

AN EXAMINATION OF STUDENT WRITTEN COMMUNICATION AND  
CRITICAL THINKING SKILLS AT ONE TEXAS PUBLIC UNIVERSITY

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by

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## DEDICATION PAGE

To my family and friends, who have pushed me to be Dr. Roberts.

To my mom, Cindy; Dad, Lynn; stepmom, Holly; and stepdad, Ned for being the best parents a son could ever have.

To Summer, who has seen me through the best of times and the worst of times, and who gave me the strength to finish!

*Hey ho, let's go!*

-The Ramones

## ABSTRACT

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The three studies within this journal-ready dissertation examined student written communication and critical thinking skills at one public university in Southeast Texas. Studies 1 and 2 examined differences in student written communication and critical thinking skills as a function of demographic characteristics (i.e., gender, race, first-generation status, socioeconomic status). These characteristics represent factors that can indicate students may be at-risk academically. Both studies employ social capital theory, which posits that group membership can influence student success. Study 3 examined the efficacy of an undergraduate critical thinking course in improving student critical thinking skills by determining what pre-to-post gains students made within the course. Study 1 used secondary data, derived from a locally developed writing rubric, from 1,285 juniors and seniors from the 2015, 2016, and 2017 academic years. Studies 2 and 3 used secondary student critical thinking data gathered from the Texas Assessment of Critical Thinking Skills (TACTS) test that was administered within undergraduate critical thinking courses. For Study 2 ( $n = 863$ ), post-test data from the 2016 and 2017 academic years were used for analysis. For Study 3 ( $n = 2,551$ ), pre-to-post test data for the 2012, 2013, 2014, 2015, 2016, and 2017 academic years were used for analysis.

Multiple regression analyses were employed to examine differences in student written communication and critical thinking scores by student race, gender, socioeconomic status, and first generation for Studies 1 and 2. These models were both predictive of student written communication and critical thinking ability; however, the

pooled  $R^2$  values for both models were indicative of trivial effect sizes for both studies. The regression analysis for Study 1 further revealed that the written communication scores for Black students and for male students were statistically significantly lower than that of the comparison group. For Study 2, the regression analysis revealed that scores for Black students, Hispanic students, and students who were first-generation were statistically significantly lower than that of the comparison group. Finally, for Study 3, dependent samples  $t$ -tests revealed that students made statistically significant pre-to-post critical thinking gains for each of the examined years; however, the size of these gains were much lower for the 2016 and 2017 academic years in comparison to the other years examined within that study.

KEYWORDS: General Education, Written Communication, Critical Thinking, Gender, Ethnicity, First-Generation, Socioeconomic Status, Social Capital, At-Risk, Assessment

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## CHAPTER I

### INTRODUCTION

General education learning outcomes for undergraduate students, like written communication and critical thinking, are increasing in importance and popularity across higher education (Furman, 2013; Galle & Galle, 2010; Laird, Niskodé-Dossett, & Kuh, 2009; McLawhon & Phillips, 2013; McNertney & Ferrandion, 2010; Siefert et al., 2008; Wehlburg, 2010). The National Institute for Learning Outcomes Assessment (NILOA) conducted a 2013 survey of chief academic officers in which 84% of respondents reported their institutions had identified general education outcomes for their students (Kuh, Jankowski, Ikenberry, & Kinzie, 2014). The Texas Higher Education Coordinating Board (THECB) identified six learning outcomes for undergraduate students' enrolled at all public institutions within the state: critical thinking; written, oral, and visual communication; empirical and quantitative reasoning; social responsibility; personal responsibility; and teamwork (THECB; 2017a). The THECB also identified clear expectations for institutions to assess these outcomes "to discover, document and seek to improve student attainment" (THECB, 2017b, p. 1).

The three studies within this journal-ready dissertation focused upon two of these six general education outcomes: written communication and critical thinking. The importance of written communication (e.g., Arnum & Roska, 2011; Allan & Driscoll, 2014; Desmet, Miller, Griffin, Balthazor, & Cummings, 2008; Faulkner, 2013; Good, Osborne, & Birchfield, 2012; Hoyt, Allred, & Hunt, 2010; Kelly-Riley, 2015; Preiss, Castillo, Flotts, & Martín, 2013; Roberts, 2016; Roberts, Nardone, & Bridges, 2017) and critical thinking (e.g., Arnum & Roska, 2011; Bensley et al., 2016; Cole & Zhou, 2014;

Fliegel & Holland, 2013; Hatcher, 2006, 2011; Haynes, Lisic, Goltz, Stein, & Harris, 2016; Haynes et al., 2015; Lampert, 2007; Mazer, Hunt, & Kuzenkoff, 2008; Nicholas & Labig Jr., 2013; Rowe et al., 2015) are well recognized by researchers, non-governmental educational agencies (Association of American Colleges & Universities, 2008), and by employers (AAC&U, 2008; Hart Research Associates 2013, 2015b). Serious questions remain regarding the ability of higher education institutions to adequately prepare students in both critical thinking (Arnum & Roska, 2011; Hart Research Associates, 2015b; Hatcher, 2015) and written communication (Arnum & Roska, 2011; Hart Research Associates, 2015b). These questions echo broader concerns of equity of student learning and success (Arnum & Roska, 2011; Montenegro & Jankowski, 2017; THECB, 2016).

In order to answer the challenges faced by higher education regarding student learning, more studies are needed to examine the written communication and critical thinking skills of students. All three studies within this journal-ready dissertation examined how students at one public university in southeast Texas performed on these outcomes. It has been argued that such studies can help “respond to the doubts of skeptical publics” (Kuh et al., 2015, p.p. 8-9). Kuh et al. (2015) noted that “if academic institutions are *collecting* and *using* evidence of student learning to inform decisions and guide change that can help students and institutions improve performance, the confidence of the American public is likely to follow” (p. 12).

### **Purpose of the Studies**

The purpose of the studies within this dissertation was to examine both the written communication and critical thinking skills of students. Studies 1 and 2 examined how

student written communication and critical thinking skills vary as a function of demographic characteristics (i.e., gender, race, first-generation status, socioeconomic status). These characteristics represent at-risk factors that can be related to student success (Gray, 2013). Both studies also examine student written communication and critical thinking ability through the lens of social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2002), which posits student success can be influenced by group membership.

Study 3 delved deeper into efforts to improve student critical thinking at the same university. Research has shown that student critical thinking improves only when students receive some form of direct instruction or curricular intervention (Bensley et al., 2016; Hatcher, 2006; Haynes et al., 2015; Mazer et al., 2008; Rowe et al. 2015). Study 3 examined the efficacy of an undergraduate critical thinking course by determining what, if any, critical thinking gains students enrolled in the course have made over six different academic years (2012-2017).

### **Significance of the Studies**

Faculty, staff, and administrators at that university will use the results from all three studies to understand, and to try to improve, written communication and critical thinking skills of their students. The results will help highlight what differences may exist in student performance by different at-risk characteristics (i.e., gender, ethnicity, socioeconomic status, first-generation status). Each of these characteristic represent important elements of social capital (Bourdieu, 1986; Coleman, 1988; Lin, 2002) and can possibly affect student success in higher education. If differences are discovered, then institutional leaders can use these data to develop future educational interventions.

Finally, all three studies will help address questions and criticism of higher education's abilities to prepare students to write effectively and to think critically (Arnum & Roska, 2011; Hart Research Associates, 2013, 2015b). Researchers and institutional leaders may find the methods and results from these studies helpful as they attempt to address issues surrounding student critical thinking and written communication abilities, and equity of learning, at their own institutions.

The results from Studies 2 and 3 will also help inform both faculty and institutional leaders regarding the efficacy of the local critical thinking course in promoting student learning of important critical thinking skills. As the improvement of student critical thinking skills is a key focus of this course, it is important to understand if the course is effective and to what levels students are making gains. These results, particularly those from Study 3, which examines student pre-to-post critical thinking scores over a multi-year period, will contribute to the debate surrounding the ability of critical thinking courses and instruction to improve meaningfully student critical thinking ability (Hatcher, 2011, 2015; Wright, 2015). The results from Study 3 may also be helpful to faculty or institutional leaders looking to implement standalone critical thinking courses to help improve student critical thinking skills.

### **Literature Review**

An in-depth exploration of the literature surrounding both student written communication and critical thinking are found within each of the three studies comprising this journal-ready dissertation. Several important themes and concepts serve as a grounding for all three studies and are discussed in this introduction.

### **Importance of Written Communication and Critical Thinking**

Researchers have widely recognized the importance of students graduating with necessary written communication (Allan & Driscoll, 2014; Anson, 2006; Arnum & Roska, 2011; Barnhisel, Stoddard, & Gorman, 2012; Desmet et al., 2008; Faulkner, 2013; Good, Osborne, & Birchfield, 2012; Kelly-Riley, 2015) and critical thinking skills (Arnum & Roska, 2011; Bensley et al., 2016; Cole & Zhou, 2014; Fliegel & Holland, 2013; Hatcher, 2006, 2011; Haynes et al., 2016; Haynes et al., 2015; Lampert; 2007; Rowe et al., 2015). The importance of these outcomes have also been acknowledged by both non-government organizations (Association of American Colleges and Universities, 2008) and governmental entities (THECB, 2015).

The Association of American Colleges & Universities (AAC&U, 2008) identified both written communication and critical thinking as “essential learning outcome(s)” for all students (p. 2). It has already been noted the THECB recognized both critical thinking and written communication as key learning outcomes for all undergraduate students in Texas (2017a). The THECB has also implemented *60x30TX*, a state-wide strategic plan for public higher education within Texas. As part of that plan, the THECB has asked institutions to identify the marketable skills, including those related to both written communication and critical thinking, students can gain through their academic programs (THECB, 2015)

Employers also recognized the importance of both these outcomes, as well as the need for institutions to better promote them within students (Hart Research Associates, 2013, 2015b). In a 2013 survey, 80% of employers indicated that institutions should place a greater emphasis on written communication, 82% believed that institutions should

place a greater emphasis on critical thinking and analytical reasoning, and 81% believed that institutions should place more emphasis on analyzing and solving complex problems (Hart Research Associates, 2013). Furthermore, 93% of the surveyed employers reported either somewhat or strongly agreeing that “A candidates’ demonstrated capacity to think critically, communicate clearly, [and] solve complex problems is more important than their undergraduate major” (Hart Research Associates, 2013, p. 4). These findings were further supported by a 2015 survey in which employers indicated that written communication skills (82% of surveyed employers), critical thinking and analytical reasoning skills (81% of surveyed employers), abilities to analyze and solve complex problems (70%), and abilities to work with numbers and understand statistics (56%) were very important for college graduates (Hart Research Associates, 2015b). Additionally, 82% of employers noted that written communication was a key skill for students to have before graduation, and 81% reported being more likely to hire students who had taken more than one writing-intensive course in college (Hart Research Associates, 2015b).

There are concerns students may be leaving higher education lacking necessary written communication and critical thinking skills. In a 2015 survey, Hart Research Associates (2015b) determined that only 65% of surveyed students believed they were well prepared with regards to written communication upon graduation. Students held similar perceptions regarding their abilities to work with statistics and numbers (55% of students), to analyze and solve complex problems (59% of students), and to critically and analytically think (66% of students; Hart Research Associates, 2015b). Employers held an even more negative view of student readiness. Only 27% of employers believed that students were coming to them prepared to write effectively, 28% of employers believed



students were well prepared to work with statistics and numbers, 26% believed students were well prepared to critically and analytically think, and 24% believed students were well prepared to analyze and solve complex problems (Hart Research Associates, 2015b).

Researchers have also raised questions regarding student written communication and critical thinking skills. The most famous of these criticisms of higher education came from Arnum and Roska (2011) in their book *Academically Adrift*. Using data from the Collegiate Learning Assessment, Arnum and Roska (2011) determined that students made very limited gains during their first two years of college. Arnum and Roska (2011) In particular, minority students and students' whose parents had lower levels of education particularly struggled in comparison to White students and to students whose parents had higher levels of education (Arnum & Roska, 2011).

### **Questions Regarding Equity in Higher Education**

The findings of Arnum and Roska (2011) reflected broader concerns surrounding the equity of both student learning and success in higher education at both the state (THECB, 2016) and national-levels (Gray, 2013; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017). From 2000 to 2015, the THECB's strategic plan for higher education in Texas focused on closing equity gaps in both educational access and success for minority students (THECB, 2016). Over this period, the percentage of Black Texas students enrolled at public institutions increased approximately 3%, Hispanic students increased by approximately 11%, and White students decreased approximately 18% (THECB, 2016). These trends in student enrollment mirrored the shifts in statewide demographics since 2000, which have seen decreases in White population by approximately 10% and increases in Hispanic population by approximately 8% (Texas

Demographic Center, 2017a, 2017b). The percentages of students enrolled in higher education in 2015, by race, now more closely resemble the demographics of the Texas's population, although Hispanic enrollment still lags behind state-wide population levels by approximately 5%.

Equity of access to higher education has improved for minority students; however, questions remained regarding the equity of student performance. Although the 6-year graduation rates for Black and Hispanic students increased from 2000 to 2015, their rates still trailed those of Whites and Asians. For the 2009 cohort, the graduation rates for Blacks and Hispanics were 41% and 51.1% respectively, while the graduation rates for Whites and Asians were 67.7% and 73.6% (THECB, 2016). The THECB (2016) also observed gaps in student performance by gender. For the same 2009 cohort, the 6-year graduation rate for full-time undergraduate female students was 64.2% whereas male students trailed at 53.8% (THECB, 2016).

Given continued questions regarding equity of student learning (Arnum & Roska, 2011) and performance (THECB, 2016), it would be logical for institutions to examine student learning data by race or gender; however, this is not the case. In a 2015 AAC&U survey of chief academic officers, 70% of respondents reported their institutions tracked learning outcomes achievement data; however, only 31% had set learning outcomes equity goals for different race and ethnic groups, 24% for different socioeconomic groups, and 14% for students by parents' highest level of education (Hart Research Associates, 2015a). When it came to reporting on these outcomes, only 17% of the respondents reported examining their student learning outcomes data by any of these demographic characteristics, with 16% disaggregating data by race, 9% by

socioeconomic status, and 6% by parents' highest level of education (Hart Research Associates, 2015a).

Montenegro and Jankowski (2017) argued that “disaggregating the data allows researchers, administrators, and practitioners to see themes that they otherwise would have missed and could inform changes that would positively impact students' education” (pp. 13-14). By examining student written communication and critical thinking skills through the lenses of race, gender, socioeconomic status, and first-generation status, it is possible to gain deeper insight into student learning at a college or university. These data can then be used to help design educational interventions to improve students' educational experiences.

### **At-Risk Factors**

Two of the three studies within this dissertation focus on the potential impacts of at-risk factors upon student performance. Given that equity of student success in higher education is becoming an increasingly important issue (AAC&U, 2017; Gray, 2013; Hart Research Associates 2015a; Montenegro & Jankowski, 2017), it is key to understand the factors influencing student success. No central definition exists for what is considered to be at-risk factors in education (Koball et al., 2011), although common traits included gender, race or ethnicity, socioeconomic status, and first-generation status (Gray, 2013). A wealth of literature exists examining these different factors: gender (e.g., Corona et al., 2017; Kim, 2011; Voyer & Voyer, 2014), race (e.g., Astin, 1975; Aud, Fox, KewalRamani, 2010; Corona et al., 2017; Harper, 2012; Kim, 2011; Lucas & Paret, 2005; Strayhorn, 2010), socioeconomic status (e.g, Braxton & Hirschy, 2005; Green, 2006; Nora, Barlow, & Crisp, 2005; Reason, 2009; Swail, Redd, & Perna, 2003), and

first-generation status (e.g., Aspelmeier, Love, McGill, Elliott, & Pierce, 2012; Corona et al., 2017; Green, 2006; Hand & Payne, 2008; Horowitz, Rabin, & Brodale, 2013; Ishitani, 2006; Martinez, Sher, Krull, & Wood, 2009; Stuber, 2011). However, this literature generally focused on broader college student success and not specific skills like written communication and critical thinking.

It is possible to find more examples of at-risk student learning performance for a variety of areas, including written communication, within K-12 research. Some include examinations of student performance data by race/ethnicity (Alhusaini & Maker, 2015; Ang, Rodgers, & Wänström, 2010; Clayton, 2011; Darensbourg & Blake, 2013; Kohlhaas, Lin, & Chu, 2010; Kotok, 2017; Olszewski-Kubilius et al., 2017), gender (Alhusaini & Maker, 2015; Andrade, Wang, Du, & Akawi, 2009; Ang et al., 2010; Bursal et al., 2015; Diniz, Piccolo, Couto, Salles, & Koller, 2014; Kohlhaas et al., 2010; Lee, 2013;), socioeconomic factors (Ang et al., 2010; Bursal et al., 2015; Clayton, 2011; Huang, 2015; Kohlhaas et al., 2010; Olszewski-Kubilius et al., 2017; Schmidt, 2014) and parent's education levels (Ang et al., 2010; Schmidt, 2014). Many of these studies also discussed persistent achievement gaps in student performance (Bursal et al., 2015; Darensbourg & Blake, 2013; Huang, 2015; Kohlhaas et al., 2010, Kotok, 2017; Lee, 2013; Olszewski-Kubilius et al., 2017; Schmidt, 2014; Zhao, 2016).

### **Social Capital Theory**

Students' written communication and critical thinking skills are not directly a result of their race, gender, socioeconomic status, or first-generation status. Rather, these at-risk characteristics represent proxies for broader elements of social capital influencing student educational success. Several researchers have identified

theories of social capital including Bourdieu (1986), Coleman (1988), and Lin (2002) and each of these theories share basic similarities.

Bourdieu's (1986) theory focused heavily on how social capital is impacted by both economic capital and cultural capital. Applied to higher education, students with greater economic need, or students from less privileged classes (e.g., minorities, first-generation students) may find themselves lacking the social capital necessary to be successful (Martin, 2015). Coleman (1988) examined slightly different aspects of social capital, focusing more on social knowledge, informal information channels, social norms, and family behaviors or actions. As applied to higher education, student membership in a disadvantaged social group "creates and reproduces inequalities in access to institutional resources" (Martin, 2015, p. 1171).

For Lin (2002), social capital were "the resources embedded in social networks accessed and used by actors for actions" (p. 25). Lin's theory embraced the idea that students' group membership, like their race, gender, socioeconomic status, and first-generation status, can affect their access to necessary elements of social capital and impact their ultimate success (Martin, 2015). With individual effort, students may overcome these social capital limitations and succeed (Lin, 2002; Martin, 2015). Using social capital theory, higher education professionals should be aware that characteristics like race, gender, socioeconomic status, and first-generation status may represent markers for students being potentially at-risk academically.

### **Efforts to Assess Written Communication at the State and National Levels**

There have been some attempts to assess student written communication at both the state and national levels. One such effort, the Multi-State Collaborative (MSC), was

carried out by the State Higher Education Executive Officer Association and the AAC&U (AAC&U, 2017; SHEEO, 2012). Similarly, a higher education organization within Texas, LEAP Texas, an offshoot of the AAC&U's broader Liberal Education and America's Promise (LEAP) States initiative, conducted its own assessment benchmarking project (LEAP Texas, n.d.). Both efforts have endeavored to gather student written communication artifacts from a wide-range of institutions and then score them using the AAC&U's Valid Assessment of Learning in Undergraduate Education (VALUE) Rubric for written communication. The original MSC project also examined. Beginning in summer 2018, the successor to the MSC, the VALUE Institute, will begin efforts to assess written communication, quantitative reasoning, critical thinking, civic engagement, ethical reasoning, and intercultural knowledge and understanding (AAC&U, 2018). However, these state and national-level efforts faced serious limitations regarding their usefulness to researchers.

Although the MSC expanded in size and scope, partnering with both the Minnesota Collaborative and the Great Lakes Colleges Associations Collaborative, only 93 colleges and universities in 16 different states participated in the initial project (AAC&U, 2017). Texas was a participating state; however, only one community college participated in the initial project. According to the National Center for Education Statistics (2016), there were a total of 4,583 degree-granting institutions in the United States in 2015-2016. The lack of representativeness has led the leaders of the MSC to warn "the data are not generalizable beyond the three individual VALUE Collaboratives" and that "extrapolating meaning and making inferences about the quality of learning at the state or national level are entirely inappropriate at this time" (AAC&U, 2017, p. 33).

Even if an institution did participate, the samples “submitted by each school are sometimes too small relative to the size of the campus to allow for broad generalizations” (AAC&U, 2017, p. 33).

The Texas Assessment Collaborative faced similar struggles. Only seven Texas colleges and universities participated in the pilot project (i.e., El Centro College, San Jacinto College, Stephen F. Austin State University, University of Houston Victoria, University of North Texas, University of Texas Arlington, Weatherford College; LEAP Texas, n.d.). In comparison, there were 272 degree granting institutions in Texas for the 2015-2016 year (National Center for Education Statistics, 2016). When data do come available from the Texas Assessment Collaborative, the lack of representativeness of the included institutions could seriously limit the generalizability of these results.

### **Research Questions**

#### **Study 1**

Study 1 will address the following research question: How does student performance on an end-of experience written communication assessment vary based on student characteristics of race, gender, socioeconomic status, and first-generation status?

#### **Study 2**

Study 2 will address the following research question: How does student performance on the Texas Assessment of Critical Thinking Skills (TACTS) test vary based on student characteristics of race, gender, socioeconomic status, and first-generation status?

### **Study 3**

Study 3 will address the following research question: What differences existed in pre-to-post TACTS test performance for students enrolled in an undergraduate critical thinking course for the 2012, 2013, 2014, 2015, 2016, and 2017 academic years?

### **Definitions of Terms**

#### **At-Risk**

Although no central definition exists for what is considered to be at-risk factors in education (Koball et al., 2011), common characteristics that indicate students could be at-risk included gender, race, socioeconomic status, and first-generation status (Gray, 2013).

#### **Critical Thinking Skills**

The general definition for critical thinking being used by the studies within this dissertation is adopted from the THECB (2017a), and is “creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information” (para. 3).

#### **Communication Skills**

The general definition for communication is adopted from the THECB, and is “effective development, interpretation and expression of ideas through written, oral and visual communication” (THECB, 2017a, para. 3). Written communication represents a sub-component of this larger outcome.

#### **First-Generation Status**

First-generation status is a self-reported variable that students provide at registration. Students are considered to be first-generation if they reported that neither of their parents graduated from college.



**Gender**

Students' gender identifications are provided by the institutional research office, and are identified as male or female.

**Race**

Student race is reported by the student at admission, and provided by the institutional research office. The following categories of race will be used for analysis: White, Black, and Hispanic. The total populations for other racial categories (e.g., Native American, Hawaiian/Pacific Islander) were too small for inclusion within the analysis and were excluded.

**Socioeconomic Status**

Student eligibility for Federal Pell Grants is being used as an indicator of economic need and will serve as a proxy for student socioeconomic status.

**Delimitations**

Certain delimitations exist for each the studies within this dissertation which limit their potential generalizability. Data for the Study 1 in this journal ready dissertation were limited to student written communication data collected from 1,285 junior- and senior-level undergraduate students enrolled in six of the seven undergraduate colleges at one 4-year, public university within southeast Texas during the 2015, 2016, and 2017 academic years. This particular assessment project began in 2015, limiting available data to only these three academic years. Data for one of the seven colleges were not available.

Data for Study 2 included 781 undergraduate students enrolled in an undergraduate critical thinking course at a 4-year, public university within southeast Texas during the 2016 and 2017 academic years. The institution began collecting student

demographics, in conjunction with student critical thinking performance data, during the 2016 academic year, thus limiting the available data to only these two academic years.

Finally, data for Study 3 were limited to 2,571 undergraduate students enrolled in undergraduate critical thinking courses at a 4-year, public university within southeast Texas for the 2012, 2013, 2014, 2015, 2016, and 2017 academic years. The philosophy program has collected student pre-and-post critical thinking data using the Texas Assessment of Critical Thinking Skills (TACTS) test from 2012 to 2017.

Student written communication and critical thinking data were gathered using specific assessment instruments unique to the institution. For example, written communication data were collected using a rubric designed by an interdisciplinary faculty committee with expertise and experience in both teaching and assessing written communication at the 4-year university at the center of Study 1. At the outset of the rubric development process, the committee reviewed examples of other writing rubrics, including the AAC&U VALUE Rubric for written communication. Over multiple rounds of consultation and revision, the committee eventually developed an applicable instrument to evaluate written communication for their university. The AAC&U VALUE Rubric, in particular, was influential in helping the committee determine the four separate domains for the rubric: (a) Ideas/Critical Thinking/Synthesis, (b) Style, (c) Organization, and (d) Conventions. Student artifacts were scored for each domain using a 4-point scale. The student's scores for each domain were then combined to create a single overall score.

For the second and third studies, student critical thinking skills were measured through the TACTS test. The TACTS is a 35-question, multiple choice test designed to assess critical thinking, empirical, and quantitative skills. The instrument was originally

created, tested, and validated by a committee of interdisciplinary faculty for use by the university's College of Business to assess critical thinking as part of that college's Association to Advance Collegiate Schools of Business accreditation requirements (Fair, Miller, Muehsam, & McCoy, 2010). As philosophy faculty helped with the creation of the TACTS, the instrument was subsequently adopted by the philosophy program for use in assessing student critical thinking skills within an undergraduate critical thinking course that is part of the institution's core curriculum.

### **Limitations**

Limitations also exist which impact the generalizability of the findings of the three studies included within this journal ready dissertation. Although large samples will be used for analysis, the findings from each study may not be generalizable across different populations, locations, and times. Each study will rely upon secondary student data that were originally collected through institutional assessment efforts. The use of secondary data necessitates the use of a nonexperimental, causal comparative research design (Johnson & Christensen, 2012). The design allows for neither the manipulation of the variables included as part of the studies or the random assignment of subjects to experimental or control groups (Johnson & Christensen, 2012). Some variables included within these studies rely on student self-reported data (e.g., first-generation status), and data may be unavailable for some students because they did not respond to the question. Finally, student Pell eligibility, which is being used as a proxy for student financial need and student socioeconomic status, is dependent upon the student having completed the Free Application for Federal Student Aid.

### **Assumptions**

It is assumed that any errors within the dataset used for these studies were random, and not specific to any one variable or group. Minimal errors are anticipated as secondary student data, previously collected and verified as part of larger institutional assessment efforts, were used for each of the three studies within this journal ready dissertation. As each study uses authentic student artifacts (i.e., papers written by the students as part of course work or graduation requirements, multiple choice exams administered for program assessment during regular classes), it is assumed that the artifacts are representative of legitimate student effort. Additionally, the rubric used for Study 1 is assumed to have content-related validity (Banta & Palomba, 2015) as it was developed by a group of interdisciplinary faculty with expertise in student writing. Similarly, as the TACTS was also originally created, tested, and validated by a committee of interdisciplinary faculty for use in assessing student critical thinking ability, it is assumed that instrument also has content-related validity (Banta & Palomba, 2015). Finally, all student demographic data used for Studies 1 and 2 were provided by the university's institutional research office and are assumed to be accurate.

### **Threats to Validity**

Researchers should be aware of threats to both internal and external validity within quantitative research. Onwuegbuzie (2003) examined both internal and external threats to validity. Internal validity is considered to be the ability of someone to draw a causal relationship from between two variables (Campbell & Stanley, 1963; Cook & Campbell, 1979). As no attempt was made within the studies comprising this journal ready dissertation to identify causation, threats to internal validity were limited. Two

particular threats to internal validity included maturation and mortality (Onwuegbuzie, 2003). Maturation represented a threat to internal validity for all three studies. One must be aware that students' growth or abilities may not necessarily be a result of direct instruction or intervention, but instead be a result of the students' natural growth and development over time. Mortality also represents a threat to internal validity that should be recognized. Onwuegbuzie (2003) noted that mortality could be particularly problematic for studies examining "at-risk students who tend to have lower levels of persistence" (p. 76). Students who are at-risk academically may not persist in college long enough to reach a point where their learning is evaluated. This is of particular concern for Study 1, which focused on the performance of junior- and senior-level students.

External validity refers to the accuracy of the interpretations, conclusions, or actions a researcher can take based on data (Johnson & Christensen, 2012). Onwuegbuzie (2003) identified multiple threats to external validity, four of which were of particular concern for all three studies within this journal ready dissertation: (a) population validity (the extent to which a researcher can generalize their findings from a sample population), (b) ecological validity (the extent to which a researcher can generalize their findings across different contexts, settings, variables, and conditions), (c) temporal validity (the extent to which a researcher can generalize their findings across time), and (d) specificity of variables (the extent to which the uniqueness of the study's variables limit a researcher's ability to generalize their findings). Several steps, highlighted in the next section, were taken in order to address these identified threats to external validity.

**Population validity, ecological validity, temporal validity.** These threats focus upon a researcher's ability to generalize the results of their study across populations, settings or times. To address these threats, each of the three studies attempted to use large samples that were representative of the targeted populations of the university. Therefore, the findings from each of these studies may be generalizable to this particular institution; however, researchers should be cautioned regarding generalizing these findings to other populations, settings, or times.

**Specificity of variables.** This threat focuses upon whether the uniqueness of variable's within a study limit the ability to generalize that study's findings. The first study used student writing scores that were determined using a locally-developed rubric unique to the institution. Similarly, Studies 2 and 3 used student critical thinking scores that were determined using a multiple-choice exam developed and used exclusively at that institution. Because of the specificity of these measures to the institution, other researchers should be cautioned regarding generalizing these findings beyond the circumstances of these studies.

### **Organization of the Dissertation**

The three journal-ready studies within this dissertation will help generate new knowledge regarding student written communication and critical thinking skills. In Study 1, analysis will be conducted to determine what, if any, differences are present in student written communication skills as a function of race, gender, socioeconomic status, and first-generation status. Study 2 will address similar questions, examining what differences exist in student critical thinking skills as a function of race, gender, socioeconomic status, and first-generation status. Finally, the Study 3 will focus on

critical thinking in greater detail by using a multi-year study to examine the efficacy of an undergraduate critical thinking course in increasing student critical thinking skills over the course of a semester.

This journal-ready dissertation will ultimately be comprised of five chapters. Chapter I contains the dissertation's background, purpose, significance, relevant literature, research questions, definitions of terms, overall delimitations, overall limitations, and overall threats to validity. Chapters II, III, and IV consist of first, second, and third studies, respectively. Finally, Chapter V will contain an overarching discussion of the findings from all three studies, as well as implications for future research.

**CHAPTER II**  
DIFFERENCES IN STUDENT WRITTEN COMMUNICATION SKILLS AS A  
FUNCTION OF DEMOGRAPHIC CHARACTERISTICS

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This dissertation follows the style and format of *Research in the Schools*.



### **Abstract**

The need for students to have effective written communication skills is well recognized by researchers and educators; however, serious questions remain whether students are leaving colleges and universities with these necessary skills. These questions are particularly acute for students who may already be at-risk academically (e.g., minority students, first-generation students, and students with financial need). Using social capital theory, this study examined differences in student written communication skills by student race, gender, first-generation status, and socioeconomic status. A multiple regression of student writing scores revealed these demographic variables were predictive of student performance. The written communication skills of Black students were lower than those of White students, and the skills of male students were lower than those of female students.

**Keywords:** General Education, Written Communication, Race, Gender, First-Generation, Socioeconomic Status, Social Capital, At-Risk, Assessment

## DIFFERENCES IN STUDENT WRITTEN COMMUNICATION SKILLS AS A FUNCTION OF DEMOGRAPHIC CHARACTERISTICS

The concept of liberal arts or general education learning outcomes, like written communication skills, are widespread throughout much of the higher education literature (Furman, 2013; Laird, Niskodé-Dossett, & Kuh, 2009; McLawhon & Phillips, 2013; McNertney & Ferrandion, 2010; Rhodes, 2010; Siefert et al., 2008; Wehlburg, 2010). The growing importance of these outcomes was highlighted by a 2013 survey in which 84% of university leaders indicated their institutions had identified common learning outcomes for undergraduate students (Kuh, Jankowski, Ikenberry, & Kinzie, 2014). The Texas Higher Education Coordinating Board (THECB) identified six core learning outcomes Texas students are expected to attain at public colleges and universities: (a) critical thinking, (b) communication, (c) empirical and quantitative reasoning, (d) teamwork, (e) social responsibility, and (f) personal responsibility (THECB, 2017a). This study will focus upon written communication, which is one component of the larger communication outcome (THECB, 2017a).

The importance of student written communication skills have been widely recognized by education researchers (Arnum & Roska, 2011; Allan & Driscoll, 2014; Desmet, Miller, Griffin, Balthazor, & Cummings, 2008; Faulkner, 2013; Good, Osborne, & Birchfield, 2012; Hoyt, Allred, & Hunt, 2010; Kelly-Riley, 2015; Preiss, Castillo, Flotts, & Martín, 2013; Roberts, 2016; Roberts et al., 2017), non-governmental agencies (Association of American Colleges & Universities, 2008), and workforce leaders (Hart Research Associates, 2013, 2015b). Educational leaders face challenges (Arnum & Roska, 2011; Hart Research Associates, 2013, 2015b) regarding their ability to

adequately prepare students to write effectively and broader concerns exist regarding the equity of both student learning and success in higher education (AAC&U, 2017; Arnum & Roska, 2011; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017; THECB, 2016).

The purpose of this study was to examine difference in student written communications skills as a function of student characteristics (i.e., race, gender, socioeconomic status, first-generation status). Each of these factors represent characteristics that could signify a student may be at-risk (Gray, 2013). By doing so, this study uses social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2002), which argues that a student's cultural, social, or economic identity can influence their success.

Kuh et al. (2015) argued that studies examining student data can help respond to the challenges higher education institutions face from skeptics. Kuh et al. (2015) noted that "if academic institutions are *collecting* and *using* evidence of student learning to inform decisions and guide change that can help students and institutions improve performance, the confidence of the American public is likely to follow" (p. 12). Texas institutions may serve as important case studies for the assessment of written communication skills, as public institutions within Texas must this outcome "to discover, document and seek to improve student attainment" (THECB, 2017b, para. 1).

The findings from this study may provide faculty, staff, and administrators at that university insight regarding how students of different races, genders, and backgrounds are performing on written communication as they approach graduation. These data may then be used by university personnel to help identify areas for future improvement. Finally, this study joins the growing body of literature examining student written

communication skills (Arnum & Roska, 2011; Allan & Driscoll, 2014; Anson, 2006; Barnhisel, Stoddard, & Gorman, 2012; Desmet et al., 2008; Faulkner, 2013; Good et al., 2012; Hoyt et al., 2010; Kelly-Riley, 2015; Preiss et al., 2013; Roberts 2016, Roberts et al., 2017) and helps address question regarding the equity of student learning (Montenegro & Jankowski, 2017).

## **Literature Review**

### **Value of Written Communication Skills**

The need for students to graduate with effective written communication skills has been recognized by researchers (Allan & Driscoll, 2014; Anson, 2006; Arnum & Roska, 2011; Barnhisel, Stoddard, & Gorman, 2012; Desmet et al., 2008; Faulkner, 2013; Good, Osborne, & Birchfield, 2012; Kelly-Riley, 2015), non-government organizations (AAC&U, 2008), governmental leaders (THECB, 2015), and business leaders (Hart Research Associates, 2013, 2015b). In a 2013 survey, 80% of employers indicated that higher education institutions should place a greater emphasis on written communication skills (Hart Research Associates, 2013). In a follow-up 2015 survey, 82% of employers noted that written communication was a key skill for students to have before graduation, and 81% reported they would be more likely to hire students who had taken more than one writing-intensive course in college (Hart Research Associates, 2015b).

Various governmental and non-governmental agencies have also recognized the importance of written communication. The Association of American Colleges and Universities (2008) identified written communication skills as an essential learning outcome for students. The THECB has implemented a recent statewide strategic plan for public higher education in Texas, *60x30TX*, which will guide the direction of higher

education within that state through 2030. As part of this plan, public institutions have been asked to identify the specific marketable skills, like written communication skills, students can gain through their academic programs (THECB, 2015).

### **Questions Regarding Student Written Communication Skills**

Despite the importance of written communication skills for college students there is evidence institutions are not doing enough to prepare students to write effectively. In their book *Academically Adrift: Limited Learning on College Campuses*, Arnum and Roska (2011) argued colleges and universities were inadequately preparing students in several important academic areas, including written communication. Students and employers have also questioned the abilities of recent graduates to write effectively. In a 2015 survey, only 65% of students believed they had effective written communication skills upon graduation. The perceptions of employers were even more troubling with only 27% believing recent graduates were prepared to write effectively (Hart Research Associates, 2015b).

### **Questions Regarding Equity in Higher Education**

Questions surrounding student written communication skills are echoed by broader concerns at the state of Texas (THECB, 2016) and national-levels (AAC&U, 2018; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017) regarding equity of student learning. From 2000 to 2015, the THECB's strategic plan for higher education in Texas focused on closing equity gaps in both educational access and success for minority students (THECB, 2016). Over this period gaps did close some, with Black Texas student enrollment at "Public, Independent, and Career Higher Education Institutions" increasing approximately 3%, Hispanic student enrollment increasing

approximately 11%, and White student enrollment decreasing approximately 18% (THECB, 2016, p. A-1).

Although equity of access to higher education improved for minority students, questions still remained regarding the equity of student performance. Six-year graduation rates for African-American and Hispanic students improved, but still trailed those of White and Asian students. For the 2009 cohort, the graduation rates for African Americans and Hispanics were 41% and 51.1%, respectively, whereas the graduation rates for Whites and Asians were 67.7% and 73.6% (THECB, 2016). The THECB (2016) also observed gaps in student performance by gender. For the same 2009 cohort, the 6-year graduation rate for full-time undergraduate female students was 64.2% whereas male students trailed at 53.8% (THECB, 2016).

Given continued questions regarding equity of student learning (Arnum & Roska, 2011) and performance (THECB, 2016), it would be logical for institutions to examine student learning data for outcomes like written communication skills by race or gender, although few institutions are doing so. In a 2015 survey, 70% of respondents reported their institutions tracked learning outcomes achievement data at their institutions. However, only 14% of the respondents had set equity goals for first-generation students, 24% by student socioeconomic status, and 31% by student race (Hart Research Associates, 2015a). When asked whether they examined student learning data by these characteristics only 17% of respondents reported their institutions had done so (parents highest level of education, 6%; student socioeconomic status, 9%; student race, 16%; Hart Research Associates, 2015a).

Montenegro and Jankowski (2017) argued that “disaggregating the data allows

researchers, administrators, and practitioners to see themes that they otherwise would have missed and could inform changes that would positively impact students' education" (pp. 13-14). By examining written communication skills through the lens of variables that are known as at-risk factors, like race, gender, socioeconomic status, and first-generation status (Gray, 2013), it is possible to gain a far greater insight into the depth and breadth of student learning at a college or university. These data can then be used, in turn, to help design educational interventions that may help improve students' educational experiences.

### **Studies of Student Written Communication Skills**

There is a limited body of literature examining student written communication skills in higher education. These studies can largely be broken down into four broad categories: longitudinal studies of student written communication skills (Faulkner, 2013; Hasswell, 2000; Kelly-Riley, 2015), studies of lower-division students' written communication skills (Allan & Driscoll, 2014; Desmet, et al., 2008; Preiss et al., 2013), studies of upper-division students' written communication skills (Hoyt et al., 2010), and studies examining written communication skills by student characteristics (Arnum & Roska, 2011; Good et al., 2012; Haswell, 2000; Preiss et al., 2013; Roberts, 2016; Roberts, Nardone, & Bridges, 2017).

Faulkner (2013) and Kelly-Riley (2015) both represented longitudinal studies of student written communication skills. Faulkner (2013) observed that the written communication skills of students at Cedarville University actually decreased from freshman to seniors, prompting Faulkner to advocate strongly for better integration of writing remediation and instruction across the curriculum. No attempt was made to

examine student data by any additional student characteristics, thus limiting the potential usefulness of this study.

The findings of Kelly-Riley (2015), which built upon the work of Haswell (2000), showed more positive results regarding student written communication skills. Haswell (2000) originally used nine different measures, including a holistic writing score, to evaluate the written communication skills of 64 students at Washington State University. Haswell (2000) observed statistically significant increases in student performance from the freshman to junior years for eight of the nine measures. In a follow-up study, Kelly-Riley used the same eight measures of written communications skills identified by Haswell (2000) as statistically significant to examine artifacts from 30 students. Kelly-Riley (2015) concluded that students made statistically significant gains over time within five of the eight measures. The small sample sizes used by both Haswell (2000) and Kelly-Riley (2015), along with the fact they did not examine student performance by group membership, represented limitations of both studies.

Several written communication studies focused upon lower-division students (Allan & Driscoll, 2014; Desmet et al., 2008; Priess et al., 2013). Although each of these studies highlighted important information about improving or measuring student written communication skills, none of these studies examined written communication by different student demographic characteristics. Other researchers have chosen to focus upon students as they approached graduation. Hoyt et al. (2010) studied the written communication skills of students graduating from a general studies bachelors program. Their study revealed that students were graduating with generally sufficient writing skills, although the authors determined that improvements could be made in the areas of both



content mastery and critical thinking (Hoyt et al., 2010).

### **Studies Examining Written Communication Ability by Student**

#### **Characteristics**

Several studies examined student written communication abilities and their relationship to different student characteristics, including student major (Good et al., 2012), race (Arnum & Roska, 2011, Roberts et al., 2017), gender (Arnum & Roska, 2011; Priess et al. 2013; Roberts et al., 2017), and levels of parental education (Arnum & Roska, 2011). Good et al. (2012) examined differences in student written communication skills by student major using both a third-party, commercial instrument and a locally developed rubric. This multi-measure approach allowed the authors to triangulate their results and helped validate their locally developed rubric (Good et al., 2012). The authors noted that their analysis gave the university a more nuanced picture of the differences in student performance and individual programs gained valuable information related to their students' written communication skills (Good et al., 2012).

Using data from the Collegiate Learning Assessment (CLA), a measure of both student written communication and critical thinking skills, Arnum and Roska (2011) determined that the CLA scores of both minority students and students whose parents had lower levels of education were lower than those of White students and students whose parents had higher levels of education. Black students, in particular, underperformed on the CLA in comparison to their counterparts, showing virtually no gain on the test over their first two years of college (Arnum & Roska, 2011). When it came to gender, the authors noted that male and female students performed equivalently (Arnum & Roska, 2011). It should be noted that Arnum and Roska (2011) made no attempt to look at

student performance beyond the second year.

Preiss et al. (2013) also examined differences in student performance by gender, although their results differed from Arnum and Roska (2011). Examining students enrolled at a Chilean university, they determined that female students outperformed male students regarding written communication skills (Preiss et al., 2013). Because of characteristics of the students involved (i.e., first-year students, students were enrolled at a foreign research university, assessment was of written communication in Spanish), these results may not generalize to students enrolled in American institutions.

There are two studies that are of particular relevance, as current study attempts to expand upon their previous work examining student written communication skills at the same university. Roberts (2016) observed that student written communication skills correlated positively with institutional GPA and with student performance in introductory English courses. Additionally, Roberts (2016) determined that no differences were present in the written communication scores of senior-level students who transferred in introductory English courses versus those who took those courses locally at that institution.

In a follow-up study, Roberts et al. (2017) examined whether differences existed in written communication skills by student race or gender. The authors observed a stair-stepped effect in student written communication skills, with female students consistently outscoring male students and White students consistently outscoring Black and Hispanic students across for all rubric domains and for student overall writing scores; however, these differences were not statistically significant (Roberts et al., 2017). There were limitations to Roberts et al.'s (2017) study. The sample included approximately 400

students from one semester and this limited sample may have limited the statistical power of the data.

### **At-Risk Factors**

Given that equity of student learning and success in higher education are becoming increasingly important issues (AAC&U, 2017; Gray, 2013; Hart Research Associates 2015a; Montenegro & Jankowski, 2017), it is key to understand the differences in student written communication skills by student group membership. No central definition exists for what are considered at-risk factors in education (Koball et al., 2011), although common traits included gender, race, socioeconomic status, and first-generation status (Gray, 2013). A wealth of literature exists examining these different factors: gender (e.g., Corona et al., 2017; Kim, 2011; Voyer & Voyer, 2014), race (e.g., Astin, 1975; Aud, Fox, & KewalRamani, 2010; Corona et al., 2017; Harper, 2012; Kim, 2011; Strayhorn, 2010), socioeconomic status (e.g., Braxton & Hirschy, 2005; Nora, Barlow, & Crisp, 2005; Green, 2006; Reason, 2009; Swail, Redd, & Perna, 2003; Tinto, 1975, 1997), and first-generation status (e.g., Aspelmeier, Love, McGill, Elliott, & Pierce, 2012; Corona et al., 2017; Green, 2006; Horowitz, Rabin, & Brodale, 2013; Ishitani, 2006; Stuber, 2011). However, this literature generally focused on broader college student success and not specific skills like written communication.

### **Theoretical Framework**

Students' written communication skills are not the direct result of their race, gender, socioeconomic status, or first-generation status, rather these characteristics are proxies for broader elements of social capital (Bourdieu, 1986; Coleman, 1988; Lin, 2002), which can influence student success. Bourdieu (1986) examined how a person's

level of social capital can be impacted by the person's economic status and cultural background (1986). When this theory is applied to higher education, the economic and cultural experiences of students, particularly for minority and first-generation students, could affect their ability to navigate and succeed in higher education (Martin, 2015). Coleman (1988) studied further aspects of social capital, including the impact of one's social knowledge and social norms, family interactions and behaviors, and informal channels for gaining information. It is possible to again apply these theories to higher education. For example, student membership in a disadvantaged social group (e.g., minority, first-generation, low socioeconomic status) "creates and reproduces inequalities in access to institutional resources" (Martin, 2015, p. 1171).

Lin (2002) defined social capital as "the resources embedded in social networks accessed and used by actors for actions" (p. 25). As with both Bourdieu (1986) and Coleman (1988), when applied to higher education, Lin's theory suggested that a student's group membership (e.g., race, gender, socioeconomic status, and first-generation status) can affect their access to necessary elements of social capital needed for success (Martin, 2015). Higher education professionals should be aware that students entering higher education with lower levels of social capital could be at-risk academically.

Studying student written communication skills by group membership can help identify potential weaknesses in these populations. Information gained through such an examination may then in turn be useful in helping develop interventions to aid student success. Conversely, if meaningful differences are not observed then these data may be evidence that institutions are helping to address possible social capital deficiencies and

ensuring that all students are learning.

## **Method**

### **Research Question**

The following research question will be addressed in this study: How does student performance on an end-of experience written communication assessment vary based on student characteristics of race, gender, socioeconomic status, and first-generation status?

### **Research Design**

As this study used secondary data, a nonexperimental, causal comparative research design was employed (Johnson & Christensen, 2012). Non-experimental student data were obtained from the university's assessment office, and were collected by the institution over a three year period. These data were collected through a sample of convenience from different colleges and departments at that institution. Entire class sets of student papers were collected and scored, with no efforts made to conduct purposeful sampling or to assign students to experimental and control groups.

### **Participants**

The participants for this study were 1,285 junior- and senior-level students enrolled within six of the seven undergraduate colleges at one 4-year, public university within southeast Texas during the 2015, 2016, and 2017 academic years. Of these students, 827 were female and 457 were male. A total of 825 students were White, 224 were Black, and 235 were Hispanic. For this study, a student's eligibility for Federal Pell Grants was used to define socioeconomic status. A total of 660 of students in the sample were identified as being Pell-eligible. First-generation status was a self-reported variable collected at the time the student registers for classes and a total of 512 students indicated

that they were first-generation (i.e., neither parent of the student had graduated from college), 448 indicated that they were not first-generation, and the status of 325 students was unknown.

The demographics of the sample population for this study were generally similar to those of the entire university. For fall 2016, approximately 62% of all undergraduate students enrolled at the university were female and 38% were male. Additionally, approximately 51% of all undergraduate students were White, 18% were Black, and 22% were Hispanic. The sample population for this study, when compared to the institution, over represented Whites by approximately 8%, and underrepresented Blacks and Hispanics by approximately 2% and 5%, respectively. Institutional comparison data regarding student Pell-eligibility and first-generation status were not available.

### **Sampling Procedures**

A sample of convenience was used to collect student writing artifacts (Johnson & Christensen, 2012). Student artifacts from College 1 were extracted from larger portfolios that students completed prior to graduation, whereas the artifacts from College 2, 3, 4, 5, and 6 were taken from 3000- and 4000-level courses from within those colleges. Therefore, all of the student writing artifacts represented authentic, end-of-experience work, and were assumed to reflect of the writing abilities of those students as they approached graduation. Because the student writing artifacts were gathered from high-stakes assignments (i.e., capstone portfolios, graded course assignments), they were assumed to represent the students' best efforts.

## Measure

Student written communication scores were derived using a locally-developed writing rubric. Kuh et al. (2015) noted that "rubrics encourage the use of authentic student work for assessment" (p. 39). This rubric was created by an interdisciplinary faculty committee from the university with expertise and experience in both teaching and assessing written communication. The use of faculty experts helped to support the content validity of the rubric (Banta & Palomba, 2015, p. 77). At the outset of the rubric development process the committee reviewed examples of other writing instruments, including the AAC&U VALUE Rubric for Written Communication. Over multiple rounds of consultation and revision, the committee eventually developed an applicable instrument to evaluate written communication skills for their university. The AAC&U VALUE Rubric, in particular, was influential in helping the committee determine the four separate domains for the rubric: (a) Ideas/Critical Thinking/Synthesis, (b) Style, (c) Organization, and (d) Conventions. Student artifacts were scored for each domain using a 4-point scale. The student's scores for each domain were then combined to create a single overall score for the student artifact. This study will make use of the overall student score. A copy of the rubric has been included in Appendix A.

In rubric-based assessments, the consistency of the raters' scores is an important measure of reliability (Banta & Palomba, 2015; Millett, Payne, Dwyer, Stickler, & Alexiou, 2008). An interdisciplinary group of raters derived the written communication scores analyzed as part of this study. Each artifact was evaluated by two different raters, with a third rater introduced when a discrepancy was identified in the first two raters scores for one or more of the rubric domains (i.e., one rater assigned a score of 1 whereas

another rater assigned a score of 4). The two scores in closest agreement for each domain were then kept, and the third score was not used.

Inter-rater reliability was then calculated for the holistic score, using one-way, random intra-class correlation (ICC) coefficients (Fleiss, 2003; Shrout & Fleiss, 1979). According to Cicchetti (1994), ICC values below .40 are considered poor agreement, values between .40 and .59 are considered fair agreement, values between .60 and .74 are considered good agreement, and values .75 and above are considered excellent agreement. The ICC value for the overall paper score was .70, which indicated good agreement between the raters scores.

### **Limitations**

There are limitations which effect the generalizability of the findings from this study. For example, findings from this study may not be generalizable across different populations, locations, and times. Additionally, the use of secondary data does not allow for manipulation of included variables (Johnson & Christensen, 2012). Some data were missing for first-generation status, as that variable is self-reported by the student. Finally, Pell eligibility was dependent upon the student having completed the Free Application for Federal Student Aid.

### **Data Analysis**

This study employed a multiple regression to attempt to identify what differences exist in student written communication skills by student race, gender, socioeconomic status, and first-generation status. As student race involve three different categories (White, Black, and Hispanic), dummy coding was employed to properly code the variables used for analysis. Prior to conducting any inferential statistics, appropriate



checks were made to ensure necessary assumptions were met (Field, 2009; Onwuegbuzie, 2002). Standardized skewness and kurtosis coefficients (i.e., the skewness and kurtosis values divided by their respective standard error) were calculated prior to conducting any statistical analysis. Analysis revealed that these values were within the range of normality of  $\pm 3$  (Onwuegbuzie & Daniel, 2001). The possible presence of multicollinearity was addressed through the examination of both Tolerance values and of the variance inflation factor (VIF). In all cases, Tolerance values were above .10 and the VIF values were very close to 1. This indicates that multicollinearity was not present for this study (Field, 2009). Finally, the presence of significant residual autocorrelation was checked through an examination of the Durbin-Watson statistic. The pooled Durbin-Watson statistic value for this study was .02, indicating that this assumption was violated. Both tests of statistical significance and model effect sizes were considered in the interpretation of statistical model results (Wilkinson & APA Task Force on Statistical Inference, 1999). The relative importance of variables were assessed using both standardized weights ( $\beta$ ) and structure coefficients ( $r_s$ ) given their purported value in the literature (Courville, & Thompson, 2001).

One variable used in this study, first-generation status, was self-reported by the students, and data were missing for approximately 25% of students. Using listwise deletion to remove these students from the dataset for analysis would have resulted in a loss of statistical power (Schlomer, Bauman, & Card, 2010). Therefore, a multiple imputation analysis was employed to account for these missing data. Multiple imputation is seen as “one of the best options for handling missing data” (Schlomer et al., 2010, p. 5). Typically, three to five imputations are sufficient (Schafer, 1997). Five imputations

were used in the current study calculate values for the missing cases. All reported results and coefficients were pooled, unless otherwise stated.

### **Results**

The overall regression model was predictive of differences in student written communication skills,  $F(5, 1278) = 2.58, p < .001$ . The pooled  $R^2$  for the model was .032 and the pooled adjusted  $R^2$  was .028, which indicated 2.8% of the total variance in written communication skills could be explained by demographic characteristics. This value was interpreted to be small (Cohen, 1988). When examining the pooled coefficients, two of the examined variables were statistically significant in the model. On a 4-point scale, the written communication scores for male students were 0.14 points, or approximately 3%, lower than female students, and the scores for Black students were 0.17, or approximately 5%, lower than those of White students. The scores for Hispanics for students who were Pell eligibility, and students who were first-generation were not statistically significantly different. Readers are directed to table 2.1 for a full breakdown of the relevant pooled coefficients. Furthermore, readers are directed to table 2.2 for a breakdown of student written communication performance by gender, race, socio-economic status (i.e., Pell eligibility) and first-generation status.

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Insert Tables 2.1 – 2.2 here  
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### **Discussion**

The purpose of this study was to exam the differences in student written communication performance by gender, race, socio-economic status, and first-generation

status. Each of these characteristics represented potential flags students might be at academic at-risk. Social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2002) suggests students' backgrounds and experiences can influence their performance in settings like higher education. Because of their backgrounds and experiences before arriving at a college or university, minority students, first-generation students, and students who are entering higher education with greater financial need may struggle when compared to their more advantaged peers.

Questions of the equity of student learning and success in higher education are at the forefront of thought for higher education researchers and policy makers (AAC&U, 2018; Arnum & Roska, 2011; THECB, 2016; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017). Furthermore, gaps have been identified in student learning (Arnum & Roska, 2011; Priess et al., 2013) and general student success (THECB, 2016). However, few institutions have examined student learning by different student characteristics (Hart Research Associates, 2015a). This study helps to address questions of equity by taking up the charge of Montenegro and Jankowski (2017) to meaningfully examine student learning data by disaggregating results by different student characteristics. Examining student learning data in this way grants far greater insight into student written communication skills and how those skills may differ by group membership. This study joins a limited body of literature examining differences in student written communication skills by different student characteristics (Arnum & Roska, 2011; Priess et al. 2013; Roberts et al., 2017).

The findings from the current study do raise some questions regarding the equity of student written communication skills at this particular institution when examined by

race, gender, socioeconomic status, and first-generation status. If the university is preparing all students equally in written communication skills, then the regression model should not be predictive of student success. Overall, the regression model used was predictive of student success, although the pooled adjusted  $R^2$  explained only 2.8% of the total variance and represented a small effect size. The small percentage of variance explained by the model in this study can be seen generally as a positive, although it does indicate some student groups had lower written communication skills than others.

The multiple regression analysis did reveal differences in student performance by both gender and race. Written communication scores for male students were statistically significantly lower than female students, and the scores for Black students were statistically significantly lower than White students. The nature of these differences were small, approximately 3% for males and 5% for Blacks, and may not warrant major curricular or pedagogical intervention on the part of the university at this time these equity gaps in student written communication skills. However, given the persistent performance gaps seen in broader success at the state level (THECB, 2015), and specific gaps seen in student written communication skills by researchers (Arnum & Roska, 2011; Preiss et al., 2013), the gaps in student performance identified within the current study are important to note and are worthy of future study.

These findings from the current study also aligned with those of Arnum and Roska (2011) who observed differences in student written communication skills, as measured through the CLA, by student race. In their study, White students outperformed all minorities. Black students, in particular, struggled showing virtually no gains in their CLA scores from pre-to-post (Arnum and Roska, 2011). Preiss et al. (2013) also

observed differences in student scores by gender, with female students out performing male students in their written communication assessment.

The results from the current study were a departure from those observed by Roberts et al. (2017), who examined the written communication skills of a different population of students at the same university, but from a different period. Although Roberts et al. (2017) observed similar mean differences to those of the current study in student written communication performance by race and gender, the differences were not statistically significant. In fact, the mean differences in overall student writing score between Black and White students were almost identical between the two studies, with a .16 difference for Roberts et al. (2017) and .18 for the current study. The differences in statistically significant findings from Roberts et al. (2017) to the current study could be explained by the fact that a much larger sample was used for analysis in the current study giving it greater statistical power and allowing it to see more subtle differences in student performance. The differences observed within the current study probably represent a more accurate picture of student written communication skills at the university.

The fact that statistically significant differences in student performance were observed in this study for male students and Black students is worth continued examination. Additional studies are needed to further examine student written communication skills by student race and gender to determine whether the differences observed within the current study shrink, persist, or possibly even widen. Further examinations should also be made to better understand how the interactions between different student characteristics could be further impacting their written communication skills. For example, the differences in written communication skills for male/female and

Black/White students were fairly limited; however, examining the interaction of these variables could reveal that Black male students might be performing at an even lower level than their peers. Such information could then be used to design educational interventions to improve student written communication skills.

One major limitation of the current study was that it focused exclusively upon junior- and senior-level students. This limitation could be addressed by conducting a similar examination of the written communication skills of students entering the university. By comparing the differences in written communication skills of students at the beginning and end of their college experiences, it could be determined whether gaps in student performance were opening, closing, or if they existed at all.

Finally, equity of written communication skills does not necessarily equate to quality of written communication skills. The observed writing scores of all the different student groups within the current study were relatively low. On a 4-point scale, the overall mean score for the entire population was a 2.40. This was below the overall university goal of 2.50 or higher on this particular assessment. Additionally, the overall scores for White, Black, Hispanic, male, and female students were all lower than those observed by Roberts et al. (2017).

If these results continue to hold true, then university will need to modify the approaches it currently uses to teach students written communication skills. In particular, more efforts could be made to strengthen and improve currently existing writing-enhanced courses already existing across the curriculum. By giving students more instruction on how to properly write within their disciplines, more practice in the form of well-designed writing assignments, and more feedback through structured

write/review/resubmit exercises, the university could see future student improvement. It will be important to continue monitoring student performance by race, gender, socioeconomic status, and first-generation status as the university implements any changes to ensure that they are effective and that they benefit all students, regardless of race, gender, socioeconomic status, or first-generation status.

### **Conclusion**

This study employed social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2002) to examine differences in student written communication skills by various demographic characteristics that could indicate a student may be at academic risk (i.e., gender, race, socioeconomic status and first-generation status). This study attempted to address serious questions regarding student written communication skills (Arnum & Roska, 2011; Hart Research Associates, 2015b) and broader questions surrounding equity of student learning for different student populations (AAC&U, 2018; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017). Additionally, this study joins a growing body of literature examining student written communication skills as a function of student characteristics (Arnum & Roska, 2011; Good et al., 2012; Priess et al. 2013; Roberts et al., 2017).

Although statistically significant differences in student written communication skills were seen for Black students, when compared to White students, and male students, when compared to female students, these differences were limited. This, along with the lack of difference in scores for Hispanic students, students who were Pell-eligible, and students who were first-generation, can be seen as potential evidence that the institution may be limiting, or even successfully closing, equity gaps related to written

communication. However, work remains to be done before this conclusion can be fully ascertained. Nor do the results from this study speak to the equity of learning across higher education, in general. This study represents one university's efforts to better understand the written communication skills of its students, and understand how differences in its students can influence student learning. It is hoped that the methods and results presented here may inspire faculty, researchers, and university administrators to address similar questions at their own institutions.



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Table 2.1

*Summary of Pooled Multiple Regression Results of Predictor Variables Upon Student**Written Communication Performance*

Predictor Variable	<i>B</i>	<i>SE B</i>	$\beta$	<i>t</i>	<i>p</i>
Constant	2.51	0.03		77.14	< .01
Male	-0.15	0.03	-.13	-4.70	< .01
Black	-0.18	0.04	-.12	-4.10	< .01
Hispanic	-0.06	0.04	-.04	-1.35	.18
Pell Eligible	-0.03	0.04	-.03	-0.88	.38
First Generation	< -0.00	0.04	< -.01	-0.03	.97

*Note.* The performance of Black and Hispanic students are both compared to that of White Students.

*Table 2.2 - Descriptive Statistics for Student Writing Scores by Student Group*

Student Group	<i>n</i>	<i>M</i>	<i>SD</i>
Overall	1,284	2.40	0.56
Population			
Race			
White	825	2.43	0.56
Black	224	2.26	0.52
Hispanic	235	2.39	0.59
Gender			
Male	457	2.31	0.57
Female	827	2.45	0.55
Socio-Economic			
Status			
Pell Eligible	600	2.36	0.55
Not Pell	684	2.42	0.57
Eligible			
First-Generation			
Status			
First-	512	2.39	0.57
Generation			
Not First-	448	2.39	0.54
Generation			



**CHAPTER III**  
DIFFERENCES IN STUDENT CRITICAL THINKING SKILLS AS A FUNCTION OF  
DEMOGRAPHIC CHARACTERISTICS

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This dissertation follows the style and format of *Research in the Schools*.

### **Abstract**

The importance of student critical thinking skills is recognized across higher education; however, questions remain whether students are graduating proficient in critical thinking. These questions are particularly acute for students who may already be at-risk academically (e.g., minority students, first-generation students, and students with financial need). Using social capital theory, this study examined differences in student critical thinking skills by gender, race, socioeconomic status, and first-generation status. A multiple regression revealed these demographic variables were predictive of student performance on a critical thinking test. Furthermore, the critical thinking scores of Black students, Hispanic students, and students who were first-generation were statistically significantly lower than those of White students and students who were not first-generation.

**Keywords:** General Education, Critical Thinking, Race, Gender, First-Generation, Socioeconomic Status, Social Capital, At-Risk, Assessment

## DIFFERENCES IN STUDENT CRITICAL THINKING SKILLS AS A FUNCTION OF DEMOGRAPHIC CHARACTERISTICS

General education learning outcomes for undergraduate students, like critical thinking, are becoming increasingly popular for higher education institutions (Galle & Galle, 2010; Laird, Niskodé-Dossett, & Kuh, 2009; McLawhon & Phillips, 2013; Siefert et al., 2008; Wehlburg, 2010). Researchers at the National Institute for Learning Outcomes Assessment conducted survey of institutional chief academic officers and 84% of respondents noted their institutions had identified general education outcomes for their students (Kuh, Jankowski, Ikenberry, & Kinzie, 2014). Within Texas, the setting for this study, the Texas Higher Education Coordinating Board (THECB) identified six core learning outcomes, including critical thinking, for undergraduate students enrolled at all state institutions (THECB; 2017a) and expects regular assessment of these outcomes “to discover, document and seek to improve student attainment” (THECB; 2017b, p 1).

The THECB (2017a) has defined critical thinking as “creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information” (para. 3). Critical thinking’s importance as a learning outcome for undergraduate students is widely acknowledged by researchers (Arnum & Roska, 2011; Bensley et al., 2016; Cole & Zhou, 2014; Fliegel & Holland, 2013; Hatcher, 2006; 2011; Haynes, Lisic, Goltz, Stein, & Harris, 2016; Haynes et al., 2015; Lampert, 2007; Mazer, Hunt, & Kuzenkoff, 2008; Nicholas & Labig Jr., 2013; Rowe et al., 2015) and non-governmental educational agencies (Association of American Colleges & Universities, 2008).

The importance of critical thinking skills are also recognized by employers (AAC&U, 2008; Hart Research Associates 2013, 2015b). In a 2008 Association of

American Colleges and Universities (AAC&U) report, 73% of employers wanted institutions to “place more emphasis” on critical thinking and analytic reasoning. By 2013, 82% of surveyed employers indicated that institutions should place more emphasis on critical thinking and analytical reasoning (Hart Research Associates). Furthermore, 93% of surveyed employers reported either somewhat or strongly agreeing that “a candidates’ demonstrated capacity to think critically, communicate clearly, [and] solve complex problems [was] more important than their undergraduate major” (Hart Research Associates, 2013, p. 4). A 2015 survey further determined that 81% of surveyed employers indicated that critical thinking and analytical reasoning skills were very important for college graduates (Hart Research Associates, 2015b).

Despite the recognized importance of student critical thinking skills (AAC&U, 2008; Hart Research Associates 2013, 2015b; THECB, 2017a), serious questions remain from both researchers (Arnum & Roska, 2011; Hatcher, 2015) and business leaders (Hart Research Associates, 2013, 2015b) regarding higher education’s ability to adequately prepare students to think critically. These concerns are compounded by broader questions related to the equity of student learning in higher education for different student groups (AAC&U, 2017; Arnum & Roska, 2011; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017).

The purpose of this study is to examine how the critical thinking skills of students enrolled within an undergraduate critical thinking course vary as a function of different student characteristics (i.e., gender, race, first-generation status, socioeconomic status). These characteristics represent potential indicators that students may be at academic risk (Gray, 2013). This study examines student critical thinking skills through the lens of



social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2002), which posits that student success can be influenced by group membership, cultural background, and past experiences.

Results from this study will help highlight any differences in student performance by group membership, and will provide data which could be used for curricular or pedagogical improvements to improve student critical thinking skills within this course. This study will join a growing body of literature centered on assessing student critical thinking skills within higher education (Arnum & Roska, 2011; Bensley et al., 2016; Cole & Zhou, 2014; Fliegel & Holland, 2013; Hatcher, 2006, 2011; Haynes et al., 2016; Haynes et al., 2015; Lampert, 2007; Mazer, Hunt, & Kuzenkoff, 2008; Nicholas & Labig Jr., 2013; Rowe et al., 2015). The study will also help address questions regarding equity of student learning (Arnum & Roska, 2011; Hart Research Associates, 2015a; Montenegro and Jankowski, 2017).

## **Literature Review**

### **Questions Surrounding Student Learning and Success in Higher Education**

Serious questions remain regarding broader student success in higher education (Hart Research Associates, 2015b; THECB, 2016) and the ability of institutions to adequately prepare students to think critically (Arnum & Roska, 2011; Hatcher, 2015; Hart Research Associates, 2015b). Texas has seen some success in closing gender and racial gaps in educational access and student success (THECB, 2016). From 2000 to 2015, the percentage of Black and Hispanic students enrolled in higher education institutions increased by approximately 3% and 6%, respectively, and the percentage of White students decreased approximately 17% (THECB, 2016). Graduation rates for

minorities also improved; however, gaps in graduation rates for Texas students remain stark. The 6-year graduation rates for the fall 2009 cohort were 41% for Black students, 51.1% for Hispanic students, and 67.7% for White students (THECB 2016). Gender gaps also continue to exist, with male students trailing female students 34.2% to 53.8% for the fall 2009 cohort graduation (THECB, 2016).

When specifically examining critical thinking skills, both employers and former students have questioned students' level of preparation. In a 2015 survey, 66% of recent graduates believed they were well prepared regarding critical and analytical thinking (Hart Research Associates, 2015b). Employers' responses to the same question were even more troubling, with only 26% of employers believing recent graduates were well prepared regarding critical and analytical thinking (Hart Research Associates, 2015b).

Given concerns regarding the equity of student success in higher education, it could be assumed that institutional leaders would regularly examine student learning data through the lenses of race or gender. However, in a 2015 survey only 31% of respondents reported their institutions had set equity goals for institutional learning outcomes by race, 24% by socioeconomic groups, and 14% by levels of parental educational attainment (Hart Research Associates, 2015a). When these same institutional leaders were asked if their institutions had actually examined their data by these different student characteristics, only 17% indicated doing so, with 16% examining student learning data by race, 9% by socioeconomic status, and 6% by parental educational level (Hart Research Associates, 2015a).

If higher education leaders desire to understand and improve student critical thinking skills, then they must fully grasp the nuances of their student learning data.

Montenegro and Jankowski (2017) argued, “disaggregating the data allows researchers, administrators, and practitioners to see themes that they otherwise would have missed and could inform changes that would positively impact students’ education” (pp. 13-14). By examining student critical thinking skills by factors like gender, race, first-generation status, and socioeconomic status, greater insight can be gained into student ability that may be useful for improving student learning (Kuh et al., 2015).

### **At-Risk Factors for Student Success**

Although no central definition exists for at-risk factors in education (Koball et al., 2011), broadly accepted characteristics included ethnicity/race, gender, first-generation status, and socioeconomic status (Gray, 2013). There is robust literature examining each of these different at-risk factors for students in higher education. Examples can be found for race/ethnicity (e.g., Astin, 1975; Aud, Fox, & KewalRamani, 2010; Corona et al., 2017; Harper, 2012; Kim, 2011; Strayhorn, 2010), gender (e.g., Corona et al., 2017; Kim, 2011), first-generation status (e.g., Aspelmeier, Love, McGill, Elliott, & Pierce, 2012; Corona et al., 2017; Stuber, 2011), and socioeconomic status (e.g., Braxton & Hirschy, 2005; Green, 2006; Nora, Barlow, & Crisp, 2005; Reason, 2009). Unfortunately, this literature examined broadly general student persistence and success. The impact of at-risk factors upon critical thinking skills remains understudied.

### **Theoretical Framework**

Students’ critical thinking skills are not directly caused by their race, gender, socioeconomic status, or first-generation status. Instead these characteristics represent proxies for broader of elements social capital that can influence student educational success. Several researchers have identified theories of social capital,

including Bourdieu (1986), Coleman (1988), and Lin (2002); however, the theories share basic similarities.

Bourdieu (1986) focused heavily on how social capital is impacted by both economic and cultural capital. Applied to higher education, students with greater economic need, or students from less privileged classes (e.g., minorities, first-generation students) may find themselves lacking the social capital (e.g., money, access, resources) necessary to be successful when compared to students from more privileged backgrounds (Martin, 2015). Coleman (1988) examined slightly different aspects of social capital, focusing more on social knowledge, informal information channels, social norms, and family behaviors or actions. Again, as applied to higher education, student membership in a disadvantaged social group “creates and reproduces inequalities in access to institutional resources” that are not seen in students from more advantageous social groups (Martin, 2015, p. 1171).

Lin (2002) defined social capital as “the resources embedded in social networks accessed and used by actors for actions” (p. 25). Lin’s theory embraced the idea that students’ group membership, like their race, gender, socioeconomic status, and first-generation status, can affect their access to necessary elements of social capital and impact their ultimate success (Martin, 2015). With individual effort, students may overcome these social capital limitations and succeed (Lin, 2002; Martin, 2015). Higher education professionals should be aware that students of different races, genders, socioeconomic statuses, and first-generation statuses may be entering their institutions with differing levels of social capital, which may put these students at-risk academically.

Studying student critical thinking skills by group membership can help identify

differences in student ability. These data could then be used to help design effective interventions for improving student learning. Additionally, if meaningful differences between different student groups were not revealed, then this could be evidence that the institution is ensuring that its students are learning equitably.

### **Importance of Critical Thinking Skills**

Critical thinking's importance as a learning outcome for students is broadly recognized by higher education researchers (Arnum & Roska, 2011; Bensley et al., 2016; Cole & Zhou, 2014; Fliegel & Holland, 2013; Hatcher, 2006; 2011; Haynes et al., 2016; Haynes et al., 2015; Lampert; 2007; Rowe et al., 2015) and both governmental (THECB, 2015; 2017a) and non-governmental agencies (AAC&U, 2008). The AAC&U (AAC&U, 2008) recognized critical thinking as an "essential learning outcome" for all students (p. 2) and the THECB recognized critical thinking as one of the six core learning outcomes for students enrolled in all public institutions within the state. The THECB (2015) has also implemented *60x30TX*, a state-wide strategic plan for public higher education within Texas, asking institutions to identify the marketable skills, including those related to critical thinking, students can gain through the course of their academic programs.

Critical thinking is complicated to both define and measure as a learning outcome. When Nicholas and Labig (2013) studied the assessment techniques used by faculty to measure critical thinking they determined that faculty across different disciplines often had very different definitions of critical thinking. The complex nature of critical thinking was also supported by Haynes et al. (2015) and Haynes et al. (2016), who identified 12 different skill elements involved with critical thinking (cf. Haynes et al., 2015, p. 39). Hatcher (2015) also highlighted the diverse nature of critical thinking, and noted how the

way it was defined could impact how one approached critical thinking assessment.

Critical thinking is a skill that does not seem to meaningfully improve in students without direct instruction or intervention. Haynes et al. (2015) noted how students enrolled in courses that included explicit critical thinking instruction showed significant gains in critical thinking skills, whereas students enrolled in classes that did not include explicit instruction did not show gains. The need for purposeful instruction is supported by additional studies which demonstrated that students in courses or curriculum with structured or integrated critical thinking content improved in their critical thinking skills, while students enrolled in courses without purposeful critical thinking instruction did not improve (Bensley et al., 2016; Hatcher, 2006; Mazer, 2008; Rowe et al., 2015).

**Examining student critical thinking skills by student characteristics.** There is a growing body of literature examining student critical thinking skills. A majority of these studies (Bensley et al., 2016; Fliegel & Holland, 2011; Hatcher, 2006; 2011; 2015; Lampert, 2007; Mazer et al., 2008; Rowe et al., 2015) focused upon measuring student critical thinking skills in general without examining student performance as a factor of specific characteristics like gender, race, first-generation status, or socioeconomic status. There were a few notable exceptions (Arnum & Roska, 2011; Cole & Zhou, 2014).

Using data from the Collegiate Learning Assessment (CLA), a standardized exam designed to measure student written communication and critical thinking skills, Arnum and Roska (2011) determined that the performance of minority students lagged behind that of their White counterparts, and students whose parents had lower levels of education lagged behind students' whose parents had greater levels of education. The authors determined that students, in general, showed limited gains on the CLA during their first

two years of college (Arnum & Roska, 2011). Black students particularly struggled, showing virtually no gain in scores (Arnum & Roska, 2011). Arnum and Roska (2011) did not observe any meaningful differences in student performance by gender, with men and women performing equivalently.

Cole and Zhou (2014) examined how both collegiate and diversity experiences impacted students' perceived gains in critical thinking. The authors examined how student experiences and perceived skills varied by race, though their categories were limited to White, Asian, and underrepresented minorities (Cole & Zhou, 2014). The largest student populations at the university studied by Cole and Zhou (2014) were White (46.6%) and Asian (22.9%). The authors noted that they “differentiated Asian as an overrepresented ethnic minority group...because research indicates that Asian student tend to have greater differences than similarities compared with [underrepresented minorities]” (p. 20). Cole and Zhou (2014) determined that several diversity and engagement factors resulted in gains to students' perceptions of critical thinking, including positive interactions with faculty, satisfaction with campus racial harmony, and participation in racial awareness workshops or diversity courses, although these effects varied by race. The authors reported that racial awareness workshops seemed to effect the self-perceived critical thinking gains for only White students; whereas diversity workshops only affected underrepresented minority students (Cole & Zhou, 2014).

**Studies examining improvements to student critical thinking skills.** Many researchers reported seeing improvements in student critical thinking skills (Bensley et al., 2016; Fliegel & Holland, 2011; Hatcher, 2006; Lampert, 2007; Mazer et al., 2008; Rowe et al., 2015). However, these studies lacked any discussion of student critical

thinking skills as a function of race, gender, socioeconomic status, or first-generation status. This literature gap represents a serious limitation to the bulk of existing research on student critical thinking skills and limits how these data could be used to address questions regarding the equity of student learning and to further improve student educational experiences.

Fliegel and Holland (2013) directly challenged some of the negative findings of Arnum and Roska (2011) regarding student critical thinking skills. Their longitudinal study of students at the University of Southern California focused on using authentic student learning artifacts to assess student learning (i.e., student work generated from class assignments) rather than a standardized test like the CLA used by Arnum and Roska (2011). Whereas Arnum and Roska (2011) observed limited student gains on the CLA from the freshman to sophomore years, Fliegel and Holland (2011) determined that students at their institution improved in their critical thinking skills from their freshman to their junior years (Fliegel & Holland, 2011). Lampert (2007) also observed improvements in student critical thinking skills. Using the California Critical Thinking Assessment Test, Lampert (2007) observed that junior- and senior-level students performed statistically higher than freshman. Lampert (2007) determined that arts students scored higher than non-arts students in several areas of the test.

Several studies specifically examined the impact of particular curricular interventions upon improving student critical thinking skills. For example, Hatcher (2006) examined the effect of integrating critical thinking instruction within an experimental two-semester sequence versus more traditional approaches using standalone logic or critical thinking courses. Hatcher (2006) observed improvement in student



critical thinking skills from the freshman to senior year at Baker University using the Ennis-Weir Critical Thinking Essay Test. The author determined that students enrolled in the integrated curriculum made greater pre-to-post gains in critical thinking skills than students in both standard logic and critical thinking courses; although students enrolled in the standard critical thinking course had higher pre-test and post-test average critical thinking scores (Hatcher, 2006). Students enrolled in the logic course actually decreased in score from pre- to post-test (Hatcher, 2006).

Mazer et al. (2008) also examined the impact of integrating critical thinking instruction into communication courses at Illinois State University. The authors sought to determine whether their experimental curriculum improved both student critical thinking and student metacognition, meaning students' perceptions of their own critical thinking skills (Mazer et al., 2008). Students in both the experimental and control groups showed increases in metacognition; however, only students enrolled in the experimental communications courses showed actual increases in critical thinking skills.

Rowe et al. (2015) observed increases in student critical thinking skills at Sam Houston State University as measured through the Critical Thinking Assessment Test. The authors examined student performance within Foundations of Science, a science course specifically designed for non-science majors that engaged students with a curriculum designed to improve student critical thinking skills. Students enrolled within Foundations of Science showed statistically significant pre-to-post gains in critical thinking skills, whereas students enrolled in normal science courses with traditional curriculums showed no significant gains (Rowe et al., 2015). Additionally, the post-test scores for Foundation of Science students were significantly higher than those of students

enrolled in normal science courses (Rowe et al., 2015).

Bensley et al. (2016) determined that introductory psychology students who received critical thinking instruction showed statistically significant pre-to-post improvements in critical thinking skills when compared to students who did not receive this instruction (Bensley et al., 2016). The authors of the study cautioned against interpreting too much into these students gains (Bensley et al., 2016). As part of their study, Bensley et al. (2016) examined both test-taking motivation and student metacognition. The authors observed that student motivation on the post-test significantly decreased for the students not engaged with the critical thinking instruction, which could have impacted their post-test scores and possibly invalidated their comparison to the post-test scores for students within the experimental courses (Bensley et al., 2016).

Questions remain as to whether these seemingly positive findings are actually reflective of meaningful improvement in student critical thinking ability. Hatcher (2011) examined the assessment of student critical thinking skills at Baker University using three separate instruments, the Ennis-Weir Critical Thinking Essay Test, the California Critical Thinking Skills Test, and the Cornell Critical Thinking Test Level Z. All three tests were used to evaluate the critical thinking skills of students enrolled within a freshman level, two-course sequence with an integrated critical thinking curriculum (Hatcher, 2011). Students demonstrated significant gains across all three critical thinking measures; however, the gains were not consistent. Students increased their performance upon the Ennis-Weir Test at a rate higher than both the California Critical Thinking Test and the Cornell Critical Thinking Test Level Z (Hatcher, 2011). Although the results from all

three assessments showed positive student performance, the differences in the overall scores raised serious questions for Hatcher (2011) regarding the value of these data to meaningful student learning gains.

Hatcher (2011) concluded that test format could be responsible for the observed differences in student performance. As the Ennis-Weir was essay based and was being given to students enrolled in a communications course, Hatcher (2011) suggested the students' comfort with the nature of the test partially resulted in higher levels of performance. Because of its format, the Ennis-Weir was a "better assessment tool for students who are familiar with applying [critical thinking] skills to their writing" (2011, p. 35). Hatcher (2011) encouraged researchers to select an appropriate critical thinking assessment measure for their setting and students.

Hatcher (2015) continued to question the results from different assessments of critical thinking skills, as well as institutions' abilities to improve those skills meaningfully. Hatcher (2015) highlighted the relatively modest gains observed in student performance at Baker University over 18 years as measured through the Ennis-Weir Critical Thinking Essay Test, the California Critical Thinking Skills Test and the Cornell Critical Thinking Test Level Z tests. For example, students only improved 2.7 points on the 52-question Cornell Level Z exam, many students demonstrated lower post-test scores across all three exams, and the overall post-test average scores for all three exams were below 60% and were what Hatcher (2015) called "a failing grade" (p.7).

These results led Hatcher (2015) to call for educators and researchers to embrace a more realistic view of their abilities to improve student critical thinking skills. Wright (2015) offered a direct response to Hatcher (2015). Wright (2015) acknowledged the

findings of Hatcher (2015) at Baker University; however, challenged Hatcher's assertion that his findings were not meaningful, arguing that the effect sizes observed by Hatcher (2015) were of real significance and indicated that the gains by students, although numerically small, were important.

## **Method**

### **Research Question**

The following research question is addressed in this study: How does student performance on the Texas Assessment of Critical Thinking Skills (TACTS) test vary based on different student characteristics (i.e., gender, race, first-generation status, socioeconomic status)?

### **Research Design**

This study employed a nonexperimental, causal comparative research design as secondary student performance data were used for analysis (Johnson & Christensen, 2012). Non-experimental data for this study were collected jointly by the university's assessment office and the philosophy program. A census sample was employed to collect data from all sections of an undergraduate critical thinking course for the 2016 and 2017 academic years. No efforts were made to place students into experimental and control groups for study or analysis.

### **Participants**

The participants for this study were 781 undergraduate students enrolled in undergraduate critical thinking courses at a 4-year, public university within southeast Texas during the 2016 and 2017 academic years. Of these students, 269 were male and 512 were female. Furthermore, 422 were White, 159 were Black, and 201 were

Hispanic. Student eligibility for Federal Pell Grants was used as an indicator of economic need for this study. A total of 347 students were identified as being Pell-eligible. Student first-generation status was a self-reported variable collected at the time of registration. A total of 396 students indicated that they were first-generation (i.e., neither parent of the student had graduated from college), 299 students indicated that they were not first-generation, and the first-generation status of 86 students was unknown.

The demographic characteristics of the sample population were very similar to the student profile of the entire university. As of the fall 2016 semester, approximately 38% of all students enrolled at the university were male and 62% were female. The sample for this study underrepresented male student by approximately 4%. Approximately 51% of undergraduate students were White, 22% were Hispanic, and 18% were Black.

Comparison data for students regarding both first-generation status and Pell-eligibility were not available from the institution at this time.

### **Measure**

Student critical thinking scores for this study were derived from the TACTS test. The TACTS is a 35-question multiple-choice instrument designed to measure student critical thinking, empirical, and quantitative skills. The TACTS was developed, tested for reliability, and validated at the university by an interdisciplinary group of faculty in a process that was led by faculty within the philosophy program (Fair, Miller, Muehsam, & McCoy, 2010). The instrument was originally developed to assess student critical thinking skills within the university's College of Business as part of that college's Association to Advance Collegiate Schools of Business accreditation efforts. The philosophy program has since adopted the instrument and utilized it to assess critical

thinking skills in an undergraduate critical thinking course. As it is a critical thinking course within the university's core curriculum, since 2015 the university has used TACTS data from this course to help assess the THECB outcome of critical thinking.

Philosophy program faculty administer the TACTS in a pre- to post-test fashion to all students enrolled within an undergraduate critical thinking course during the fall and spring semesters of each academic year in order to gather data for course and program improvement. The test is low-stakes, as it is not counted as a grade for the students. Faculty do not expect students to answer every question on the test correctly by the end of the semester, rather the instrument is used in a value-added format to determine whether students' critical thinking skills increased, without an expectation the students met a target score. Although reliability analysis was not typically conducted by the philosophy program as part of their critical thinking assessment, Cronbach's alpha values calculated for the 2017 year for both the pre- and post-test administrations. The Cronbach's alpha value for the pre-test was .58; however, this value increased for the post-test to .68. For this study, only student post-test scores were used for analysis. Post-test scores were most reflective of student critical thinking skills at the completion of this undergraduate critical thinking course and provide the greatest insight into what differences exist in student performance as a factor of student characteristics.

### **Sampling Procedure**

A census sample was employed for collecting student critical thinking data. The TACTS was administered to all students enrolled in all sections of an undergraduate critical thinking course at a 4-year, public university within southeast Texas during the 2016 and 2017 academic years. All students who completed the TACTS post-test were

included within the sample for analysis.

### **Limitations**

Limitations exist which impact the generalizability of the findings from this study. Although this study used a large sample for analysis, the findings from this study may not be generalizable across different settings, times, or populations. Additionally, the research design did not allow for random assignment of participants to control or experimental groups, nor the manipulation of included variables (Johnson & Christensen, 2012). The variable for student first-generation status relied on student self-reported data and were unavailable for students who did not answer that question. Finally, student Pell eligibility, which was used as a proxy for student financial need and student socioeconomic status, was dependent upon the student having completed the Free Application for Federal Student Aid.

### **Data Analysis**

This study employed a multiple regression to attempt to identify what differences existed in student critical thinking skills by race, gender, socioeconomic status, and first-generation status. Dummy coding was employed to code the data for analysis, with male students compared to female; Black and Hispanic students compared to White; Pell-eligible students, with Pell-eligibility serving as a proxy for student financial need, compared to students who were not Pell-eligible; and first-generation students compared to students who were not first-generation. The variable for student first-generation status was self-reported by the students at the point of registration for classes and data were missing for approximately 11% of students. Schlomer, Bauman, and Card (2010) recommend simply deleting cases with missing data. Given the relatively larger

percentage of students missing first-generation data, listwise deletion of these cases analysis is would have resulted in a loss of statistical power for the study (Schlomer et al., 2010). Instead, a multiple imputation, which is considered “one of the best options for handling missing data” (Schlomer et al., 2010, p. 5), was employed to help calculate values for the missing student first-generation data. Three to five imputed datasets are typically sufficient for analysis (Schafer, 1997), and the current study employed five imputed datasets to account for the missing first-generation values. All analysis were conducted using the multiple imputed datasets and all reported results and coefficients used the pooled values, unless otherwise stated.

Prior to conducting a multiple regression analysis, standardized skewness and kurtosis coefficients (i.e., the skewness and kurtosis values divided by their respective standard error) were calculated. These analyses revealed the standardized coefficients for this study were within the range of normality of +/- 3 (Onwuegbuzie & Daniel, 2001). The extent to which multicollinearity was present was addressed through the calculation of Tolerance values and of the variance inflation factor (VIF). The Tolerance values were above .10 and the VIF values were very close to 1 in all cases, indicating that multicollinearity was not present for this study (Field, 2009). Finally, the presence of significant residual autocorrelation was checked through an examination of the Durbin-Watson statistic. The pooled Durbin-Watson statistic value for this study was .02, indicating that this assumption was violated. Both tests of statistical significance and model effect sizes were considered in the interpretation of statistical model results (Wilkinson & APA Task Force on Statistical Inference, 1999). The relative importance of variables were assessed using both standardized weights ( $\beta$ ) and structure coefficients



( $r_s$ ) given their purported value in the literature (Courville, & Thompson, 2001).

### **Results**

The overall regression model was predictive of student TACTS performance,  $F(5, 775) = 1536.97, p < .001$ . However, the pooled  $R^2$  for the model was .058, and the pooled adjusted  $R^2$  was .051, which explained 5.1% of the total variance. This was indicative of a small effect size (Cohen, 1988). When examining the pooled coefficients, three of the variables demonstrated statistically significant differences. The TACTS scores for both Black and Hispanic students were statistically significantly lower than the scores of White students, with the scores for Black and Hispanic students being 6.44% and 4.48% lower than the scores for White students, respectively. The TACTS scores for first generation student were also statistically significantly lower (3.75%) than those of students who were not first-generation. No statistically significant differences were observed by gender or Pell eligibility. Readers are directed to table 3.1 for a full breakdown of the pooled regression coefficients and to table 3.2 for descriptive statistics of student TACTS scores by the different demographic characteristics.

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Insert Tables 3.1 – 3.2 here  
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### **Discussion**

The purpose of this study was to examine differences in the critical thinking skills of students enrolled within an undergraduate critical thinking course as a function of different student characteristics (i.e., gender, race, first-generation status, socioeconomic status). It is important for higher education professionals to understand the differences in

student critical thinking skills for different student populations, as these variables can represent potential indicators of student academic risk. Social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2002) posits that a student's experiences and setting can influence their skills and abilities. The experiences of a student from a minority group, a first-generation college student, or a student with financial need may be very different from those of student who was in the racial majority, a student with a family history of college graduation, or a student who is financially secure and is not concerned about how to pay for college. These differences can potentially affect a student's future success in higher education. It is important for higher education professionals to recognize the potential impact of these differences and to take steps to ensure students from all backgrounds are successful.

Higher education policy makers (AAC&U, 2018; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017) and researchers (Arnum & Roska, 2011) have raised serious questions regarding the equity of student learning at colleges and universities. In Texas, similar concerns were raised at the state level and were the focus of the state-wide strategic plan from 2000-2015 (THECB, 2016). Although many institutions have identified equity goals for student learning few institutions are making actual efforts to examine student skills, like critical thinking, by different student characteristics (Hart Research Associates, 2015a). Examining student performance through these characteristics is key to understanding what differences may exist in student performance, and can help inform the effectiveness of efforts to meet equity goals. This study addresses questions of equity by taking up the charge of Montenegro and Jankowski (2017) to examine student learning by disaggregating student data by

different student characteristics in order to understand more fully student performance.

The multiple regression model used in the current study was predictive of student critical thinking skills, although the model only explained 5.1% of the total variance. The regression analysis also revealed statistically significant differences in critical thinking by student race and first-generation status. The critical thinking scores for both Black and Hispanic students were lower than those of White students, and the scores for students who were first-generation were lower than those of students who were not first generation.

The findings from the current study indicate equity gaps existed in critical thinking skills for both minority and first generation students within this critical thinking course. These findings align with those of Arnum and Roska (2011), who also observed differences in student critical thinking skills by race and level of parental education. Arnum and Roska determined that minority students underperformed in comparison to White students, with Black students showing virtually no pre-to-post gains on the CLA. The authors also observed that students whose parents had lower levels of education performed lower than students whose parents had higher levels of education.

The presence of the statistically significant results for minority students and first-generation students is important. Any gaps in the equity of student learning are noteworthy, and deserve further investigation. However, the practical relevance of the observed differences should be understood. The average percentage of TACTS questions answered correctly by Black students was 33.12%, which represented the lowest score of any of the student groups examined within this study. In comparison, the average TACTS scores for White students were 39.56%. Although the scores for White students

were 6.44% higher, this only equated to a difference of 2.24 questions on a 35-question exam. The differences for Hispanic students and White students was even smaller, at only 4.48%, and equated to only a difference of 1.57 questions. The difference between first-generation students and students who were not first generation was smaller still, with first-generation students scoring 35.44% and students whom were not first generation scoring 39.19%. The gap of 3.75% only equated to a difference of 1.31 questions.

The limited nature of these differences, along with the fact that no statistically significant differences were observed in student critical thinking skills by gender or by Pell-eligibility, could indicate that while some equity gaps remain, the university is limiting gaps in student critical thinking skills for minorities and first generation students. Furthermore, the institution may be closing any gaps that may exist by gender and for students with financial need. However, more work is needed before any equity conclusions can be fully reached. This study represented only the first effort of the institution to examine student critical thinking data by these factors. Further replication is needed to determine whether these results will continue to hold true.

The TACTS test was administered in a pre- to post-test fashion to students within this critical thinking course; however, as the focus of this study was on end-of-course differences in student performance, only student post-test scores were used for analysis. A follow-up study could examine what differences may have existed in the pre-test scores for the same students. Larger differences in the pre-test scores for the different student groups, when compared to the limited post-test differences in this study, could be interpreted as additional evidence of increased equity of student learning.

Furthermore, the nature of the gains in critical thinking skills could be revealed by

examining both pre- and post-test data. It is evident within the literature that student critical thinking skills do not increase without purposeful instruction or intervention (Bensley et al., 2016; Hatcher, 2006; Haynes et al., 2015; Mazer, 2008; Rowe et al., 2015). However, this literature examined student gains in general, with no efforts made to understand how these gains may have differed for different student groups. Further study could be done to determine whether student gains were equitable for all different student groups. Such findings would further support arguments that the university was helping ensure student equity with regards to critical thinking skills. However, if the analysis revealed that certain student populations were not making equitable gains, then these data could be used to develop curricular interventions to improve student learning for the disadvantaged groups.

Studies could also be done to better understand how the interactions between student demographic variable could be impacting student performance. The differences observed in the critical thinking skills for minority and first-generation students could be magnified when students are members of more than one groups. For example, Black, first-generation students could potentially be scoring at an even lower level than either Black students or first-generation students separately.

It should also be noted that the data used for the present study came from a sophomore-level, general education critical thinking course. The results from this study may not necessarily represent the critical thinking skills of the broader student population, nor of students as they approach graduation. Further examinations are needed of end-of experience student critical thinking skills to determine whether the results from this study hold true for students as they are approaching graduation. By the

time students are reaching their senior year any remaining equity gaps in critical thinking by race or first-generation status may have been fully eliminated. On the other hand, an examination of senior-level students could reveal that the gaps between student groups have actually widened, or new gaps have emerged.

Finally, equitable student performance does not mean students are demonstrating sufficient critical thinking skills. The average score for the entire sample within this study was only 37.10%. Typically, the philosophy program at this university has not set targets for general student performance, instead relying on student pre-to-post gains; however, even if the students are increasing in knowledge, it does not mean that they have sufficient knowledge of these skills as the finish this critical thinking course. Both the philosophy program and the university should examine these results further to determine whether the level of student knowledge being demonstrated by the students within this critical thinking course is truly sufficient, or whether students should be performing at a higher level. If it is determined that students are not demonstrating sufficient critical thinking skills, then changes will need to be made to the curriculum and pedagogy of this critical thinking course. Continued observation of student performance by student group will be important as changes are implemented to ensure that all students benefit equally.

### **Conclusion**

The purpose of this study was to examine differences in critical thinking skills as a function of student race, gender, socioeconomic status, and first-generation status. Social capital theory posits the backgrounds and experiences of students before they enter higher education can impact their academic success (Bourdieu, 1986; Coleman, 1988; Lin,

2002). It is important for higher education researchers and professionals to examine student critical thinking by these characteristics in order to better understand the learning of their students. Questions exist regarding the broader equity of student learning and success (AAC&U, 2018; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017), and student critical thinking skills in particular (Arnum & Roska, 2011; Hart Research Associates, 2015b). However, literature examining critical thinking skills of students in higher education remains limited (Arnum & Roska, 2011; Cole & Zhou, 2014).

Statistically significant differences in student critical thinking skills were identified for minority students (Hispanic and Black) in comparison to Whites, and for first-generation students in comparison to students who were not first-generation. The appearance of any differences in student learning by student group membership is important and worthy of continued investigation. However, the sizes of the score differences for these student groups were limited. Additionally, statistically significant differences were not seen by student gender or by student socioeconomic status. These data could be interpreted to mean that this university is seeing some success in limiting or eliminating potential gaps in student learning, although further study is needed to further replicated these results over time. The findings from this study do not reflect the student critical thinking skills of students across all of higher education. More work is needed across all of higher education to fully understand the critical thinking skills of students and to address questions surrounding the equity of student learning.

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Table 3.1

*Summary of Pooled Multiple Regression Results of Predictor Variables Upon Student*

*TACTS Test Performance*

Predictor Variable	<i>B</i>	<i>SE B</i>	$\beta$	<i>t</i>	<i>p</i>
Constant	40.57	0.91		44.62	< .01
Gender	0.69	0.97	.02	0.71	.48
Black	-6.01	1.13	-.18	-4.90	< .01
Hispanic	-3.50	1.16	-.12	-3.01	.03
Pell	0.48	1.02	.01	0.47	.64
Eligibility					
First	-3.15	1.19	-.12	-2.65	.01
Generation					



*Table 3.2 - Descriptive Statistics for Student TACTS Scores by Student*

*Demographic Characteristic*

<hr/> Student			
Demographic			
Characteristic	<i>n</i>	<i>M%</i>	<i>SD%</i>
<hr/>			
Overall			
Population	781	37.10	13.08
Race			
White	422	39.56	13.03
Black	159	33.12	12.18
Hispanic	200	35.08	12.63
Gender			
Male	269	37.83	13.80
Female	512	36.72	12.68
Socio-Economic			
Status			
Pell Eligible	347	36.03	12.14
Not Pell	434	37.96	13.74
Eligible			
First-Generation			
Status			

(continued)

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Student			
Demographic			
Characteristic	<i>n</i>	<i>M%</i>	<i>SD%</i>
First-	396	35.44	12.75
Generation			
Not First-	299	39.19	13.04
Generation			

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**CHAPTER IV****A MULTI-YEAR EXAMINATION OF STUDENT CRITICAL THINKING SKILLS  
WITHIN AN UNDERGRADUATE CRITICAL THINKING COURSE**

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This dissertation follows the style and format of *Research in the Schools*.

### **Abstract**

The importance of student critical thinking skills is widely recognized. However, improving student critical thinking is not accidental, but instead takes intentionality on the part of an institution. This study examined the pre-to-post critical thinking skills gains for students enrolled within a general education, critical thinking course. Multiple years of data (2012-2017) allowed for comparisons in student gains over time. Parametric, dependent samples *t*-tests revealed that students made statistically significant gains in critical thinking scores each year. Meaningful critical thinking gains were observed for the 2012, 2013, 2014, and 2015 academic years; however, gains for the 2016 and 2017 academic years were far lower than the other years within the study and were not meaningful.

**Keywords:** General Education, Critical Thinking, Educational Measurement, Assessment

A MULTI-YEAR EXAMINATION OF STUDENT CRITICAL THINKING  
SKILLS WITHIN AN UNDERGRADUATE CRITICAL THINKING COURSE

General educational learning outcomes, like critical thinking, are increasingly important for students to attain in higher education (Furman, 2013; Galle & Galle, 2010; Laird, Niskodé-Dossett, & Kuh, 2009; McLawhon & Phillips, 2013; McNertney & Ferrandion, 2010; Siefert et al., 2008; Wehlburg, 2010). In a 2013 survey of chief academic officers conducted by the National Institute for Learning Outcomes Assessment, 84% of responding institutional leaders reported their institutions had general education learning outcomes (Kuh, Jankowski, Ikenberry, & Kinzie, 2014). General education outcomes are also of great importance for public colleges and universities in Texas. Starting in fall 2014, the Texas Higher Education Coordinating Board (THECB) adopted six general education learning outcomes for all the state's public colleges and universities: (a) critical thinking, (b) empirical and quantitative reasoning, (c) teamwork, (d) communication, (e) personal responsibility, and (f) social responsibility (2017a). This study will examine how one 4-year, public university in southeast Texas is assessing the THECB outcome of critical thinking within an undergraduate critical thinking course.

The institution examined by this study regularly offers a critical thinking course as part of the institution's core curriculum. The focus of this course is to improve student critical thinking skills, including the areas of inductive and deductive reasoning, identification of logical fallacies, and preparing students to be critical consumers of information. The purposes of this course align with the THECB's definition of critical thinking, which is "creative thinking, innovation, inquiry, and analysis, evaluation and

synthesis of information” (THECB, 2017a, para. 3). This course provides direct instruction designed to improve student critical thinking skills and serves as a useful setting for assessing critical thinking for course, program, and institutional improvement.

Critical thinking’s importance to students is broadly recognized by higher education researchers (Arnum & Roska, 2011; Bensley et al., 2016; Cole & Zhou, 2014; Fliegel & Holland, 2013; Hatcher, 2006; 2011; Haynes, Lisic, Goltz, Stein, & Harris, 2016; Haynes et al., 2015; Lampert, 2007; Mazer, Hunt, & Kuzenkoff, 2008; Nicholas & Labig Jr., 2013; Rowe et al., 2015) and employers (AAC&U, 2008; Hart Research Associates 2013, 2015). Concerns have also been raised by researchers (Arnum & Roska, 2011) and business leaders (Hart Research Associates, 2013; 2015) regarding higher education’s ability to adequately prepare students to think critically. Research from the last 10 years has shown that many institutions have improved student critical thinking skills (Bensley et al., 2016; Fliegel & Holland, 2011; Hatcher, 2006; Lampert, 2007; Mazer et al., 2008; Rowe et al., 2015); although, some critical thinking researchers have questioned whether these gains are actually meaningful (Hatcher, 2011; 2015).

The purpose of this study was to examine the extent to which students were making critical thinking gains through their enrollment in an undergraduate critical thinking course at 4-year, public university within southeast Texas. Data from multiple years were used for this study. By using multiple years of data, this study reveals changes in student learning that have occurred over time that speak to the efficacy of this critical thinking course in improving student critical thinking skills. The results from this study may be used in several ways. First, the results may help inform local institutional leaders regarding the efficacy of this course in promoting student learning of important

critical thinking skills. Second, the results may help address criticism of higher education's abilities to prepare students to think critically (Arnum & Roska, 2011; Hart Research Associates, 2013; 2015; Hatcher, 2015). Third, the results will further inform recent debate regarding the ability of critical thinking instruction to meaningfully improve student critical thinking ability (Hatcher, 2011; 2015; Wright, 2015).

## **Literature Review**

### **Defining Critical Thinking**

Critical thinking represents a difficult concept to define and to promote within students. The way in which a faculty member defines critical thinking can vary greatly depending upon their background or discipline (Nicholas & Labig Jr., 2013). The complexity of defining critical thinking is further supported by the research of Haynes et al. (2015) and Haynes et al. (2016), who identified 12 different skill elements comprising the broader concept of critical thinking. These include the ability to: (a) separate factual information from inferences, (b) interpret numerical relationships in graphs, (c) understand the limitations of correlational data, (d) evaluate evidence and identify inappropriate conclusions, (e) identify alternative interpretations for data or observations, (f) identify new information that might support or contradict a hypothesis, (g) explain how new information can change a problem, (h) separate relevant from irrelevant information, (i) integrate information to solve problems, (j) learn and apply new information, (k) use mathematical skills to solve real-world problems, (l) communicate ideas effectively (Haynes et al., 2016; Haynes et al., 2015). Some researchers have attempted to create a central definition of critical thinking. For example, Hatcher (2015) defined critical thinking as “attempts to arrive at a judgment only after honestly

evaluating alternatives with respect to available evidence and arguments” (p. 4).

As previously noted, the THECB has identified its own definition of critical thinking that all public institutions in Texas are expected to impart upon their students, “creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information” (THECB, 2017a, para. 3), and will be used as the central definition of critical thinking for this study. This definition shares commonalities with both Hatcher (2015), Haynes et al. (2015), and Haynes et al. (2016), with each focusing upon inquiry, evaluation of evidence, and synthesizing information. These definitions also align with the broader purposes of the critical thinking course examined within this study, which is to “cover the fundamentals of deductive reasoning, the identification of common fallacies, and an induction of inductive reasoning, as well as sensitizing the students to some of the ways information is distorted, e.g., by advertising and news management” (Sam Houston State University, 2017, para. 2).

### **The Importance of Critical Thinking as a Student Learning Outcome**

The importance of critical thinking for today’s college students is recognized by those within higher education (AAC&U, 2008; Arnum & Roska, 2011; Haynes et al., 2016; Haynes et al., 2015; THECB, 2015, 2017a) and by employers (AAC&U, 2008; Hart Research Associates, 2013; 2015). At the national level, the AAC&U (2008) identified critical thinking as an “essential learning outcome” institutions should provide to undergraduate students (p. 2). Within Texas, the THECB has recognized critical thinking as one of six core learning objectives for all undergraduate students at public colleges or universities within the state (THECB 2017a). The THECB also recognized critical thinking as a potential marketable skill for students to gain through the course of



the academic programs (THECB, 2015).

Employers also want college graduates to think critically (AAC&U 2008; Hart Research Associates, 2013, 2015b). In a 2015 survey, employers indicated that the ability to work with numbers and statistics (56% of employers), the ability to analyze and solve complex problems (70% of employers), and the ability to critically think and analytically reason (81% of employers) were very important for college graduates (Hart Research Associates, 2015). Additionally, 93% of employers indicated that “candidates’ demonstrated capacity to think critically, communicate clearly, [and] solve complex problems is more important than their undergraduate major” (Hart Research Associates, 2013, p. 4).

Employers also believe higher education should be emphasizing critical thinking to a greater degree. As far back as 2008, 73% of employers believed that colleges and universities should “place more emphasis” on skills like critical thinking and analytic reasoning (AAC&U, 2008, p. 11). These findings have been replicated in more recent employers’ surveys. In 2013, 81% of employers noted more emphasis was needed on analyzing and solving complex problems, and 82% believed more was needed on critical thinking and analytical reasoning (Hart Research Associates, 2013).

### **Questions Surrounding Student Critical Thinking Skills**

Despite critical thinking’s importance, some have questioned higher education’s ability to meaningfully improve student critical thinking skills (Arnum & Roska, 2011; Hart Research Associates, 2013, 2015). For example, in a national study using data from the Collegiate Learning Assessment (CLA), Arnum and Roska (2011) determined that students made very limited gains in critical thinking skills during their first two years of

college. The authors noted that minority students and students whose parents had lower levels of education performed lower on the CLA in comparison to White students and to students whose parents had higher levels of education (Arnum & Roska, 2011).

However, Arnum and Roska (2011) only examined student performance in their first two years of college, posing a serious limitation to their study.

Some employers also held a negative view of the critical thinking skills of recent graduates. In a 2015 survey, 28% of employers believed students were well prepared to work with statistics and numbers, 26% believed students were well prepared to critically and analytically think, and 24% believed students were well prepared to analyze and solve complex problems (Hart Research Associates, 2015). Recent graduates shared similarly negative opinions of their critical thinking skills. Only 55% of responding graduates believed they were well prepared to work with statistics and numbers, 66% believed they were well prepared to critically and analytically think, and 59% believed they were well prepared to analyze and solve complex problems.

Despite the negative perceptions of employers and recent graduates, and the findings of Arnum and Roska (2011), the bulk of the critical thinking research highlighted within this literature review indicates that institutions are seeing at least some success in improving student critical thinking skills. Lampert (2007) examined student critical thinking scores by student level (i.e., freshman, sophomore, junior, senior). Lampert (2007) observed that junior- and senior-level students performed statistically significantly better than freshman students. Fliegel and Holland (2011) directly challenged the findings and approach of Arnum and Roska (2011). Using authentic student artifacts (i.e., student in-class assignments), as opposed to a commercial test like

the CLA, Fliegel and Holland (2011) conducted a longitudinal study of student critical thinking performance in which they determined that student critical thinking skills improved from the freshman to junior years.

### **Improving Student Critical Thinking Skills**

Critical thinking can be a difficult skill to improve in students without some form of direct curricular intervention. Haynes et al. (2015) detailed how students enrolled in courses with purposeful critical thinking content showed statistically significant gains in critical thinking skills, whereas students enrolled in courses without purposeful critical thinking content did not. Further examples of the impact of purposeful intervention are seen within several studies within this literature review (Bensley et al., 2016; Hatcher, 2006; Mazer et al., 2008; Rowe et al., 2015).

Hatcher (2006) examined the impact of integrating critical thinking instruction into freshman-level communication courses, versus using stand-alone critical thinking or logic courses at Baker University. Hatcher (2006) determined that students enrolled in the experimental communications courses made greater gains as measured by the Ennis-Weir Critical Thinking Essay Test than did students enrolled in either stand-alone critical thinking or logic courses. Although students enrolled within the critical thinking courses had the highest post-test scores of the three groups of students, they also had highest pre-test scores, thus limiting their pre-to-post gains (Hatcher, 2006). The scores for students enrolled in logic courses actually decreased from pre-to-post (Hatcher, 2006). The relatively small sample sizes for students enrolled in both the critical thinking ( $n = 23$ ) and logic ( $n = 44$ ) courses in comparison to the students enrolled in the experimental communications courses ( $n = 977$ ), as well as the dated nature of the data (i.e. tests

administered from 1995-1999), represented serious limitations of the study.

Mazer et al. (2008) examined the impact of integrating critical thinking into communication courses at Illinois State University upon improving both student critical thinking and student metacognitive perceptions of their own critical thinking skills. The authors determined student perceptions of their own abilities improved in both the experimental and control courses, although student critical thinking skills actually improved for only those students enrolled in the experimental courses with the modified curriculum (Mazer et al., 2008). Mazer et al.'s (2008) focus upon communications courses served as a limitation to the study's generalizability to other settings.

Rowe et al. (2015) highlighted the critical thinking gains of students enrolled within Foundations of Science, a science course designed for non-science majors, at Sam Houston State University. This course used a modified curriculum designed to improve student critical thinking skills (Rowe et al., 2015). As with the current study, Rowe et al. (2015) examined pre-to-post gains in student critical thinking skills over multiple years. Students enrolled in the Foundations of Science course for the 2010-2013 academic years showed statistically significant pre-to-post gains in critical thinking skills, as measured through the Critical Thinking Assessment Test. In comparison, students enrolled in regular science courses from the fall 2011 semester did not show improvement (Rowe et al., 2015). Post-test scores for Foundations of Science students were also statistically significantly higher than their counterparts enrolled in regular science courses (Rowe et al., 2015). However, the small sample sizes used each year for the study represented a limitation to the ability to generalize these results to larger populations.

Finally, Bensley et al. (2016) examined the impact of integrating critical thinking

instruction into introductory psychology courses. The authors also studied both student metacognitive perceptions of their own critical thinking abilities and student test-taking motivation (Bensley et al., 2016). Bensley et al. (2016) determined that students enrolled in the experimental psychology courses made statistically significant pre-to-post gains in critical thinking skills when compared to students enrolled in normal psychology courses (Bensley et al., 2016). Students who received critical thinking instruction also showed some improvements in their abilities to predict their post-test performance; however, they still overestimated their abilities (Bensley et al., 2016). The authors also discovered that post-test motivation decreased significantly for students not engaged with the critical thinking curriculum. Bensley et al. (2015) warned the decrease in test motivation could have impacted the post-test performance of these students and possibly invalidated their comparison to students who did receive critical thinking instruction (Bensley et al., 2016).

### **The Meaning of Student Critical Thinking Gains**

Although multiple studies have identified gains in student critical thinking ability (Bensley et al., 2016; Fliegel & Holland, 2011; Hatcher, 2006; Lampert, 2007; Mazer et al., 2008, Rowe et al., 2015), questions remain regarding whether gains like these are really meaningful for students (Hatcher, 2011; 2015). Despite past success in improving student critical thinking skills (Hatcher, 2006), Hatcher (2011) raised questions with a further study of student critical thinking gains at Baker University. Hatcher (2011) examined student performance on three separate critical thinking assessment instruments, the California Critical Thinking Skills Test (CCTST), the Cornell Critical Thinking Test Level Z, and the Ennis-Weir Critical Thinking Essay Test. The instruments were not

used simultaneously. The Ennis-Weir was used from 1990 to 1995, the CCTST from 1996 to 2005, and the Cornell Level Z from 2006 onwards (Hatcher, 2011). Like Hatcher (2011), the current study attempts to examine student gains in student critical thinking skills over a longitudinal period of time. Such examinations can reveal differences in student learning that may be missed in a study examining a limited period.

Students made gains across all three instruments, although the gains were not consistent (Hatcher, 2011). On the Ennis-Weir, students increased their scores pre-to-post from 7.5 to 12.8, for a gain of 5.3 points and a standardized mean difference of  $d = 0.97$ . Student scores on the CCTST increased from 15.4 to 18.0, for a gain of 2.6 points and a standardized mean difference of  $d = 0.57$ . Finally, students increased their scores on the Cornell Level Z from 26.7 to 29.7, for a gain of 3 points and a standardized mean difference of  $d = 0.60$  (see Hatcher, 2011, p. 35). These results prompted Hatcher (2011) to speculate as to why students seemed to make larger gains on the essay-based Ennis-Weir than on the multiple-choice based CCTST and Cornell Level Z exams despite all three being validated measures of student critical thinking skills.

Hatcher (2011) concluded that the format of the Ennis-Weir might be the cause. Because the test was essay-based and was being administered in communications classes, Hatcher (2011) hypothesized that students were more comfortable with the format and thus performed better. Therefore, the Ennis-Weir was a “better assessment tool for students who are familiar with applying [critical thinking] skills to their writing” (Hatcher, 2011, p. 35). Hatcher (2011) emphasized the importance of selecting an assessment instrument that matched how the institution defined and taught critical thinking. Hatcher (2011) also noted the variation observed within student gains across

different course sections. Whereas the average point gain for students on the Cornell Level Z exam was 3.0, the average gains for different course sections ranged from -1.0 to 6.0. These results led Hatcher (2011) to caution researchers against drawing conclusions from data gathered from one faculty member, from one class section, or from one semester.

Hatcher (2015) raised further questions regarding the meaningfulness of student critical thinking gains. Further examining findings from critical thinking research at Baker University, Hatcher (2015) did observed students made statistically significant gains across different assessment instruments; however, the numerical gains in total student performance upon the instruments were small (Hatcher, 2015). The limited size of these gains led Hatcher to question the practical relevance of using tests of statistical significance and effect sizes to determine the meaningfulness of student learning gains, and to question whether students made relevant gains in critical thinking skills. Hatcher's (2015) questions are of particular relevance to this study as this study uses similar approaches to assess student critical thinking abilities. The current study will help shed further light on the debate regarding the use of effect sizes to determine whether students are making meaningful critical thinking gains (Hatcher, 2015; Wright, 2015).

Hatcher (2015) noted that students at Baker University demonstrated a 0.57 effect size gain on the Cornell Level Z test, and although this effect size gain for students was significant, he noted that it translated to an average gain of only 2.7 points on a 52-question test. Further analysis of these data revealed that 30% of students at Baker University actually scored lower on their post-test than the pre-test (Hatcher, 2015). Finally, the average number of questions answered correctly by the students on the 52-

question post-test was 29.1, which Hatcher described as “less than 60%, a failing grade” (2015, p. 7). Similar results were observed with the CCTST, with students answering only 53% of the post-test questions correctly (Hatcher, 2015).

Hatcher (2015) acknowledged that not all student results were negative, stating “even though 30% of students do worse on the post tests, 70% do better, and some students do much better” (p. 14). In fact, approximately 11% of students who took the Cornell Level Z test made large improvements of 9 or more points (Hatcher, 2015). Hatcher (2015) cautioned faculty members and researchers to consider whether they were meaningfully impacting the critical thinking abilities for most of their students, and instead urged higher education professionals to moderate their expectations regarding their ability to significantly improve student critical thinking.

## **Method**

### **Research Question**

This study addressed the following research question: What differences existed in pre-to-post Texas Assessment of Critical Thinking Skills (TACTS) test performance for students enrolled in an undergraduate critical thinking course for the 2012, 2013, 2014, 2015, 2016, and 2017 academic years?

### **Research Design**

Secondary data highlighting student critical thinking performance were used for this study; therefore, the study employed a nonexperimental, causal comparative research design (Johnson & Christensen, 2012). Non-experimental data for this study were provided by the university’s assessment office and the coordinator of the philosophy program. A census sample was employed to collect student critical thinking data from



each section of the undergraduate critical thinking course from 2012 to 2017 and no efforts were made to place students within experimental or control groups.

### **Participants**

The total number of participants for this study were 2,571 undergraduate students enrolled in undergraduate critical thinking courses at a 4-year, public university within southeast Texas for the 2012, 2013, 2014, 2015, 2016, and 2017 academic years. These courses are offered during both the fall and spring semesters, with the fall and spring populations combined each year for analysis. The total number of students included in this study for each year were as follows: 2012 ( $n = 470$ ), 2013 ( $n = 488$ ), 2014 ( $n = 540$ ), 2015 ( $n = 331$ ), 2016 ( $n = 394$ ), and 2017 ( $n = 348$ ).

### **Measure**

Student critical thinking skills were measured using the TACTS. The TACTS is a 35-question, multiple-choice test designed to assess critical thinking, empirical, and quantitative skills. The instrument was originally created, tested, and validated by a committee of interdisciplinary faculty for use by the university's College of Business to assess critical thinking as part of that college's Association to Advance Collegiate Schools of Business accreditation requirements (Fair, Miller, Muehsam, & McCoy, 2010). As members of the philosophy program helped with the creation of the TACTS, the instrument was subsequently adopted by the philosophy program to assess student critical thinking skills within an undergraduate critical thinking course that is part of the university's core curriculum.

The TACTS was administered in a pre-to-post fashion within all sections of this undergraduate critical thinking course each fall and spring semester. Students complete

the TACTS at the beginning of the semester to establish baseline scores, and then again at the end of the semester. Student pre- and post-test scores are matched through the use of the student's ID number to allow for analysis of student critical thinking gains over the course of the semester. Only those students who could be identified as having completed both the pre- and the post-test were included within this study for analysis.

Philosophy program faculty collect TACTS data for program assessment only. The test is not counted as a grade for the students, and is therefore low-stakes. Students are not expected to correctly answer all of the questions on the test. Instead, the TACTS is used in a value-added format to determine whether students have increased in knowledge without the program expecting students to meet a minimum score. The philosophy program do not regularly conduct reliability analysis as part of their TACTS administration; however, Cronbach's alpha values were calculated for the 2017 year for both the pre- and post-test administrations. The Cronbach's alpha value for the pre-test was .58; however, this value increased for the post-test to .68.

### **Sampling Procedure**

The TACTS was administered to students enrolled in all sections of an undergraduate critical thinking course from 2012-2017. Students completed the TACTS as a pre-test at the start of the semester and then again at the end of the semester as a post-test. Only students who completed both pre- and post-tests were included within the samples being used for analysis for this study. Student pre- and post-test scores were matched through the use of a unique identifier for each student.

### **Limitations**

The nonexperimental, causal comparative research design allowed for neither the random assignment of participants to control or experimental groups, nor the manipulation of included variables (Johnson & Christensen, 2012). Despite the large sample size being used for this study, these data may not be generalizable across different times, population, and locations. Finally, the specificity of the TACTS test to the institution examined through this study means that the student results gathered from this assessment may not be comparable to data collected through other critical thinking instruments employed at other institutions.

### **Data Analysis**

As this study used matched student pre- and post-test data, dependent samples *t*-tests were employed to determine what, if any, differences existed in student pre- and post-test scores for the 2012, 2013, 2014, 2015, 2016, and 2017 academic years. Appropriate checks were made prior to conducting any inferential statistics to determine the normality of the data for each academic year (Onwuegbuzie & Daniel, 2002). A total of 16 of the 24 total standardized skewness and kurtosis coefficients (i.e., the skewness or kurtosis values divided by their respective standard error) for student TACTS scores were within the limits of normality,  $\pm 3$  (Onwuegbuzie & Daniel, 2002). A total of 11 of the 12 standardized skewness values were within the limits of normality, but only 5 of the 12 standardized kurtosis values were within the limits of normality. At least half of these values were within normality for each of the years examined within this study. Therefore, parametric dependent samples *t*-tests were used to analyze student data for

each of the academic years. A full breakdown of the standardized skewness and kurtosis coefficients for this study can be found in Table 4.1.

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Insert Table 4.1 about here  
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### **Results**

Parametric dependent samples *t*-tests revealed statistically significant differences in student pre-to-post test scores for 2012 ( $t(469) = -20.71, p < .001; d = 1.10$ ), 2013 ( $t(487) = -10.14, p < .001; d = 0.66$ ), 2014 ( $t(539) = -14.12, p < .001; d = 0.87$ ), 2015 ( $t(330) = -13.39, p < .001; d = 0.83$ ), 2016 ( $t(393) = -6.89, p < .001; d = 0.42$ ), and 2017 ( $t(347) = -4.26, p < .001; d = 0.26$ ) academic years. The effect sizes for 2012, 2014, and 2015 academic years were large, the effect size for 2013 was medium, and the effect sizes for 2016 and 2017 were small. Students made the largest gains during the 2012 academic year (15.23%), followed closely student gains during the 2014 academic year (14.63%). The smallest student gains were seen in the two most recent academic years (2016, 4.8%; 2017; 3.17%). Readers are directed to table 4.2 for further descriptive statistics regarding student pre-to-post TACTS test gains for each of these academic years.

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Insert Table 4.2 about here  
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## Discussion

The purpose of this study was to explore gains in student critical thinking skills, as measured by the TACTS test, through their enrollment in an undergraduate, general education, critical thinking course. This study joins a growing body of literature examining student critical thinking skills (Arnum & Roska, 2011; Bensley et al., 2016; Cole & Zhou, 2014; Fliegel & Holland, 2013; Hatcher, 2006; 2011; Haynes, Lisic, Goltz, Stein, & Harris, 2016; Haynes et al., 2015; Lampert, 2007; Mazer, Hunt, & Kuzenkoff, 2008; Nicholas & Labig Jr., 2013; Rowe et al., 2015). Furthermore, this study helps inform institutional leaders regarding the efficacy of critical thinking courses in improving student critical thinking skills (Hatcher, 2015) and provides insight into using tests of statistical significance and effect sizes to help demonstrate the practical relevance of student learning gains (Hatcher, 2015; Wright, 2015).

It is possible to conclude that students made statistically significant gains in critical thinking skills from 2012-2017. The fact that students demonstrated pre-to-post gains in learning should be seen as a positive outcome and aligns with much of the literature on critical thinking, which argues that it takes meaningful intervention to improve student critical thinking skills (Bensley et al., 2016; Hatcher, 2006; Haynes et al., 2015; Mazer et al., 2008; Rowe et al., 2015). Students made double-digit percentage gains during the 2012, 2013, 2014, and 2015 academic years. Additionally, the effect sizes for the gains in each of these years were medium to large. These findings were consistent with those observed within the literature (Bensley et al., 2016; Hatcher, 2011; 2015; Rowe et al., 2015).

Bensley et al. (2016) noted students improved by approximately two questions on a locally developed, 20-question pre-to-post exam, representing a moderate effect size ( $d = 0.58$  (Cohen, 1988)). Hatcher (2011) observed similar results at Baker University with students improving 5.3 points (18.28%) on the 29-point Ennis-Weir exam, representing a large effect size ( $d = 0.97$ ); 2.6 points (7.65%) on the 34 question CCTST, representing a moderate effect size ( $d = 0.57$ ); and 3 points (5.77%) on the 52-question Cornell Level Z exam, representing a moderate effect size ( $d = 0.60$ ). Hatcher (2015) again found similar results on the Cornell Level Z exam, with students gaining 2.7 points (5.19%), representing a moderate effect size ( $d = 0.57$ ). Finally, Rowe et al. (2015) observed students made statistically significant gains on the CAT across multiple years, ranging from 3.74 to 4.65 points (9.84% to 12.24%) on a 38-point exam. Large effect sizes were seen by Rowe et al. (2015) for the Spring 2011 ( $d = 0.84$ ), Fall 2011 ( $d = 0.85$ ), and Fall 2012 ( $d = 0.83$ ) semesters; medium effect sizes were seen for the Fall 2009 ( $d = 0.71$ ) and Spring 2010 ( $d = 0.71$ ) semesters, and a small effect size was seen for the Fall 2010 ( $d = 0.36$ ) semester.

However, the gains seen in student critical thinking skills in the current study were not equal across the years. The size of student gains observed for the 2016 (4.8%) and 2017 (3.17%) academic years were substantially smaller than the gains from 2012-2015. Additionally, the gains for 2016 and 2017 academic years were smaller than any of those observed within the literature (Bensley et al., 2016; Hatcher, 2011; 2015; Rowe et al., 2015). The effect sizes for these gains followed a similar pattern and were small, calling into question the practical relevance of these gains in student scores.

The contrast in student performance within the current study is particularly striking when these percent gains are translated into the number of additional questions students answered correctly for the 2016 and 2017 academic years. The largest gains observed in 2012 of 15.23% meant that students answered, on average, 5.33 more questions correctly on the post-test than they did the pre-test. However, the smallest gains observed in 2017 of 3.17% translated to an increase, on average, of 1.11 more questions correctly answered on the post-test. From a practical standpoint, it could be argued that an average gain of 5 questions on a 35-question test is meaningful, but a gain of 1 question is not.

The data from the current study did not support Hatcher's (2015) opinion that statistical significance and effect sizes are of limited use in evaluating student-learning gains. Analysis revealed statistically significant gains in student critical thinking skills for the 2012, 2013, 2014, and 2015 academic years, with medium to large effect sizes. These results translated into meaningful, double-digit mean percentage gains in student critical thinking skills, from pre-to-post. However, researchers must not examine statistical significance and effect sizes in isolation, but instead place these data within appropriate contexts. Student gains for the 2016 and 2017 academic years were statistically significant within the current study; however, their small effect sizes accurately portrayed their small practical effects. The findings from the present study, along with those from the broader literature (Bensley et al., 2016; Hatcher, 2011; 2015; Rowe et al., 2015), suggest that moderate to large effect sizes may represent meaningful student pre-to-post gains; however, small effect sizes may represent student gains that, while statistically significant, are not necessarily meaningful.

The findings from the current study do support the position of Hatcher (2011) who cautioned researchers from drawing conclusions from one individual semester. If one examined data from the 2012 academic year alone one might conclude students were making significant and practically relevant gains, but if one examined the 2017 data alone one might conclude the gains, while statistically significant, were not practically relevant. Instead, an examination of the data over time revealed a decrease in student performance for the 2016 and 2017 academic years in comparison to 2012-2015. Similarly, if the student scores had been averaged across all years, this decline in student performance may have gone completely unnoticed.

This shift student critical thinking skill gains strongly suggests something has changed within the critical thinking courses that is affecting student success. Within the last several years, the philosophy program has seen turnover in the faculty members who regularly teach the critical thinking course. Additionally, the program determined that some of the newer faculty have not been covering all expected topics within the course. The data from this study indicate these changes have had a negative impact on student learning within that course, in comparison to previous years.

In order for this course to remain an effective tool for improving student critical thinking skills, the philosophy program will need to improve how it is coordinating the faculty teaching the course. The program should consider establishing clear course expectations and learning objectives and take steps taken to ensure all faculty members teaching the critical thinking course are covering all necessary topics. It will be important to continue to examine student pre-to-post performance over time to determine whether the changes made are effective. Additionally, the program could disaggregate



student data at the course level to determine if particular course sections consistently perform higher or lower when compared to others.

Finally, the data examined within this study came from a 2000-level, general education, critical think course. The critical thinking skills of students observed within this course do not necessarily represent the critical thinking skills of the broader student population or of students as they approach graduation. This course plays an important role in helping improve student critical thinking skills; however, it is not the only critical-thinking focused educational intervention students experience at the university. Students engage in critical thinking throughout the curriculum and within their majors. Further studies are needed to examine the critical thinking skills of students as they approach graduation in order to determine whether they are attaining sufficient mastery of these important skills.

### **Conclusion**

It take purposeful intervention on the part of an institution to meaningfully improve student critical thinking skills (Bensley et al., 2016; Hatcher, 2006; Haynes et al., 2015; Mazer et al., 2008; Rowe et al., 2015). Furthermore, it is important for institutions to study the effectiveness of their interventions in order to ensure they are having a positive impact on student learning. This study examined the extent to which students enrolled within a general education critical thinking course at a 4-year, public university within southeast Texas made gains in critical thinking skills over a multi-year period. Multi-year studies can highlight changes and differences in student learning overtime, which can reveal that an intervention has lost effectiveness. The findings from this study revealed students made statistically significant gains in critical thinking skills

for each of the examined academic years; however, student gains for the 2016 and 2017 were not of practical relevance, indicating that this course has potentially lost some of its effectiveness to meaningfully improve student critical thinking skills. These findings will be invaluable to faculty and administrators at that university as work to improve student critical thinking skills. Additionally, the methodologies and findings from this study may inspire faculty, administrators, and assessment professionals to evaluate student critical thinking skills at their institutions.

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*Table 4.1 – Standardized Skewness and Kurtosis Values for Student TACTS**Scores by Academic Year*

Academic Year	Standardized Skewness Coefficient	Standardized Kurtosis Coefficient
2012		
Pre-Test	2.77	-3.60
Post-Test	1.12	-4.34
2013		
Pre-Test	-0.56	-3.48
Post-Test	-0.60	-5.47
2014		
Pre-Test	-0.24	-3.45
Post-Test	0.16	-5.21
2015		
Pre-Test	-0.50	0.66
Post-Test	0.54	-1.27
2016		
Pre-Test	0.92	-1.11
Post-Test	-0.72	-0.90
2017		
Pre-Test	4.44	3.26
Post-Test	2.18	-0.44



Table 4.2 - Descriptive Statistics for Student TACTS Scores by Academic Year

Academic Year	Aca	Pre-Test			Post-Test			Cohen's <i>d</i>
		<i>n</i>	<i>M</i>	<i>S</i>	<i>M</i>	<i>S</i>		
2	201	4	2	1	3	1		1.1
		70	1.88	1.12	7.11	6.16	20.71	.01
3	201	4	2	1	3	1		0.6
		88	4.98	1.57	5.76	9.96	10.14	.01
4	201	5	2	1	3	2		0.8
		40	2.53	1.70	7.16	0.60	14.12	.01
5	201	3	3	1	4	1		0.8
		31	6.49	2.94	7.87	4.89	13.39	.01
6	201	3	3	1	4	1		0.4
		94	5.70	0.33	0.50	2.43	6.89	.01
7	201	3	3	1	3	1		0.2
		48	0.17	1.24	3.34	2.71	4.26	.01

*Note.* Cohen's *d* from 0.2 – 0.49 indicate a small effect size, 0.50-0.79 indicate a moderate effect size, and 0.80 and higher indicate a large effect size (Cohen, 1988).

## CHAPTER V

### DISCUSSION

The purpose of this dissertation was to examine the written communication and critical thinking skills of students at a public university in Southeast Texas. The first two studies within this dissertation focused on how student written communication and critical thinking skills varied as a function of demographic characteristics (i.e., gender, race, first-generation status, socioeconomic status). These characteristics represented factors which can indicate students may be at academic risk (Gray, 2013). Both studies employed social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2002), which posits how group membership, background, and culture can effect student success, to understand student written communication and critical thinking skills. For example, the experiences of students from a minority group, first-generation college students, or students with financial need may be very different from students who were in the racial majority, students with a family history of college graduation, or financially secure students who are not concerned about how to pay for college. These differences, in turn, can impact a students' success in higher education. It is important for higher education professionals to recognize the potential impact of these differences and to take steps to ensure that students from all backgrounds are succeeding.

Higher education policy makers (AAC&U, 2018; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017) and researchers (Arnum & Roska, 2011) have raised serious questions regarding the equity of student learning at colleges and universities. In Texas, similar concerns have also been raised at the state level and were the focus of the state-wide strategic plan to close equity gaps from 2000-2015 (THECB,

2016). Differences in student learning (Arnum & Roska, 2011) and success (THECB, 2016) have been observed over time. Although many institutions have identified equity goals for student learning, few institutions have made any efforts to examine skills, like written communication and critical thinking, by different student characteristics (Hart Research Associates, 2015a). The first two studies within this dissertation take up the charge of Montenegro and Jankowski (2017) to address questions regarding the equity of student learning by meaningfully examining student learning data through disaggregation by different student characteristics. In doing so, institutions can better understand student performance and potentially observe differences that would have otherwise gone unseen (Montenegro & Jankowski, 2017).

The third study provided a deeper examination of efforts to improve student critical thinking at the same university by examining student pre- to post-test critical thinking gains over a six-year period (2012-2017). Research has shown that student critical thinking improves only when students receive some form of direct instruction or curricular intervention (Bensley et al., 2016; Hatcher, 2006; Haynes et al., 2015; Mazer et al., 2008; Rowe et al. 2015). The third study specifically examined the efficacy of an undergraduate, general education, critical thinking course to determine what critical thinking gains students were making during their enrollment within this course and how those gains may have changed overtime. Further discussions of the results for all three studies are provided here, along implications for future research.

### **Discussion of Study 1**

The purpose of Study 1 was to exam the differences in student written communication performance by gender, race, socio-economic status, and first-generation

status. Each of these characteristics represented potential flags that students might be academically at-risk. Social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2002) suggests that students' backgrounds and experiences can influence their performance in settings like higher education. Because of their backgrounds and experiences before they arrived at a college or university, minority students, first-generation students, and students who are entering higher education with greater financial need may struggle when compared to their more advantaged peers.

Questions of the equity of student learning and success in higher education are at the forefront of thought for higher education researchers and policy makers (AAC&U, 2018; Arnum & Roska, 2011; THECB, 2016; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017). Furthermore, gaps have been identified in student learning (Arnum & Roska, 2011; Priess et al., 2013) and general student success (THECB, 2016). However, few institutions have examined student learning by different student characteristics (Hart Research Associates, 2015a). This study helps to address questions of equity by taking up the charge of Montenegro and Jankowski (2017) to meaningfully examine student learning data by disaggregating results by different student characteristics. Examining the data in this way grants far greater insight into student written communication skills and how those skills may differ by group membership. In doing so, this study joins the limited literature examining differences in student written communication skills by different student characteristics (Arnum & Roska, 2011; Priess et al. 2013; Roberts et al., 2017).

The findings from Study 1 do raise some questions regarding the equity of student written communication skills at this particular institution when examined by race, gender,

socioeconomic status, and first-generation status. If the university is preparing all students equally in written communication skills, regardless of their race, gender, socioeconomic status, or first generation status, then the regression model should not be predictive of student success. Overall, the regression model used was predictive of student success, although the pooled adjusted  $R^2$  explained only 2.8% of the total variance and represented a small effect size. The small percentage of variance explained by the model in this study can be seen generally as a positive outcome, although it does indicate some student groups had lower written communication skills than others.

The multiple regression analysis revealed differences in student performance by gender and by race. The written communication scores for male students were statistically significantly lower than female students and the scores for Black students were statistically significantly lower than White students. The nature of these differences were small, approximately 3% and 5% respectively, and may not warrant major curricular or pedagogical intervention on the part of the university at this time these equity gaps in student written communication skills. However, given the persistent performance gaps seen in broader success at the state level (THECB, 2015), and specific gaps seen in student written communication skills by researchers (Arnum & Roska, 2011; Preiss et al., 2013), the gaps in student performance identified within the Study 1 are important to note and are worthy of future study.

These findings from Study 1 do align with those of Arnum and Roska (2011) who observed differences in student written communication skills, as measured through the CLA by student race. In their study, White students outperformed all minorities. Black students, in particular, struggled, showing virtually no gains in their CLA scores from

pre-to-post (Arnum and Roska, 2011). When it comes to gender, Preiss et al. (2013) observed that female students out performed male students in their written communication assessment.

The results from Study 1 were a departure from those observed by Roberts et al. (2017), who examined the written communication skills of a different population of students at the same university but from a different period. Although Roberts et al. (2017) did observe similar mean differences in student written communication performance by race and gender, these differences were not statistically significant. The mean difference in overall student writing score between Black and White students were almost identical between the two studies, with a .16 difference for Roberts et al. (2017) and .18 for Study 1. The differences in statistically significant findings from Roberts et al. (2017) to Study 1 could be explained by the fact that Study 1 employed a much larger sample giving it greater statistical power and allowing it to see more subtle differences in student performance. The differences observed within the current study probably represent a more accurate picture of student written communication skills at the university.

### **Implications for Future Research for Study 1**

The fact that statistically significant differences in student performance were observed in Study 1 for male students and Black students is worth continued examination by the university. Additional studies should continue to examine student written communication skills by student race and gender to determine whether the differences observed within the current study shrink, persist, or possibly even widen. Further examinations should also be made to better understand how the interactions between

different student characteristics could be further impacting their written communication skills. For example, the differences in written communication skills for male/female and Black/White students were fairly limited; however, examining the interaction of these variables could reveal that Black male students might be performing at an even lower level than their peers. Such information could then be used to design educational interventions to improve student written communication skills.

One major limitation of the current study rests was it focused exclusively upon junior- and senior-level students. This limitation could be addressed by conducting a similar examination of the written communication skills of students entering the university. By comparing the differences in written communication skills of students at the beginning and end of their college experiences, it could be determined whether gaps in student performance were opening, closing, or if they existed at all.

Finally, equity of written communication skills does not necessarily equate to quality of written communication skills. The observed writing scores of all the different student groups within the current study were relatively low. On a 4-point scale, the overall mean score for the entire population was a 2.40. This was below the overall university goal of students averaging a 2.50, or higher, on this particular assessment. Additionally, the scores for White, Black, Hispanic, male, and female students were all lower than those observed by Roberts et al. (2017). If these results continue to hold true, then university will need to modify the approaches it is currently using to teach its students written communication skills. In particular, more efforts could be made to strengthen and improve currently existing writing-enhanced courses within the curriculum. By giving students more instruction on how to properly write within their

disciplines, more practice in the form of well-designed writing assignments, and more feedback through structured write/review/resubmit exercises, the university could see future student improvement. It will be important to continue monitoring student performance by race, gender, socioeconomic status, and first-generation status as the university implements any changes to ensure they are effective and they benefit all students, regardless of race, gender, socioeconomic status, or first-generation status.

### **Discussion of Study 2**

The purpose of Study 2 was to examine differences in the critical thinking skills of students enrolled within an undergraduate, general education, critical thinking course as a function of different student characteristics (i.e., gender, race, first-generation status, socioeconomic status). It is important for higher education professionals to understand the differences in student critical thinking skills for different student populations, as these variables can be potential indicators of student academic risk. Social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2002) posits that a student's experiences and backgrounds can influence their skills and abilities. For example, the experiences of a student from a minority group, a first-generation college student, or a student with financial need may be very different from those of student who was in the racial majority, a student with a family history of college graduation, or a student is financially secure and does worry about how to pay for college. These differences, in turn, can impact a student's future success in higher education. It is important for higher education professionals to recognize the potential impact of these differences and to take steps to ensure students from all backgrounds are successful.

Higher education policy makers (AAC&U, 2018; Hart Research Associates,



2015a; Montenegro & Jankowski, 2017) and researchers (Arnum & Roska, 2011) have raised serious questions regarding the equity of student learning at colleges and universities. In Texas, similar concerns were raised at the state-level and were the focus of the state-wide strategic plan from 2000-2015 (THECB, 2016). Although many institutions have identified equity goals for student learning, few institutions are making actual efforts to examine student skills, like critical thinking, by different student characteristics (Hart Research Associates, 2015a). Examining student learning by student group membership is an important step in understanding what differences may exist in student performance, and can help inform the effectiveness of efforts to meet equity goals. This study helps to address these questions by taking up the charge of Montenegro and Jankowski (2017) to examine meaningfully institutional data by disaggregating results by different student characteristics. This approach allows institutions to understand different nuances in student performance.

The multiple regression model used in Study 2 was predictive of student critical thinking skills, although the model only explained 5.1% of the total variance. The regression analysis also revealed statistically significant differences in critical thinking by student race and student first-generation status. The critical thinking scores for both Black and Hispanic students were lower than those of White students. Furthermore, the scores for students who were first-generation were lower than those of students who were not first generation.

The findings from Study 2 indicated there were equity gaps in student critical thinking skills of minority and first generation students within this critical thinking course. These findings aligned with those of Arnum and Roska (2011), who also

observed differences in student critical thinking skills by race and first-generation status. Arnum and Roska determined minority students underperformed in comparison to White students. Black students, in particular, underperformed and showed virtually no pre-to-post gains on the CLA. The authors also observed that students whose parents had lower levels of education performed lower on the CLA than students whose parents had higher levels of education (Arnum & Roska, 2011).

The presence of statistically significant results for minority and first-generation students is important. Any gaps in the equity of student learning are important, and worthy of further investigation. However, the practical relevance of the differences needs to be understood. The average percentage of TACTS questions answered correctly by Black students was 33.12%, which represented the lowest score of any of the student groups examined within this study. In comparison, the average TACTS scores for White students were 39.56%. Although the scores for White students were 6.44% higher, this only equated to a difference of 2.24 questions on a 35-question exam. The differences for Hispanic students and White students was even smaller, at only 4.48%, and equated to a difference of 1.57 questions. The difference between first-generation students and students who were not first generation was smaller still, with first-generation students scoring 35.44% and students who were not first generation scoring 39.19%. The gap of 3.75% only equated to a difference of 1.31 questions.

The limited nature of these differences could mean that the university is seeing some success in limiting the gaps in critical thinking skills for minorities and first generation students. Furthermore, the fact that statistically significant differences were not observed in student critical thinking skills by gender or by Pell-eligibility could also

indicate that any gaps that may have existed by gender and for students with financial need have closed. However, more work is needed before any equity conclusions can be fully reached. This study represented only the first effort of the institution to examine student critical thinking data by these factors. Further replication is needed to determine whether these results will continue to hold true.

### **Implications for Future Research for Study 2**

The TACTS test was administered in a pre- to post-test fashion to students within this critical thinking course; however, as this study focused on differences in student performance at the end of course, only student post-test scores were used for analysis. A follow-up study could examine what differences may have existed in the pre-test scores for the same students. Larger differences in the pre-test scores for the different student groups, when compared to the limited post-test differences in this study, could be interpreted as additional evidence of increased equity of student learning.

Furthermore, the nature of the gains in critical thinking skills could be revealed by examining both pre- and post-test data. It is evident within the literature that student critical thinking skills do not increase without purposeful instruction or intervention (Bensley et al., 2016; Hatcher, 2006; Haynes et al., 2015; Mazer, 2008; Rowe et al., 2015). However, this literature examined student gains in general, with no efforts made to understand how these gains may have differed for different student groups. Further study is needed to determine whether the gains students made were equitable for all different student groups. Such findings would further support arguments that the university was helping ensure student equity regarding critical thinking skills. However, if the analysis revealed that certain student populations were not making equitable gains,

then these data could be used to develop curricular interventions to improve student learning for the disadvantaged groups.

Studies could also be done to better understand how the interactions between student demographic variables could be influencing student performance. The differences observed in the critical thinking skills for minority and first-generation students could be magnified when students are members of more than one groups. For example, Black, first-generation students could potentially be scoring at an even lower level than either of those groups separately.

It should also be noted that the data used for the present study came from a sophomore-level, general education, critical think course. Therefore, the results from this study may not necessarily represent the critical thinking skills of the broader student population, nor of students as they approach graduation. Further examinations are needed of end-of experience student critical thinking skills to determine whether the results from this study hold true for students as they are approaching graduation. It could be that by the time students are reaching their senior year remaining equity gaps in critical thinking by race or first-generation status may have been fully eliminated. On the other hand, an examination of senior-level students could reveal that the gaps between student groups have actually widened, or new gaps have emerged.

Finally, equitable student performance does not mean students are demonstrating sufficient critical thinking skills. The average score for the entire sample within this study was only 37.10%. Typically, the philosophy program at this university has not set targets for general student performance, instead relying on student pre-to-post gains; however, even if the students are increasing in knowledge, it does not mean that they

have sufficient knowledge of these skills as the finish this critical thinking course. Both the philosophy program and the university should examine these results further to determine whether the level of student knowledge being demonstrated by the students within this critical thinking course is truly sufficient, or whether students should be performing at a higher level. If it is determined that students are not demonstrating sufficient critical thinking skills, then changes will need to be made to the curriculum and pedagogy of this critical thinking course. Continued observation of student performance by student group will be important as changes are implemented to ensure that all students benefit from these changes equally.

### **Discussion of Study 3**

The purpose of Study 3 was to explore what gains students made in their critical thinking abilities, as measured by the TACTS test, through their enrollment in an undergraduate, general education, critical thinking course. Study 3 joins a growing body of literature examining student critical thinking skills (Arnum & Roska, 2011; Bensley et al., 2016; Cole & Zhou, 2014; Fliegel & Holland, 2013; Hatcher, 2006; 2011; Haynes, Lisic, Goltz, Stein, & Harris, 2016; Haynes et al., 2015; Lampert, 2007; Mazer, Hunt, & Kuzenkoff, 2008; Nicholas & Labig Jr., 2013; Rowe et al., 2015). Furthermore, Study 3 helps inform institutional leaders regarding the efficacy of critical thinking courses in improving student critical thinking skills (Hatcher, 2015) and provides insight into using tests of statistical significance and effect sizes to help demonstrate the practical relevance of student learning gains (Hatcher, 2015; Wright, 2015).

It is possible to conclude that students made statistically significant gains in critical thinking performance from 2012-2017. The fact that students demonstrated pre-

to-post gains in learning should be seen as a positive outcome and aligns with much of the literature on critical thinking, which argues that it takes meaningful intervention to improve student critical thinking skills (Bensley et al., 2016; Hatcher, 2006; Haynes et al., 2015; Mazer et al., 2008; Rowe et al., 2015). Students made double-digit percentage gains during the 2012, 2013, 2014, and 2015 academic years. Additionally, the effect sizes for the gains in each of these years were medium to large. These findings were consistent with those observed within the literature (Bensley et al., 2016; Hatcher, 2011; 2015; Rowe et al., 2015).

Bensley et al. (2016) noted students improved by approximately two questions on a locally developed, 20-question pre-to-post exam, representing a moderate effect size ( $d = 0.58$  (Cohen, 1988)). Hatcher (2011) observed similar results at Baker University with students improving 5.3 points (18.28%) on the 29-point Ennis-Weir exam, representing a large effect size ( $d = 0.97$ ); 2.6 points (7.65%) on the 34 question CCTST, representing a moderate effect size ( $d = 0.57$ ); and 3 points (5.77%) on the 52-question Cornell Level Z exam, representing a moderate effect size ( $d = 0.60$ ). Hatcher (2015) examined similar results on the Cornell Level Z exam, with students gaining 2.7 points (5.19%), representing a moderate effect size ( $d = 0.57$ ). Finally, Rowe et al. (2015) observed students making statistically significant gains on the CAT across multiple years, ranging from 3.74 to 4.65 points (9.84% to 12.24%) on a 38-point exam. Large effect sizes were seen by Rowe et al. (2015) for the Spring 2011 ( $d = 0.84$ ), Fall 2011 ( $d = 0.85$ ), and Fall 2012 ( $d = 0.83$ ) semesters; medium effect sizes were seen for the Fall 2009 ( $d = 0.71$ ) and Spring 2010 ( $d = 0.71$ ) semesters, and a small effect size was seen for the Fall 2010 ( $d = 0.36$ ) semester.

However, the gains seen in student critical thinking skills in Study 3 were not equal across the years. The size of student gains observed for the 2016 (4.8%) and 2017 (3.17%) academic years were substantially smaller than the gains from 2012-2015. Additionally, gains for 2016 and 2017 academic years were smaller than any of those observed within the literature (Bensley et al., 2016; Hatcher, 2011; 2015; Rowe et al., 2015). The effect sizes for these gains followed a similar pattern and were small, calling into question the practical relevance of these gains in student scores.

This contrast in student performance within Study 3 is particularly striking when these mean percentage gains are translated into the number of additional questions students answered correctly for the 2016 and 2017 academic years. The largest gains observed in 2012 of 15.23% meant that students answered, on average, 5.33 more questions correctly on the post-test than they did the pre-test. However, the smallest gains observed in 2017 of 3.17% translated to an increase, on average, of 1.11 more questions correctly answered on the post-test. From a practical standpoint, it could be argued that an average gain of 5 questions on a 35-question test is meaningful, but a gain of 1 question is not.

The data from Study 3 do not support Hatcher's (2015) opinion that statistical significance and effect sizes are of limited use in evaluating student-learning gains. Analysis revealed statistically significant gains in student critical thinking skills for the 2012, 2013, 2014, and 2015 academic years, with medium to large effect sizes. These results translated into meaningful, double-digit gains mean percentage gains in student critical thinking skills, from pre-to-post. However, researchers must not examine statistical significance and effect sizes in isolation, but instead place these data within

appropriate contexts. Student gains for the 2016 and 2017 academic years were statistically significant within the current study; however, their small effect sizes accurately portrayed their small practical effects. The findings from Study 3, along with those from the broader literature (Bensley et al., 2016; Hatcher, 2011; 2015; Rowe et al., 2015), suggest that moderate to large effect sizes may be interpreted as representing meaningful student pre-to-post gains; however, small effect sizes represented student gains that, while statistically significant, were not necessarily meaningful.

The findings from Study 3 do support the position of Hatcher (2011) who cautioned researchers from drawing conclusions from one individual semester. If one examined data from the 2012 academic year alone one might conclude students were making significant and practically relevant gains, but if one examined the 2017 data alone one might conclude the gains, while statistically significant, were not practically relevant. Instead, an examination of the data over time revealed a decrease in student performance for the 2016 and 2017 academic years in comparison to 2012-2015. Similarly, if the student scores had been averaged across all years, this decline in student performance may have gone completely unnoticed.

This shift in gains in student critical thinking skills strongly suggests something has changed within the critical thinking courses that is affecting student success. Within the last several years, the philosophy program has seen turnover in the faculty members who regularly teach the critical thinking course. Additionally, the program determined that some of the newer faculty have not been covering all expected topics within the course. The data from this study indicate that these changes have had a negative impact on student learning within that course, in comparison to previous years.



### **Implications for Future Research for Study 3**

In order for this critical thinking course to remain an effective tool for improving student critical thinking skills, the philosophy program will need to improve how it is coordinating the faculty teaching the course. The program should consider establishing clear course expectations and learning objectives, and take steps taken to ensure all faculty members teaching the critical thinking course are covering all necessary topics. It will be important to continue examining student pre-to-post performance over time to determine whether changes made are effective. Additionally, the program could further disaggregate student data critical thinking data at the individual course-section level to determine if particular course sections were performing higher or lower when compared to others.

The data for Study 3 came from a 2000-level, general education, critical thinking course. The critical thinking skills of students observed within this study do not necessarily represent the critical thinking skills of the broader student population or of students as they approach graduation. This course plays an important role in helping improve student critical thinking skills; however, it is not the only critical-thinking focused educational intervention students experience at the university. Students engage in critical thinking throughout the curriculum and within their majors. Further studies are needed to examine the critical thinking skills of students as they approach graduation in order to determine whether they are gaining sufficient mastery of these important skills.

### **Conclusion**

The three studies within this journal ready dissertation explored different elements of student written communication and critical thinking skills. Both written

communication and critical thinking represent important skills students should achieve, however, questions remain regarding student attainment of these skills (Arnum & Roska, 2011; Hart Research Associates, 2015b; Hatcher, 2015). Additionally, questions also exist around the equity of student learning in higher education (Arnum & Roska, 2011; AAC&U, 2018; Hart Research Associates, 2015a; Montenegro & Jankowski, 2017; THECB, 2016), but few institutions are actually examining their data by student demographic characteristics (Hart Research Associates, 2015a). Furthermore, even fewer researchers have examined written communication (Arnum & Roska, 2011; Good et al., 2012; Priess et al. 2013; Roberts et al., 2017) or critical thinking (Arnum & Roska, 2011) skills by these factors.

Studies 1 and 2 attempt to fill this research gap by exploring how student written communication and critical thinking skills differed as a function of student race, gender, socioeconomic status, and first-generation status. Both studies identified gaps in the equity of student written communication and critical thinking skills. Student race was a factor for both written communication and critical thinking skills. The written communication and critical thinking skills of Black students were statistically significantly lower than those of White students. Furthermore, the critical thinking scores for Hispanics were lower than Whites. Gender was a factor for written communication, with the written communication skills of male students being statistically significantly lower than those of female students. Finally, first-generation status was a factor for critical thinking, with the critical thinking skills of first-generation students being statistically significantly lower than those of students who were not first-generation.

Although the differences in the scores between all of these groups were limited,

the presence of any inequality in student learning is important. The fact that Black students performed lower than Whites for both written communication and critical thinking is particularly troubling and worthy of further investigation. Small differences in student learning may compound and become more significant over time. Particularly if differences exist across multiple skills, like written communication and critical thinking. Higher education researchers and professionals should make greater efforts to be aware of these differences and be ready to work to close and eliminate gaps in student performance.

Finally, Study 3 provided a deeper examination of the critical thinking skills of students enrolled within a general education critical thinking course. Multiple years of data (2012-2017) were examined to allow for comparisons in student improvement overtime. Improving student critical thinking skills takes direct intervention (Bensley et al., 2016; Hatcher, 2006; Haynes et al., 2015; Mazer et al., 2008; Rowe et al., 2015). Therefore, it is important to examine efficacy of this critical thinking course to improve student critical thinking skills.

The results Study 3 indicated that students did make statistically significant gains for the 2012, 2013, 2014, 2015, 2016, and 2017 academic years. Student pre- to post-test improvement for the 2012-2015 academic years represented meaningful student learning gains; however, student gains for 2016 and 2017, while statistically significant, were not large enough to represent meaningful improvements in student learning. The data from this study reveals that changes within the faculty and topic coverage within this course may have resulted in the course losing its effectiveness to meaningfully improve student critical thinking skills. The findings from Study 3 will be immensely helpful to faculty

and administrators at the university as they take steps to improve this critical thinking course.

The three studies within this dissertation have each contributed to the growing literature surrounding student written communication and critical thinking skills. Higher education faculty, administrators, and researchers should be encouraged to further examine student learning in these areas. Particular attention should be given to questions surrounding equity of student learning and the effectiveness of interventions to improve student written communication and critical thinking skills. The three studies within this dissertation represented one university's efforts to understand these skills and to understand how differences in its students can influence student learning. It is hoped the methodologies and results presented within these three studies may inspire others to examine student written communication and critical thinking skills at their own institutions.

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## Writing Assessment Rubric

This rubric asks you to identify features of the writing present in the sample. You should *apply the numerical score based on degree of presence* of the characteristic features. The writing features selected for the rubric are those most likely present in any disciplinary writing sample and represent a writing level expected of a senior-level college student.

Legend:

N/A = Not Applicable

1 = few features are present

2 = features are not often present

3 = features are often present

4 = features are most always present

### CATEGORY

### CHARACTERISTIC FEATURES

<p><b>Ideas/Critical Thinking/Synthesis</b> The depth of sophistication of thoughts and ideas. Features may include research, reasoning, evidence, detail, and development (appropriate to the field and genre)</p>	<ul style="list-style-type: none"> <li>Central subject or argument of the assignment is easily identified, clearly emphasized, consistent with the evidence, and intriguing</li> <li>Reasoning is fully developed throughout the assignment with logical examples, details, and evidence where and as appropriate</li> <li>Assignment contains information that addresses counterarguments, biases, or reader's expectations as appropriate</li> </ul>
<p><b>Style</b> The choices the writer makes for specific audiences. Features may include word choice, tone, and sentence length and structure</p>	<ul style="list-style-type: none"> <li>Sustained awareness of audience throughout the assignment</li> <li>Writing tone suits the audience and enhances the assignment's purpose</li> <li>Sentence structure varies according to the content, purpose, and audience</li> <li>Sentences are consistently clear and logical</li> <li>Word choice is appropriate to the writing task</li> </ul>
<p><b>Organization</b> The coherence of the writing. Features may include balance and ordering of ideas, flow, transition, and appropriate format (as defined in assignment)</p>	<ul style="list-style-type: none"> <li>Text is purposefully organized and substantially developed in a way that clarifies the argument and enhances style</li> <li>Arrangement of ideas (overall structure) is clear, logical, and compelling as appropriate to the assignment; the reader moves through the text easily</li> <li>Internal structure is cohesive and coherent; text flows and ideas are clearly and logically connected</li> <li>Transitions used appropriately</li> </ul>
<p><b>Conventions</b> Adherence to standard American edited English. Features include grammar, punctuation, capitalization, spelling, and documentation.</p>	<ul style="list-style-type: none"> <li>Grammar and mechanics support the reader's understanding of the writer's purpose without distracting errors</li> <li>Documentation style is consistent, if appropriate to assignment</li> <li>Sources, when appropriate, are effectively integrated into the body of the assignment</li> <li>Minor errors do not interfere with readability or damage the writer's credibility (as appropriate to the assignment parameters)</li> </ul>

## APPENDIX A

## APPENDIX B



Institutional Review Board  
 Office of Research and Sponsored Programs  
 1831 University Ave, Suite 303, Huntsville, TX 77341-2448  
 Phone: 936.294.4875  
 Fax: 936.294.3622  
[irb@shsu.edu](mailto:irb@shsu.edu)  
<http://www.shsu.edu/dept/office-of-research-and-sponsored-programs/compliance/irb/>

DATE: February 1, 2018

TO: Jeff Roberts [Faculty Sponsor: Dr. Forrest Lane]

FROM: Sam Houston State University (SHSU) IRB

PROTOCOL #: 2017-12-37449

PROJECT TITLE: *An Examination of Student Written Communication and Critical Thinking Skills at One Texas Public University [T/D]*

SUBMISSION TYPE: INITIAL REVIEW

ACTION: APPROVED

APPROVAL DATE: January 31, 2018

**EXPIRATION DATE: January 31, 2019**

REVIEW TYPE: EXPEDITED

REVIEW CATEGORIES: 7

The Sam Houston State University (SHSU) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received **Expedited** Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate revision forms for this procedure which are found on the Application Page to the SHSU IRB website.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All Department of Health and Human Services and sponsor reporting requirements should also be followed.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Sam Houston State University IRB's records



**Institutional Review Board**  
Office of Research and Sponsored Programs  
1831 University Ave, Suite 303, Huntsville, TX 77341-2448  
Phone: 936.294.4875  
Fax: 936.294.3622  
[irb@shsu.edu](mailto:irb@shsu.edu)  
<http://www.shsu.edu/dept/office-of-research-and-sponsored-programs/compliance/irb/>

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. **Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of January 31, 2019. When you have completed the project, a Final Report must be submitted to ORSP in order to close the project file.**

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact the IRB Office at 936-294-4875 or [irb@shsu.edu](mailto:irb@shsu.edu). Please include your project title and protocol number in all correspondence with this committee.

Sincerely,

Donna Desforges  
IRB Chair, PHSC  
PHSC-IRB

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Sam Houston State University IRB's records

## VITA

### Jeff Roberts

#### Education

B.A. Degree in History and Philosophy, Sam Houston State University,  
Huntsville, TX  
Cum Laude  
Highest Honors in History and Philosophy  
Honors Thesis Title: *How We Fight: A Perspective on the Just War Tradition*

M.A. Degree in History, Sam Houston State University, Huntsville, TX  
4.0 Graduate GPA  
Graduate Writing Project Title: *For a Cause Not their Own: Motivations for Service and Life Aboard the C.S.S. Alabama During the American Civil War*

Ed.D. Degree Candidate in Higher Education Leadership, Sam Houston State University,  
Huntsville, TX (Anticipated Graduation August 2018)  
Dissertation Title: *An Examination of Student Written Communication and Critical Thinking Skills at one Texas Public University*

#### Publications

- Flood, J. T., and **Roberts, J.** (2017). The evolving nature of higher education accreditation: Legal considerations for institutional research leaders. *New Directions for Institutional Research*, 2016(172), 73-84. doi:10.1002/ir.20205
- Roberts, J., Nardone, C. F., & Bridges, B. (2017). Examining differences in student writing proficiency as a function of student race and gender. *Research & Practice in Assessment*, 12(Winter 2017), 59-68. Retrieved from [http://www.rpajournal.com/dev/wp-content/uploads/2018/02/RPA\\_Winter\\_2017\\_FINAL.pdf](http://www.rpajournal.com/dev/wp-content/uploads/2018/02/RPA_Winter_2017_FINAL.pdf)
- Roberts, J., Wright, D., & Sanford, G. (2017). Using factor analysis to test a measure of student metacognitive ability related to critical thinking and intellectual humility. *Intersection*, Autumn 2017. Retrieved from [http://c.ymcdn.com/sites/www.aalhe.org/resource/resmgr/docs/Int/AAHLE\\_Fall\\_2017\\_Intersection.pdf](http://c.ymcdn.com/sites/www.aalhe.org/resource/resmgr/docs/Int/AAHLE_Fall_2017_Intersection.pdf)

#### Manuscripts in Progress

Roberts, J., Nardone, C. F., & Bridges, B. (TBD). Relationship between student writing ability and student characteristics at a Texas 4-year university. Manuscript in Preparation.

#### National Presentations

Jones, B., and **Roberts, J.** (2018, February). *Assessing teamwork using student self-reflections: Evolution of a locally developed instrument*. Poster presented at the 2018 AAC&U Conference on General Education and Assessment, Philadelphia, PA.

- Roberts, J. (2016, April). *Relationship between student writing ability and student characteristics at a Texas 4-year university*. Paper presented at the American Educational Research Association Annual Meeting, Washington, DC.
- Roberts, J. (2016, February). *Moving beyond means: Exploring how one university is using writing data to improve performance*. Poster presented at the 2015 AAC&U Conference on General Education and Assessment, New Orleans, LA.
- Jordan, J. D., & **Roberts, J.** (2015, December). *Student support services assessment: Moving beyond headcounts*. Presented at the 2015 SACSCOC Annual Meeting, Houston, TX.
- Roberts, J., & Franklin, S. (2015, December). *Using meta-assessment to evaluate programmatic assessment plans and build a culture of assessment*. Presented at the 2015 SACSCOC Annual Meeting, Houston, TX.
- Roberts, J. (2015, February). *Building global citizens: One institution's plan to use multiple measures to assess social responsibility, intercultural knowledge, and civic engagement*. Presented at the 15th Annual Texas A&M University Assessment Conference, College Station, TX.
- Roberts, J. (2015, February). *Promoting the scholarship of assessment at Sam Houston State University through mini-grants*. Poster presented at the 15th Annual Texas A&M University Assessment Conference, College Station, TX.
- Simon, J. F., **Roberts, J.**, Bledsoe, E. C. (2015, February). *Assessing the assessment: Utilizing rubrics to evaluate the quality of programmatic assessment plans*. Workshop presented at the 15th Annual Texas A&M University Assessment Conference, College Station, TX.
- Roberts, J., Bledsoe, E. C., & McLawhon, R. (2014, October). *The development and evolution of assessment review processes at two Texas institutions*. Presented at the 2014 Assessment Institute, Indianapolis, IN.
- Roberts, J. (2014, February). *How do we assess the assessment? Developing and implementing a process for formal meta-assessment*. Presented at the 14th Annual Texas A&M University Assessment Conference, College Station, TX.
- Roberts, J., & Franklin, S. (2014, February). *Sam Houston State University's plan for assessing its core curriculum and the THECB's six core learning objectives*. Poster presented at the 14th Annual Texas A&M University Assessment Conference, College Station, TX.
- Roberts, J., Nardone, C., & Bridges, B. (2014, February). *(Re)building credibility: One university's journey into writing assessment*. Presented at 14th Annual Texas A&M University Assessment Conference, College Station, TX.
- Roberts, J. (2013, March). *In the face of necessity: International maritime law and the British blockade of Germany during the First World War*. Paper presented at the 2013 Britain and the World Conference, Austin, TX.
- Roberts, J. (2012, February). *Making assessment work for you: Using course-embedded assessment to measure student learning*. Poster presented at the 12th Annual Texas A&M University Assessment Conference, College Station, TX.
- Lineberger, D., & **Roberts, J.** (2011, February). *Capturing the student experience: How the department of horticulture sciences is using e-portfolios for student assessment and development*. Poster presented at the 11th Annual Texas A&M University Assessment Conference, College Station, TX.



- Roberts, J., and Caso, R. (2009, February). *Using IDEA results in assessment of core curriculum student learning objectives*. Presented at the 9th Annual Texas A&M University Assessment Conference, College Station, TX.
- Roberts, J., & Caso, R. (2008, February). *Sam Houston State University's online assessment tracking database (OATDB)*. Presented at the 8th Annual Texas A&M University Assessment Conference, College Station, TX.
- Roberts, J. (2006, January). *The greyhound of the seas: The C.S.S. Alabama*. Paper presented at the Phi Alpha Theta Biannual Conference, Philadelphia, PA.
- Roberts, J. (2002, April). *The evidential argument from evil and how this is a perfect world: A theodicy for the existence of God*. Paper presented at the 4th Annual Undergraduate Philosophy Research Conference, Pacific University, Forest Grove, OR.
- Roberts, J. (2001, November). *The evidential argument from evil and how this is a perfect world: A theodicy for the existence of God*. Poster presented at the National Collegiate Honors Conference, Chicago, IL.

### **Regional Presentations**

- Roberts, J. (2017, February). *General education assessment: Differences in written communication skills as a function of demographic characteristics*. Paper presented at the Southwest Educational Research Association Conference, San Antonio, TX.
- Roberts, J. (2016, February). *Differences in student writing ability as a function of student characteristics at one Texas university*. Paper presented at the Southwest Educational Research Association Conference, New Orleans, LA.
- Enriquez, R. A., Godley, S., Jacobs, K. O., Moss, S., & **Roberts, J.** (2015, February). *Perceived self-efficacy of research skills of select higher education doctoral students*. Paper presented at the Southwest Educational Research Association Conference, San Antonio, TX.
- Roberts, J. (2015, February). *Maturation of assessment practices for states within the Southern Association of Colleges and Schools accreditation region*. Paper presented at the Southwest Educational Research Association Conference, San Antonio, TX.
- Roberts, J. (2006, October). *A grey ship in blue waters: The C.S.S. Alabama in the Caribbean and Gulf of Mexico during the American Civil War*. Paper presented at the Gulf South Historical and Humanities Conference, Pensacola, FL.
- Roberts, J. (2006, February). *Ice and steel: Forgotten WWII naval battles in the Arctic*. Paper presented at the Phi Alpha Theta Regional Conference, Sam Houston State University, Huntsville, TX.
- Roberts, J. (2004, April). *The greyhound of the seas: The C.S.S. Alabama*. Paper presented at the Great Plains Honors Conference, San Antonio, TX.

### **State/Local Presentations**

- Hamrick, T., & **Roberts, J.** (2018, March). *Supporting faculty engagement in ongoing and innovative assessment practices through assessment mini-grants*. Presented at the 5th Annual LEAP Texas Conference, Houston, TX.

- Jones, B., & **Roberts, J.** (2018, March). *Slaying assessment dragons: Assessing teamwork using the Teamwork Self-Reflection Instrument (TSRI)*. Presented at the 5th Annual LEAP Texas Conference, Houston, TX.
- Roberts, J., Sanford, G. M., Wright, D. (2018, March). *Assessing student critical thinking, metacognition, and intellectual humility using a locally developed instrument*. Presented at the 5th Annual LEAP Texas Conference, Houston, TX.
- Jones, B., Hamrick, T., & **Roberts, J.** (2017, February). *Assessing teamwork using student self-reflections: Efforts to design and pilot a locally developed instrument*. Presented at the 4th Annual LEAP Texas Forum, Dallas, TX.
- Roberts, J., & Sanford, G. M. (2017, February). *Expanding the use of an existing course/program-level critical thinking assessment to the institutional level*. Presented at the 4th Annual LEAP Texas Forum, Dallas, TX.
- Roberts, J. (2016, October). *Institutional assessment at Sam Houston State University*. Invited presentation at the Stephen F. Austin State University Assessment Workshop, Nacogdoches, TX.
- Roberts, J. (2016, August). *Resources and activities of LEAP Texas*. Invited presentation at the American Historical Association's 2nd Annual Texas Conference on Introductory History Courses, San Antonio, TX.
- Franklin, S., Bledsoe, E. C., & **Roberts, J.** (2015, January). *Two universities approach to core curriculum and meta-assessment*. Invited presentation at the Texas Council of Chief Academic Officers Annual Retreat, Austin, TX.
- Franklin, S., & **Roberts, J.** (2014, June). *Sam Houston State University's plan for core curriculum assessment*. Invited presentation at the LEAP Texas Forum, Dallas, TX.
- Roberts, J. (2012, March). *Cruisers and ironclads: The successes and failures of Confederate shipbuilding in Great Britain during the American Civil War*. Paper presented at the Student Research Week, Texas A&M University, College Station, TX.
- Roberts, J., & Caso, R. (2009, February). *Using IDEA results in assessment of core curriculum student learning objectives*. Presented at the 2009 Texas Association of Institutional Researchers Conference, Lubbock, TX.
- Roberts, J., & Caso, R. (2008, February). *Sam Houston State University's online assessment tracking database (OATDB)*. Presented at the 2008 Texas Association of Institutional Researchers Conference, Galveston, TX.
- Roberts, J. (2001, August). *Practical applications of Bayes' Theorem*. Poster presented at the EURECA Exhibition, Sam Houston State University, Huntsville, TX.

### **Historical Exhibits**

Sam Houston State University Tree of Light Ceremony, December, 2006.

Researched and gathered a collection of historical images of the Sam Houston State University Tree of Light that are displayed as part of the annual Tree of Light ceremony.

### **Teaching Experience**

Lone Star College - Montgomery

Adjunct Instructor, Department of History, Fall 2009 - Summer 2010

History 1301 - United States History to 1877  
 History 1302 - United States History since 1877

Sam Houston State University

Lecture-Pool Faculty, Department of General Business and Finance, Fall  
 2016

BUAD 1305 – Business Communication Technology  
 Guest Lecturer, Spring 2014

The American Revolution

Lecture-Pool Faculty, Department of History, Fall 2008 - Fall 2009

History 1301 - United States History to 1876

History 1302 - United States History Since 1876

Lecture-Pool Faculty, Office of First Year Experience, Fall 2009

UNIV 1301 - Introduction to Collegiate Studies

Guest Lecturer, Summer 2007

The American Civil War

Graduate Teaching Assistant, Department of History, Spring 2005-Fall  
 2006

History 1301 - United States History to 1876

History 1302 - United States History Since 1876

History 2311 - Dawn of Civilization to the Middle Ages

### **Work Experience**

Sam Houston State University

Office of Academic Planning and Assessment, January 2013 to Present  
 Director of Assessment

Texas A&M University

Office of Institutional Assessment, June 2010 to December 2012  
 Program Coordinator

Sam Houston State University

Office of Institutional Research and Assessment, February 2007 to August  
 2009

Assessment Coordinator

Department of Student Activities

Graduate Student Research Assistant, June 2006 - February 2007

Department of History

Graduate Student Assistant, Summer 2005

Assisted with the "Teaching American History Grant"

Honors Program and Scholarships Office

Undergraduate Student Assistant, January - December 2004

Department of Library Science

Undergraduate Student Assistant, August 2000 - December 2003

### **Professional Service**

Member of the Board of Directors for LEAP Texas, 2016-2018

Chair of the 5<sup>th</sup> Annual LEAP Texas Conference Planning Committee

Vice-Chair of LEAP Texas, 2018-present

**Professional Development**

Certified VALUE Institute Expert Scorer – Written Communication  
Southern Association of Colleges and Schools (SACSCOC) Institutional Effectiveness  
Evaluator Training, December, 2014  
Critical Thinking Assessment Test (CAT) "Train the Trainer" Workshop, March,  
2014

**Awards**

Winner of the 2016 Southwest Educational Research Association (SERA) Dean's Award  
for Exceptional Graduate Student Research  
Received the Archie K. Davis Fellowship from the North Caroliniana Society, Spring,  
2006, to conduct research at the Southern Historical Collection  
Winner of "Best Paper" prize at the Phi Alpha Theta Regional Convention at Sam  
Houston State University, Spring 2006  
Received the Sam Houston State University Excellence in Writing Award for 2005