration scores, the individuals went on to score two more work samples; if there was a divergence in scoring the individual would work with a team to review the discrepancy before moving on to score additional work samples. Scorers then completed a review of online training materials, scored four additional student works samples, to determine the necessity of additional practice with the rubrics. Qualified scorers participated in scoring of artifacts. AAC&U scored all artifacts one time and one-third, randomly selected, artifacts twice in order to measure inter-rater reliability (Carnahan & Rhodes, 2016). The scores on the artifacts used in this study came from the national scoring completed for the institution under study. I used the scores from each artifact and combined them with student characteristics to create the database.
Analysis

I relied on analysis techniques to examine the data to make conclusions and uncover whether there were significant differences in the three dependent variables; students’ VALUE rubric scores in critical thinking, quantitative literacy, and written communication learning outcomes. As stated previously, I am using a multiple linear regression. I dummy-code the independent variables as shown in Table 2 below. For example, gender was recoded into a different variable as female (1) and male (0). Pell-eligibility was recoded yes/no/not available. A decision was made as to whether to recode the ‘not available’ as not Pell-eligible, or to not include this data in the sample. I chose not to include students in the sample who did not have Pell-eligible information available from the office of institutional research. The students who did not have Pell-eligible information available may not have filled out the Free Application for Federal Student Aid (FAFSA) or may be international students. Taking them out meant a loss in response rate. In order to analyze each race/ethnicity individually it was necessary to recode each race/ethnicity variable independently. For instance, Hispanic student response data was recoded as a 1 and all others were recoded as a 0, African American students were recoded as a 1 and all others were recoded as a 0, and so on. This was completed rather than coding all students of color as a 1 in comparison to White students recoded as a 0.

Academic major was restructured into categories. Programs were divided into the following categories: health and medicine, natural sciences, business and math, criminal justice, technical fields, social sciences, engineering, and education. I included community health worker, addiction counseling, pre-nursing, professional nursing, human services, dental assistance, medical office assistant, and pharmacy technician in health and medicine. I included chemistry, biology, and polysomnography in sciences. Business management, software
development, computer support and network administration, mathematics, accounting technician, and entrepreneurship were grouped within business and math. Criminal justice included legal office specialist, criminal justice studies, and law enforcement. Technical areas included HVAC (heating, ventilation, and air conditioning), welding and metal fabrication, early childhood education, and architectural technology. Engineering was its own category. Education included urban teacher education and special education. I controlled for major because I analyzed whether or not students in a certain major may have a higher performance on certain outcomes. For instance, we might expect that math majors would score higher in quantitative literacy.

Students in this study were from a number of programs that require a variety of credit hours to complete the specific degree. Some of the degrees at the community college involved in this study had up to 72 credits to completion. It is important to keep in mind that most community college degrees only require around 60 credits, but it is possible for students to have completed more than 60 credits due to a change in majors or transferring in a number of credits. I decided to categorize students into those who have completed 0-30 credits and a second category of student who have completed over 50 credits. Students ranged from having completed 0 credits to up to 106 credits.
### Coding Scheme

<table>
<thead>
<tr>
<th>Demographic Characteristics: Inputs</th>
<th>Coding Scheme</th>
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<tbody>
<tr>
<td>Race/Ethnicity</td>
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<tr>
<td>Hispanic</td>
<td>0 = all other students; 1 = Hispanic</td>
</tr>
<tr>
<td>African American</td>
<td>0 = all other students; 1 = African American</td>
</tr>
<tr>
<td>Asian</td>
<td>0 = all other students; 1 = Asian</td>
</tr>
<tr>
<td>Native American</td>
<td>0 = all other students; 1 = Native American</td>
</tr>
<tr>
<td>White</td>
<td>0 = all other students; 1 = White</td>
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<tr>
<td>Age</td>
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</tr>
<tr>
<td>Gender</td>
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<tr>
<td>Socioeconomic Status</td>
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</table>

<table>
<thead>
<tr>
<th>Collegiate Experiences: Environment</th>
<th>Coding Scheme</th>
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<td>Program of study</td>
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<td>Health/Medicine</td>
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<td>Natural Sciences</td>
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<td>Business and Math</td>
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<tr>
<td>Technical</td>
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</tr>
<tr>
<td>Social Sciences</td>
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<tr>
<td>Education</td>
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<table>
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<td>Certificate degree</td>
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</tr>
<tr>
<td>Associates degree</td>
<td>0 = all other degrees; 1 = Associate’s degree</td>
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</table>
The dependent variable average scores on the rubrics were used rather than analyzing each criterion separately. To build the data in SPSS, I entered in all of the separate independent variables to be analyzed. Academic program, race/ethnicity, Pell-eligibility, number of credits, gender, and age were all entered into SPSS. I used SPSS 23.0 to analyze the relationships between students’ demographic background characteristics and collegiate experiences with students’ learning outcome scores.

I examined underlying assumptions of multiple linear regression to ensure the data were suitable. Multicollinearity, homoscedasticity, linearity, normality of residuals, independent errors, and presence of outliers were reviewed in each model to ensure no assumptions were violated. I first tested for multi-collinearity, which occurs when there are strongly correlated independent variables. I reviewed the correlations table and variance inflation factors (VIF) for evidence of strong correlations. I looked at the Durbin-Watson value, which is a statistic related to independence of residual errors in the model.

After testing assumptions, I ran multiple linear regressions for each of the three outcomes to determine the relationship between students’ demographic characteristics and collegiate experiences and their outcomes associated with critical thinking, quantitative literacy, and written communication as measured using the Association of American Colleges and Universities (AAC&U) Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics. I chose a p value of less than .05 to indicate statistical significance (Research Consultation, 2007).
Institutional Review Board Process

This study involved minimal risk to the individuals who submitted work samples in the original data collected. Violation of confidentiality in this study is not a research risk or a risk that rose above minimal. This study included educational practices conducted in “established or commonly accepted educational settings, involving normal educational practices” (Office of Human Subjects Protections, 2009, section 45CFR46.101). This study used existing information, which involves research through “the collection or study of existing data, documents, records…if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects” (Office of Human Subjects Protections, 2009, section 45CFR46.101).

The Institutional Review Board from the institution at St. Cloud State University approved the study, and can be found in Appendix D. The researcher assured that the risk was minimal and confidentiality assured. The study was an evaluation of an educational process conducted by the institution to improve its own processes.

Summary

This chapter described the research methodology used in the study. The purpose of this study was to determine how students perform on assessments of institutional student learning outcomes. The results, organized by demographic variables, will help to determine how students perform on assignments assessed in three learning outcome areas: critical thinking, quantitative literacy, and written communication. Demographics such as age, gender, ethnicity and Pell-eligibility often relate to student success. I captured the data previously collected by the institution under study for participation in a collaborative project to assess how students are performing on institutional learning outcomes using the AAC&U VALUE rubrics.
Chapter 4 will reiterate the research question and present the data and the findings, to examine what differences and correlations were found. Chapter five presents an interpretation of the findings, possibilities for further research, implications of the theory used in the study, and recommendations to the field.
Chapter IV: Results

I conducted an explanatory study to examine students’ performance on institutional learning outcomes. This study used existing data, generated by trained faculty evaluators, to move beyond the raw scores to produce findings on the relationships between students’ demographic characteristics and collegiate experiences associated with scores using a common definition and set of criteria in the areas of critical-thinking, quantitative literacy, and written communication. An explanatory study examines the trait or mechanism of the relationship between the independent and dependent variables to enrich a theory’s expectation or belief. I used Astin’s I-E-O model as the principle framework to examine input, environment, and outcomes.

Astin’s I-E-O model considers student inputs, the educational environment, and student outcomes after exposure to the environment (Astin, 1993). This study examined student characteristics at entry, such as gender or socioeconomic status, and then analyzed in an effort to identify co-variations between student characteristics (I), environment (E) and outcomes (O). Collegiate experiences (E) indicated student experiences during enrollment at the institution under study and include program of study, credit hours completed and degree level. Student outcome (O) included numerical results of student work samples obtained using the Association of American Colleges and Universities (AAC&U) Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics.

I investigated the following research question:

RQ1. Is there a relationship between students’ demographic characteristics, collegiate experiences, and learning outcome scores in critical thinking, quantitative literacy, and written communication?
This chapter discusses the results of data previously collected from faculty and evaluated by trained scorers regarding student learning as measured by the AAC&U VALUE rubrics. I conducted three separate multiple linear regressions to predict students’ performance on three dependent variables in the study. Before that, I examined assumptions of multicollinearity, homoscedasticity, linearity, and independent/normal errors in each model. A synthesis of the results presents conclusions drawn from the data regarding my research question. The chapter concludes with a summary of the findings.

**Demographic Information**

Table 3 below contains the demographics of the independent variables of race/ethnicity, age, gender, socioeconomic status, program of study, credit hours earned, and degree level. Scores were originally collected for 377 artifacts. Sixty-five artifacts, not included in the analyses conducted, were lost due to lack of information such as the students’ age, Pell-eligibility, or program of study. Data from the institutional research office was missing, which may be due to the fact that students did not fill out a FAFSA form, or may have been undocumented or international students. The loss of this data decreased the sample size. In reviewing the impact of sample size, with 300 artifacts the margin of error increases from 5% to 5.62% (Raosoft, 2004). Artifacts were not assessed by more than one of the outcome rubrics, therefore, in breaking the data down into individual outcomes of critical thinking \( n = 106 \), quantitative literacy \( n = 107 \), and written communication \( n = 99 \); the margin of error increases to 9.78% (Raosoft, 2004). The lower the sample size, the higher the margin of error. Margin of error determines the level of accuracy of the results. The implications for this for the findings of the study will indicate caution when extending findings from the sample to the population.

It is important to collect enough data to obtain a reliable regression model to examine
each of the dependent variables (Field, 2013). According to Field (2013), the aim is to test the overall fit of a model to find a large effect, then a sample size of 77 would suffice (with up to 20 predictors); however, if I am expecting a medium effect, a sample size of 160 will suffice (with up to 20 predictors). Field states that you should always have a sample size above 55 in a regression model, and encourages researchers not to bother with a small effect size because it would require the time and resources to collect hundreds of cases of data (p. 313). The message Field provides is that sample sizes do not need to be massive if the researcher is looking for medium to large effects (Field, 2013, p. 313). I have a sample size of 106 for critical thinking, 99 in written communication, and 107 in quantitative literacy. With that sample size, I can expect to find a medium to large effect.

The participants in this study included 316 students enrolled in the two-year public community college involved in the study. Table 3 lists the frequency and percentage of students for each of the independent variables found in the study.
Table 3

Descriptive Statistics for Demographic Independent Variables

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Total (n)</th>
<th>Frequency</th>
<th>Percentage</th>
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<td>Two or more races</td>
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Demographic Information in Critical Thinking
I used three separate dependent variables in my analysis: critical thinking, quantitative literacy, and written communication. Artifacts collected for critical thinking showed a higher percentage of Asian students in the sample as compared to the institution, higher number of females then males, higher number of Pell-eligible students, lower number of students in the 17-24 age range in the sample compared to the institution, and a higher number of students in the health/medicine and social science programs of study than are found in the population of students at this institution. All other areas were comparable to the population found at the institution under study.

**Demographic Information in Quantitative Literacy**

Artifacts collected for quantitative literacy showed a higher percentage of White students and students from two or more races, a lower number of African American students, more males than females, a higher number of Pell-eligible students, a higher number of students in the 45-54 age range, and a higher number of students in the health/medicine and social science programs of study than are found in the population of students at this institution. No artifacts were collected from Native American students. All other areas were comparable to the population found at the institution under study.

**Demographic Information in Written Communication**

Artifacts collected for written communication showed a higher percentage of Pell-eligible students, a lower number of students in the 17-24 age range, and a higher number of students in the 25-34 and 35-44 age ranges. All other areas were comparable to the population found at the institution under study.

As presented in chapter 3, the overall demographics found in my study was representative of the population of students enrolled at this Midwestern urban community college. The sample
included students from a diverse population as represented in race/ethnicity, age, program of study and degree level.

**Mean Scores**

The mean scores and standard deviations were calculated for all the three dependent variables used in a simultaneous multiple regression analysis. Results are in Table 4 below. Correlational analysis was used to examine the relationships between the variables.

Table 4

*Descriptive Statistics for Dependent Variables*

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This indicated that the mean scores for all students in critical thinking was 1.683, quantitative literacy was 1.6195, and written communication was 1.952. Scores range from 0 to 4. Benchmark scores are 1, milestone scores are 2 and 3, and capstone scores are 4. Students’ in critical thinking and quantitative literacy scored at the benchmark level. Students’ in written communication scored close to the milestone level. Students’ scored highest in written communication and lowest in quantitative literacy.

**Testing Multiple Linear Regression Assumptions**

Before presenting the data results, it is essential to run tests to ensure statistical assumptions have been met and to make sure that the data does not fail these assumptions.
Multiple linear regression assumes that the variables are normally distributed, that the independent variables are not highly correlated with each other, and that the variance of error terms are similar across the independent variables. Multicollinearity tests the assumption that the independent variables are not highly correlated with each other (Field, 2013). I performed correlational analyses to examine the relationships among the independent variables. I ran tests to explore normal distribution, variance, and linear correlation. I examined assumptions of multicollinearity, homoscedasticity, linearity, and independent/normal errors.

I ran separate linear regressions with my three dependent variables of critical thinking, quantitative literacy, and written communication along with all of the independent variables: race/ethnicity, age, gender, socioeconomic status, and program of study.

**Pearson Correlations**

As displayed in Tables 5, 6, and 7, Pearson Correlations calculated independent variables to make sure the co-variation between independent variables was not too high, which means that each variable could potentially contribute some explanation independent of the other variables. In critical thinking, certificate and associate’s degrees were closely related. Over 30 credits earned and over 50 credits earned were also closely related in critical thinking. As none of the other correlations reached the .80 threshold, the analysis indicated that no other variables were closely related for critical thinking. For quantitative literacy, certificate and associate’s degrees were closely related. No other correlations reached the .80 threshold, which indicated that no other variables were closely related for quantitative literacy. For written communication, certificate and associate’s degrees were closely related. No other correlations reached the .80 threshold, which indicated that no other variables were closely related for written communication.
Table 5

**Critical Thinking Pearson Correlation**

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### Table 6

**Quantitative Literacy Pearson Correlation**

|          | QuantOut | Female | Asian | SociaScien | Black | Hispnic | Pell | Age | Associates | Certif | Justice | Techn | Bus/Ma | Health | Scien | Than | Over |
|----------|----------|--------|-------|------------|-------|---------|------|-----|------------|--------|---------|-------|--------|--------|-------|-------|------|------|
| **QuantOut** | 1.000    |        |       |            |       |         |      |     |            |        |         |       |        |        |       | 30    | 50   |
| Female     | -.210    | 1.000  |       |            |       |         |      |     |            |        |         |       |        |        |       |       |      |      |
| Asian      | .034     | -.005  | 1.000 |            |       |         |      |     |            |        |         |       |        |        |       |       |      |      |
| SocialScienc | -.016  | .003   | -.035 | 1.000       |       |         |      |     |            |        |         |       |        |        |       |       |      |      |
| Black      | .169     | -.048  | -.129 | .130        | 1.000 |         |      |     |            |        |         |       |        |        |       |       |      |      |
| Hispanic   | .121     | -.138  | -.071 | .165        | -.187 | 1.000   |      |     |            |        |         |       |        |        |       |       |      |      |
| Pell       | -.145    | .113   | .034  | -.007       | .339  | -.144   | 1.000|     |            |        |         |       |        |        |       |       |      |      |
| Age        | .026     | -.088  | -.145 | .065        | .253  | -.051   | .250 |     | 1.000     |        |         |       |        |        |       |       |      |      |
| Associates | -.193    | .051   | -.025 | .265        | -.042 | -.036   | .148 | .075| .007      |        |         |       |        |        |       |       |      |      |
| Certificate| .122     | .004   | .062  | -.217       | .066  | .089    | -.017| .007| -.818     | 1.00   |         |       |        |        |       |       |      |      |
| Justice    | .052     | -.115  | -.031 | .226        | -.080 | .193    | -.006| .030| .060      | -.049  | 1.00    |       |        |        |       |       |      |      |
| Technical  | .026     | -.237  | .062  | -.217       | -.002 | -.012   | .043 | -.017| -.251     | .343   | -.049   | 1.000 |        |        |       |       |      |      |
| Bus/Math   | .211     | -.096  | -.113 | -.258       | .024  | -.084   | -.070| .364| .095      | -.034  | -.070   | -.181 | 1.000   |        |       |       |      |      |
| Health     | -.115    | .226   | -.067 | .042        | .134  | .018    | .222 | .160| -.329     | .426   | -.042   | -.108 | -.154   | 1.000 |        |       |       |      |      |
| Sciences   | .013     | .088   | -.038 | -.104       | -.099 | .140    | -.065| .042| .074      | -.060  | -.023   | -.060 | -.086   | -.051 | 1.000 |        |       |      |      |
| Lessthan30 | .149     | -.100  | -.103 | -.094       | -.129 | -.017   | -.235| -.144| -.177     | .091   | -.179   | .275  | -.085   | -.114 | .131  | 1.000 |        |      |      |
| Over 50    | -.114    | -.031  | .081  | -.002       | .122  | .043    | .148 | .128| .067      | -.078  | -.201   | .035  | .221   | -.096 | -.733 | 1.000 |        |      |      |
### Table 7

**Written Communication Pearson Correlation**

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<td>-.228</td>
<td>-.112</td>
<td>-.051</td>
<td>.047</td>
<td>.041</td>
<td>.065</td>
<td>.009</td>
<td>-.148</td>
<td>.201</td>
<td>-.090</td>
<td>.254</td>
<td>-.172</td>
</tr>
<tr>
<td>Less30</td>
<td>-.130</td>
<td>-.021</td>
<td>.201</td>
<td>-.013</td>
<td>-.010</td>
<td>-.047</td>
<td>-.029</td>
<td>-.037</td>
<td>-.252</td>
<td>.182</td>
<td>.178</td>
<td>-.103</td>
<td>-.015</td>
<td>-.009</td>
</tr>
<tr>
<td>Over50</td>
<td>.146</td>
<td>.001</td>
<td>-.031</td>
<td>-.029</td>
<td>.077</td>
<td>.056</td>
<td>.021</td>
<td>.084</td>
<td>.334</td>
<td>-.124</td>
<td>.041</td>
<td>.111</td>
<td>.001</td>
<td>.047</td>
</tr>
</tbody>
</table>
Tables 5, 6, and 7 calculate the correlation coefficients to provide an indication of the magnitude of the relationship between variables. Multicollinearity is possible if variables are strongly correlated, which can lead to errors in regression models (Field, 2013). The results showed a low relationship between almost all of the variables. In all three models certificate degrees were closely correlated with associate’s degrees. For critical thinking, over 50 credits earned was closely correlated with under 30 credits earned. All correlations among all other variables were below .80, indicating a low likelihood of multicollinearity between the independent variables (Field, 2013). Pearson’s correlation coefficient provides a good overall method, but misses more subtle forms of multicollinearity (Field, 2013). According to Field (2013), “luckily, SPSS produces various collinearity diagnostics, one of which is the variance inflation factor (VIF)” (p. 325). The VIF and tolerance levels were examined and described below. These two statistics conduct a closer analysis of whether the variables had a strong linear relationship with one another.

**Tolerance Levels and Variance Inflation Factor**

Two additional checks for multicollinearity of the independent variables are the tolerance levels and the Variance Inflation Factor (VIF). When using a multiple linear regression, adding more, similar variables may fail to make things clearer as the variables may correlate with one another. The VIF scores should be well beneath 10 and tolerance values greater than .1 to indicate the relative threshold levels that, if crossed, would highlight problems with the data. (Field, 2013). For critical thinking the VIF scores ranged from 1.136 to 4.393 and the tolerance values ranged .228 to .881. For quantitative literacy the VIF scores ranged from 1.227 and 4.184 and the tolerance values ranged from .247 and .838. For written communication the VIF scores ranged from 1.205 and 4.734 and the tolerance values ranged from .211 and .830. This
indicates that there is no reason for concern that the independent variables excessively influence each other, and that multicollinearity was not a concern for all variables within the three models.

**Scatter Diagrams**

Multiple linear regression assumes that the data are not skewed, that outliers do not exist, that the residuals are normally distributed, that the variance around the regression line is the same for all values of the predictor variable, and that the residuals have a constant variance and are not correlated with each other. Scatter diagrams of residuals, partial plots, and normal probability plots of residuals were constructed to test these assumptions.

The histograms of standardized residuals indicated the data contained normally distributed errors (see Figures 2, 3, and 4). The normal P-P plots of standardized residuals showed points close to the line (see Figures 5, 6, and 7). The scatterplots of standardized residuals showed the data met the assumptions of homogeneity of variance and linearity (see Figures 8, 9, and 10).
Figure 2. Histogram of standardized residuals in critical thinking
Figures 2, 3, and 4 show the histogram is a bar-type graph for quantitative data. Each histogram developed respectively from the three dependent variable of critical thinking, quantitative literacy, and written communication and the same independent variables submitted for each dependent variable. The common boundaries between adjacent bars emphasized the continuity of the data, as with continuous variables (Field, 2013). The graphs show that a dense concentration of the independent variables has an impact on each of the learning outcomes (Field, 2013). The histogram of standardized residuals in critical thinking, quantitative literacy, and written communication indicated the data contained normally distributed errors.
Figure 5. Normal P-P plot of standardized residuals for critical thinking
The scatterplots shown in Figures 5, 6, and 7 represent the difference between the expected value and the observed value for a given variable that is shown in the form of a straight line. If the residuals are normally distributed, then the data should appear as a collection of points that are randomly scattered around a straight line. Normal P-P plot of standardized residuals showed points close to the line for critical thinking, quantitative literacy, and written communication.
Figure 8. Scatterplot of standardized residuals in critical thinking
The scatterplots shown in figures 8, 9, and 10 reflect no obvious outliers and the cloud of dots is evenly spaced around the line, and indicate homoscedasticity (Field, 2013). Homoscedasticity literally means the same amount of scatter. In testing homoscedasticity, the results suggested random scatter and variability in scatterplots of standardized residuals against the standardized predicted values. Scatterplot of standardized residuals showed the data met the assumptions of homogeneity of variance and linearity in critical thinking, quantitative literacy, and written communication.

In summary, testing assumptions of multiple regressions ensures data is suitable for regression analysis. In all regressions, I examined assumptions of multicollinearity, homoscedasticity, linearity, and independent/normal errors. I found that multicollinearity
assumptions were not violated (variance inflation factors in all three outcomes ranged from 1.136 to 4.734). In testing homoscedasticity, the results suggested random scatter and variability in scatterplots of standardized residuals against the standardized predicted values. The scatter plot for all three outcomes did suggest a potential for a linear relationship. In producing histograms of standardized residuals and normal probability plots comparing the distribution of standardized residuals to a normal distribution, I found evidence for normality (Field, 2013). Examinations of matrix scatterplots suggested the relationships between the predictor and outcome variables were linear. Residual errors were consistently independent across the models. Overall, the results of these tests suggest that the assumptions were not violated for each of the linear regressions in this study (Field, 2013).

**Multiple Linear Regression Results**

After completing tests for assumptions, I ran multiple linear regressions to determine if there was a relationship between students’ demographic background characteristics and collegiate experiences, and learning outcome scores in critical thinking, quantitative literacy and written communication. I used the multiple linear regression in order to determine which independent variables had statistically significant relationships with higher scores on the three learning outcomes (dependent variables), which allowed me to examine the research question to test covariations among the variables.

**Critical Thinking**

The results of the first linear regression, Table 8, shows the results of the independent variables in the multiple regression analysis in critical thinking. The Durbin-Watson value is at 2.42. Durbin-Watson value is a statistic related to independence of residual errors in the model.
The $R^2$ is the percent (36.5%) of variation in the outcome variable (critical thinking) can be accounted for by the independent variables.
Table 8

*Model Summary for Critical Thinking*

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.605*</td>
<td>.365</td>
<td>.234</td>
<td>.6853</td>
<td>2.423</td>
</tr>
</tbody>
</table>

Table 9 illustrates the overall regression for the model predicting students’ critical thinking scores was statistically significant, $F(17, 88) = 2.885, p < .001$. The first number is the number of variables included in the data. The second number is the between-group variance divided by the within-group variance. This study set out to investigate the variation between groups. The $F$-value is statistically significant ($p < .001$), which signifies that there is a significant relationship between the set of independent variables and the dependent variable.

Table 9

*ANOVA for Critical Thinking*

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>23.041</td>
<td>17</td>
<td>1.355</td>
<td>2.885</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>41.348</td>
<td>88</td>
<td>.470</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>64.389</td>
<td>105</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I conducted analyses to test the unique contribution between the independent variables and the dependent variables by calculating coefficients for each independent variable. An analysis of beta weight and the statistical significance for critical thinking is presented in Table 10 below.
### Critical Thinking Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>1.261</td>
<td>.437</td>
</tr>
<tr>
<td>Female</td>
<td>-.518</td>
<td>.163</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>-.178</td>
<td>.174</td>
</tr>
<tr>
<td>Asian</td>
<td>-.502</td>
<td>.235</td>
</tr>
<tr>
<td>Native American</td>
<td>-.111</td>
<td>.734</td>
</tr>
<tr>
<td>Black</td>
<td>-.267</td>
<td>.179</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-.059</td>
<td>.223</td>
</tr>
<tr>
<td>Pell</td>
<td>-.239</td>
<td>.147</td>
</tr>
<tr>
<td>Age</td>
<td>.020</td>
<td>.009</td>
</tr>
<tr>
<td>Associates</td>
<td>.440</td>
<td>.329</td>
</tr>
<tr>
<td>Certificate</td>
<td>.496</td>
<td>.400</td>
</tr>
<tr>
<td>Justice</td>
<td>.630</td>
<td>.385</td>
</tr>
<tr>
<td>Technical</td>
<td>-.417</td>
<td>.444</td>
</tr>
<tr>
<td>BusinessNMath</td>
<td>.255</td>
<td>.232</td>
</tr>
<tr>
<td>Health</td>
<td>.460</td>
<td>.202</td>
</tr>
<tr>
<td>Sciences</td>
<td>.679</td>
<td>.358</td>
</tr>
<tr>
<td>Lessthan30</td>
<td>-.250</td>
<td>.261</td>
</tr>
<tr>
<td>Over50</td>
<td>-.037</td>
<td>.284</td>
</tr>
</tbody>
</table>

*Note. * p < .05

Examination of the regression coefficient on the critical thinking outcome reveals that there is a significant difference in performance between males and females (B =-.310, t = -3.168, p = .002). Based on the beta the direction of the impact is negative. The results indicate that women score lower than men on the critical thinking outcome. Simply put, scores were significantly lower for females than males. Asian students have significantly lower critical thinking scores compared to all of their peers (B =-.204, t = -2.132, p = .036). For every year of
age that a student increases they are significantly more likely to have higher critical thinking 
scores (B = .243, t = 2.271, p = .026). Students in health majors have significantly higher critical 
thinking scores (B = .294, t = 2.283, p = .025). All other students had similar performance in 
critical thinking based on their scores; meaning that significant differences in scores were not 
found for any other independent variable.

**Quantitative Literacy**

Table 11 shows the results of the independent variables in the multiple regression 
analysis in quantitative literacy. The Durbin-Watson value is at 2.34. This suggests that I have a 
model that showed independence of residual errors in the model. The model explains 24.1% of 
the variance. All of the variables in the model account for about 24.1% of variance (R Square) 
for the quantitative literacy outcome.

Table 11

*Model Summary for Quantitative Literacy*

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.491a</td>
<td>.241</td>
<td>.086</td>
<td>.78672</td>
<td>2.348</td>
</tr>
</tbody>
</table>

Table 12 illustrates the overall regression for the second model predicting students’ 
quantitative literacy scores was statistically significant, $F(16, 90) =1.7555, p < .050$. There are 
16 variables included in the data, 90 is the between-group variance divided by the within-group 
variance. The $F$-value is statistically significant ($p < .050$), which signifies that there is a 
significant relationship between the set of independent variables and the dependent variable.
Table 12

ANOVA for Quantitative Literacy

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>17.062</td>
<td>16</td>
<td>1.066</td>
<td>1.755</td>
<td>.050</td>
</tr>
<tr>
<td>Residual</td>
<td>54.695</td>
<td>90</td>
<td>.608</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>71.757</td>
<td>106</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An analysis of beta weight and statistical significance for quantitative literacy is presented in Table 13 below.

Table 13

Quantitative Literacy Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>2.025</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>-.173</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>.422</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>.457</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>.367</td>
</tr>
<tr>
<td></td>
<td>Social Science</td>
<td>.119</td>
</tr>
<tr>
<td></td>
<td>Pell</td>
<td>-.083</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>-.006</td>
</tr>
<tr>
<td></td>
<td>Associates</td>
<td>-.664</td>
</tr>
<tr>
<td></td>
<td>Certificate</td>
<td>-.243</td>
</tr>
<tr>
<td></td>
<td>Justice</td>
<td>.530</td>
</tr>
<tr>
<td></td>
<td>Technical</td>
<td>-.059</td>
</tr>
<tr>
<td></td>
<td>BusinessNMATH</td>
<td>.577</td>
</tr>
<tr>
<td></td>
<td>Health</td>
<td>-.274</td>
</tr>
<tr>
<td></td>
<td>Sciences</td>
<td>.264</td>
</tr>
<tr>
<td></td>
<td>Lessthan30</td>
<td>.240</td>
</tr>
<tr>
<td></td>
<td>Over50</td>
<td>-.005</td>
</tr>
</tbody>
</table>
Examination of the regression coefficient on the quantitative literacy outcome (Table 13) revealed a significant difference in performance in two of the variables. Black students performed significantly higher in quantitative literacy than their peers ($B = .242, t = 2.092, p = .039$), the beta direction of the impact is positive. Students in business and math majors had significantly higher quantitative literacy scores ($B = .285, t = 2.298, p = .024$). All other students had similar performance in quantitative literacy based on their scores; meaning that significant differences in scores were not found for any other independent variable.

**Written Communication**

Table 14 shows the results of the independent variables in the multiple regression analysis in written communication. The Durbin-Watson value is at 2.00. This suggests that the model shows independence of residual errors. All of the variables in the model account for about 30.9% of variance (R Square) for the written communication outcome.

Table 14

*Model Summary for Written Communication*

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.556$^a$</td>
<td>.309</td>
<td>.143</td>
<td>.72692</td>
<td>2.004</td>
</tr>
</tbody>
</table>

Table 15 illustrates the overall regression for the written communication model was statistically significant, $F(18, 80) = 1.887, p < .029$. The $F$-value is statistically significant ($p < .029$), which signifies that there is a significant relationship between the set of independent variables and the dependent variable.
Table 15

ANOVA for Written Communication

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>18.012</td>
<td>18</td>
<td>1.0001</td>
<td>1.887</td>
<td>.029</td>
</tr>
<tr>
<td>Residual</td>
<td>42.435</td>
<td>80</td>
<td>.530</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>60.447</td>
<td>99</td>
<td>.530</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An analysis of beta weight and the statistical significance for written communication is presented in Table 16 below.
Examination of the regression coefficient on the written communication outcome (Table 16) revealed that none of the variables independently accounted for significant variation in the dependent variable.

**Results of Independent Variables**

**Race/Ethnicity.** Results of multiple linear regressions revealed that race/ethnicity was a significant predictor of performance on learning outcomes in two areas. Asian students were
significantly more likely to score lower in critical thinking and Black students were significantly more likely to score higher in quantitative literacy.

**Age.** Age was significantly related to performance in critical thinking. As age increased, scores in critical thinking increased. Age was not significantly related to performance in quantitative literacy or written communication outcomes.

**Gender.** Gender was negatively associated with student learning gains in critical thinking, indicating that women tended to score lower than men in critical thinking. Gender was not significantly related to performance in quantitative literacy or written communication outcomes.

**Pell-Eligibility.** This study measured socioeconomic status through Pell-eligibility. The results of multiple linear regressions revealed that Pell-eligibility was not a significant predictor of performance in critical thinking, quantitative literacy, or written communication.

**Program of Study.** Results of multiple linear regressions revealed that program of study showed significant findings in two areas: first, students enrolled in health programs scored higher in critical thinking, and second, students enrolled in business and math programs scored higher in quantitative literacy.

**Credit Hours.** Credit hours, indicating length of time in college, was not positively associated with student performance on any of the three learning outcomes measured.

**Degree Levels.** Results of multiple linear regressions revealed that the degree level that a student is completing is not a significant predictor of performance in critical thinking, quantitative literacy, or written communication.
Synthesis

Multiple linear regressions revealed a number of findings regarding relationships between students’ demographic background characteristics and collegiate experiences associated with students’ learning outcome scores in critical thinking, quantitative literacy, and written communication as measured using the Association of American Colleges and Universities (AAC&U) Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics.

I presented demographic information regarding the students at the institution under study. Data presented confirmed that the sample was a close representation of the population of students at the institution under study. The study included more females than males. The ages ranged from 17 – 66 years of age. There were a higher number of students from low socioeconomic status, as measured by Pell-eligibility.

I performed regression analyses to examine the relationships among the independent variables. The results showed a low relationship between almost all of the variables; in all three models certificate degrees were closely correlated with associate’s degrees, and in critical thinking the over 50 credits earned was closely correlated with the under 30 credits earned. All correlations among all other variables were below .80, indicating a low likelihood of multicollinearity between the independent variables. The VIF values were below 10 and tolerance values were greater than .1, indicating there was no reason for concern that the independent variables excessively influence each other, or that multicollinearity was a concern.

I used the multiple linear regression in order to determine which independent variables had statistically significant relationships to higher scores on the three learning outcomes (dependent variables). Examination of the regression coefficient on the critical thinking outcome revealed that there was a significant difference in females scoring lower than males, Asian
students having significantly lower scores, students enrolled in health programs scoring higher, and for every year of age that a student increases they are significantly more likely to have higher critical thinking scores. The regression coefficient on the quantitative literacy outcome revealed that there was a statistical significance in Black students and students in business and math programs to perform higher on the quantitative literacy outcome. Examination of the regression coefficient on the written communication outcome reveals that there are no significant differences in performance within all of the variables. Table 17 below provides information on the significant predictive variables relative to their beta weights and statistical significance to the outcome dependent variable.

Table 17

*Significant Predictive Variables*

<table>
<thead>
<tr>
<th>Critical Thinking</th>
<th>Beta</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health majors</td>
<td>.294</td>
<td>2.283</td>
<td>.025</td>
</tr>
<tr>
<td>Age</td>
<td>.243</td>
<td>2.271</td>
<td>.026</td>
</tr>
<tr>
<td>Lower scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>-.310</td>
<td>-3.168</td>
<td>.002</td>
</tr>
<tr>
<td>Asian students</td>
<td>-.204</td>
<td>-2.132</td>
<td>.036</td>
</tr>
<tr>
<td>Quantitative Literacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business and math majors</td>
<td>.285</td>
<td>2.298</td>
<td>.024</td>
</tr>
<tr>
<td>African American students</td>
<td>.242</td>
<td>2.092</td>
<td>.039</td>
</tr>
<tr>
<td>Written Communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No significant predictive</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$p < .05$

This study allowed me to examine the research question and the relationships between students’ demographic background characteristics and collegiate experiences associated with
students’ learning outcome scores in critical thinking, quantitative literacy, and written communication as measured using the Association of American Colleges and Universities (AAC&U) Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics. Are these results meaningful?

First of all, the models used in this study explained 36.5% of the variance of critical thinking, 24% of the variance of quantitative literacy, and 31% of the variance of written communication. In a multiple linear regression model R-squared correlates all the variables, including the independent variables with each other as well as with the dependent variable (Field, 2013). The variables do not explain all of the factors that contribute to student performance. It is difficult to determine if the variance results for critical thinking, quantitative literacy and written communication is an important amount. It makes for a good explanatory model, but there are variables that could be added that would allow for a higher explanatory power. Other variables could include high school grade point average or ACT and SAT scores. The difficulty is found in the community college not tracking this information because they are open access institutions. Other available variables could include high school attended, scores on college entrance exams, students participating in pre-college experiences like Postsecondary Enrollment Options (PSEO), assignment difficulty, course enrolled that the assignment was submitted from, or the faculty status that the assignment was taken from.

Second, the results were statistically significant at the threshold of confidence of \( p < .05 \). It suggested that the particular findings from my study is unlikely to have occurred by chance, but also that it is practically meaningful (Pascarella, Mayhew, Rockenbach, Bowman, Seifert, Wolniak, & Terenzini, 2016). Findings that are statistically significant are important and necessary as individuals within higher education want to respond to these findings to create
change that improves student outcomes. From the data, I can draw the conclusion that there were some significant differences between students’ performance in both the critical thinking and quantitative literacy learning outcomes. The co-variants showed us what contributed to improved outcomes: health majors scored higher in critical thinking and business and math major majors scored higher in quantitative literacy. I can conclude that there is a lack of difference between those early in their collegiate programs compared with students late in their collegiate education in all of the outcome areas of critical thinking, quantitative literacy, and written communication. This leads me to believe that students are not showing significant gains in these outcomes as a result of their collegiate experience.

In addition, the beta weights indicated how much the dependent variable increased when the independent variable increased by one standard deviation (Field, 2013). This assumes that other variables in the model are held constant. In a multiple linear regression, the beta weights can be ranked in order to decide which variable has the most impact (Field, 2013). It is important to be careful not to rely on beta weights too heavily, but should be used as a starting point for further investigation. Examination of the standardized coefficients suggest that students in health programs (β = .294), students who increase in age (β = .243), and students completing an associate’s degree (β = .225) and certificate degree (β = .222) were the most positively associated with students’ development of critical thinking scores. Students in business and math programs (β = .285) and African American students (β = .242) were the most positively associated with students’ development of quantitative literacy scores. Students completing an associate’s degree (β = .249) and students enrolled in health programs (β = .244) were the most positively associated with students’ development of written communication scores. A change in rubric scores between .222 and .294 is not a substantial change, but it is something to learn from
that could lead to further investigation into what variables play an important role and have the most impact in a community college environment.

Finally, the average range of the scores on the rubrics were between .5 and 2. It is not unreasonable that students at a community college would perform at the benchmark and milestone levels. This is appropriate for students who have completed the majority of their coursework for a certificate or associate’s degree. The scores were what is expected of students in their first years at a community college. This is not to say that all students at a two-year community college should perform at a benchmark level and progress in a linear fashion toward the capstone level. All students perform at varying levels, and the scores found in this study reflected this variation.

**Summary**

The insights gained by this research will contribute to the data regarding student performance on institutional learning outcomes. This study hopes to provide insights gained by the AAC&U as well as individuals at the institution under study in examining how to improve student learning and performance. Chapter 5 brings together the previous four chapters and analyze the findings to add interpretations and implications for further research and practice to colleges and university personnel.
Chapter V: Conclusions

The purpose of this study was to examine how students performed on institutional learning outcomes using the American Association of Colleges and Universities (AAC&U) Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics to determine whether there were significant differences in students’ performance based upon their demographic background characteristics and collegiate experiences. What I discovered from the literature was that, even though there is increased pressure to measure student learning in higher education, there is a lack of information that shows what students are actually learning while enrolled in colleges and universities (Astin, 1993; Arum & Roksa, 2011; Berrett, 2016; Blaich & Wise, 2011; Harward, 2007; Kuh, Ikenberry, Ewell, Hutchings, & Kinzie, 2015). Assessment tools are often either standardized tests that do not reflect what a student is learning in the classroom, or the tools used to assess learning consist of students’ perceptions of what they have learned. The development of the AAC&U VALUE rubrics provided the opportunity to measure authentic student work samples from the classroom to complete a quantitative analysis of student rubric scores. The rubrics offered a common definition and set of criterion for select learning outcomes that can be used to compare within and between college campuses. I developed the following research question that served as a basis for the study:

RQ1. Is there a relationship between students’ background characteristics, collegiate experiences, and learning outcome scores in critical thinking, quantitative literacy, and written communication?

I examined the research question through multiple linear regressions to analyze the relationship between the learning outcomes and the variables of race/ethnicity, age, gender, Pell-eligibility, program of study, credit hours, and degree level. What we know from previous
research is that students of color and students having a low socioeconomic status have lower levels of performance in higher education than white students (Borman & Dowling, 2010; Campbell, 2016; Freeman & Fox, 2005; Garibaldi, 2014; Samuel & Scott, 2014). Studies suggest the necessity of taking into account the demographic variables, such as race/ethnicity and socioeconomic status, when evaluating student performance on learning outcomes in higher education.

To my surprise, I discovered that students show a lack of performance on learning outcomes as they progress through their collegiate experience (Arum & Roksa, 2011; Blaich & Wise, 2011; Bok, 2008). The Wabash National Study of Liberal Arts Education and Arum and Roksa’s Academically Adrift findings drew conclusions that students complete their degrees not really having learned much from their college or university experience. Insights gained from this study will contribute to the data regarding student performance on institutional learning outcomes, and will inform assessment practitioners of implications for theory, practice, and future research.

What I found from the analysis of the data used in this study is that health majors scored higher in critical thinking. Women did not perform as well as men in critical thinking. Asians scored lower in critical thinking. African Americans scored higher in quantitative literacy. Students from business and math majors scored higher in quantitative literacy. As individuals increased in age their scores in critical thinking also increase. I also found that students were not scoring higher on any of the outcomes as they completed more credits in college. First, I discuss my findings and compare them to the existing body of research on student performance on institutional learning outcomes. Next, I present limitations of the study and considerations for future research. Third, the implications of the use of Astin’s (1993) I-E-O model will be
addressed, as well as how my results align to a number of current findings on underachieving colleges in regards to the lack of increase in student performance on many outcome measures. Finally, I present implications for practice and future research in order to use the results of my study to improve student learning and success and point to new avenues for further research topics.

**Conclusions**

The results of this study suggest that implementation of the AAC&U VALUE rubrics provides the opportunity to use authentic student work samples to gain insight into student performance. I investigated if there was a relationship between student demographic characteristics and collegiate experiences and their performance on learning outcomes. It would seem that a student would increase in performance on learning outcomes as they earned more credits in college. This lack of increase in performance based on an increase in credits earned is in line with the findings from my literature review. Educators in higher education can use these results to design curricula that will better prepare students for success in higher education and increase the likelihood of faculty to design instruction with every learner in mind.

By detecting these predictors of success (age, program majors, race/ethnicity, gender), higher education administrators can better prepare faculty to identify the needs of the students and design instruction that will meet their learning needs. Identifying and connecting students through engaged instruction in critical thinking, quantitative literacy, and written communication will provide an environment that fosters an increase in attainment of these outcomes.

As presented in the first chapter, the American Association for Higher Education (AAHE) developed principles of good practice for assessing student learning (New Leadership Alliance for Student Learning and Accountability, 2012). These principles include tying learning with
educational values, such as institutional outcomes, and increasing attention to outcomes and to the experiences that lead to increased performance in those outcomes (New Leadership Alliance for Student Learning and Accountability, 2012).

The most important “take away” is that the results of this study suggest that implementation of the AAC&U VALUE rubrics produce reliable results and provides the opportunity to use authentic student work samples to gain insight into student performance. It is imperative that individuals from institutions use the results from the assessment of learning outcomes to make informed decisions on practices that would lead to an increase of student performance on the outcomes. It is equally important to desegregate the data to know how students from specific demographic background areas and collegiate experiences are performing on the outcomes. The key to increasing performance is to provide academic support to students that are not showing significant gains in outcome areas. All of this leads to a culture around assessment of learning outcomes that is valuable and meaningful and works toward student success. The results of this study suggest that there were some significant indicators related to student learning, which are examined below.

**Race/Ethnicity**

Results of multiple linear regressions revealed that race/ethnicity was a significant predictor of performance on learning outcomes in two areas. Asian students were significantly more likely to score lower in critical thinking and African American students were significantly more likely to score higher in quantitative literacy. The low performance of Asian students in critical thinking was an unexpected finding. Asian students, in the research conducted by Shireman (2016), Baum and Flores (2011), and Poon et al. (2016), have been described as high-achieving. Shireman (2016) and Baum and Flores (2011) found that Asian Americans are more
likely than African Americans or Latinos to obtain a high school diploma and a bachelor’s degree. Poon et al. found from college entry tests that Asian students are achieving high levels of educational success. However, in my analysis, Asian students scored significantly lower in critical thinking than all other variables other than females.

My findings in regards to Asian students are more in line with the Liu and Roohr (2013) study. Liu and Roohr (2013) found that Asian students declined in reading, math, and critical thinking scores on standardized tests administered over 10 years at community colleges. One possible explanation, according to Liu and Roohr, is that there is an increase in first-generation Asian immigrants attending community colleges over the last 10 years. Another explanation for the low-performance of Asian students in my study may be due to the fact that there are large variations among students from different countries of origin. I will present implication for future research that disaggregates this population into different Asian subgroups in order to perform an in-depth analysis of the findings. It is important to pay attention to Asian students’ declining performance, especially if the trends of enrollment for this racial group continue to increase across the United States (Garibaldi, 2014)

My findings in regards to African American students are not in line with research conducted by Arum and Roksa (2011), Schmidt (2003), and Terenzini, Springer, Yaeger, Pascarella, and Nora (1994). What we know in general about African American students’ performance in higher education is that they have lower graduation rates than White and Asian students (Schmidt, 2003). According to Terenzini et al., (1994), Black students have significantly smaller gains in standardized scores in critical thinking than White students. According to Arum and Roksa (2011), Black students lagged behind white students by almost 1 standard deviation (or 34 percentile points) when they entered college, and Black students gain
less over time than white students, which means that the gap widens over time. Arum and Roksa administered the Collegiate Learning Assessment (CLA) tool; which measures critical thinking, analytic reasoning, problem solving, and written communication skills. The CLA does contain some assessment of quantitative reasoning skills. Arum and Roksa found that African American students enter college with lower CLA scores, and that the gap between African American and white students widen over time.

At the two-year institution under study there is a high number of Somali students. The results from this study do not reflect the number of African American students born inside the United States and those who are foreign-born. It would be important in the future for community and technical colleges to collect demographic information that breaks down race and ethnicities into subgroups. In the era of big data, there is a necessity for institutions to collect more information on students and the potential of seeing a more democratic way to measure outcomes.

It is interesting that my findings, in regards to the high performance of African American students in quantitative literacy, were in line with the positive effects found in African American students attending a two-year college (Pascarella, Edison, Nora, Hagedorn, & Terenzini, 1995/1996). When looking at institutional type and its’ impact on African American students, attending a two-year college prior to a four-year institution found an increase in performance for African American students on quantitative literacy skills. This is important to note, and will be addressed in my implications for practice section.

Age

Results of multiple linear regressions revealed that age is significantly related to performance in critical thinking. As age increased, scores in critical thinking increased. My findings are in line with the overall results found in the studies by Hoskins, Newstead, and
Dennis (2006) and Sheard (2009). Hoskins et al., found age to be a significant predictor of performance in higher education in more mature students gaining higher level of degrees than younger students do. Sheard (2009) found that mature-age students achieved higher final degree GPAs compared to younger undergraduates. In the findings from my study, age was not significantly related to performance in quantitative literacy or written communication outcomes.

**Gender**

I found that gender was negatively associated with student learning gains in critical thinking, indicating that women tended to score lower than men in critical thinking. My findings are not in line with studies conducted by Garibaldi (2007), Kuh, Kinzie, Buckly, Bridges, and Hayek (2011), and Arum and Roksa (2011). Geribaldi (2007) found that women of all race/ethnicities are completing college at a higher rate and receiving more degrees than men do. Kuh et al., (2011) found that college enrollment for women has increased at a higher rate than for men and women score higher in reading and math on standardized tests than men do. Contrary to my findings, Arum and Roksa (2011) found that women demonstrate the same level of skills in learning outcomes such as critical thinking, complex reasoning, and writing skills and demonstrate the same level of performance at college entrance and progress through college as men. Similar levels of performance on the CLA for gender is interesting to note as it was in sharp contrast to observed race/ethnicity and socioeconomic status inequalities. Women and men entered college at a similar level of skill in critical thinking and persisted through higher education remaining at the same levels in critical thinking.

**Pell-Eligibility**

This study measured socioeconomic status through Pell-eligibility, and did not find that socioeconomic status had an impact on academic performance. My findings from the data
analysis was in sharp contrast to my review of the literature with regards to socioeconomic status. According to Bowman and Dowling (2010), socioeconomic status is the best indicator of success in achievement on learning outcomes among demographic variables. According to Kuh et al. (2011), academic performance increased as family income increased. Fowler and Boylan (2010) found that financial issues affect performance and students’ ability to persist. Perna and Swail (2001) also found a link between low-income students and corresponding lower persistence and graduation rates. Achievement outcomes for students of all race/ethnicities increased as their income increased (Bowman & Dowling, 2010). The results of this study may be due to the high number of Pell-eligible students found on the campus under study, or the high diversity found in all demographic areas. My study may indicate that socioeconomic status was not a significant indicator of performance, but it is still important to be mindful of this demographic in future studies as prior research has shown it to be significant.

Program of Study

Program of study revealed significant findings in two areas: first, students enrolled in health programs scored higher in critical thinking; and second, students enrolled in business and math programs scored higher in quantitative literacy. My findings in regards to students in health programs, and students in business and math programs are in line with research conducted by Arum and Roksa (2011). Arum and Roksa (2011) found that students in health programs are more likely to score higher in critical thinking and writing. A number of studies found it difficult to determine if program of study, or other experiences, cause the differences in high scores on learning outcomes (McDonough, 1997; Money, 1997; Sebrell & Erwin, 1998; Spaulding & Kleiner, 1992). Gadzella and Masten (1998) and Gunn (1993) found it difficult to determine if programs of study tend to attract students with different levels of skills, or if experiences in the
program of study cause the differences in skills. Arum and Roksa (2011), although indicating that students in health programs scored higher in critical thinking, did find it difficult to determine student performance based on programs of study.

Some programs may emphasize certain learning outcomes over other learning outcomes, and as a result, students in these programs may score higher on outcomes such as critical thinking than other outcomes such as written communication (Arum & Roksa, 2011). Developing critical thinking in students is a required outcome in health programs such as pre-nursing, nursing, home health aide, community health worker, dental assistant, pharmacy technician, and medical office assistant. Health programs include critical thinking in accreditation and licensure requirements. Students in health programs must be able to analyze, reason, and make decisions in order to demonstrate proficiency in critical thinking. Students in health majors scored higher in critical thinking due to the attention paid to this learning outcome. I will address, in the implications for practice section, the continued attention in health programs to familiarize students in what it means to think critically and how to measure the attainment of this skill.

My findings also indicated that students in business and math programs scored higher in quantitative literacy. Several components may help to explain the positive and significant relationships observed between higher performance of students in business and math programs on the quantitative literacy outcome. High quantitative literacy scores for business and math students may be the effect of the course or the effect of the fact that students who are pursuing a business or math major have a propensity for that particular learning outcome. Deciding to pursue a particular major indicates not only that there is the potential for taking classes in that major but also an interest in that subject. Business and math majors may enjoy math, and,
consequently, take classes in that area. The students in these majors receive more practice in quantitative literacy skills because they do math regularly in their classes. Proficiency in a particular learning outcome may be another indicator for success. It is not surprising that my findings revealed that students in health programs performed higher in critical thinking and students in business and math programs had higher scores on the quantitative literacy outcome.

**Credit Hours**

Credit hours, indicating length of time in college, was not positively associated with student performance on any of the three learning outcomes measured. This lack of difference by credit hours earned is important as it provides some empirical support for the findings from Liu and Roohr (2013), Bok (2008), Arum and Roksa’s (2011) study as well as the Wabash National Study (2007), which indicate that a significant number of students do not demonstrate improvements in a range of learning outcomes as they progress through their college experience. Longitudinal studies are necessary to test whether this lack of progress persists when tracking the same group of students through college, which is difficult to complete at a two-year community college because the student completion rate remains low and it is challenging to track students if they transfer to other institutions to complete their degrees.

My data included scores from students at the beginning of their college experience, having completed less than 30 credits, and at the end of their college experience, having completed more than 50 credits. Note that most community college degrees only require around 60 credits, but it is possible for students to have completed more than 60 credits due to a change in majors or transferring in a number of credits. I decided to categorize students who have completed 0-30 credits and students who have completed over 50 credits earned. The recently released VALUE Report (2017) included associates degree students enrolled at a 2-year college
as those students who completed over 45 credits in the category of completing more than 75% of their program of study. It is important to note that in this study, as well as in the AAC&U multi-state study findings in the VALUE Report in 2017, the credit hours completed may not reflect students enrolled in certificate or diploma degree programs.

Pascarella and Terenzini, in their 1991 synthesis, found that students’ exposure to postsecondary education increased performance in critical thinking, quantitative literacy, and written communication. In Pascarella and Terenzini’s 2005 synthesis uncovered inconsistent findings and did not see the same gains from freshmen to senior progress as they did in their 1991 synthesis of the research. Much of the work of Pascarella and Terenzini’s first two volumes focused on a comparison between students who attended college versus those who did not. The 2016 volume did not find that researchers were conducting studies that compared students who attended college with students who did not, but rather focused on longitudinal studies that evaluated performance based on progress through college measured in credit hours (Pascarella et al., 2016). The studies reviewed in the most recent volume did not see significant progress in students as they progressed through college. The current volume aligns with the focus of my study, and the findings presented here that students do not experience significant progress in select learning outcomes with the increase in the number of credit hours completed.

Degree Levels

Results of multiple linear regressions revealed that the degree level that a student is completing was not a significant predictor of performance in critical thinking, quantitative literacy, or written communication. Students earning an associate’s degree did not perform higher on any of the learning outcomes than students earning a certificate degree. Arum and Roksa (2011) found that the type of coursework varied in the degree requirements, and reported
that students in higher-level degrees took courses with high reading and writing requirements. According to the research findings, degree levels have not consistently affected students’ level of performance on learning outcomes. For instance, Harper (2006) found that race/ethnicity and gender were greater indicators than degree levels on performance on learning outcomes. Although the beta weights did indicate associate’s degrees were the positively associated with students’ development of critical thinking and written communication scores, the findings from the data analysis were in line with the inconclusive findings from the literature. As stated earlier, it is important to be careful not to rely too heavily on beta weights, but they are a starting point for further investigation into the impact of associate’s degrees compared with other variables.

**Dependent Variables**

I conducted an analysis to show the mean averages for the variables used in the multiple regression analysis. This indicated that the mean scores for all students in critical thinking was 1.683, quantitative literacy was 1.6195, and written communication was 1.952. The rubrics are assessment tools that include definitions and criteria that involve not only knowledge, but also values, attitudes, and habits of mind. Student performance measures the “benchmark” starting point for learning (score of 1), “milestones” representing progress toward more accomplished performance (score of 2-3), and the “capstone” describing the culminating level of achievement (score of 4). Students can score zero, which could represent that this criterion was not attempted or that this criterion was attempted but the student failed to reach the benchmark. In critical thinking and quantitative literacy, the average score for all student performance measured between benchmark and milestone, or starting point for learning. In written communication, the average score for all student performance measured at the beginning of the “milestone” level, representing more accomplished performance.
The findings in my study aligned with the VALUE Report (2017) findings that the strongest student performance was found in written communication. The report limited its analysis to initiative-wide results for 2-year and 4-year institutions, including only the data from students who had completed 75% of the credits toward program completion. It provided only the score percentages for individual criterion and not overall rubric scores. It did not break down any of the data into performance based on students’ demographics.

There is some discussion in regards to the AAC&U VALUE rubrics that students attending a two-year community college should perform at the “benchmark” or beginning of the “milestones” level. As students’ progress and transfer to a four-year college or university, they should progress further on the scale reaching higher “milestones” and finally the “capstone” level. The newly released VALUE Report (2017), makes no determination of what types of scores should be considered levels of achievement at two-year institutions. They qualify this by adding that the rubrics reflect the collective best thinking for learning within higher education, “so it is not unreasonable to say that scores at the two Milestone levels are appropriate for students who have completed the majority of their coursework for an associate’s degree” (p. 35). My conclusion is that the average scores in this study are what you would expect of students in their first year at a community college.

Summary Discussion

The AAC&U VALUE rubrics create a common framework to define and measure specific learning outcomes. Progress in analyzing the data that has been gathered from the multi-state and within-state projects to measure select outcomes using the VALUE rubrics is lacking. Only recently, January 2017, a report came out from AAC&U with an overview of the multi-state and two within-state projects and their findings. Very little is known regarding the in-house
assessments that colleges participate in through the use of these rubrics. One concern is that the data collected to assess learning outcomes is not being used to make informed decisions that impact student performance on the outcomes measured. Faculty participating in assessment acknowledge that there are several years of student learning outcomes assessment data that has not been evaluated or reported back to stakeholders to indicate how students are performing or what can be done to work toward continuous improvement (VALUE Report, 2017). Greater attention should be paid to use the data aggregated through the use of the VALUE rubrics to assess authentic student learning outcomes to produce meaningful and sustainable benefits to practices that lead to student success.

What was surprising are the areas in which there were no significant findings. There were no significant differences between several race/ethnicity demographics (including Native American, Hispanic, and multiracial), several programs of study (including criminal justice, social science, science, education, and technical programs), socioeconomic status, credit hours completed, and degree level of the student on the three VALUE rubric outcome measures. If students are gaining knowledge during their college experience, measured in credit hours completed, scores should increase with more credits completed.

The model in this study explained 36.5% of the variance of critical thinking, 24% of the variance of quantitative literacy, and 31% of the variance of written communication. This indicates a good model fit. We can’t explain all factors that contribute to student performance on outcomes, but my study explained approximately one-third of the variation in performance on the dependent variables.

This study produced a number of significant findings, to provide important information about students’ learning on these three learning-outcome assessments. This study provides
implications for administrators, faculty members, researchers, and policymakers in regards to future research, practice, and theory. My findings point to the need to further utilize qualitative and quantitative assessments using the VALUE rubrics to produce comparable results to conduct with-in institution evaluation and between-institution comparisons that should lead to improvement.

**Limitations**

I conducted this study in one institution of higher education located in a Midwestern urban area. The particular institutional context of the study – student demographic characteristics, geography, institution type, and programs of study – could limit generalizability of the findings to other institutional types. In addition to the fact that the study was conducted at one institution, it also does not involve a random sample, which would limit the generalizability.

Data was missing for a number of students in the Pell-eligible category because there was no information on a number of students. This could be due to students being ineligible for financial aid, (wealthy, international, undocumented, etc.) or not having completed the Free Application for Federal Student Aid (FAFSA). Studies have indicated that many students who would be Pell-eligible do not complete the FAFSA (Kantrowitz, 2009). As mentioned earlier, these students were removed from the study.

Low scores of Asian students in critical thinking may be because this demographic includes a wide variety of Asian cultures, with tremendous variations in ethnicity and socioeconomic class (Chang, Park, Lin, Poon, & Nakanishi, 2007). It is unrealistic to view all Asian categories as having similar demographic characteristics and experiences within higher education. Not having desegregated this population into subgroups may limit the analysis of these findings. A study that broke down the race/ethnicities into subcategories would be
valuable. Black students include both individuals born in the United States as well as foreign-born, and not differentiated in this study. Further research differentiating race/ethnicities would provide valuable insight into student performance regarding specific demographic characteristics.

There were limited variables for me to use to match the I-E-O model. There were some variables that could potentially have informed this study that were not being tracked by the institution, and therefore were not included in my study. Community colleges may not collect the kind of admissions data collected at a four-year university including high school attended, attitudinal indicators like intent for enrolling, ACT scores, high school grade point average, or students participating in pre-college experiences like Postsecondary Enrollment Options (PSEO).

A determination was made to use 0-30 credits earned and over 50 credits earned. This reflects the population of students at a community college who are enrolled in an associate’s degree, but does not take into account those students enrolled in a certificate or diploma program. It also does not take into account students who enroll who are not seeking a degree, but are taking a course for another reason.

Despite these limitations, there are several strengths to this study. To my knowledge, this is the first dissertation that uses authentic student work samples scored with the AAC&U VALUE rubrics to evaluate students’ performance on learning outcomes. A recent report was released by AAC&U in January 2017 that does not include an analysis of the demographics included in this study. The variables included in my study identify and provide information in regards to Astin’s I-E-O model that includes Input (race/ethnicity, age, gender, Pell-eligibility) Environment (programs of study, degree level, credit hours) and Outcomes (critical thinking, quantitative literacy, written communication) measures.
**Recommendations**

Based on the results of the study, there are a number of recommendations for future efforts centered on theory, practice, and research that would directly impact student performance on institutional outcomes.

**Implications for Theory**

Theories provide an opportunity to explain the relationships among and between the variables in the study, but are often not considered to be measured directly. The difficulty I found in developing the theory for my dissertation was that there is a lack of theories that explain the how and why of student learning. I found research studies that explained learning measures, and the magnitude of what was learned, but this was limited to research findings and not to theories related to student learning. The first two Pascarella and Terenzini (1991, 2005) volumes, and the third volume by Pascarella et al. (2016), provide many relevant examples of how college affects students. The difference between the synthesis of the studies gathered in the Pascarella and Terenzini texts and the creation of a theory is that a theory explains the how and why of the phenomena related to the studies.

Arum and Roksa’s (2011) findings and the Wabash National Study (2007) findings explored the lack of increase in student performance on institutional outcomes. These two studies were longitudinal, which adds to their value. Longitudinal studies are difficult to perform at a two-year college, due to the low completion rate and the reality that students transfer to four-year institutions to complete their degree. What these two studies failed to do, however, was to discuss the reasons for the lack of performance on learning outcomes. For example, the studies failed to explore how the increase in use of technology benefit or detract from the development of critical thinking, quantitative literacy, and written communication in higher education today.
Arum and Roksa (2011), critique higher education institutions because their research suggests that students in higher education do not demonstrate significant improvements of learning outcomes throughout the four-semester span of their study. Arum and Roksa’s work serves as a framework for components of this study, including the duration of study (as shown in credits earned) and performance on the AAC&U VALUE rubrics criteria, but is not a theory that relates to students’ performance on outcomes.

Astin’s I-E-O model was the closest I could find to a theory. Astin’s model was first developed in 1962, which suggests there is work to be done in developing relevant theories today that relate to student learning, the assessment of student learning, and students’ performance on learning outcomes. The basic elements have remained the same over the years and remain relevant today, yet Astin’s I-E-O Model was developed over fifty years ago.

Astin’s I-E-O model served as a framework for my study to determine student performance at one point in time, based on the characteristics students bring to college. The model allowed for the independent variables used in my study to be open to choice and availability of data collected at the institution. Astin’s (1993) study indicated that students’ change in many ways through their college experience. Women get better grades in college, are more likely to complete a bachelor’s degree and graduate with honors; and men become more proficient on verbal and quantitative scales on the GRE test (Astin, 1993). My study actually found that females have the most significant negative outcome than any other indicator in critical thinking, although I am unable to know if this was a pre-college condition or one obtained during college. Astin found that students from high socioeconomic families have the most significant positive outcomes in college in completion of a bachelor’s degree, satisfaction with the undergraduate experience, a higher grade point average, more likely to enter graduate school,
higher retention and completion rates, and significantly higher scores in critical thinking and problem solving skills (Astin, 1993). This study did not find socioeconomic status to be a significant predictor of positive or negative outcomes in critical thinking, quantitative literacy, or written communication. However, this might be because the yes/no response on Pell Eligibility is not a very effective measure of socioeconomic status and the Pell qualification standards are so low that many non-Pell eligible students are still at a relatively low socioeconomic status.

It would be helpful in the future to find ways to measure learning to better understand student development and connections between theory and practice. The future may include a Norman Model of Student Outcomes, based on what is lacking today in regards to relevant student learning theories. This model would include the use of tools, such as the AAC&U VALUE rubrics, to assess authentic student learning. The rubrics appear to lead to equitable results that move toward a more democratic way to measure learning. It is difficult to avoid cultural bias in standardized tests (Jaschik, 2010; Reese, 2013). This new model promotes racial equity by evaluating students on an individual basis. The model will encourage the interaction between faculty and students in the assignment design process through the integration of clearly defined criteria necessary for students to demonstrate the desired outcome. Student involvement in the implementation of rubrics that define criteria, along with assignment design, would lead to significant learning experiences and increase student performance in outcomes such as critical thinking, quantitative literacy, and written communication. There is work to be done to develop this new model that connects theory to practice. To summarize, the theory I am suggesting connects authentic student work taken from course assignments with the implementation of clearly defined criteria to increase individual student performance that is equitable and democratic.
Implications for Practice

This study adds to the research using a quantitative method to move beyond raw data to produce findings to allow individuals within institutions to improve decision-making that leads to student success. There is a gap between the introduction of the critical thinking learning outcome and the measurement of this skill that fails to guide instructors in how to teach critical thinking (Willingham, 2007). Through the implementation of essential learning practices, such as active learning, instructors can be developed in their craft of teaching to better meet the needs of their students. The implication is that there is a compelling need to strengthen the support of, and investment in, faculty development at the community college level.

Based on the results of the study, it is crucial to understand the challenges and barriers females and Asian students experience in critical thinking in higher education, and to develop strategies to overcome those barriers. Providing academic support to these two demographics is essential. Kim and Sax (2011), found that Asian American students showed significant gains in critical thinking skills when connected to faculty interaction. Providing Asian role models in the classroom can significantly influence performance in learning outcomes (Liu & Roohr, 2013). Programs like Statway, a two-semester course for completing a college-level statistics equivalent for developmental math students, identify at-risk students in math, but there are other programs to identify at-risk students in other learning outcomes (Carnegie Foundation, 2017). Statway is a student-centered approach that focuses on involving students in their own learning and breaks down negative ideas of struggle areas to create a sense of belonging to empower students toward success. Low confidence levels, lack of support, lower levels of academic preparation in pre-college education experience, and lack of support from college faculty of students who have
been historically marginalized may deter students from performing in areas such as critical thinking, quantitative literacy, and written communication.

The institution under study has taken measures to directly work toward increasing a students’ sense of belonging in math courses by implementing the Statway program. The Statway program may have led to an increase in math scores for African American students who participated in this study. It is interesting to note that my study was in line with the findings that African American students’ performed higher in quantitative literacy when they attended a two-year college before a four-year institution (Pascarella et al., 1995/1996). One practice to consider is to encourage students to complete their math requirement at the two-year level before transferring to a four-year institution to complete their degree. It would be interesting to track whether or not any of the students who scored higher in quantitative literacy completed the Statway program.

An important implication for practice is to encourage individuals within institutions to report results of data collection to stakeholders impacted by the assessment of learning outcomes. Very little is known about the in-house assessment procedures and use of results within institutions that are implementing the AAC&U VALUE rubrics. Individuals within institutions of higher education are collecting this data, but may not be using the results to make informed decisions about how students are learning or what can lead to improvements in learning. Blaich and Wise suggest that individuals use the data already collected to perform thorough audits of useful information (2011). Individuals within the institution under study should allow a significant number of faculty, staff, students, and administrators an opportunity to respond to the evidence – and engage in collaborative discussions surrounding the results of the findings as well as the use of the VALUE Rubrics. This would allow individuals an opportunity to offer their
perceptions of what the results might indicate as well as discuss the potential of the rubrics as an equitable assessment tool to measure student learning. Response from faculty, staff, and administrators could identify one or two outcomes on which to focus improvement efforts. Blaich and Wise emphasize how important and impactful it is to include students in the discussion. As already emphasized, students should be brought in to the assessment process and instructional design at all stages of the implementation of the AAC&U VALUE rubrics.

During this time of big data, institutions need to collect more information on students. Community colleges are open access and, therefore, are not tracking important demographic information that would lead to informed decisions on student performance. The study is not able to analyze which specific Asian American subgroups performed poorly in critical thinking or if there were specific African American subgroups that scored higher in quantitative literacy. Socioeconomic status is measured by Pell-eligibility. Students are either Pell-eligible or they are not. It would be helpful to analyze socioeconomic status as a continuum based on income, rather than through the yes or no response indicating Pell-eligibility status. Pell-eligibility is difficult to define as students may come from the same circumstances, but be coded differently. An implication for future practice needs to include a better plan to gather demographic information that would lead to a more democratic way to measure and analyze student performance on learning outcomes. Present practices make it difficult to analyze the findings to make relevant steps to increase student performance.

**Use of Rubrics.** One last implication for practice is to promote the use of rubrics as a teaching tool to improve existing assignments and to share with students to create a better understanding of how to demonstrate outcomes. According to Goodrich-Andrade (2000), rubrics
are easy to use and explain to students, allow students to know what they will be graded on, and provide students with feedback about their strengths and areas of needed improvement.

This study revealed the possibility of faculty use of common rubrics to evaluate authentic student work samples. According to AAC&U’s *On Solid Ground* report (2017), faculty can score these artifacts produced within their area of expertise or outside of their area of expertise. A wide range of individuals within institutions across the nation, and even globally, can develop plans that use student work samples across a variety of departments to demonstrate achievement of select student learning outcomes. Faculty members within institutions can train and produce reliable results using a rubric-based assessment approach rather than rely on standardized tests to determine performance on learning outcomes. The results taken from the data can be used to improve assignments to teach and assess key learning outcomes such as critical thinking, quantitative literacy, and written communication. Faculty members can use the rubrics with students to allow them to see the elements necessary to demonstrate proficiency in the learning outcome.

A web-based program, such as TaskStream or SharePoint, can create a framework to upload and score student artifacts to facilitate in the assessment process. According to the AAC&U report (2017), “any system of reviewing learning outcomes should help build and support a culture of student learning that allows for assessment results to be used by each campus and by larger public systems for improving student learning and for program improvement” (p. 19). The key element of this statement is the importance of building a culture that uses assessment results for improvement of learning. The use of assessment results is missing in closing the loop that leads to improvement in student performance. What I discovered in my research is that there are more than enough data being gathered. The analysis of the data and
reporting back the results is what is missing on college campuses today. The use of the rubrics would allow for an approach that is designed to measure how students from a variety of demographics perform on select learning outcomes.

The results of this study suggest that the VALUE rubrics are an unbiased assessment tool. The utility of the findings indicate very few differences in scores that point to the possibility that the rubrics are nonbiased, and can be used to develop and score artifacts that individualize results. This is a remarkable study in that it contributes to the work that is currently being undertaken in using the VALUE rubrics, but the findings also suggest that this is an assessment tool that provides an opportunity to go beyond standardized tests and students’ perceptions of their learning to create equity in student learning.

As individuals in institutions bring stakeholders within the campus community together to participate in implementing the AAC&U VALUE rubrics, it is important to focus on intentional assignment design that leads to students having the opportunity to learn and succeed in these learning outcomes. According to Berrett (2016), implementation of the VALUE rubrics in a project will help guide faculty on how to create assignments that develop skills in critical thinking, quantitative literacy, and written communication. It is not that students cannot demonstrate the skill; it may be that students do not receive information about what that skill is (Berrett, 2016). Embedding the VALUE rubrics into course assignments encourages faculty to revise assignments and make explicit steps for students to demonstrate select learning outcomes. For instance, individuals within institutions can study a course or a number of courses within a program and focus on one learning outcome during one semester or over time. Faculty can work on developing skills through implementing modifications in the curriculum then reassess the learning again after those changes take place to look for improvements.
Implications for Research

In reviewing the limitations of the study, they provided areas of opportunity for future researchers to gather additional information regarding student demographics to examine measures of students’ development in learning outcomes using authentic classroom assignments. Researchers could look into students in the Pell-eligible variable to determine status for students who do not complete the FAFSA. It would be interesting to learn how international or undocumented students, who would not have completed the FAFSA, score compared to native-born students.

Gaining further insight into what variables would contribute to the literature, researchers may consider including a number of student demographic characteristics and collegiate experiences. The list of variables used in my study is not an exhaustive list. The community college staff may not collect the kind of data collected at a four-year university. Further research could include variables such as ACT scores, students’ high school grade point average (GPA), students participating in pre-college experiences like Postsecondary Enrollment Options (PSEO) or College in the Schools (CIS), high school attended, score on placement tests, and attitudinal indicators like educational intent.

My study provides a correlational research design to consider the use of quantitative methods presented here to drive continued research in the use of the AAC&U VALUE rubrics to measure student performance on institutional learning outcomes. Future research might also involve qualitative methods in relation to the AAC&U VALUE rubrics. Qualitative methods may include interviews and observation of faculty regarding assignment design and scoring methods. Qualitative methods such as conducting interviews with students may add meaning to their experiences and perceptions of their performance on learning outcomes.
Continued work to embed Astin’s I-E-O model within future research would emphasize inputs and experience to the VALUE rubric outcomes. Future researchers may adopt alternative models to examine student performance on learning outcomes using authentic student work taken from classroom assignments. Currently, research in using authentic student work tied to performance on institutional learning outcomes is limited. Continued research using authentic student work samples taken from their classroom experience, and scored using the AAC&U VALUE rubrics, would prove valuable and provide insight into what leads to progress in learning outcomes for all students. Ideally, it would be beneficial to use authentic work samples on the same students on two or more occasions and then compare the outcomes at these different times to be able to measure an increase in performance. However, this type of longitudinal data collection requires tracking of students’ personal information, as well as an increase in human and financial resources beyond those needed in a single data collection (Pascarella et al., 2016). Obtaining longitudinal data at a two-year community college is a challenge as students drop out and transfer and the time between the initial sample and follow-up sample may be too short for a significant increase in performance to occur.

Astin’s (1993) intensity of exposure addresses the frequency of interaction with other students and with faculty. Intensity of exposure is not included in this study. Another area for future research adds faculty interaction with students through interviews and observations in a qualitative or quantitative study approach. Faculty interaction can be studied through intentional assignment design and implementation that focuses on specific criteria within an outcome as presented in the VALUE rubrics.

Last, future research could include a deeper analysis of existing data from the institution’s participation in the AAC&U project. An analysis of the data could include an in-
depth review of only one of the learning outcomes. The data could be desegregated into race/ethnicities subgroups to determine if there is a difference in performance for particular student populations. The data could be broken into separate categories for students enrolled in certificate programs, diploma awards, and associate’s degrees. Analysis could evaluate the faculty members to see if there is an impact on student performance based on full-time or adjunct faculty. If this type of data was available, future research could include additional variables that may further explain all of the factors that contribute to student performance. Further analysis of the data from the institution under study could provide additional insights into student performance.

**Summary**

In summary, the results of this study suggest that the AAC&U VALUE rubrics not only provides the unique opportunity to use authentic student work samples to gain insight into student performance, but it also appears to be an unbiased assessment tool to measure learning. Continued implementation of the VALUE rubrics is encouraged on this and other college campuses. Introduce the definition and criteria included in the rubrics for select learning outcomes, desegregate the demographic variables to collect important information, analyze results, and then use the data to dialogue on how students’ performed on the learning outcomes. Future development of the Norman Model of Student Outcomes connects authentic student work taken from course assignments with the implementation of clearly defined criteria to increase individual student performance that is equitable and democratic.
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Appendix A: Critical Thinking VALUE Rubric

for more information, please contact value@aacu.org

The VALUE rubrics were developed by teams of faculty experts representing colleges and universities across the United States through a process that examined many existing campus rubrics and related documents for each learning outcome and incorporated additional feedback from faculty. The rubrics articulate fundamental criteria for each learning outcome, with performance descriptors demonstrating progressively more sophisticated levels of attainment. The rubrics are intended for institutional-level use in evaluating and discussing student learning, not for grading. The core expectations articulated in all 15 of the VALUE rubrics can and should be translated into the language of individual campuses, disciplines, and even courses. The utility of the VALUE rubrics is to position learning at all undergraduate levels within a basic framework of expectations such that evidence of learning can by shared nationally through a common dialog and understanding of student success.

Definition

Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.

Framing Language

This rubric is designed to be transdisciplinary, reflecting the recognition that success in all disciplines requires habits of inquiry and analysis that share common attributes. Further, research suggests that successful critical thinkers from all disciplines increasingly need to be able to apply those habits in various and changing situations encountered in all walks of life.

This rubric is designed for use with many different types of assignments and the suggestions here are not an exhaustive list of possibilities. Critical thinking can be demonstrated in assignments that require students to complete analyses of text, data, or issues. Assignments that cut across presentation mode might be especially useful in some fields. If insight into the process components of critical thinking (e.g., how information sources were evaluated regardless of whether they were included in the product) is important, assignments focused on student reflection might be especially illuminating.

Glossary

The definitions that follow were developed to clarify terms and concepts used in this rubric only.

- Ambiguity: Information that may be interpreted in more than one way.
- Assumptions: Ideas, conditions, or beliefs (often implicit or unstated) that are "taken for granted or accepted as true without proof." (quoted from www.dictionary.reference.com/browse/assumptions)
- Context: The historical, ethical, political, cultural, environmental, or circumstantial settings or conditions that influence and complicate the consideration of any issues, ideas, artifacts, and events.
- Literal meaning: Interpretation of information exactly as stated. For example, "she was green with envy" would be interpreted to mean that her skin was green.
- Metaphor: Information that is (intended to be) interpreted in a non-literal way. For example, "she was green with envy" is intended to convey an intensity of emotion, not a skin color.
**Critical Thinking Value Rubric**

For more information, please contact value@aacu.org

**Definition**

Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion.

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell one) level performance.

<table>
<thead>
<tr>
<th></th>
<th>Capstone</th>
<th>Milestones</th>
<th>Benchmark</th>
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<tbody>
<tr>
<td><strong>Explanation of issues</strong></td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Issue/problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.</td>
<td>Issue/problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions.</td>
<td>Issue/problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/or backgrounds unknown.</td>
<td>Issue/problem to be considered critically is stated without clarification or description.</td>
</tr>
<tr>
<td><strong>Evidence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting and using information to investigate a point of view or conclusion</td>
<td>Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.</td>
<td>Information is taken from source(s) with enough interpretation/evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.</td>
<td>Information is taken from source(s) without any interpretation/evaluation. Viewpoints of experts are taken as fact, without question.</td>
</tr>
<tr>
<td><strong>Influence of context and assumptions</strong></td>
<td>Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.</td>
<td>Identifies own and others' assumptions and several relevant contexts when presenting a position.</td>
<td>Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position.</td>
</tr>
<tr>
<td><strong>Student's position (perspective, thesis/hypothesis)</strong></td>
<td>Specific position is imaginative, taking into account the complexities of an issue. Limits of position are acknowledged. Others' points of view are synthesized within position.</td>
<td>Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/hypothesis).</td>
<td>Specific position (perspective, thesis/hypothesis) is stated, but is simplistic and obvious.</td>
</tr>
<tr>
<td><strong>Conclusions and related outcomes (implications and consequences)</strong></td>
<td>Conclusions and related outcomes are logical and reflect student’s informed evaluation and ability to place evidence and perspectives discussed in priority order.</td>
<td>Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes (consequences and implications) are identified clearly.</td>
<td>Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequences and implications) are oversimplified.</td>
</tr>
</tbody>
</table>
Appendix B: Quantitative Literacy VALUE Rubric

for more information, please contact value@aacu.org

The VALUE rubrics were developed by teams of faculty experts representing colleges and universities across the United States through a process that examined many existing campus rubrics and related documents for each learning outcome and incorporated additional feedback from faculty. The rubrics articulate fundamental criteria for each learning outcome, with performance descriptors demonstrating progressively more sophisticated levels of attainment. The rubrics are intended for institutional-level use in evaluating and discussing student learning, not for grading. The core expectations articulated in all 15 of the VALUE rubrics can and should be translated into the language of individual campuses, disciplines, and even courses. The utility of the VALUE rubrics is to position learning at all undergraduate levels within a basic framework of expectations such that evidence of learning can be shared nationally through a common dialog and understanding of student success.

Definition

Quantitative Literacy (QL) – also known as Numeracy or Quantitative Reasoning (QR) – is a “habit of mind,” competency, and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations. They understand and can create sophisticated arguments supported by quantitative evidence and they can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc., as appropriate).

Quantitative Literacy Across the Disciplines

Current trends in general education reform demonstrate that faculty are recognizing the steadily growing importance of Quantitative Literacy (QL) in an increasingly quantitative and data-dense world. AAC&U’s recent survey showed that concerns about QL skills are shared by employers, who recognize that many of today’s students will need a wide range of high level quantitative skills to complete their work responsibilities. Virtually all of today’s students, regardless of career choice, will need basic QL skills such as the ability to draw information from charts, graphs, and geometric figures, and the ability to accurately complete straightforward estimations and calculations.

Preliminary efforts to find student work products which demonstrate QL skills proved a challenge in this rubric creation process. It’s possible to find pages of mathematical problems, but what those problem sets don’t demonstrate is whether the student was able to think about and understand the meaning of her work. It’s possible to find research papers that include quantitative information, but those papers often don’t provide evidence that allows the evaluator to see how much of the thinking was done by the original source (often carefully cited in the paper) and how much was done by the student herself, or whether conclusions drawn from analysis of the source material are even accurate.

Given widespread agreement about the importance of QL, it becomes incumbent on faculty to develop new kinds of assignments which give students substantive, contextualized experience in using such skills as analyzing quantitative information, representing quantitative information in appropriate forms, completing calculations to answer meaningful questions, making judgments based on quantitative data and communicating the results of that work for various purposes and audiences. As students gain experience with those skills, faculty must develop assignments that require students to create work products which reveal their thought processes and demonstrate the range of their QL skills.

This rubric provides for faculty a definition for QL and a rubric describing four levels of QL achievement which might be observed in work products within work samples or collections of work. Members of AAC&U’s rubric development team for QL hope that these materials will aid in the assessment of QL – but, equally important, we hope that they will help institutions and individuals in the effort to more thoroughly embed QL across the curriculum of colleges and universities.

Framing Language

This rubric has been designed for the evaluation of work that addresses quantitative literacy (QL) in a substantive way. QL is not just computation, it is a habit of mind, a way of thinking about the world that relies on data and on the mathematical analysis of data to make connections and draw conclusions. Teaching QL requires us to design assignments that address authentic, data-based problems. Such assignments may call for the traditional written paper, but we can imagine other alternatives: a video of a PowerPoint presentation, perhaps, or a well designed series of web pages. In any case, a successful demonstration of QL will place the mathematical work in the context of a full and robust discussion of the underlying issues addressed by the assignment.

Finally, QL skills can be applied to a wide array of problems of varying difficulty, confounding the use of this rubric. For example, the same student might demonstrate high levels of QL achievement when working on a simplistic problem and low levels of QL achievement when working on a very complex problem. Thus, to accurately assess a students QL achievement it may be necessary to measure QL achievement within the context of problem complexity, much as is done in diving competitions where two scores are given, one for the difficulty of the dive, and the other for the skill in accomplishing the dive. In this context, that would mean giving one score for the complexity of the problem and another score for the QL achievement in solving the problem.
**Quantitative Literacy VALUE Rubric**

for more information, please contact value@aacu.org

**Definition**
Quantitative Literacy (QL) – also known as Numeracy or Quantitative Reasoning (QR) – is a "habit of mind," competency, and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations. They understand and can create sophisticated arguments supported by quantitative evidence and they can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc., as appropriate).

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<thead>
<tr>
<th>Capstone</th>
<th>4</th>
<th>3</th>
<th>Milestones</th>
<th>2</th>
<th>1</th>
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<tbody>
<tr>
<td><strong>Interpretation</strong>&lt;br&gt;Able to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)</td>
<td>Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information.</td>
<td>Provides accurate explanations of information presented in mathematical forms. For instance, accurately explains the trend data shown in a graph.</td>
<td>Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units.</td>
<td>Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means.</td>
<td></td>
</tr>
<tr>
<td><strong>Representation</strong>&lt;br&gt;Able to convert relevant information into various mathematical forms</td>
<td>Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.</td>
<td>Competently converts relevant information into an appropriate and desired mathematical portrayal.</td>
<td>Completes conversion of information but resulting mathematical portrayal is only partially appropriate or accurate.</td>
<td>Completes conversion of information but resulting mathematical portrayal is inappropriate or inaccurate.</td>
<td></td>
</tr>
<tr>
<td><strong>Calculation</strong>&lt;br&gt;Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.</td>
<td>Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.</td>
<td>Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.</td>
<td>Calculations are attempted but are both unsuccessful and are not comprehensive.</td>
<td>Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.</td>
<td></td>
</tr>
<tr>
<td><strong>Application / Analysis</strong>&lt;br&gt;Able to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis</td>
<td>Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work.</td>
<td>Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work.</td>
<td>Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work.</td>
<td>Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work.</td>
<td></td>
</tr>
<tr>
<td><strong>Assumptions</strong>&lt;br&gt;Able to make and evaluate important assumptions in estimation, modeling, and data analysis</td>
<td>Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.</td>
<td>Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.</td>
<td>Explicitly describes assumptions.</td>
<td>Attempts to describe assumptions.</td>
<td></td>
</tr>
<tr>
<td><strong>Communication</strong>&lt;br&gt;Expressing quantitative evidence in support of the argument or purpose of the work</td>
<td>Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high quality.</td>
<td>Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven.</td>
<td>Uses quantitative information, but does not effectively connect it to the argument or purpose of the work.</td>
<td>Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support.</td>
<td></td>
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</tbody>
</table>
Appendix C: Written Communication VALUE Rubric

for more information, please contact value@aacu.org

The VALUE rubrics were developed by teams of faculty experts representing colleges and universities across the United States through a process that examined many existing campus rubrics and related documents for each learning outcome and incorporated additional feedback from faculty. The rubrics articulate fundamental criteria for each learning outcome, with performance descriptors demonstrating progressively more sophisticated levels of attainment. The rubrics are intended for institutional-level use in evaluating and discussing student learning, not for grading. The core expectations articulated in all 15 of the VALUE rubrics can and should be translated into the language of individual campuses, disciplines, and even courses. The utility of the VALUE rubrics is to position learning at all undergraduate levels within a basic framework of expectations such that evidence of learning can be shared nationally through a common dialog and understanding of student success.

Definition

Written communication is the development and expression of ideas in writing. Written communication involves learning to work in many genres and styles. It can involve working with many different writing technologies, and mixing texts, data, and images. Written communication abilities develop through iterative experiences across the curriculum.

Framing Language

This writing rubric is designed for use in a wide variety of educational institutions. The most clear finding to emerge from decades of research on writing assessment is that the best writing assessments are locally determined and sensitive to local context and mission. Users of this rubric should, in the end, consider making adaptations and additions that clearly link the language of the rubric to individual contexts. This rubric focuses assessment on how specific written work samples or collections of work respond to specific contexts. The central question guiding the rubric is "How well does writing respond to the needs of audience(s) for the work?" In focusing on this question the rubric does not attend to other aspects of writing that are equally important: issues of writing process, writing strategies, writers' fluency with different modes of textual production or publication, or writer's growing engagement with writing and disciplinarity through the process of writing.

Evaluators using this rubric must have information about the assignments or purposes for writing guiding writers' work. Also recommended is including reflective work samples of collections of work that address such questions as: What decisions did the writer make about audience, purpose, and genre as s/he compiled the work in the portfolio? How are those choices evident in the writing -- in the content, organization and structure, reasoning, evidence, mechanical and surface conventions, and citational systems used in the writing? This will enable evaluators to have a clear sense of how writers understand the assignments and take it into consideration as they evaluate.

The first section of this rubric addresses the context and purpose for writing. A work sample or collections of work can convey the context and purpose for the writing tasks it showcases by including the writing assignments associated with work samples. But writers may also convey the context and purpose for their writing within the texts. It is important for faculty and institutions to include directions for students about how they should represent their writing contexts and purposes. Faculty interested in the research on writing assessment that has guided our work here can consult the National Council of Teachers of English/Council of Writing Program Administrators' White Paper on Writing Assessment (2008; www.wpacouncil.org/whitepaper) and the Conference on College Composition and Communication's Writing Assessment: A Position Statement (2008; ww.ncte.org/cccc/resources).

Glossary

- Content Development: The ways in which the text explores and represents its topic in relation to its audience and purpose.
- Context of and purpose for writing: The context of writing is the situation surrounding a text: who is reading it? Under what circumstances will the text be shared or circulated? What social or political factors might affect how the text is composed or interpreted? The purpose for writing is the writer's intended effect on an audience. Writers might want to persuade or inform; they might want to report or summarize information; they might want to work through complexity or confusion; they might want to argue with other writers, or connect with other writers.
- Disciplinary conventions: Formal and informal rules that constitute what is seen generally as appropriate within different academic fields. Writers will incorporate sources according to disciplinary and genre conventions, according to the writer's purpose for the text. Through increasingly sophisticated use of sources, writers develop an ability to differentiate between their own ideas and the ideas of others, credit and build upon work already accomplished in the field or issue they are addressing, and provide meaningful examples to readers.
- Evidence: Source material that is used to extend, in purposeful ways, writers' ideas in a text.
- Genre conventions: Formal and informal rules for particular kinds of texts and/or media that guide formatting, organization, and stylistic choices, e.g. academic papers, poetry, webpages, or essays.
- Sources: Texts (written, oral, behavioral, visual, or other) that writers draw on as they work for a variety of purposes -- to extend, argue with, develop, define, or shape their ideas, for example.
**WRITTEN COMMUNICATION VALUE RUBRIC**

*for more information, please contact valu@aacu.org*

**Definition**
Written communication is the development and expression of ideas in writing. Written communication involves learning to work in many genres and styles. It can involve working with many different writing technologies, and mixing texts, data, and images. Written communication abilities develop through iterative experiences across the curriculum.

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<thead>
<tr>
<th>Capstone</th>
<th>Milestones</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context of and Purpose for Writing</td>
<td>Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work.</td>
<td>Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s) (e.g., the task aligns with audience, purpose, and context).</td>
</tr>
<tr>
<td>Includes considerations of audience, purpose, and the circumstances surrounding the writing task(s).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Development</td>
<td>Uses appropriate, relevant, and compelling content to illustrate mastery of the subject, conveying the writer's understanding, and shaping the whole work.</td>
<td>Uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work.</td>
</tr>
<tr>
<td>Uses appropriate, relevant, and compelling content to illustrate mastery of the subject, conveying the writer's understanding, and shaping the whole work.</td>
<td>Uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work.</td>
<td>Uses appropriate and relevant content to develop and explore ideas through most of the work.</td>
</tr>
<tr>
<td>Genre and Disciplinary Conventions</td>
<td>Demonstrates detailed attention to and successful execution of a wide range of conventions particular to a specific discipline and/or writing task including organization, content, presentation, formatting, and stylistic choices</td>
<td>Demonstrates consistent use of important conventions particular to a specific discipline and/or writing task(s), including organization, content, presentation, and stylistic choices</td>
</tr>
<tr>
<td>Formal and informal rules inherent in the expectations for writing in particular forms and/or academic fields (please see glossary).</td>
<td>Demonstrates consistent use of important conventions particular to a specific discipline and/or writing task(s), including organization, content, presentation, and stylistic choices</td>
<td>Follows expectations appropriate to a specific discipline and/or writing task(s) for basic organization, content, and presentation</td>
</tr>
<tr>
<td>Sources and Evidence</td>
<td>Demonstrates skillful use of high-quality, credible, relevant sources to develop ideas that are appropriate for the discipline and genre of the writing</td>
<td>Demonstrates consistent use of credible, relevant sources to support ideas that are situated within the discipline and genre of the writing.</td>
</tr>
<tr>
<td>Demonstrates skillful use of high-quality, credible, relevant sources to develop ideas that are appropriate for the discipline and genre of the writing.</td>
<td>Demonstrates consistent use of credible, relevant sources to support ideas that are situated within the discipline and genre of the writing.</td>
<td>Demonstrates an attempt to use credible and/or relevant sources to support ideas that are appropriate for the discipline and genre of the writing.</td>
</tr>
<tr>
<td>Control of Syntax and Mechanics</td>
<td>Uses graceful language that skillfully communicates meaning to readers with clarity and fluency, and is virtually error-free.</td>
<td>Uses straightforward language that generally conveys meaning to readers. The language in the portfolio has few errors.</td>
</tr>
<tr>
<td>Uses graceful language that skillfully communicates meaning to readers with clarity and fluency, and is virtually error-free.</td>
<td>Uses straightforward language that generally conveys meaning to readers. The language in the portfolio has few errors.</td>
<td>Uses language that generally conveys meaning to readers with clarity, although writing may include some errors.</td>
</tr>
</tbody>
</table>
Appendix D: Institutional Review Board Letter

Institutional Review Board (IRB)
729 4th Avenue South MC 294K, St. Cloud, MN 56301-4458

Name: Cheryl Noman
Address: 
Email: cmoran@stcloudstate.edu

IRB PROTOCOL DETERMINATION:
Exempt Review

Project Title: How Students Perform on Institutional Learning Outcomes
Advisor: Dr. Michael Mills

The Institutional Review Board has reviewed your protocol to conduct research involving human subjects. Your project has been: APPROVED

Please note the following important information concerning IRB projects:
- The principal investigator assumes the responsibilities for the protection of participants in this project. Any adverse events must be reported to the IRB as soon as possible (e.g., research-related injuries, harmful outcomes, significant withdrawal of subject population, etc.).
- For expedited or full board review, the principal investigator must submit a Continuing Review/First Report form in advance of the expiration date indicated on this letter to report conclusion of the research or request an extension.
- Exempt review only requires the submission of a Continuing Review/First Report form in advance of the expiration date indicated in this letter if an extension of time is needed.
- Approved consent forms display the official IRB stamp which documents approval and expiration dates. If a renewal is requested and approved, new consent forms will be officially stamped and reflect the new approval and expiration dates.

- The principal investigator must seek approval for any changes to the study (e.g., research design, consent process, survey/interview instruments, funding source, etc.). The IRB reserves the right to review the research at any time.

If we can be of further assistance, feel free to contact the IRB at 320-363-2300 or email irb@stcloudstate.edu and please reference the SCU IRB number when corresponding.

IRB Institutional Official:

______________________________
Dr. Letha Ramakrishnan
Interim Associate Provost for Research
Dean of Graduate Studies

OFFICE USE ONLY

SCU IRB# 1540 - 2503
1st Year Approval Date: 1/14/2016
1st Year Expiration Date: 
2nd Year Approval Date: 
2nd Year Expiration Date: 
3rd Year Approval Date: 
3rd Year Expiration Date: