ACADEMIC ENGAGEMENT, COGNITIVE STRATEGIES, AND LEARNING OUTCOMES: A STRUCTURAL EQUATION MODEL

A Thesis

by

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ABSTRACT

The quality of university education has never been more important. Academics and university administrators have paid significant attention to create the conditions that assure the quality of higher education. Measuring learning outcomes viewed as a relatively new method to assess the value of college education. Previous research indicates that student's background characteristics, engagement in educationally purposeful activities, and cognitive or learning strategies are related to their perceived learning outcomes. The present study uses Astin's Input-Environment-Outcome (I-E-O) model as a theoretical framework to determine the influences of students' background characteristics, academic engagement, and cognitive strategies on the self-reported learning outcomes of Texas A&M undergraduate students using the Student Experience in the Research University (SERU) survey administered in 2015.

The results indicate that academic engagement and learning outcomes differed based on background characteristics. Overall, my findings support that certain student background characteristics influence the student engagement in educationally purposeful activities, which consequently affects their learning. Moreover, the structural equation models tested in this study showed the effect of academic engagement and cognitive strategies on learning outcomes. Overall, academic involvement and critical reasoning are the best predictors of critical thinking skills and communication and research skills. In terms of cultural appreciation, there was a significant direct effect only for academic

initiative and critical reasoning. It is reasonable to conclude that academic engagement and cognitive strategies predicted critical thinking and communication outcome best.

DEDICATION

To my husband Fatih who believed in me and started this journey with me.

To my lovely son Ibrahim Alp.

You are my happiness!

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CHAPTER I

INTRODUCTION

The quality of university education has never been more important. Academics and university administrators have paid significant attention to create the conditions that assure the quality of higher education. Researchers also have examined the complicated array of social and educational approaches to estimate the quality of universities. Research has shown that some of the best approaches to assessing quality involves measuring the learning outcomes of a college education via standard tests and using self-reports instruments asking students to report the skills and capabilities they have acquired while they are in college (Douglass, Thomson, & Zhao, 2012; Carini, Kuh, & Klein, 2006; Kuh, 2003). Measuring learning outcomes viewed as a relatively new method to assess the value of college education. Therefore, there is an ongoing need to use student self-reported learning gains as a tool of institutional effectiveness. Such expectations are valuable, given that more people than ever attend college and the knowledge and skills acquired during higher education are required to thrive after graduation.

Previous research discussed in the literature review part indicates that students' background characteristics, engagement in educationally purposeful activities, acquisition of desired knowledge and skills, and cognitive or learning strategies are related to their perceived learning outcomes. For these multiple dimensions, student surveys are valuable in understanding and identifying learning outcomes (Douglass,

Thomson, & Zhao, 2012). The present study uses Astin's Input-Environment-Outcome (I-E-O) model as a theoretical framework to determine the influences of students' background characteristics, academic engagement, and cognitive strategies on the self-reported learning outcomes of Texas A&M undergraduate students using the Student Experience in the Research University (SERU) survey administered in 2015.

Kuh, Kinzie, Buckley, Bridges, & Hayek (2007) identified several research areas that need to be examined in higher education, such as verifying effective approaches that foster the success of diverse groups of students at various types of institutions, and using student achievement indicators for purposes of accountability and improvement. Therefore, the current study aims to provide a broad understanding of academic engagement, cognitive strategies, and learning outcomes by examining the structural relationship among those variables to better understand the paths of student success and use them as a means of institutional assessment and self-improvement. The proposed model differs from prior research by being more comprehensive in how the variables are measured. The learning outcomes construct consists of 11 items and three factors: (a) critical thinking and communication, (b) research skills, and (c) cultural appreciation. The academic engagement part includes a total of 21 items and four factors: (a) academic involvement, (b) academic initiative, (c) collaborative work, and (d) class preparation. The cognitive strategies construct has seven items and two factors: (a) elaboration and (b) critical reasoning. Examining the relationships among those constructs will add further understanding of the quality of education through understanding the influences of student input characteristics, the campus environment,

and the learning outcomes based on Astin's I-E-O theory. Contributing the knowledge based in this area enables higher education institutions to identify the students who are more academically engaged and the areas of where they are most engaged, which allows them to make decisions regarding improving institutional effectiveness. The present study is also expected to contribute practical perspectives on the evaluation of quality in higher education to those who explore the SERU survey as an effective means of getting information on students' behaviors and outcomes in a research university. Further, the study attempts to determine if some of the factors are more effective than others at predicting learning outcomes and how academic engagement and cognitive strategies affect different types of learning outcomes. Specifically, the study provides incentives to Texas A&M University educational leaders to see a bigger picture of indicators of student success, to better understand students' behaviors and achievement, and to design effective instructional practices throughout the institution to enhance student learning.

Purpose of the Study

The purpose of this study is to examine the relationships among students' background characteristics (e.g., gender, ethnicity, matriculation, social class, first-generation), academic engagement (e.g., academic involvement, academic initiative, collaborative work, and class preparation), cognitive strategies (e.g., elaboration and critical reasoning), and self-reported learning outcomes(e.g., critical thinking and communication, research skills, and cultural appreciation), using the structural equation modeling (SEM) in the SERU survey.

Research Questions

Kuh et al. (2007) use a broad definition of student success, including students' perceptions of learning outcomes. Moreover, Kuh and colleagues (2007) depicted a path of what matters to student success: (1) the first section of path represents students' pre-college experiences, including demographics and family background (2) the next part includes student behaviors and institutional conditions. Student engagement represents aspects of both student behaviors and institutional performance. Research also indicates that to better understand the aspects of students' success, how student perceptions of learning interact with background characteristics such as gender, race and ethnicity, first generation status, and family income needs to be examined (Kuh, Cruce, Shoup, Kinzie & Gonyea, 2008). Thus, I formed a conceptual model as illustrated in Figure 1 that integrates two research topics to further explore how academic engagement and cognitive strategies related to learning outcomes and how students' background characteristics affect those constructs based on the assumptions of Astin's I-E-O theory and the literature review.

My research explores the following research questions:

1. How do academic engagement and learning outcomes differ based on students' background characteristics?
2. How do academic engagement and cognitive strategies predict a causal relationship with self-reported learning outcomes?

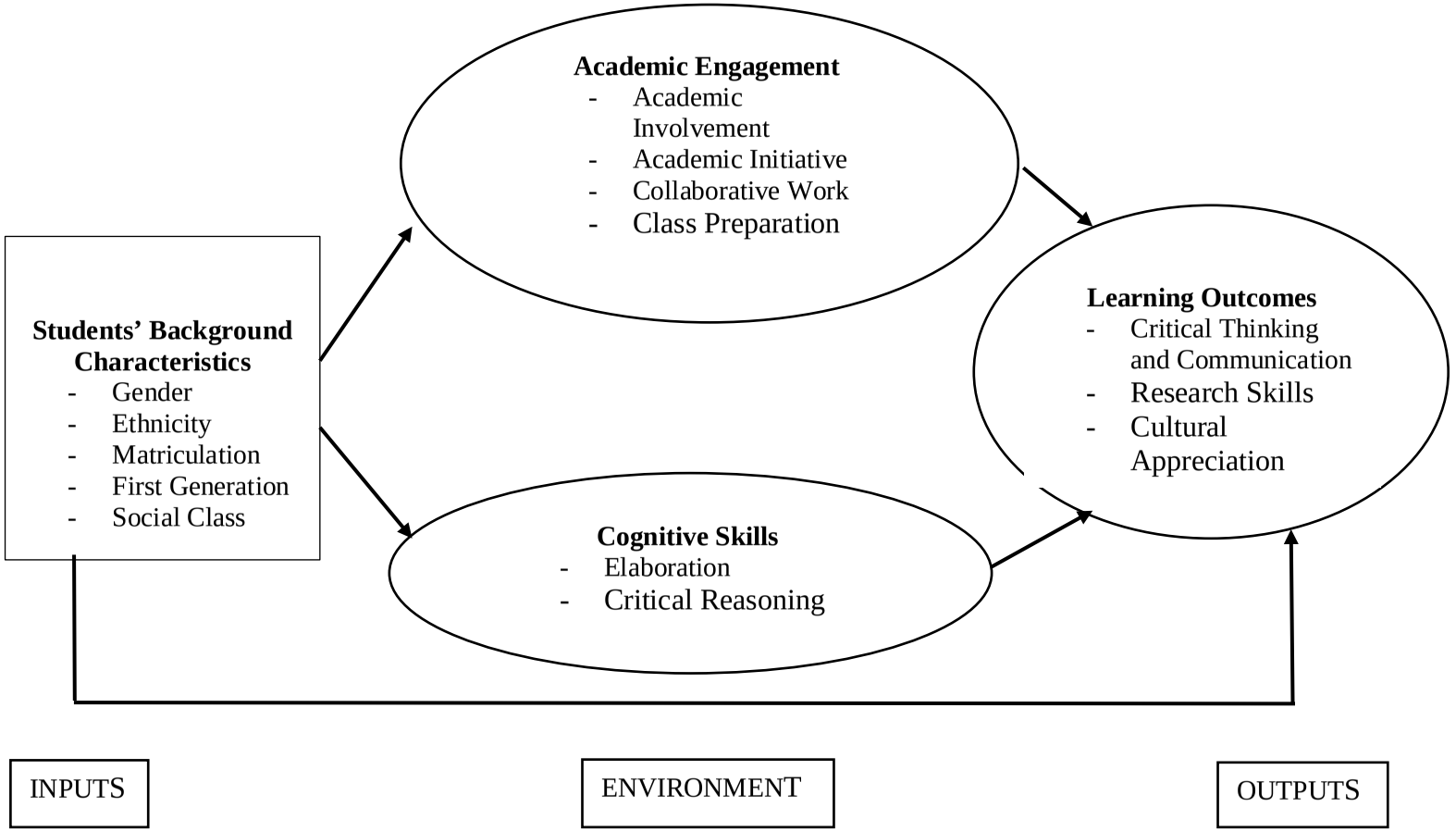

Figure 1. The Theoretical Model of the Relationships among Students' Background Characteristics, Academic Engagement, Cognitive Skills, and Learning Outcomes

Theoretical Framework

The conceptual foundation for the current study is based on Astin & Antonio's (2012) I-E-O model which is commonly used in higher education to explain undergraduate learning and personal development and a synthesis of the previous literature. Astin & Antonio (2012) stated that any educational assessment is not complete unless it contains data on student inputs (I), educational environment (E), and outcomes (O). Inputs are defined as "those personal qualities the student brings initially to the educational program (including the student's initial level of developed talent at the time of entry)" (p.19). Examples of inputs might include student background characteristics such as gender, ethnicity, socioeconomic status, parental education, high school GPA, goals and aspirations, and reason to choose major or university. Environment "refers to the student's actual experiences during the educational program" (Astin & Antonio, 2012, p.19). Environmental factors may include student engagement in academically purposeful activities or specific activities such as community and civic engagement or global skills and awareness in the campus environment. Student outcomes "refer to 'talents' we are trying to develop in our educational program" (Astin & Antonio, 2012, p.19). In higher education, student outcomes might include exam scores, grade point average (GPA), self-reported gains, degree completion, course performance, and satisfaction with academic experience. While the construct of outcomes can be viewed as dependent or endogenous variables, both the environment and inputs are types of independent or exogenous variables (Astin & Antonio, 2012). Inputs can also be called as control variables. In the I-E-O model, the effects of environmental variables on

outcome variables cannot be understood without also considering student inputs, which can be related to both outputs and environments (Astin & Antonio, 2012).

The purpose of the I-E-O theory is “to allow us to measure relevant input characteristics of each student and then correct or adjust for the effects of these input differences in order to get a less biased estimate of the comparative effects of different environments on outputs” (Astin & Antonio, 2012, p.21). In this study, the constructs of I-E-O model will be identified as follows: students’ background characteristics compose the inputs, academic engagement and cognitive strategies compose the environment, and learning outcomes compose the outputs.

CHAPTER II

LITERATURE REVIEW

Learning Outcomes

Learning outcomes refer to the personal changes or benefits which can be measured in terms of abilities and achievements as a result of learning (Nusche, 2008). Otter (1992) defined learning outcomes as "what a learner knows or can do as a result of learning." There is no single assessment to comprehensively measure learning outcomes in higher education. However, student surveys and questionnaires provide valuable information on how students spend their time, how they engage with their studies, and what they have gained from their learning environment.

Learning outcomes are viewed by accountability authorities as valuable methods to measure the effectiveness of colleges and universities (Douglass et al., 2012; Carini et al., 2006). Moreover, collecting some form of learning outcome data is a component of institutional assessment and a guide for institutional self-improvement (Douglass et al., 2012). There are several different mechanisms for gauging learning outcomes such as standardized testing, student self-reported gains, student portfolios and outcome based assessments. To determine an effective mechanism, Douglass et al. (2012) indicated that SERU data offers a unique opportunity to better understand the nature of self-reported learning outcomes in undergraduate education and to contribute as indirect but valid measures of positive educational outcomes at the research university.

Learning Outcomes and Academic Engagement

To assess the quality of the undergraduate education at an institution, we need more information about student engagement (Kuh, 2003). Student engagement, which is defined as the quality of effort students expend in educationally purposeful activities and on using the institution's resources and facilities (Hu & Kuh, 2003), is commonly considered to be among the best predictors of learning outcomes. Student engagement in educationally purposeful activities has a strong positive effect on student self-reported gains (Hu & Kuh, 2003). Coates (2005) states that "student engagement data has the potential to provide a very sensitive index of the extent to which students are going about the kinds of things which are likely to generate high-quality learning outcomes" (p. 31). Further, according to the *Student Involvement Theory* (Astin, 1984), an individual's involvement, which refers to "the quantity and quality of the physical and psychological energy that students invest in the college experience" (p. 528), play a central role in determining the learning at university. Carini et al. (2006) have also found that student engagement is linked positively to desirable learning outcomes such as critical thinking and grades. Students learn more when they participate in educationally purposeful activities. Therefore, engagement as one of the key aspects affecting learning is necessary, and the extent to which students are engaged in academics is highly correlated with the quality of it. Additionally, the relationship between academic engagement and learning outcomes of higher education is well documented in numerous research (Hu & McCormick, 2012; Astin, 2012; Hu & Kuh, 2003; Pascarella &Terenzini, 2005).

Kuh, Kinzie, Schuh, Whitt & Associates (2005) defined two key components of student engagement: (1) the amount of time and effort students spend in their studies and other activities and (2) the ways the institution allocates resources and provides learning opportunities and services that allow students to engage in those activities. Specifically, Hu & Kuh (2003) have found that high-quality relations among different groups – such as faculty members are approachable and encouraging – positively affect the amount of effort that students put forth. Student-faculty interaction has a positive relationship with a variety of student educational and personal outcomes (Pascarella & Terenzini, 2005). Collaborating with faculty on research and creative projects is considered as a highlighting experience of their undergraduate career and deepens their learning (Kuh et al., 2005). The students are more engaged when faculty employs active and collaborative learning techniques (Umbach & Wawrzynski, 2005). Based on the different aspects of student engagement defined in the literature, the present study specifies a broad definition of academic engagement at a four-dimensional structure: Academic Involvement, Academic Initiative, Collaborative Work, and Class Preparation.

Learning Outcomes and Cognitive Strategies

Learning outcomes are also related to the strategies that students employ to guide their learning. These strategies are named as cognitive strategies/skills or learning strategies/skills. Cognitive strategies used by students to learn academic material may refer to “process and utilize new information; communicate effectively; reason objectively and draw objective conclusions from various types of data; evaluate new ideas and techniques efficiently, become more objective about beliefs, attitudes, and

values; evaluate arguments and claims critically; and make reasonable decisions in the face of imperfect information" (Pascarella & Terenzini, 2005, p.155). Another study used the term "academic-related skills" which is defined as "cognitive, behavioral, and affective tools and abilities necessary to successfully complete task, achieve goals, and manage academic demands" (Robbins, Lauver, Davis, Langley & Carsltrom, 2004, p. 267).

Hattie, Biggs & Purdie (1996) did a meta-analysis of 51 studies in which strategy training interventions aimed to improve student learning by enhancing the use of learning strategies. The results showed that there is empirical evidence about the efficacy of different types of learning strategies on academic achievement and learning outcomes. Moreover, many experimental studies conclude that students have higher levels of knowledge acquisition when they are exposed to their preferred learning style in colleges (Pascarella & Terenzini, 2005).

Learning Outcomes, Academic Engagement, Cognitive Strategies, and Student Background Characteristics

Differences in gender, ethnicity, matriculation status, parents' educational experience, and social class was examined due to the discrepant findings for those variables found in the literature. Academic engagement and cognitive strategies may have differential impacts on learning outcomes depending on several backgrounds. Because some groups of students are somewhat more engaged than others (Kuh et al., 2007), the effort students expend on educationally purposeful activities is differed, which consequently affects their learning. Certain student background characteristics

such as gender, race and ethnicity, parents' educational experience, years in college, and major fields influence the student engagement in educationally purposeful activities (Hu & Kuh, 2002). Similar students expend comparable amounts of effort engaging in similar kinds of activities which make different amounts of progress toward outcomes of college (Hu & Kuh, 2003). The effect of college environment on critical thinking skills – a factor of learning outcomes – may vary in magnitude by students' race and gender (Pascarella & Terenzini, 2005).

One study indicates that the higher the family income, the more likely that a student will aspire to earn a bachelor's degree" (Kuh et al. 2007). Pascarella & Terenzini (2005) have also found that socioeconomic status affect college outcomes. Kim & Sax (2007) found that the impact of student-faculty interactions on student outcomes varies by student gender and race. Additionally, the first-generation students differ in their curricular, instructional experiences and their perceptions of the environments compared to their traditional peers which put them at a potential disadvantage (Terenzini, Springer, Yaeger, Pascarella & Nora, 1996).

In this study, as previous research has supported the relationships among students' background characteristics, academic engagement, and cognitive strategies, a model incorporating these aspects was examined to provide a means of predicting the self-reported learning outcomes of undergraduate students at Texas A&M University.

CHAPTER III

METHODOLOGY

The purpose of this study is to examine the effects of academic engagement and cognitive strategies on student-self reported learning outcomes among undergraduate students in a research university. Specifically, the present study utilizes SERU 2015 Survey data in order to examine the relationship between students' background characteristics, academic engagement, cognitive strategies, and learning outcomes based on Astin's I-E-O model.

Participants

This study used the data from the SERU survey administered at Texas A&M University in 2015. The sample consists of 9524 undergraduate students who responded to the survey during the 2015 data-collection period. The sample includes 5711 (60%) female students and 3813 (40%) male students. A majority of students identified themselves as White (62%, n=5905) or Hispanic (16.1%, n=1535). Other ethnicities include African American (2.7%, n=256), American Indian (0.6%, n=57). An additional 6.2% were identified as other (n=586) and 12.4% were unknown (n=1185). Within this sample, 28.6% of students (n= 2234) are first generation students and 71.4% of students (n= 5584) are non-first-generation students.

Instrument

The SERU undergraduate survey is designed as a census survey that examines the students experience in top-tier research universities by the Center for Studies in Higher Education (CSHE). The survey employs a modular design which consists of six

different modules. The core module, which is administered to every respondent, includes 36 questions and focuses on learning outcomes, academic and research engagement, time use, personal development, plans and aspirations, student satisfaction, and background characteristics. The remaining are unique modules of additional questions that are randomly assigned to the participants. The thematic areas of the individual modules are as follows: (a) academic experience and globalization, (b) community and civic engagement, (c) student life and development, (d) uses of technology, and (e) international students. The participating campuses may also choose to develop an additional Wildcard module which includes a set of questions specific to the university. Additionally, respondents were asked to offer their background information such as demographics, social class, and parental education.

Several technical reports of the instrument have been published to support the internal validity and reliability of the survey (Chatman, 2009, 2011; Soria, 2015). Chatman (2011) conducted exploratory factor analysis (EFA) employing varimax orthogonal rotation to determine principal components. Chatman employed promax oblique rotation to identify subgroups from a simple random sample of about 47,000 students who took SERU 2011 from nine different campuses, including Texas A&M University. The author reported internal consistency factors, as measured by Cronbach's coefficient alpha, ranging from 0.53 to 0.92, and all subfactor reliability estimates higher than 0.43 which are consistent over time. Soria (2015) also conducted an independent factor analysis from 44,126 students who took SERU 2015 at nine different institutions and reported that the factors and subfactors have good internal consistency.

Procedure

The survey has been administered online since the first administration which was named as the University of California Undergraduate Experience Survey (UCUES) – what is now known as SERU – in 2002. In collaboration with the CSHE at the University of California (UC), Berkeley, the administration and project management of the survey is conducted by the University of Minnesota. In the interest of expanding the number of institutions administering the survey, the SERU Consortium was established in 2008. In addition to the nine undergraduate UC campuses, the SERU Consortium involves major American research universities, including Texas A&M University, all of which are members of the Association of American Universities (AAU). Each SERU Consortium campus administers a customized survey. The survey is conducted annually, although not every consortium member chooses to administer the survey annually. At Texas A&M University, the SERU survey, which takes approximately 30 minutes to complete, is distributed to all undergraduate students who are 18 years and older. The students are invited to participate in the study by an email which describes the purpose and the length of the survey as well as the incentives for participating. The students first give their consent for participation and then start to respond the questions. Although student participation is voluntary, students may skip questions they do not want to answer. Data collection is monitored by the Office of Institutional Effectiveness & Evaluation of Texas A&M University.

Variables

The population sample in my study consisted of undergraduates who responded to the SERU survey during the 2015 data-collection period at Texas A&M University. Data included in this study came from core module items focusing on academic and research engagement, time use, learning outcomes, and background characteristics, including demographics. I analyzed multiple predictors and one outcome measure derived from 32 survey items as well as student background characteristics (i.e. gender, ethnicity, etc.).

Learning Outcomes Items on SERU

The SERU survey provides students' ability levels of learning outcomes at two-time points (when they started at the university and the time of taking the survey). In this study, learning outcomes was based on eleven self-reported items asking students to assess their skills now by using a 6-point scale ranging from very poor (1) to excellent (6). Chatman (2011) and Soria (2015) specified three subfactors for these items, respectively the former: (a) critical thinking and communication, (b) cultural appreciation and social awareness, and (c) computer, research and presentation skills, and the latter: (a) critical thinking and communication, (b) cultural appreciation, and (c) research skills. In this study, three different learning outcomes' factors which are named as critical thinking and communication, research skills, and cultural appreciation were used. Examples of items on the survey included "Analytical and critical thinking skills," "Ability to appreciate and understand racial and ethnic diversity," and "Library research skills."

Academic Engagement Items on SERU

Academic Engagement was specified comprising four factors with 21 items in total: (a) academic involvement, (b) academic initiative, (c) collaborative work, and (d) class preparation. The first factor, academic involvement, consists of six items in which three items ask how much students have engaged in classroom activities such as asking insightful questions, bringing up ideas or concepts from different courses and contributing to discussions in class. Additionally, one item asks students how frequently they engage in interactions with faculty in the classroom. Two items ask students to report how many professors they know well enough to ask for a letter of recommendation and how often they have a class in which the professor knew or learned students' name. The second factor, academic initiative, includes two items ask how often students find a course so interesting that they do more work than is required and choose challenging courses even though it might cause to lower GPA. The third factor, collaborative work, consists of three items ask how frequently students have engaged in activities that go beyond the classroom experience such as seeking academic help, helping a classmate, and working on projects outside of class. The fourth factor, class preparation, includes three items, one asks how much students have completed their assigned coursework in the semester that they respond the survey. Additionally, two items are associated with low academic performance such as going the class without completing assigned reading and going to class unprepared were examined within the class preparation factor. Engagement is indicated by low scores on these items.

Therefore, scores were reversed for analysis. Higher scores indicate greater engagement for these two items in the factor of class preparation.

Cognitive Strategies Items on SERU

The cognitive strategies factor consists of seven items and two factors: (a) elaboration and (b) critical reasoning. The first factor, elaboration, consists of three items such as breaking down material into component parts, judging the value of information, ideas, actions, and conclusions, and creating and generating new ideas. The second factor, critical reasoning, includes four items such as reconsideration of position on a topic after assessing the arguments of others, examination of how others gathered and interpreted data, incorporating ideas or concepts from other courses, using facts and examples to support a viewpoint.

Table 1 provides a list of the 32 items and the corresponding latent constructs in this study.

Table 1

Survey Items and Latent Variables

Item	Description	Latent Variable
ACADINV1	During this academic year, how often have you contributed to a class discussion?	Academic involvement
ACADINV2	During this academic year, how often have you brought up ideas or concepts from different courses during class discussions?	
ACADINV3	During this academic year, how often have you asked an insightful question in class?	
ACADINV4	During this academic year, how often have had a class in which the professor knew or learned your name?	
ACADINV5	How frequently have you engaged in interacted with faculty during lecture class sessions so far this academic year?	

Table 1 Continued

Item	Description	Latent Variable
ACADINV6	How many professors do you know well enough to ask for a letter of recommendation in support of an application for a job or for graduate or professional school?	
ACADEMI1	During this academic year, how often have found a course so interesting that you did more work than was required?	Academic initiative
ACADEMI2	During this academic year, how often have chosen challenging courses, when possible, even though you might lower your GPA by doing so?	
COLWORK1	How frequently during this academic year have you sought academic help from instructor or tutor when needed?	Collaborative work
COLWORK2	How frequently during this academic year have you worked on class projects or studied as a group with classmates outside of class?	
COLWORK3	How frequently during this academic year have you helped a classmate better understand the course material when studying together?	
CLASSPR1	How frequently during this academic year have you gone to class without completing assigned reading?	Class preparation
CLASSPR2	How frequently during this academic year have you gone to class unprepared?	
CLASSPR3	On average, how much of your assigned course reading have you completed this academic year?	
ELABORA1	Thinking back over your coursework this academic year, how often were you required to break down material into component parts or arguments into assumptions to see the basis for different outcomes and conclusions?	Elaboration
ELABORA2	Thinking back over your coursework this academic year, how often were you required to judge the value of information, ideas, actions, and conclusions based on the soundness of sources, methods, and reasoning?	
ELABORA3	Thinking back over your coursework this academic year, how often were you required to create or generate new ideas, products, or ways of understanding?	
CRITREA1	Thinking back on this academic year, how often have you incorporated ideas or concepts from different courses when completing assignments?	Critical reasoning
CRITREA2	Thinking back on this academic year, how often have you examined how others gathered and interpreted data and assessed the soundness of their conclusions?	
CRITREA3	Thinking back on this academic year, how often have you reconsidered your own position on a topic after assessing the arguments of others?	
CRITREA4	Thinking back on this academic year, how often have you used facts and examples to support your viewpoint?	
CTHINK1	Please rate your level of proficiency in analytical and critical thinking skills.	Critical thinking and communication
CTHINK2	Please rate your level of proficiency in ability to be clear and effective when writing.	

Table 1 Continued

Item	Description	Latent Variable
CTHINK3	Please rate your level of proficiency in ability to read and comprehend academic material.	
CTHINK4	Please rate your level of proficiency in understanding your field of study (i.e., college major).	
CTHINK5	Please rate your level of proficiency in leadership skills.	
RSKILLS1	Please rate your level of proficiency in library research skills (e.g. finding books, articles, evaluating information sources).	Research skills
RSKILLS2	Please rate your level of proficiency in other research skills.	
RSKILLS3	Please rate your level of proficiency in ability to prepare and make a presentation.	
CULTURA1	Please rate your level of proficiency in ability to appreciate and understand racial and ethnic diversity.	Cultural appreciation
CULTURA2	Please rate your level of proficiency in ability to appreciate the fine arts (e.g., painting, music, drama, and dance).	
CULTURA3	Please rate your level of proficiency in ability to appreciate cultural and global diversity.	

Student Background Items on SERU

The present study involves five background characteristics: gender, ethnicity, matriculation status, first generation status, and social class. First generation status and social class data were provided in SERU. One item capture students' self-reported social class with a five-point scale from low-income or poor (1) to wealthy (5) when growing up. One asks students to describe their parents' educational experience with a three-point scale: (1) neither parent attended college, (2) neither parent has a four-year degree but one or both attended college, and (3) one or both parents have a four-year degree, which was used to identify first-generation college students. First-generation students were defined as one whose parents have a four-year degree. Gender, ethnicity, and matriculation status were provided by the campus.

Data Analysis

Prior to conducting SEM analysis, the preliminary analysis was run by using IBM SPSS Statistics 24 to calculate means, standard deviations (SD), skewness, kurtosis, Pearson correlation coefficients, and minimum and maximum values for each variable. After running the initial descriptive statistics, Mplus 7 was used to conduct confirmatory factor analysis (CFA) in order to indicate the validity of the study's variables as measured by the SERU survey items. CFA specifies the measurement models delineating how well measured variables reflect certain latent variables (Thompson, 2004). Once these measurement models fit the data satisfactorily, then the researcher can explore structural models that link the latent variables (2004). After confirming the measurement models, structural models were tested to address research questions. SEM extends the possibility of relationships among the latent variables and encompasses a measurement model which is CFA and a structural model (Schreiber, Nora, Stage, Barlow & King, 2006). In the present study, SEM was used to test direct effects of academic engagement and cognitive strategies on learning outcomes as well as to determine if the proposed models were a good fit for the data. The main reason that SEM is widely employed in research is that it explicitly takes into account measurement error in the observed variables in a given model (Raykov & Marcoulides, 2006).

There are several necessary steps to test SEM. The first step is the model specification in which relationships are hypothesized to exist or not to exist among observed and latent variables (Weston & Gore, 2006). The second step is model identification which is concerned if a single, unique value for every free parameter can

be obtained from the observed data (Hoyle, 1995). Models can be under-identified, just-identified, and over-identified. The model is over-identified when there are more than zero degrees of freedom (Weston & Gore, 2006). Accordingly, the hypothesized models in this study are over-identified. It is also recommended to have more than two indicators for a latent variable. The academic initiative latent factor was defined by two items. However, if there is more than one latent variable in the measurement model, having two observed indicators can be acceptable. The current model met this rule. The researcher should address additional issues related to data, including sample size, multicollinearity, outliers, normality, and missing data as the third step (Weston & Gora, 2006). After specifying the model, determining the model identification, and addressing issues with data, finally, the model can be estimated. Estimation includes calculating the value of the unknown parameters and the error associated with the estimated value (Weston & Gore, 2006). Once parameters have been estimated, the model's fit to data can be evaluated. The goodness-of-fit indices which were commonly used in testing conformity of the models are as follows: the chi-square value (χ^2), the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean squared error of approximation (RMSEA) (Schreiber et al., 2006). The cutoff criteria for several fit indexes for determining model fit are: χ^2: $df \leq 2$ or 3, CFI $\geq .95$, TLI $\geq .95$, RMSEA $< .06$ to.08 (Schreiber et al., 2006; Hooper, Coughlan, and Mullen, 2008). If the proposed model does not fit well to the data, a modification which involves adjusting the estimated model by freeing or setting parameters may be needed (Weston & Gore, 2006).

In this study, there are three hypothesized theoretical models. Figure 2 illustrates the conceptual model of the effects of academic engagement and cognitive strategies factors on critical thinking and communication. Figure 3 shows the conceptual model of the effects of same constructs on research skills. Lastly, Figure 4 illustrates the conceptual model of the influences of academic engagement and cognitive strategies on cultural appreciation. The solid lines in the models represent the theoretically assumed direct effects that are examined.

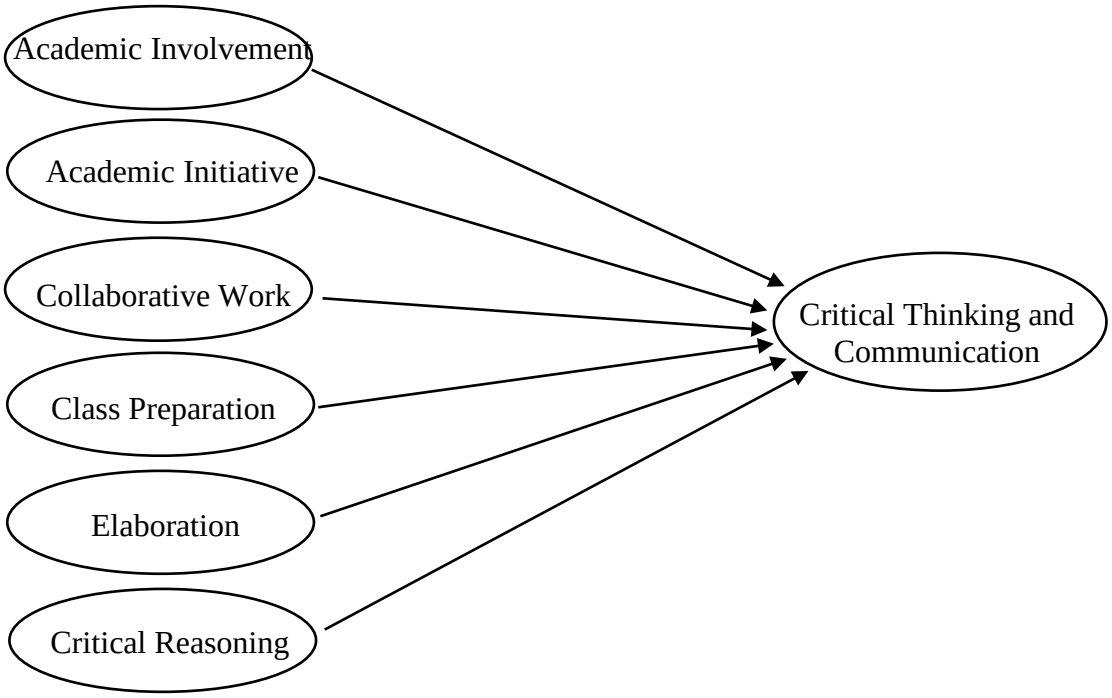

Figure 2. Hypothesized Theoretical Model 1

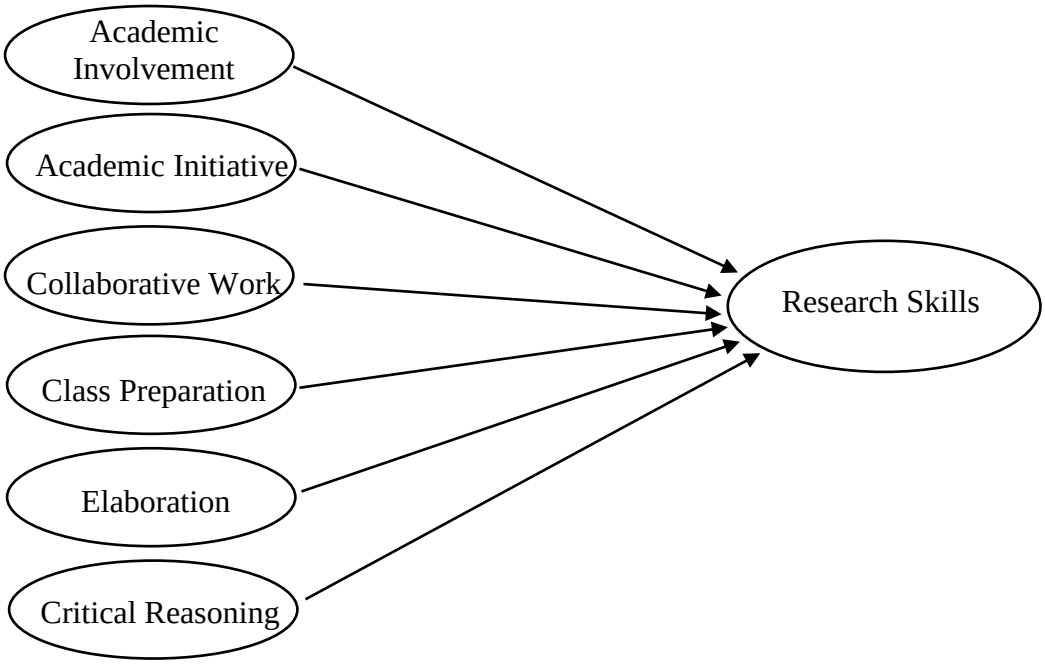

Figure 3. Hypothesized Theoretical Model 2

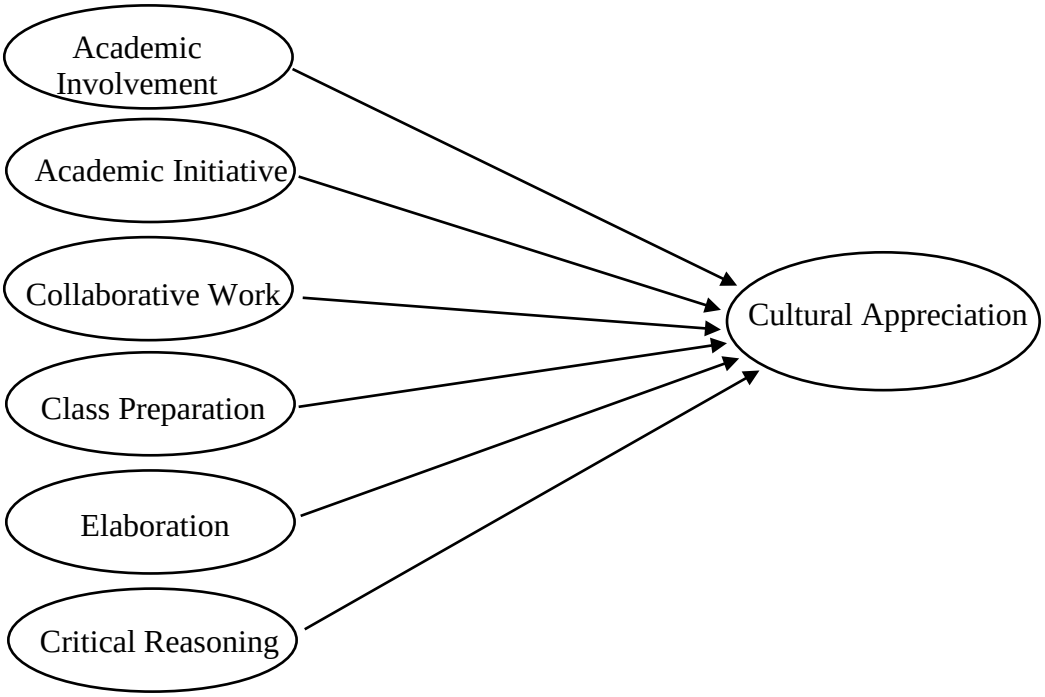

Figure 4. Hypothesized Theoretical Model 3

Based on the literature review, the researcher hypothesized that academic engagement and cognitive strategies would positively affect students' critical thinking and communication, research skills, and cultural appreciation outcomes. Specifically, students who are academically more involved, frequently interacted with faculty, go to class prepared, and collaborate in their studies would have higher learning outcomes. Also, students who use cognitive strategies to learn a material would have higher learning outcomes regarding critical thinking and communication, research skills, and cultural appreciation.

CHAPTER IV

RESULTS

The present study aimed to examine the relationship of students' background characteristics, academic engagement, cognitive strategies, and learning outcomes among undergraduate students. Study participants included 9524 students at Texas A&M University. Descriptive statistics, t-tests, one-way analysis of variance (ANOVA) and SEM were used to analyze the data. SEM is a statistical technique which is used to quantify and test the plausibility of hypothetical assertions about potential interrelationships among the constructs and their relationships to measures assessing them (Raykov & Marcoulides, 2006). The researcher sought to answer the following questions:

1. Do students' academic engagement and learning outcomes differ based on their gender, ethnicity, first-generation status, matriculation status, and social class?
2. Is academic engagement related to student self-reported learning outcomes among Texas A&M undergraduate students?
3. Are cognitive strategies related to student self-reported learning outcomes among Texas A&M undergraduate students?

The researcher conducted preliminary analyses to see if there is missing data on variables of interest and calculated descriptive statistics of variables. Then, SEM assumptions were evaluated. Differences between groups of individuals based on students' background characteristics on academic engagement and learning outcomes

were examined. Additionally, based on the literature review and results of EFA (Chatman, 2009, 2011 & Soria 2015), confirmatory factor analysis was conducted to ensure whether or not the items utilized in the study to represent the latent variables by using Mplus 7. The model includes three latent constructs: academic engagement, cognitive strategies, and learning outcomes. After specification and estimation of the measurement model, the structural model was tested to ensure that a relationship exists between the variables of interest.

Preliminary Analyses

The sample size, minimum and maximum values, means, standard deviations (SD), skewness, and kurtosis for each variable are shown in Table 2. The means for academic engagement items ranged from 1.55 to 6.89 (SD = 1.09 to 2.46) and for cognitive strategies ranged from 3.74 to 4.42 (SD = 1.19 to 1.43). The means for learning outcomes ranged from 4.07 to 4.84 (SD = .81 to 1.21). The dataset was comprised of 9524 participants.

Table 2

Descriptive Statistics for the Study Variables

Variable	N	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
Academic Involvement							
ACADINV1	9454	1	6	3.61	1.36	0.12	-0.85
ACADINV2	9432	1	6	3.15	1.38	0.33	-0.69
ACADINV3	9414	1	6	3.17	1.33	0.33	-0.58
ACADINV4	9434	1	6	4.14	1.49	-0.35	-0.91
ACADINV5	9435	1	6	3.58	1.41	0.15	-0.87
ACADINV6	7881	0	4	1.55	1.28	0.39	-0.90
Academic Initiative							

Table 2 Continued

Variable	N	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
ACADEMI1	9386	1	6	3.20	1.35	0.30	-0.58
ACADEMI2	9438	1	6	3.46	1.51	0.04	-0.98
Collaborative Work							
COLWORK1	9025	1	6	3.67	1.45	-0.02	-0.91
COLWORK2	9044	1	6	4.21	1.44	-0.39	-0.82
COLWORK3	9045	1	6	4.01	1.35	-0.26	-0.68
Class Preparation							
CLASSPR1	9045	1	6	3.83	1.35	-0.35	-0.55
CLASSPR2	9027	1	6	4.4	1.09	-0.84	0.78
CLASSPR3	8939	1	10	6.89	2.46	-0.72	-0.42
Elaboration							
ELABORA1	9031	1	6	4.15	1.35	-0.29	-0.77
ELABORA2	9022	1	6	4.07	1.37	-0.24	-0.83
ELABORA3	9034	1	6	3.84	1.43	-0.08	-0.95
Critical Reasoning							
CRITREA1	8853	1	6	4.21	1.23	-0.25	-0.67
CRITREA2	8848	1	6	3.77	1.33	-0.10	-0.69
CRITREA3	8849	1	6	3.74	1.27	0.02	-0.64
CRITREA4	8863	1	6	4.42	1.19	-0.44	-0.45
Critical Thinking and Communication							
CTHINK1	8226	1	6	4.72	0.81	-0.46	0.67
CTHINK2	8224	1	6	4.58	0.94	-0.42	0.16
CTHINK3	8203	1	6	4.71	0.88	-0.59	0.82
CTHINK4	8221	1	6	4.79	0.95	-0.87	1.20
CTHINK5	8237	1	6	4.73	1.02	-0.74	0.61
Research Skills							
RSKILLS1	8148	1	6	4.07	1.10	-0.30	-0.12
RSKILLS2	8129	1	6	4.24	0.98	-0.28	0.20
RSKILLS3	8127	1	6	4.64	0.92	-0.44	0.31
Cultural Appreciation							
CULTURA1	8163	1	6	4.84	0.98	-0.84	1.10
CULTURA2	8169	1	6	4.5	1.21	-0.59	-0.16
CULTURA3	8168	1	6	4.78	1.03	-0.75	0.59

The extent of missing data ranged from 0.7% of participants for ACADINV1 to 17.3% for ACADINV3 creating a sample ranging from 7881-9454 participants. Table 3 shows the cases with valid data values and the percentages of observations with missing data for each variable. When the Full Information Maximum Likelihood (FIML) method is available in the statistical program, it is reasonable to conduct the analysis with an incomplete set (Kline, 2016). Thus, the FIML method was used to estimate the parameters. Mplus 7 uses all the data that is available to estimate the model using full information maximum likelihood.

Table 3

Missing Value Percentages by Study Variables

	Missing		
Variable	N	Percent	Valid N
Academic Involvement			
ACADINV1	70	0.7	9454
ACADINV2	92	1.0	9432
ACADINV3	110	1.2	9414
ACADINV4	90	0.9	9434
ACADINV5	89	0.9	9435
ACADINV6	1643	17.3	7881
Academic Initiative			
ACADEMI1	138	1.4	9386
ACADEMI2	86	0.9	9438
Collaborative Work			
COLWORK1	499	5.2	9025
COLWORK2	480	5.0	9044
COLWORK3	479	5.0	9045
Class Preparation			
CLASSPR1	479	5.0	9045
CLASSPR2	497	5.2	9027
CLASSPR3	585	6.1	8939

Table 3 Continued

Variable	Missing N	Missing Percent	Valid N
Elaboration			
ELABORA1	493	5.2	9031
ELABORA2	502	5.3	9022
ELABORA3	490	5.1	9034
Critical Reasoning			
CRITREA1	671	7.0	8853
CRITREA2	676	7.1	8848
CRITREA3	675	7.1	8849
CRITREA4	661	6.9	8863
Critical Thinking and Communication			
CTHINK1	1298	13.6	8226
CTHINK2	1300	13.6	8224
CTHINK3	1321	13.9	8203
CTHINK4	1303	13.7	8221
CTHINK5	1287	13.5	8237
Research Skills			
RSKILLS1	1376	14.4	8148
RSKILLS2	1395	14.6	8129
RSKILLS3	1397	14.7	8127
Cultural Appreciation			
CULTURA1	1361	14.3	8163
CULTURA2	1355	14.2	8169
CULTURA3	1356	14.2	8168

The univariate statistics were computed to evaluate the skewness and kurtosis of the variables. Kline (2016) reported that the absolute values greater than three can be described as severely skewed and absolute values from about eight to 20 are indicating severe kurtosis. All variables in this study met the criteria for skewness (ranged from -.84 to .39) and kurtosis (ranged from -.98 to 1.20).

Bivariate correlations were conducted to check the multicollinearity between study variables. Table 4 shows the correlation matrix of the study variables. Correlations ranged from r =.03 to r =.75. Kline indicates that a correlation coefficient higher than r =.85 can cause potential problems (as cited in Weston & Gore, 2006). Consequently, no variable exhibited collinearity issues.

Table 4

Correlation Matrix of the Variables in the Study

Item	1	2	3	4	5	6	7	8
ACADINV1	1							
ACADINV2	.750**	1						
ACADINV3	.745**	.717**	1					
ACADINV4	.540**	.498**	.495**	1				
ACADINV5	.687**	.618**	.646**	.600**	1			
ACADINV6	.431**	.411**	.399**	.553**	.473**	1		
ACADEMI1	.416**	.479**	.496**	.371**	.413**	.299**	1	
ACADEMI2	.255**	.310**	.330**	.210**	.258**	.177**	.450**	1
COLWORK1	.209**	.210**	.272**	.221**	.279**	.142**	.249**	.178**
COLWORK2	.263**	.274**	.265**	.273**	.327**	.214**	.206**	.166**
COLWORK3	.286**	.314**	.333**	.266**	.342**	.210**	.310**	.255**
CLASSPR1	.077**	.097**	.121**	.045**	.067**	.044**	.197**	.122**
CLASSPR2	.068**	.063**	.074**	.029**	.047**	.040**	.155**	.074**
CLASSPR3	.158**	.154**	.168**	.100**	.144**	.080**	.245**	.184**
ELABORA1	.212**	.262**	.250**	.193**	.250**	.136**	.277**	.256**
ELABORA2	.260**	.310**	.291**	.249**	.293**	.195**	.298**	.237**
ELABORA3	.281**	.346**	.312**	.279**	.319**	.212**	.320**	.246**
CRITREA1	.329**	.424**	.338**	.338**	.368**	.264**	.369**	.271**
CRITREA2	.311**	.386**	.353**	.309**	.345**	.226**	.361**	.271**
CRITREA3	.259**	.325**	.286**	.254**	.282**	.173**	.321**	.245**
CRITREA4	.367**	.367**	.337**	.330**	.370**	.237**	.303**	.227**
CTHINK1	.276**	.264**	.291**	.227**	.275**	.238**	.238**	.184**
CTHINK2	.242**	.230**	.238**	.216**	.238**	.222**	.192**	.126**
CTHINK3	.220**	.215**	.235**	.197**	.240**	.216**	.221**	.163**

Table 4 Continued

Item	1	2	3	4	5	6	7	8
CTHINK4	.260**	.268**	.255**	.287**	.268**	.314**	.265**	.148**
CTHINK5	.312**	.304**	.313**	.265**	.305**	.274**	.203**	.107**
RSKILLS1	.227**	.243**	.228**	.220**	.227**	.227**	.252**	.164**
RSKILLS2	.221**	.249**	.252**	.214**	.237**	.230**	.263**	.196**
RSKILLS3	.309**	.311**	.297**	.292**	.320**	.298**	.218**	.120**
CULTURA1	.108**	.119**	.106**	.112**	.104**	.083**	.148**	.108**
CULTURA2	.128**	.131**	.116**	.106**	.129**	.094**	.155**	.117**
CULTURA3	.142**	.149**	.125**	.137**	.143**	.120**	.167**	.123**

Table 4 Continued

Item	9	10	11	12	13	14	15	16
COLWORK1	1							
COLWORK2	.364**	1						
COLWORK3	.400**	.699**	1					
CLASSPR1	.153**	.029**	.079**	1				
CLASSPR2	.124**	.030**	.070**	.649**	1			
CLASSPR3	.196**	.077**	.144**	.519**	.344**	1		
ELABORA1	.238**	.251**	.302**	.093**	.059**	.163**	1	
ELABORA2	.244**	.243**	.292**	.099**	.063**	.178**	.695**	1
ELABORA3	.235**	.307**	.318**	.101**	.070**	.154**	.574**	.644**
CRITREA1	.230**	.301**	.346**	.052**	.050**	.157**	.406**	.441**
CRITREA2	.253**	.295**	.353**	.091**	.066**	.160**	.442**	.513**
CRITREA3	.237**	.260**	.304**	.065**	.029**	.140**	.367**	.412**
CRITREA4	.207**	.260**	.300**	.037**	.057**	.172**	.384**	.462**
CTHINK1	.047**	.142**	.207**	.040**	.071**	.110**	.219**	.220**
CTHINK2	.090**	.101**	.125**	.064**	.087**	.133**	.164**	.206**
CTHINK3	.064**	.109**	.165**	.088**	.104**	.192**	.179**	.205**
CTHINK4	.076**	.162**	.207**	.058**	.094**	.090**	.191**	.213**
CTHINK5	.161**	.221**	.257**	.027*	.033**	.066**	.174**	.200**
RSKILLS1	.132**	.109**	.142**	.131**	.105**	.168**	.158**	.219**
RSKILLS2	.116**	.136**	.174**	.110**	.093**	.148**	.207**	.240**
RSKILLS3	.113**	.236**	.220**	.052**	.068**	.094**	.188**	.224**
CULTURA1	.090**	.079**	.117**	.053**	.060**	.101**	.119**	.148**
CULTURA2	.059**	.059**	.082**	.046**	.043**	.084**	.104**	.126**
CULTURA3	.093**	.082**	.111**	.047**	.057**	.104**	.142**	.175**

Table 4-Continued

Item	17	18	19	20	21	22	23	24
ELABORA3	1							
CRITREA1	.452**	1						
CRITREA2	.492**	.602**	1					
CRITREA3	.420**	.521**	.640**	1				
CRITREA4	.418**	.597**	.561**	.485**	1			
CTHINK1	.218**	.280**	.251**	.172**	.306**	1		
CTHINK2	.175**	.230**	.227**	.155**	.289**	.518**	1	
CTHINK3	.185**	.246**	.224**	.167**	.272**	.543**	.513**	1
CTHINK4	.211**	.295**	.229**	.181**	.255**	.448**	.335**	.416**
CTHINK5	.214**	.232**	.225**	.163**	.234**	.394**	.333**	.324**
RSKILLS1	.200**	.241**	.246**	.197**	.241**	.303**	.368**	.340**
RSKILLS2	.235**	.270**	.281**	.215**	.268**	.394**	.406**	.408**
RSKILLS3	.258**	.273**	.264**	.186**	.284**	.411**	.445**	.385**
CULTURA1	.144**	.169**	.162**	.190**	.172**	.219**	.250**	.247**
CULTURA2	.129**	.137**	.147**	.147**	.154**	.184**	.248**	.205**
CULTURA3	.165**	.188**	.184**	.205**	.203**	.231**	.264**	.242**

Table 4-Continued

Item	25	26	27	28	29	30	31	32
CTHINK4	1							
CTHINK5	.356**	1						
RSKILLS1	.313**	.257**	1					
RSKILLS2	.361**	.300**	.635**	1				
RSKILLS3	.396**	.477**	.425**	.515**	1			
CULTURA1	.172**	.213**	.278**	.284**	.268**	1		
CULTURA2	.148**	.171**	.262**	.261**	.252**	.486**	1	
CULTURA3	.180**	.220**	.284**	.294**	.282**	.742**	.593**	1

Note. **Correlation is significant at the 0.01 level (2-tailed).

There is no consensus on what sample size is adequate for SEM. Weston & Gore (2006) reported that a minimum sample size of 200 for any SEM is recommended.

Accordingly, the sample size of this study would be sufficient for both the CFA and SEM analyses.

Research Question One

Research Question 1 investigated the relationship between students' background characteristics, academic engagement, and learning outcomes. Students' background characteristics involves gender, ethnicity, matriculation status, first generation status, and social class. Table 5 shows the descriptive statistics of background variables.

Table 5

Descriptive Statistics of Participants' Background Characteristics

Variable	N	%
Gender		
Male	3813	40.0
Female	5711	60.0
Ethnicity		
White	5905	62.0
Hispanic	1535	16.1
African American	256	2.7
American Indian	57	0.6
Other	586	6.2
Unknown	1185	12.4
Total	9524	100.0
First-generation		
First-Gen	2234	28.6
Non-1st Gen	5584	71.4
Social Class		
Low-income or poor	437	5.6
Working-class	1342	17.2
Middle-class	3417	43.7
Upper-middle or professional-middle	2400	30.7

Table 5 Continued

Variable	N	%
Wealthy	218	2.8
Matriculation status		
Entered as freshman	7836	82.3
Entered as transfer	1641	17.2

40.0% of participants are male and 60.0% of them are female. First-generation students represent about 28.6% of the participants in 2015 TAMU SERU. While 82.3% of the participants entered college as freshmen, 17.2% of them entered as transfer students. 62.0% of the students are White, 16.1% are Hispanic, 2.7% are African American, 0.6% are American Indian and 6.2% of them are from other ethnic groups. 22.8% of the participants are coming from low-income or working-class, 43.7% of them are from middle-class, and 33.5% of them are from upper-middle or professional-middle or wealthy class. The breakdown of sample sizes were as follows: females (n = 5711); males (n = 3813); first-generation (n= 2234); non-first generation (n = 5584); transfer (n= 1641); non-transfer (n = 7836); White (n = 5905); Hispanic (n = 1535); African American (n= 256); other (n= 643); low-income/working-class (n= 1779); middle class (n= 3417); upper-middle/professional-middle/wealthy (n= 2618).

In order to determine if there are significant differences between female and male, first-generation and non-first-generation, transfer or non-transfer students at Texas A&M University regarding their academic engagement and learning outcomes, a series of independent-samples t-tests were conducted on 32 items.

For female versus male students, a statistically significant difference was found for every item in academic engagement construct except for the items such as working on class projects or studied as a group with classmates outside of class (COLWORK2), helping a classmate better understand the course material when studying together (COLWORK3), and going to class without completing assigned reading (CLASSPR1). Male students reported more frequent engagement than females in contributing to a class discussion (ACADINV1), bringing up ideas or concepts from different courses during class discussions (ACADINV2), asking an insightful question in class (ACADINV3), interacting with faculty during lecture class sessions (ACADINV5), finding a course so interesting that they did more work than was required (ACADEMI1), and choosing challenging courses (ACADEMI2). Interestingly, female students reported higher scores than males on the items related to faculty interactions such as having a class in which the professor knew or learned their name (ACADINV4), knowing professors well enough to ask for a letter of recommendation (ACADINV6), and seeking academic help from instructor or tutor when needed (COLWORK1). Additionally, female students reported that they are more likely to go to class prepared (CLASSPR2) and complete their assigned course reading (CLASSPR3) compared to male students. Further, effect sizes for each variable were calculated. Cohen (1988) suggested that d=0.2 be considered as a “small' effect size, 0.5 a “medium” effect size and 0.8 a “large” effect size. Cohen’s effect size values of study variables ranged from d= 0.01 to d= 0.19 suggested low practical significance. The results can be found in Table 6.

Table 6

Independent Sample T-Test Results for Academic Engagement by Gender

								CI		
Variable	Group	N	Mean	SD	t	df	p	Lower	Upper	ES(d)
ACADINV1					2.395	8336.98	0.017	0.012	0.123	0.05
	Male	3786	3.65	1.32						
	Female	5668	3.58	1.38						
ACADINV2					4.802	9430	0.000	0.082	0.195	0.10
	Male	3775	3.23	1.34						
	Female	5657	3.09	1.39						
ACADINV3					8.714	9412	0.000	0.188	0.298	0.18
	Male	3774	3.31	1.30						
	Female	5640	3.07	1.35						
ACADINV4					-3.496	9432	0.000	-0.17	-0.048	0.07
	Male	3775	4.07	1.49						
	Female	5659	4.18	1.48						
ACADINV5					2.987	8468.09	0.003	0.03	0.144	0.06
	Male	3777	3.63	1.35						
	Female	5658	3.55	1.44						
ACADINV6					-2.581	7879	0.010	-0.134	-0.018	0.05
	Male	3154	1.51	1.30						
	Female	4727	1.58	1.28						
ACADEMI1					2.401	8005.41	0.016	0.013	0.124	0.05
	Male	3754	3.24	1.35						
	Female	5632	3.17	1.35						
ACADEMI2					7.966	9436	0.000	0.189	0.313	0.17
	Male	3774	3.61	1.51						
	Female	5664	3.36	1.49						
COLWORK1					-8.923	9023	0.000	-0.338	-0.216	0.19
	Male	3601	3.50	1.45						
	Female	5424	3.78	1.44						
COLWORK2					-1.832	9042	0.067	-0.117	0.004	0.04
	Male	3601	4.17	1.45						
	Female	5443	4.23	1.43						
COLWORK3					0.528	9043	0.597	-0.042	0.072	0.01
	Male	3602	4.02	1.34						
	Female	5443	4.01	1.36						
CLASSPR1					-1.602	9043	0.109	-0.104	0.01	0.03

Table 6 Continued

Variable	Group	N	Mean	SD	t	df	p	CI Lower	CI Upper	ES(d)
	Male	3604	3.80	1.34						
	Female	5441	3.84	1.37						
CLASSSPR2					-3.28	9025	0.001	-0.123	-0.031	0.06
	Male	3600	4.36	1.10						
	Female	5427	4.43	1.08						
CLASSPR3					-5.111	7256.34	0.000	-0.381	-0.17	0.11
	Male	3568	6.72	2.56						
	Female	5371	7.00	2.39						

For learning outcomes items, a statistically significant difference was found for every item except for understanding the field of study (CTHINK4) and leadership skills (CTHINK5). Females reported higher ability levels than males on clear and effective writing (CTHINK2), reading and comprehending academic material (CTHINK3), library research skills (RSKILLS1), other research skills (RSKILLS2), preparing and making a presentation (RSKILLS3), appreciating and understanding racial and ethnic diversity (CULTURA1), appreciating fine arts (CULTURA2), and appreciating cultural and global diversity (CULTURA3). Males reported higher ability levels only on analytical and critical thinking skills (CTHINK1) compared to females. Cohen's effect size values of study variables ranged from d= 0.01 to d= 0.39 suggested low to moderate practical significance. The results can be found in Table 7.

Table 7

Independent Sample T-Test Results for Learning Outcomes by Gender

								CI		
Variable	Group	N	Mean	SD	t	df	p	Lower	Upper	ES(d)
CTHINK1					7.846	6878.01	0.000	0.108	0.179	0.17
	Male	3290	4.81	0.82						
	Female	4936	4.67	0.80						
CTHINK2					-5.254	6816.88	0.000	-0.153	-0.07	0.12
	Male	3294	4.51	0.96						
	Female	4930	4.62	0.92						
CTHINK3					-3.061	6864.11	0.002	-0.1	-0.022	0.07
	Male	3284	4.68	0.90						
	Female	4919	4.74	0.87						
CTHINK4					-1.784	8219	0.074	-0.08	0.004	0.04
	Male	3292	4.76	0.97						
	Female	4929	4.80	0.94						
CTHINK5					-0.332	8235	0.740	-0.053	0.037	0.01
	Male	3299	4.73	1.03						
	Female	4938	4.74	1.02						
RSKILLS1					-8.888	8146	0.000	-0.269	-0.172	0.20
	Male	3276	3.93	1.11						
	Female	4872	4.16	1.09						
RSKILLS2					-2.617	8127	0.009	-0.101	-0.014	0.06
	Male	3267	4.21	0.98						
	Female	4862	4.27	0.97						
RSKILLS3					-5.058	6849.42	0.000	-0.147	-0.065	0.12
	Male	3269	4.57	0.94						
	Female	4858	4.68	0.91						
CULTURA1					-14.042	6199.78	0.000	-0.36	-0.272	0.33
	Male	3276	4.65	1.06						
	Female	4887	4.97	0.89						
CULTURA2					-16.963	6247.72	0.000	-0.526	-0.417	0.39
	Male	3281	4.22	1.31						
	Female	4888	4.69	1.11						
CULTURA3					-15.641	6225.44	0.000	-0.418	-0.325	0.36
	Male	3279	4.56	1.12						
	Female	4889	4.93	0.95						

In considering first-generation and non-first-generation students, other significant findings emerged. Interestingly there were few statistically significant items in terms of academic engagement. Non-first-generation students reported that they are more likely to interact with faculty during lectures (ACADINV5), to work with classmates outside of class (COLWORK2), and to help a classmate when studying together (COLWORK3) compared to first-generation students. On the other hand, first-generation students reported higher means on only one item which was going to class prepared (CLASSPR2) compared to non-first-generation. However, Cohen's effect size values of study variables were small, which suggested low practical significance. The results can be found in Table 8.

Table 8

Independent Sample T-Test Results for Academic Engagement by First-generation

								CI		
Variable	Group	N	Mean	SD	t	df	p	Lower	Upper	ES(d)
ACADINV1					-1.053	7769	0.292	-0.103	0.031	0.03
	FG	2220	3.62	1.37						
	NFG	5551	3.66	1.35						
ACADINV2					0.75	7755	0.453	-0.042	0.094	0.01
	FG	2213	3.19	1.40						
	NFG	5544	3.17	1.36						
ACADINV3					-1.363	7747	0.173	-0.111	0.02	0.04
	FG	2206	3.15	1.36						
	NFG	5543	3.20	1.32						
ACADINV4					0.874	7762	0.382	-0.04	0.105	0.02
	FG	2219	4.20	1.48						
	NFG	5545	4.17	1.48						
ACADINV5					-2.515	7762	0.012	-0.158	-0.02	0.06
	FG	2215	3.55	1.43						

Table 8 Continued

Variable	Group	N	Mean	SD	t	df	p	CI Lower	CI Upper	ES(d)
	NFG	5549	3.64	1.40						
ACADINV6					0.477	7794	0.633	-0.048	0.079	0.02
	FG	2224	1.57	1.28						
	NFG	5572	1.55	1.29						
ACADEMI1					1.671	7715	0.095	-0.01	0.123	0.04
	FG	2202	3.26	1.36						
	NFG	5515	3.20	1.34						
ACADEMI2					-0.352	7765	0.724	-0.087	0.061	0.01
	FG	2216	3.47	1.49						
	NFG	5551	3.48	1.51						
COLWORK1					1.135	7765	0.256	-0.03	0.113	0.03
	FG	2209	3.68	1.46						
	NFG	5558	3.64	1.45						
COLWORK2					-4.806	3914.63	0.000	-0.249	-0.105	0.12
	FG	2217	4.08	1.48						
	NFG	5564	4.25	1.42						
COLWORK3					-4.776	7784	0.000	-0.228	-0.095	0.12
	FG	2221	3.89	1.37						
	NFG	5565	4.05	1.34						
CLASSPR1					1.714	4112.99	0.087	-0.008	0.124	0.04
	FG	2219	3.88	1.35						
	NFG	5561	3.82	1.36						
CLASSPR2					4.657	7764	0.000	0.073	0.18	0.11
	FG	2216	4.50	1.06						
	NFG	5550	4.38	1.09						
CLASSPR3					-0.124	4282.12	0.901	-0.126	0.111	0.00
	FG	2228	6.90	2.38						
	NFG	5578	6.91	2.50						

Note. FG refers to first-generation and NFG refers to Non-first-generation students.

For learning outcome factor, a statistically significant finding was found for every item except for understanding the field of study (CTHINK4), other research skills (RSKILLS2), and ability to appreciate fine arts (CULTURA2). There were few items in

which first-generation students had significantly higher means such as library research skills (RSKILLS1), ability to appreciate and understand racial and ethnic diversity (CULTURA1), and ability to appreciate cultural and global diversity (CULTURA3) compared to non-first-generation students. Non-first-generation students reported higher means in five items which are analytical and critical thinking skills (CTHINK1), clear and effective writing (CTHINK2), read and comprehend academic material (CTHINK3), leadership skills (CTHINK5), and prepare and make a presentation (RSKILLS3). Cohen's effect size values of study variables ranged from d= 0.02 to d= 0.22 suggested low to moderate practical significance. The results can be found in Table 9.

Table 9

Independent Sample T-Test Results for Learning Outcomes by First-generation

								CI		
Variable	Group	N	Mean	SD	t	df	p	Lower	Upper	ES(d)
CTHINK1					-8.677	3808.47	0.000	-0.221	-0.14	0.22
	FG	2153	4.60	0.83						
	NFG	5448	4.78	0.79						
CTHINK2					-3.985	7598	0.000	-0.141	-0.048	0.10
	FG	2153	4.52	0.93						
	NFG	5447	4.61	0.94						
CTHINK3					-4.849	3865.92	0.000	-0.153	-0.065	0.13
	FG	2151	4.64	0.89						
	NFG	5431	4.75	0.87						
CTHINK4					-1.637	7597	0.102	-0.087	0.008	0.03
	FG	2149	4.77	0.96						
	NFG	5450	4.80	0.95						
CTHINK5					-6.177	3678.92	0.000	-0.218	-0.113	0.15
	FG	2157	4.62	1.08						
	NFG	5456	4.78	0.99						
RSKILLS1					3.592	7628	0.000	0.046	0.155	0.09

Table 9 Continued

Variable	Group	N	Mean	SD	t	df	p	CI Lower	CI Upper	ES(d)
	FG	2163	4.14	1.10						
	NFG	5467	4.04	1.11						
RSKILLS2					0.848	7611	0.396	-0.028	0.07	0.02
	FG	2160	4.26	0.98						
	NFG	5453	4.24	0.97						
RSKILLS3					-3.606	3754.66	0.000	-0.134	-0.04	0.08
	FG	2160	4.58	0.96						
	NFG	5451	4.66	0.91						
CULTURA1					5.766	4013.77	0.000	0.093	0.189	0.14
	FG	2163	4.95	0.96						
	NFG	5480	4.81	0.98						
CULTURA2					0.659	7646	0.510	-0.04	0.081	0.02
	FG	2166	4.53	1.21						
	NFG	5482	4.51	1.22						
CULTURA3					3.096	4092.42	0.002	0.029	0.131	0.08
	FG	2166	4.85	1.01						
	NFG	5482	4.77	1.04						

Note. FG refers to first-generation and NFG refers to Non-first-generation students.

In considering matriculation status, a statistically significant finding was found for every academic engagement item except for choosing challenging courses (ACADEMI2), helping a classmate when studying together (COLWORK3), and completing assigned course reading (CLASSPR3). As seen in Table 10, students who entered as transfer to college reported higher frequency than those who entered as a freshman for every significant item. These items were: contributing to a class discussion (ACADINV1), bringing up ideas from different courses (ACADINV2), asking insightful questions (ACADINV3), having a class in which the professor knew student name

(ACADINV4), interacting with faculty (ACADINV5), knowing professors well enough to ask for a letter of recommendation (ACADINV6), finding a course so interesting that they did more work than was required (ACADEMI1), seeking academic help from instructor (COLWORK1), working with classmates outside of class (COLWORK2), going to class completing assigned reading (CLASSPR1), and going to class prepared (CLASSPR2). Cohen's effect size values of study variables ranged from d= 0.02 to d= 0.40 suggested low to moderate practical significance.

Table 10

Independent Sample T-Test Results for Academic Engagement by Matriculation Status

								CI		
Variable	Group	N	Mean	SD	t	df	p	Lower	Upper	ES(d)
ACADINV1					-11.551	9405	0.000	-0.497	-0.352	0.32
	NT	7779	3.53	1.34						
	T	1628	3.96	1.37						
ACADINV2					-10.647	2360.85	0.000	-0.47	-0.324	0.29
	NT	7754	3.07	1.37						
	T	1631	3.47	1.37						
ACADINV3					-10.017	2295.75	0.000	-0.443	-0.298	0.28
	NT	7746	3.10	1.32						
	T	1621	3.47	1.36						
ACADINV4					-15.001	2494.63	0.000	-0.643	-0.495	0.40
	NT	7763	4.03	1.49						
	T	1624	4.60	1.37						
ACADINV5					-9.93	9386	0.000	-0.453	-0.303	0.27
	NT	7759	3.51	1.40						
	T	1629	3.89	1.39						

Table 10 Continued

Variable	Group	N	Mean	SD	t	df	p	CI Lower	CI Upper	ES(d)
ACADINV6					-12.516	7836	0.000	-0.544	-0.397	0.37
	NT	6460	1.46	1.26						
	T	1378	1.93	1.31						
ACADEMI1					-6.764	2291.63	0.000	-0.328	-0.181	0.19
	NT	7723	3.15	1.34						
	T	1616	3.41	1.38						
ACADEMI2					1.13	9390	0.258	-0.034	0.127	0.03
	NT	7764	3.46	1.50						
	T	1628	3.42	1.52						
COLWORK1					-2.241	8979	0.025	-0.17	-0.011	0.06
	NT	7414	3.65	1.45						
	T	1567	3.74	1.44						
COLWORK2					-2.733	8998	0.006	-0.188	-0.031	0.08
	NT	7428	4.18	1.44						
	T	1572	4.29	1.45						
COLWORK3					-1.612	2261.05	0.107	-0.135	0.013	0.04
	NT	7427	4.00	1.35						
	T	1574	4.06	1.37						
CLASSPR1					-4.582	2325.59	0.000	-0.242	-0.097	0.13
	NT	7428	3.79	1.36						
	T	1573	3.96	1.33						
CLASSPR2					-5.143	2364.45	0.000	-0.207	-0.093	0.14
	NT	7416	4.38	1.10						
	T	1567	4.53	1.04						
CLASSPR3					-0.996	8893	0.319	-0.203	0.066	0.02
	NT	7337	6.88	2.46						
	T	1558	6.94	2.46						

Note. T refers to transfer students and NT refers to non-transfer students.

There were statistically significant results between transfer and non-transfer students for seven items assessing learning outcomes. The results in Table 11 indicated that transfer students reported higher ability levels on clear and effective writing (CTHINK2), understanding the field of study (CTHINK4), leadership skills (CTHINK5), library research skills (RSKILLS1), other research skills (RSKILLS2), and prepare and make a presentation (RSKILLS3). Non-transfer students reported higher means than transfer students for only one item which was appreciating the fine arts (CULTURA2). Cohen's effect size values of study variables ranged from d= 0.01 to d= 0.24 suggested low to moderate practical significance.

Table 11

Independent Sample T-Test Results for Learning Outcomes by Matriculation Status

								CI		
Variable	Group	N	Mean	SD	t	df	p	Lower	Upper	ES(d)
CTHINK1					-0.348	2127.68	0.728	-0.053	0.037	0.01
	NT	6754	4.72	0.82						
	T	1429	4.73	0.79						
CTHINK2					-4.463	2142.94	0.000	-0.17	-0.066	0.13
	NT	6751	4.55	0.94						
	T	1430	4.67	0.90						
CTHINK3					-0.731	8159	0.465	-0.069	0.032	0.02
	NT	6738	4.71	0.88						
	T	1423	4.73	0.87						

Table 11 Continued

Variable	Group	N	Mean	SD	t	df	p	CI Lower	CI Upper	ES(d)
CTHINK4					-8.743	2238.28	0.000	-0.276	-0.175	0.24
	NT	6752	4.75	0.97						
	T	1426	4.97	0.87						
CTHINK5					-2.248	2117.98	0.025	-0.123	-0.008	0.07
	NT	6764	4.72	1.03						
	T	1430	4.79	1.00						
RSKILLS1					-7.282	8103	0.000	-0.298	-0.171	0.22
	NT	6690	4.02	1.11						
	T	1415	4.26	1.07						
RSKILLS2					-5.836	8084	0.000	-0.223	-0.111	0.17
	NT	6676	4.21	0.97						
	T	1410	4.38	0.98						
RSKILLS3					-5.859	2076.12	0.000	-0.209	-0.104	0.16
	NT	6672	4.61	0.92						
	T	1412	4.76	0.91						
CULTURA1					-1.561	8118	0.119	-0.101	0.011	0.05
	NT	6700	4.83	0.98						
	T	1420	4.88	0.97						
CULTURA2					2.76	8124	0.006	0.028	0.167	0.07
	NT	6706	4.52	1.21						
	T	1420	4.43	1.24						
CULTURA3					-0.375	8123	0.708	-0.071	0.048	0.01
	NT	6704	4.78	1.04						
	T	1421	4.79	1.04						

Note. T refers to transfer students and NT refers to non-transfer students.

To determine if academic engagement and learning outcomes related to ethnicity, a series of one-way ANOVA were conducted. For this analysis, four ethnicity groups were created, including White, Hispanic, African American, and other. American Indian students were added in "other" ethnicity category. The ANOVA results showed that the relationship between ethnicity and all academic engagement items was significant except for completed assigned reading in this academic year (CLASSPR3). Also, the strength of the relationship between ethnicity and study variables was assessed by η^2 (eta-squared) for every item. However, the η^2 s was very small ranging from 0.000 to 0.011. This indicated that ethnicity accounted for only 0-1% of the variance. Descriptive statistics and ANOVA results can be seen in Tables 12 and 13.

Table 12

Descriptive Statistics of Academic Engagement and Ethnicity

Variable	Group	N	Mean	SD
ACADINV1	White	5863	3.65	1.34
	Hispanic	1524	3.43	1.36
	African American	254	3.59	1.35
	Other	639	3.29	1.35
ACADINV2	White	5850	3.15	1.36
	Hispanic	1519	3.05	1.40
	African American	254	3.16	1.44
	Other	636	3.01	1.31
ACADINV3	White	5844	3.18	1.31
	Hispanic	1514	3.04	1.33
	African American	252	3.21	1.47
	Other	635	2.94	1.32

Table 12 Continued

Variable	Group	N	Mean	SD
ACADINV4	White	5851	4.15	1.48
	Hispanic	1521	3.98	1.52
	African American	255	4.20	1.46
	Other	637	3.91	1.48
ACADINV5	White	5855	3.64	1.39
	Hispanic	1523	3.33	1.42
	African American	254	3.52	1.54
	Other	633	3.26	1.36
ACADINV6	White	4898	1.58	1.30
	Hispanic	1243	1.39	1.22
	African American	209	1.53	1.26
	Other	550	1.36	1.22
ACADEMI1	White	5824	3.14	1.33
	Hispanic	1516	3.29	1.36
	African American	253	3.08	1.52
	Other	630	3.26	1.30
ACADEMI2	White	5859	3.45	1.50
	Hispanic	1518	3.50	1.52
	African American	253	3.29	1.63
	Other	634	3.60	1.48
COLWORK1	White	5599	3.62	1.45
	Hispanic	1444	3.70	1.46
	African American	246	3.99	1.51
	Other	614	3.64	1.46
COLWORK2	White	5609	4.25	1.41
	Hispanic	1447	4.13	1.44
	African American	247	4.13	1.56
	Other	614	4.15	1.50

Table 12 Continued

Variable	Group	N	Mean	SD
COLWORK3	White	5605	4.05	1.32
	Hispanic	1449	3.97	1.35
	African American	247	3.86	1.53
	Other	616	3.96	1.36
CLASSPR1	White	5605	3.78	1.36
	Hispanic	1450	3.89	1.32
	African American	247	3.79	1.38
	Other	616	3.85	1.35
CLASSPR2	White	5599	4.36	1.08
	Hispanic	1449	4.49	1.09
	African American	247	4.42	1.21
	Other	613	4.36	1.15
CLASSPR3	White	5541	6.85	2.54
	Hispanic	1435	6.98	2.27
	African American	243	6.94	2.27
	Other	610	6.82	2.43

Table 13

Analysis of Variance Results for Academic Engagement and Ethnicity

		Sum of Squares	df	Mean Square	F	p	η^2
ACADINV1	Between	115.379	3	38.46	21.211	0.000	0.008
	Within	15006.3	8276	1.813			
	Total	15121.7	8279				
ACADINV2	Between	21.645	3	7.215	3.854	0.009	0.001
	Within	15453.9	8255	1.872			
	Total	15475.5	8258				
ACADINV3	Between	49.122	3	16.374	9.396	0.000	0.003
	Within	14361.1	8241	1.743			
	Total	14410.2	8244				

Table 13 Continued

		Sum of Squares	df	Mean Square	F	p	η^2
ACADINV4	Between	63.073	3	21.024	9.559	0.000	0.003
	Within	18167.6	8260	2.199			
	Total	18230.6	8263				
ACADINV5	Between	178.206	3	59.402	30.525	0.000	0.011
	Within	16075.8	8261	1.946			
	Total	16254	8264				
ACADINV6	Between	52.773	3	17.591	10.771	0.000	0.005
	Within	11262.3	6896	1.633			
	Total	11315	6899				
ACADEMI1	Between	33.485	3	11.162	6.195	0.000	0.002
	Within	14807.9	8219	1.802			
	Total	14841.4	8222				
ACADEMI2	Between	23.534	3	7.845	3.457	0.016	0.001
	Within	18743.4	8260	2.269			
	Total	18767	8263				
COLWORK1	Between	38.34	3	12.78	6.061	0.000	0.002
	Within	16655	7899	2.108			
	Total	16693.3	7902				
COLWORK2	Between	22.403	3	7.468	3.65	0.012	0.001
	Within	16190.3	7913	2.046			
	Total	16212.7	7916				
COLWORK3	Between	16.321	3	5.44	3.041	0.028	0.001
	Within	14154.4	7913	1.789			
	Total	14170.8	7916				
CLASSPR1	Between	15.662	3	5.221	2.84	0.036	0.001
	Within	14548	7914	1.838			
	Total	14563.6	7917				

Table 13 Continued

		Sum of Squares	df	Mean Square	F	p	η^2
CLASSPR2	Between	20.216	3	6.739	5.696	0.001	0.002
	Within	9350.85	7904	1.183			
	Total	9371.07	7907				
CLASSPR3	Between	22.692	3	7.564	1.237	0.295	0.000
	Within	47866	7825	6.117			
	Total	47888.7	7828				

Follow-up tests were conducted to evaluate pairwise differences among the means of academic engagement items. If Levene's test of equality of error variances was not significant, it was assumed that variances were homogeneous and post hoc comparisons were conducted by using the Tukey HSD test. If Levene's test of equality of error variances was significant, it was assumed that variances were not homogeneous and thus post hoc comparisons were conducted with the use of the Games-Howell test. The significant group differences for every item can be seen in Table 14. Overall, White students reported a higher level of engagement than other groups. For instance, the mean level of contributing to a class discussion (ACADINV1) for White students (M=3.65) was significantly higher than Hispanic (M=3.43) and other (M=3.59) students. Similarly, the mean amount of contributing to a class discussion for African American students (M= 3.59) was significantly higher than other (M=3.29) group.

Table 14

Post-hoc Comparisons for Academic Engagement and Ethnicity

Variable	Group	N	Mean	2	3	4
ACADINV1	1White	5863	3.65	*		*
	2Hispanic	1524	3.43			
	3African A.	254	3.59			*
	4Other	639	3.29			
ACADINV2	1White	5850	3.15			*
	2Hispanic	1519	3.05			
	3African A.	254	3.16			
	4Other	636	3.01			
ACADINV3	1White	5844	3.18	*		*
	2Hispanic	1514	3.04			
	3African A.	252	3.21			
	4Other	635	2.94			
ACADINV4	1White	5851	4.15	*		*
	2Hispanic	1521	3.98			
	3African A.	255	4.20			*
	4Other	637	3.91			
ACADINV5	1White	5855	3.64	*		*
	2Hispanic	1523	3.33			
	3African A.	254	3.52			
	4Other	633	3.26			
ACADINV6	1White	4898	1.58	*		*
	2Hispanic	1243	1.39			
	3African A.	209	1.53			
	4Other	550	1.36			

Table 14 Continued

Variable	Group	N	Mean	2	3	4
ACADEMI1	1White	5824	3.14	*		
	2Hispanic	1516	3.29			
	3African A.	253	3.08			
	4Other	630	3.26			
ACADEMI2	1White	5859	3.45			
	2Hispanic	1518	3.50			
	3African A.	253	3.29			*
	4Other	634	3.60			
COLWORK1	1White	5599	3.62		*	
	2Hispanic	1444	3.70			
	3African American	246	3.99			
	4Other	614	3.64			
COLWORK2	1White	5609	4.25	*		
	2Hispanic	1447	4.13			
	3African A.	247	4.13			
	4Other	614	4.15			
CLASSPR1	1White	5605	3.78	*		
	2Hispanic	1450	3.89			
	3African A.	247	3.79			
	4Other	616	3.85			
CLASSPR2	1White	5599	4.36	*		
	2Hispanic	1449	4.49			
	3African A.	247	4.42			
	4Other	613	4.36			

Note. *p<.05

The one-way ANOVA results showed statistically significant relationships existed between all of the learning outcomes items except for other research skills (RSKILLS2). The strength of the relationship between ethnicity and study variables, which was assessed by η^2, was very small. This indicated that ethnicity accounted for a small amount of the variance. Descriptive statistics and the ANOVA results can be found in Tables 15 and 16.

Table 15

Descriptive Statistics of Learning Outcomes and Ethnicity

Variable	Group	N	Mean	SD
CTHINK1	White	5099	4.79	0.79
	Hispanic	1315	4.59	0.85
	African American	218	4.58	0.82
	Other	571	4.54	0.87
CTHINK2	White	5101	4.62	0.93
	Hispanic	1314	4.46	0.98
	African American	218	4.56	0.90
	Other	570	4.38	0.94
CTHINK3	White	5083	4.78	0.87
	Hispanic	1311	4.63	0.90
	African American	218	4.55	0.96
	Other	571	4.48	0.91
CTHINK4	White	5097	4.85	0.92
	Hispanic	1315	4.68	1.01
	African American	218	4.50	0.97
	Other	571	4.55	1.01

Table 15 Continued

Variable	Group	N	Mean	SD
CTHINK5	White	5110	4.82	0.98
	Hispanic	1315	4.55	1.09
	African American	218	4.62	1.15
	Other	572	4.51	1.07
RSKILLS1	White	5059	4.02	1.11
	Hispanic	1291	4.13	1.08
	African American	215	4.04	1.19
	Other	572	4.04	1.09
RSKILLS2	White	5050	4.25	0.97
	Hispanic	1285	4.24	0.98
	African American	215	4.18	1.04
	Other	570	4.15	1.03
RSKILLS3	White	5050	4.68	0.90
	Hispanic	1289	4.55	0.96
	African American	215	4.63	1.04
	Other	566	4.42	1.00
CULTURA1	White	5065	4.74	0.98
	Hispanic	1297	5.07	0.91
	African American	216	5.20	0.99
	Other	572	4.96	0.98
CULTURA2	White	5068	4.46	1.23
	Hispanic	1297	4.69	1.19
	African American	216	4.59	1.19
	Other	573	4.57	1.13

Table 15 Continued

Variable	Group	N	Mean	SD
CULTURA3	White	5068	4.69	1.04
	Hispanic	1297	5.02	0.97
	African American	216	5.03	1.02
	Other	573	4.93	0.98

Table 16

Analysis of Variance Results for Learning Outcomes and Ethnicity

		Sum of Squares	df	Mean Square	F	p	η^2
CTHINK1	Between	68.698	3	22.899	34.896	0.000	0.014
	Within	4724.144	7199	0.656			
	Total	4792.841	7202				
CTHINK2	Between	50.699	3	16.9	19.158	0.000	0.008
	Within	6350.575	7199	0.882			
	Total	6401.274	7202				
CTHINK3	Between	64.701	3	21.567	27.932	0.000	0.012
	Within	5543.044	7179	0.772			
	Total	5607.745	7182				
CTHINK4	Between	84.708	3	28.236	31.561	0.000	0.013
	Within	6438.796	7197	0.895			
	Total	6523.504	7200				
CTHINK5	Between	108.14	3	36.047	35.208	0.000	0.014
	Within	7382.86	7211	1.024			
	Total	7491	7214				
RSKILLS1	Between	12.995	3	4.332	3.526	0.014	0.001
	Within	8764.278	7133	1.229			
	Total	8777.273	7136				
RSKILLS2	Between	4.983	3	1.661	1.741	0.156	0.001

Table 16 Continued

		Sum of Squares	df	Mean Square	F	p	η^2
	Within	6788.612	7116	0.954			
	Total	6793.596	7119				
RSKILLS3	Between	44.435	3	14.812	17.418	0.000	0.001
	Within	6051.306	7116	0.85			
	Total	6095.74	7119				
CULTURA1	Between	157.008	3	52.336	55.618	0.000	0.023
	Within	6724.27	7146	0.941			
	Total	6881.278	7149				
CULTURA2	Between	58.172	3	19.391	13.215	0.000	0.005
	Within	10491.27	7150	1.467			
	Total	10549.442	7153				
CULTURA3	Between	138.952	3	46.317	44.189	0.000	0.018
	Within	7494.355	7150	1.048			
	Total	7633.307	7153				

Table 17 shows the pairwise differences among the means of learning outcomes' items. Overall, White students reported higher ability levels than other ethnicity groups. For instance, the mean amount of analytical and critical thinking skills (CTHINK1) for White students (M= 4.79) was significantly higher than Hispanic (M=4.59), African American (M= 4.58), and other (M=4.54) students. All of the group differences for each item can be interpreted from Table 17 as well.

Table 17

Post-hoc Comparisons for Learning Outcomes and Ethnicity

Variable	Group	N	Mean	2	3	4
CTHINK1	1White	5099	4.79	*	*	*
	2Hispanic	1315	4.59			
	3African A.	218	4.58			
	4Other	571	4.54			
CTHINK2	1White	5101	4.62	*		*
	2Hispanic	1314	4.46			
	3African A.	218	4.56			
	4Other	570	4.38			
CTHINK3	1White	5083	4.78	*	*	*
	2Hispanic	1311	4.63			*
	3African A.	218	4.55			
	4Other	571	4.48			
CTHINK4	1White	5097	4.85	*	*	*
	2Hispanic	1315	4.68		*	
	3African A.	218	4.50			
	4Other	571	4.55			
CTHINK5	1White	5110	4.82	*		*
	2Hispanic	1315	4.55			
	3African A.	218	4.62			
	4Other	572	4.51			
RSKILLS1	1White	5059	4.02	*		
	2Hispanic	1291	4.13			
	3African A.	215	4.04			
	4Other	572	4.04			

Table 17 Continued

Variable	Group	N	Mean	2	3	4
RSKILLS3	1White	5050	4.68	*		*
	2Hispanic	1289	4.55			
	3African A.	215	4.63			
	4Other	566	4.42			
CULTURA1	1White	5065	4.74	*	*	*
	2Hispanic	1297	5.07			
	3African A.	216	5.20			*
	4Other	572	4.96			
CULTURA2	1White	5068	4.46	*		
	2Hispanic	1297	4.69			
	3African A.	216	4.59			
	4Other	573	4.57			
CULTURA3	1White	5068	4.69	*	*	*
	2Hispanic	1297	5.02			
	3African A.	216	5.03			
	4Other	573	4.93			

Note. *p<.05

To determine if academic engagement and learning outcomes related to social class, a series of one-way ANOVA were conducted. For social class, three groups were created which involves low-income, middle class, and upper-middle. Working class level was added to low-income, and wealthy level was added to upper-middle group. The ANOVA showed a significant relationship between social class and bringing up

ideas or concepts from different courses (ACADINV2), asking insightful questions (ACADINV3), interacting with faculty (ACADINV5), finding a course so interesting that they did more work (ACADEMI1), choosing challenging courses (ACADEMI2), working on class projects with classmates outside of class (COLWORK2), helping a classmate when studying together (COLWORK3), and going to class prepared (CLASSPR2). The strength of the relationship between social class and study variables was also assessed by η^2 for every item. However, the η^2 s was very small. This indicated that social class accounted for a small magnitude of the variance. Descriptive statistics and ANOVA results can be seen in Tables 18 and 19.

Table 18

Descriptive Statistics of Academic Engagement and Social Class

Variable	Group	N	Mean	SD
ACADINV1	Low-income	1771	3.67	1.39
	Middle-class	3392	3.62	1.33
	Upper-middle	2604	3.66	1.36
ACADINV2	Low-income	1761	3.26	1.41
	Middle-class	3389	3.15	1.35
	Upper-middle	2602	3.14	1.37
ACADINV3	Low-income	1762	3.23	1.37
	Middle-class	3384	3.14	1.30
	Upper-middle	2599	3.22	1.34
ACADINV4	Low-income	1768	4.17	1.52
	Middle-class	3387	4.19	1.45
	Upper-middle	2605	4.16	1.48

Table 18 Continued

Variable	Group	N	Mean	SD
ACADINV5	Low-income	1767	3.57	1.44
	Middle-class	3395	3.57	1.39
	Upper-middle	2598	3.69	1.40
ACADINV6	Low-income	1772	1.52	1.27
	Middle-class	3410	1.56	1.29
	Upper-middle	2610	1.56	1.29
ACADEMI1	Low-income	1760	3.33	1.36
	Middle-class	3367	3.19	1.32
	Upper-middle	2586	3.18	1.35
ACADEMI2	Low-income	1766	3.56	1.52
	Middle-class	3391	3.43	1.48
	Upper-middle	2606	3.49	1.52
COLWORK1	Low-income	1766	3.66	1.47
	Middle-class	3389	3.63	1.43
	Upper-middle	2609	3.67	1.47
COLWORK2	Low-income	1769	4.07	1.49
	Middle-class	3401	4.20	1.45
	Upper-middle	2608	4.30	1.39
COLWORK3	Low-income	1770	3.91	1.40
	Middle-class	3407	3.97	1.34
	Upper-middle	2606	4.12	1.32
CLASSPR1	Low-income	1769	3.85	1.37
	Middle-class	3402	3.86	1.32
	Upper-middle	2606	3.78	1.38
CLASSPR2	Low-income	1766	4.43	1.12
	Middle-class	3394	4.45	1.07
	Upper-middle	2603	4.36	1.08

Table 18 Continued

Variable	Group	N	Mean	SD
CLASSPR3	Low-income	1775	6.86	2.44
	Middle-class	3415	6.91	2.46
	Upper-middle	2613	6.94	2.49

Table 19

Analysis of Variance Results for Academic Engagement and Social Class

		Sum of Squares	df	Mean Square	F	p	η^2
ACADINV1	Between	4.833	2	2.416	1.317	0.268	0.000
	Within	14246.080	7764	1.835			
	Total	14250.913	7766				
ACADINV2	Between	18.109	2	9.054	4.802	0.008	0.001
	Within	14610.222	7749	1.885			
	Total	14628.331	7751				
ACADINV3	Between	12.908	2	6.454	3.641	0.026	0.000
	Within	13724.375	7742	1.773			
	Total	13737.283	7744				
ACADINV4	Between	1.569	2	0.784	0.360	0.698	0.000
	Within	16887.573	7757	2.177			
	Total	16889.142	7759				
ACADINV5	Between	26.930	2	13.465	6.825	0.001	0.001
	Within	15303.982	7757	1.973			
	Total	15330.912	7759				
ACADINV6	Between	2.085	2	1.042	0.631	0.532	0.000
	Within	12876.843	7789	1.653			
	Total	12878.928	7791				
ACADEMI1	Between	29.562	2	14.781	8.201	0.000	0.002
	Within	13896.765	7710	1.802			

Table 19 Continued

		Sum of Squares	df	Mean Square	F	p	η^2
	Total	13926.328	7712				
ACADEMI2	Between	17.246	2	8.623	3.826	0.022	0.000
	Within	17488.469	7760	2.254			
	Total	17505.715	7762				
COLWORK1	Between	2.743	2	1.371	0.650	0.522	0.000
	Within	16384.807	7761	2.111			
	Total	16387.550	7763				
COLWORK2	Between	59.635	2	29.817	14.450	0.000	0.004
	Within	16043.409	7775	2.063			
	Total	16103.043	7777				
COLWORK3	Between	57.738	2	28.869	15.928	0.000	0.004
	Within	14101.066	7780	1.812			
	Total	14158.805	7782				
CLASSPR1	Between	10.377	2	5.188	2.833	0.059	0.000
	Within	14237.650	7774	1.831			
	Total	14248.027	7776				
CLASSPR2	Between	13.532	2	6.766	5.767	0.003	0.001
	Within	9104.786	7760	1.173			
	Total	9118.319	7762				
CLASSPR3	Between	6.909	2	3.454	0.569	0.566	0.000
	Within	47359.292	7800	6.072			
	Total	47366.201	7802				

Follow-up tests were conducted to evaluate pairwise differences among the means of academic engagement. Overall, there were significant differences between low-income students and other groups. For instance, the mean amount of bringing up

ideas or concepts from different courses during class discussions (ACADINV2) for low-income students (M=3.26) was significantly higher than middle-class students (M=3.15) and upper-middle students (M=3.14). The significant group differences for every item can be seen in Table 20.

Table 20

Post-hoc Comparisons for Academic Engagement and Social Class

		N	Mean	2	3
ACADINV2	1Low-income	1761	3.26	*	*
	2Middle-class	3389	3.15		
	3Upper-middle	2602	3.14		
ACADINV5	1Low-income	1767	3.57		*
	2Middle-class	3395	3.57		*
	3Upper-middle	2598	3.69		
ACADEMI1	1Low-income	1760	3.33	*	*
	2Middle-class	3367	3.19		
	3Upper-middle	2586	3.18		
ACADEMI2	1Low-income	1766	3.56	*	
	2Middle-class	3391	3.43		
	3Upper-middle	2606	3.49		
COLWORK2	1Low-income	1769	4.07	*	*
	2Middle-class	3401	4.20		*
	3Upper-middle	2608	4.30		
COLWORK3	1Low-income	1770	3.91		*
	2Middle-class	3407	3.97		*
	3Upper-middle	2606	4.12		

Table 20 Continued

		N	Mean	2	3
CLASSPR2	1Low-income	1766	4.43		
	2Middle-class	3394	4.45		*
	3Upper-middle	2603	4.36		

Note. *p<.05

Finally, for learning outcomes and social class, a statistically significant result was found for every item except for other research skills (RSKILLS2). The strength of the relationship between social class and study variables was also assessed by η^2 for every item. However, the η^2 s was very small. This indicated that social class accounted for a small magnitude of the variance. The descriptive statistics and ANOVA results can be seen in Table 21 and 22.

Table 21

Descriptive Statistics of Learning Outcomes and Social Class

Variable	Group	N	Mean	SD
CTHINK1	Low-income	1727	4.60	0.86
	Middle-class	3322	4.71	0.79
	Upper-middle	2548	4.85	0.77
CTHINK2	Low-income	1724	4.49	0.96
	Middle-class	3324	4.57	0.91
	Upper-middle	2548	4.66	0.94

Table 21 Continued

Variable	Group	N	Mean	SD
CTHINK3	Low-income	1722	4.61	0.92
	Middle-class	3316	4.71	0.85
	Upper-middle	2540	4.81	0.86
CTHINK4	Low-income	1723	4.72	1.00
	Middle-class	3322	4.79	0.94
	Upper-middle	2550	4.85	0.93
CTHINK5	Low-income	1729	4.60	1.09
	Middle-class	3326	4.71	1.01
	Upper-middle	2554	4.85	0.98
RSKILLS1	Low-income	1735	4.16	1.11
	Middle-class	3333	4.08	1.09
	Upper-middle	2558	4.00	1.12
RSKILLS2	Low-income	1730	4.26	1.01
	Middle-class	3328	4.22	0.96
	Upper-middle	2551	4.26	0.97
RSKILLS3	Low-income	1732	4.57	0.99
	Middle-class	3324	4.62	0.91
	Upper-middle	2551	4.71	0.90
CULTURA1	Low-income	1735	4.98	0.98

Table 21 Continued

Variable	Group	N	Mean	SD
CULTURA1	Low-income	1735	4.98	0.98
	Middle-class	3340	4.85	0.95
	Upper-middle	2564	4.76	1.00
CULTURA2	Low-income	1737	4.57	1.22
	Middle-class	3339	4.51	1.20
	Upper-middle	2568	4.47	1.23
CULTURA3	Low-income	1737	4.88	1.03
	Middle-class	3339	4.78	1.01
	Upper-middle	2568	4.74	1.06

Table 22

Analysis of Variance Results for Learning Outcomes and Social Class

		Sum of Squares	df	Mean Square	F	p	η^2
CTHINK1	Between	68.615	2	34.308	53.502	0.000	0.013
	Within	4869.549	7594	0.641			
	Total	4938.164	7596				
CTHINK2	Between	29.661	2	14.831	17.056	0.000	0.004
	Within	6602.422	7593	0.870			
	Total	6632.083	7595				
CTHINK3	Between	39.828	2	19.914	26.232	0.000	0.007
	Within	5750.602	7575	0.759			
	Total	5790.430	7577				
CTHINK4	Between	18.745	2	9.372	10.418	0.000	0.002

Table 22 Continued

		Sum of Squares	df	Mean Square	F	p	η^2
	Within	6830.126	7592	0.900			
	Total	6848.871	7594				
CTHINK5	Between	66.065	2	33.033	31.978	0.000	0.008
	Within	7856.736	7606	1.033			
	Total	7922.802	7608				
RSKILLS1	Between	23.996	2	11.998	9.872	0.000	0.002
	Within	9264.891	7623	1.215			
	Total	9288.887	7625				
RSKILLS2	Between	2.578	2	1.289	1.352	0.259	0.000
	Within	7247.772	7606	0.953			
	Total	7250.350	7608				
RSKILLS3	Between	21.703	2	10.852	12.726	0.000	0.003
	Within	6484.272	7604	0.853			
	Total	6505.975	7606				
CULTURA1	Between	48.648	2	24.324	25.849	0.000	0.007
	Within	7185.618	7636	0.941			
	Total	7234.266	7638				
CULTURA2	Between	10.762	2	5.381	3.657	0.026	0.000
	Within	11243.248	7641	1.471			
	Total	11254.010	7643				
CULTURA3	Between	22.584	2	11.292	10.614	0.000	0.003
	Within	8129.240	7641	1.064			
	Total	8151.824	7643				

Follow-up tests were conducted to evaluate the pairwise differences among the means. Overall, low-income students reported lower ability levels on critical thinking and communication items and higher ability levels on cultural appreciation items. For

instance, the mean amount of analytical and critical thinking skills (CTHINK1) for low-income (M=4.60) was significantly lower than middle class (M=4.71), and upper-middle class (M=4.85). The results of comparisons for every item can be found in Table 23.

Table 23

Post-hoc Comparisons for Learning Outcomes and Social Class

Variable	Group	N	Mean	2	3
CTHINK1	1Low-income	1727	4.60	*	*
	2Middle-class	3322	4.71		*
	3Upper-middle	2548	4.85		
CTHINK2	1Low-income	1724	4.49	*	*
	2Middle-class	3324	4.57		*
	3Upper-middle	2548	4.66		
CTHINK3	1Low-income	1722	4.61	*	*
	2Middle-class	3316	4.71		*
	3Upper-middle	2540	4.81		
CTHINK4	1Low-income	1723	4.72	*	*
	2Middle-class	3322	4.79		*
	3Upper-middle	2550	4.85		
CTHINK5	1Low-income	1729	4.60	*	*
	2Middle-class	3326	4.71		*
	3Upper-middle	2554	4.85		
RSKILLS1	1Low-income	1735	4.16	*	*
	2Middle-class	3333	4.08		*
	3Upper-middle	2558	4.00		

Table 23 Continued

Variable	Group	N	Mean	2	3
RSKILLS3	1Low-income	1732	4.57		*
	2Middle-class	3324	4.62		*
	3Upper-middle	2551	4.71		
CULTURA1	1Low-income	1735	4.98	*	*
	2Middle-class	3340	4.85		*
	3Upper-middle	2564	4.76		
CULTURA2	1Low-income	1737	4.57		*
	2Middle-class	3339	4.51		
	3Upper-middle	2568	4.47		
CULTURA3	1Low-income	1737	4.88	*	*
	2Middle-class	3339	4.78		
	3Upper-middle	2568	4.74		

Note. *p<.05

Research Question Two and Three

Confirmatory Factor Analysis Findings

The exogenous and endogenous models were first tested separately to evaluate how well the observed indicators relate to their latent variable by using the maximum likelihood estimation method. For exogenous model, two CFA models were employed based on academic engagement and cognitive strategies constructs. A 4-factor model was estimated by using Mplus7 in which the academic involvement, academic initiative, collaborative work, and class preparation latent variables were included. Figure 5

illustrates the CFA model, latent constructs and the underlying observed items for academic engagement construct.

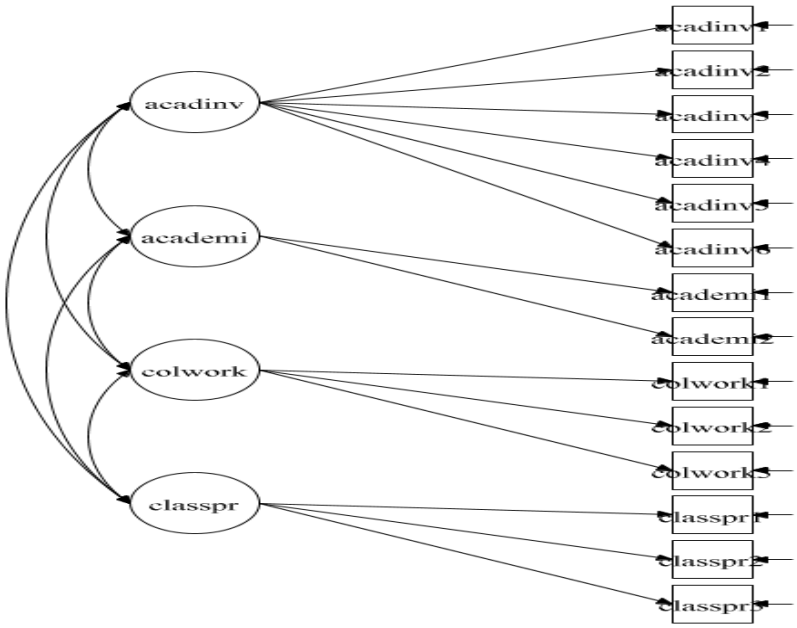

Figure 5. Measurement Model of Academic Engagement

All items in the model significantly contributed to the latent constructs they measured, as one item had a factor loading of 0.47 and the rest item factor loadings were above 0.53. The R^2s of observed variables ranged from .22 to .75. Moreover, the model fit indices indicated a good fit with the data, $\chi^2 = 3489.84$; $df = 71$; $p < .001$; CFI = .94; TLI = .92; RMSEA = .07, and SRMR = .05.

A 2-factor model was estimated by using Mplus 7 in which the elaboration and critical reasoning latent variables were included. Figure 6 illustrates the CFA model, latent constructs and the underlying observed items for cognitive strategies construct. All items in the model significantly contributed to the latent constructs they measured, as all item factor loadings were above .71. The R^2s of observed variables ranged from .22 to

.75. Moreover, the model fit indices indicated a good fit with the data, $\chi^2 = 624.59$; $df = 13$; $p < .001$; CFI = .98; TLI = .97; RMSEA = .07, and SRMR = .02.

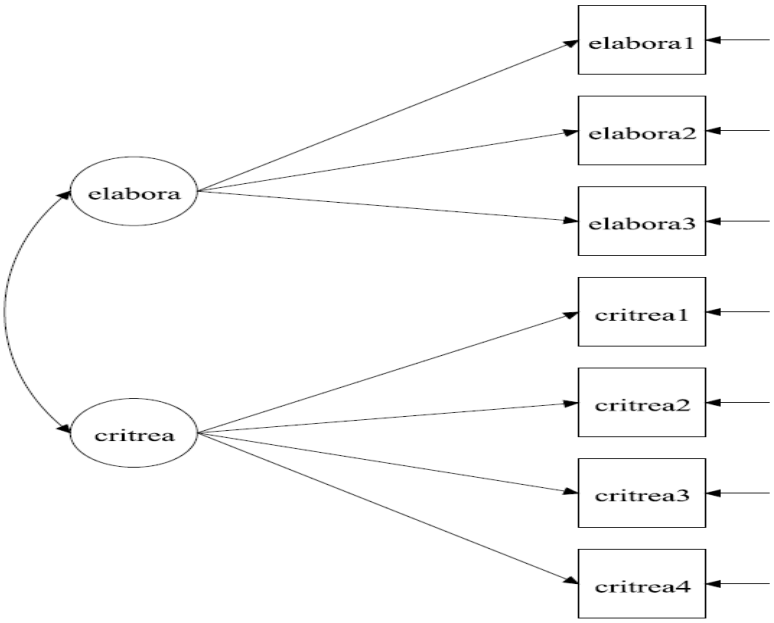

Figure 6. Measurement Model of Cognitive Strategies

For the endogenous factor, a 3-factor model was estimated by using M plus7. The endogenous model included the critical thinking, research skills, and cultural appreciation latent variables. Figure 7 illustrates the CFA model, latent constructs and the underlying observed items. All items in the model significantly contributed to the latent constructs they measured, as all item factor loadings were above 0.53. The R^2s of observed variables ranged from .22 to .75. Moreover, the model fit indices indicated a good fit with the data, $\chi^2 = 1817.59$; $df = 41$; $p < .001$; CFI = .95; TLI = .93; RMSEA = .07, and SRMR = .04. In the figures, the straight single-headed arrows indicate the factor loadings of the observed variables on the latent variable, and the double-headed arrows

show the covariance among latent constructs. Overall, the examination of the goodness-of-fit indices suggests the models fit the data well. Consequently, all 21 items as indicators of the three latent constructs were used to test SEM models.

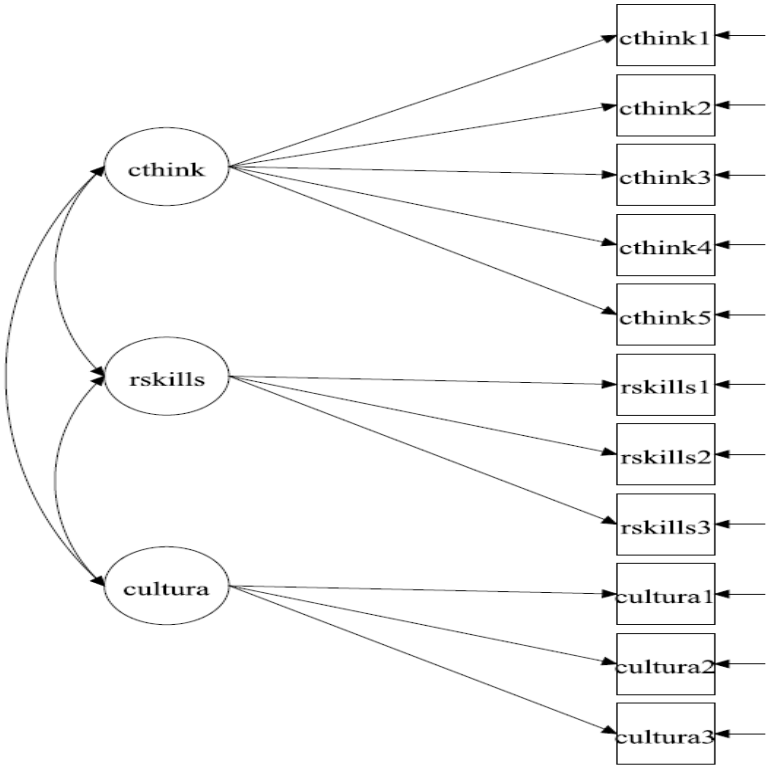

Figure 7. Measurement Model of Learning Outcomes

Structural Equation Modeling

Based on the conclusions found in prior research, the structural model was analyzed for every single learning outcomes factor separately. Figure 8 illustrates that the six latent variables predicted critical thinking latent variable and standardized estimates for the observed indicators.

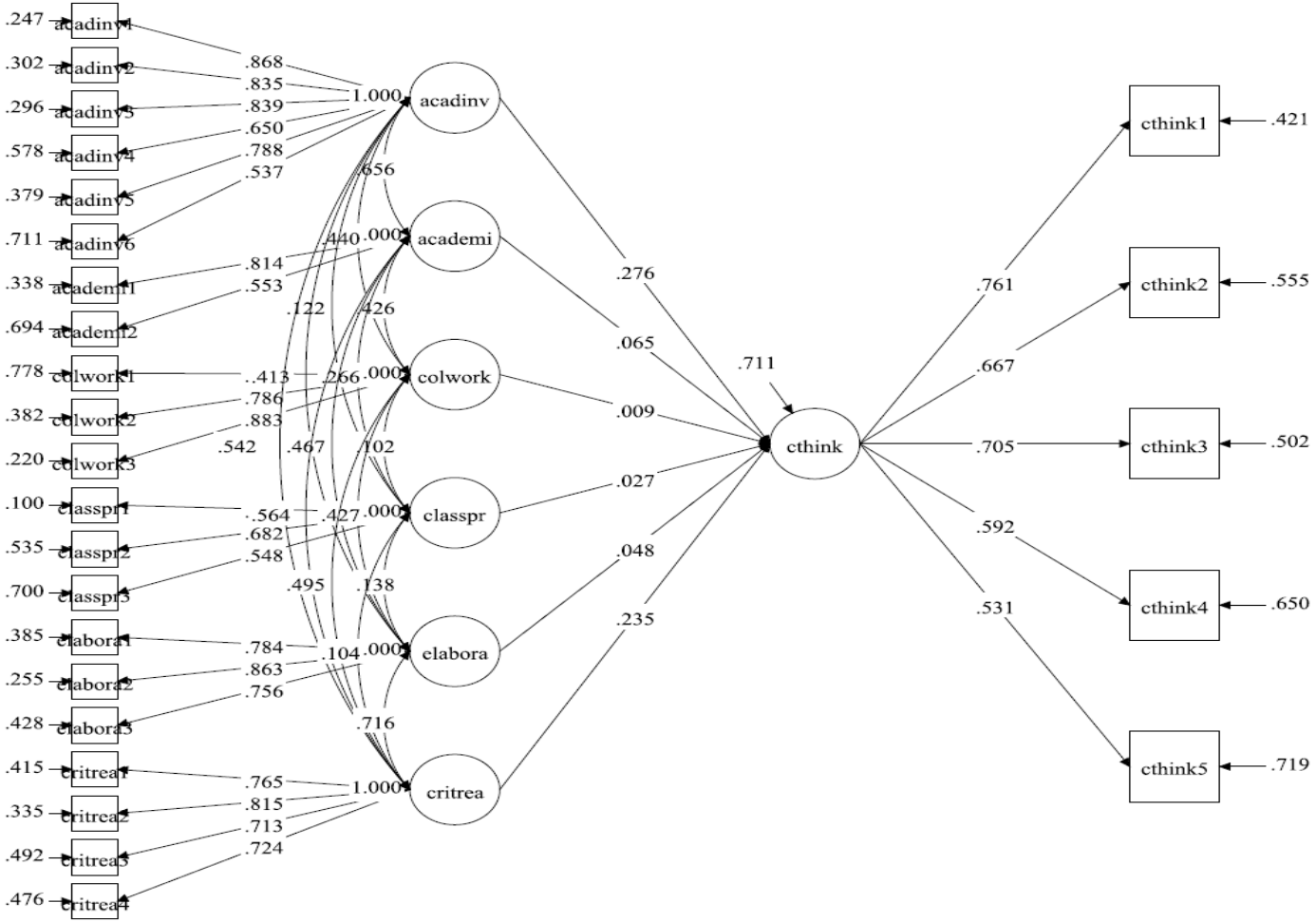

Figure 8. Structural Model 1 with Standardized Estimates

Note: Model Fit Indices CFI = .93, TLI = .92, RMSEA = .05, and SRMR = .05.

Specifically, the researcher hypothesized that academic involvement, academic initiative, collaborative work, class preparation, elaboration, and critical reasoning would positively predict variability in critical thinking skills. The model yielded a statistically significant Chi-square, $\chi^2 = 7152.55$; $df = 278$; $p < .001$. The fit indices were CFI = .93; TLI = .92; RMSEA = .05, and SRMR = .05, which are an indicators of good model fit. The standardized regression coefficients among the latent variables for the structural portion of the model were illustrated in Figure 9.

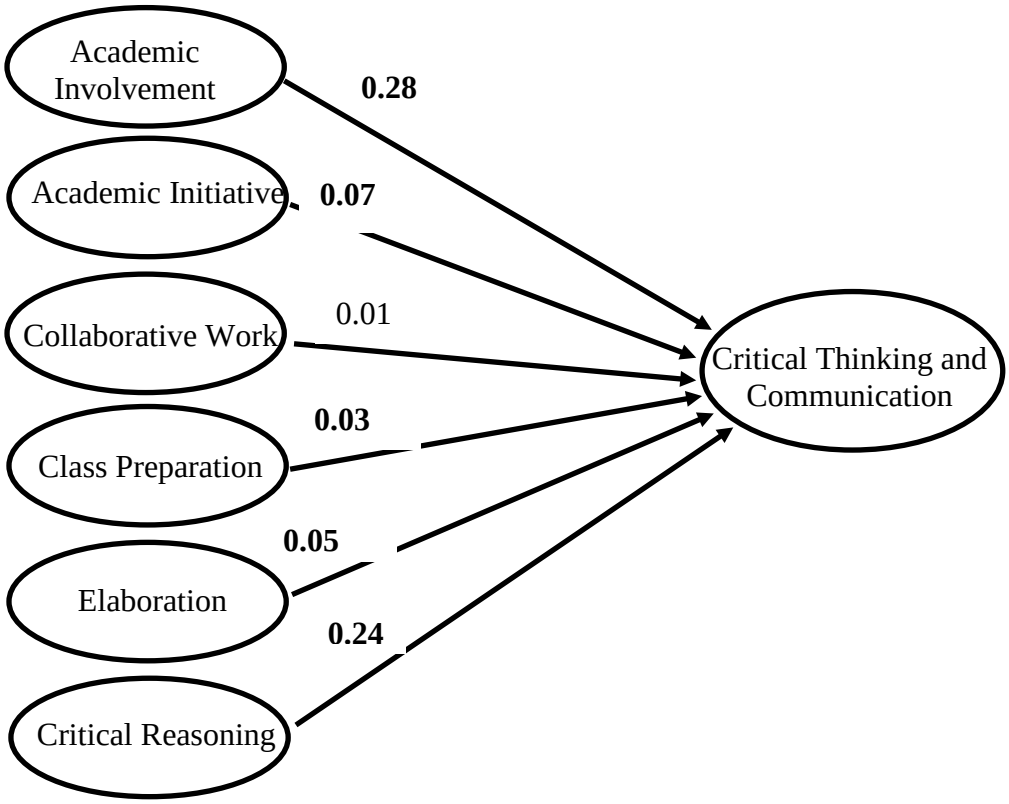

Figure 9. Structural Model 1 with Standardized Path Coefficients
Note: The bolded values indicate significant relationships.

Squared multiple correlations were also examined to measure the amount of variance estimated by the predictors of the dependent variable. The effect of academic involvement on critical thinking and communication was statistically significant and positive ($\beta = .28$, $t= 15.36$, $p<.001$, $R^2 =.08$), indicating that the academic involvement latent variable explained 8% of the variance in critical thinking and communication. The effect of academic initiative on critical thinking and communication was statistically significant and positive ($\beta = .06$, $t= 2.88$, $p<.001$, $R^2 =.004$), indicating that the academic involvement latent variable explained .4% of the variance in critical thinking and communication, which is very small in magnitude. The effect of class preparation on critical thinking and communication was statistically significant and positive ($\beta = .03$, $t= 2.19$, $p<.001$, $R^2 =.001$), indicating that the class preparation latent variable explained .1% of the variance in critical thinking and communication which was also very small. The effect of elaboration on critical thinking and communication was statistically significant and positive ($\beta = .05$, $t= 2.46$, $p<.001$, $R^2 =.003$), indicating that the elaboration latent variable explained %3 of the variance in critical thinking and communication. Similarly, the effect of critical reasoning on critical thinking and communication was statistically significant and positive ($\beta = .24$, $t= 10.36$, $p<.001$, $R^2 =.06$), indicating that the critical reasoning latent variable explained 6% of the variance in critical thinking and communication. However, the collaborative work construct had a non-significant effect on critical thinking and communication. ($\beta = .01$, $t= .58$). Taken together, academic engagement and cognitive strategies explained 29% of the variance in the critical thinking and communication outcome ($R^2 =.29$). The standardized results

revealed that all items yielded coefficients above 0.47. All estimates were significant ($p<.001$) and exhibited small to large effect sizes ranging from 0.22 to 0.75. Figure 10 illustrates that the six latent variables predicted research skills and standardized estimates for the observed indicators. Specifically, the researcher hypothesized that academic involvement, academic initiative, collaborative work, class preparation, elaboration, and critical reasoning would positively predict variability in research skills. The model yielded statistically significant Chi-square, $\chi^2 = 6247.075$; $df = 231$; $p < .001$. The fit indices were CFI = .94; TLI = .93; RMSEA = .05, and SRMR = .05, which are an indicator of good model fit. The standardized regression coefficients among the latent variables for the structural portion of the model were illustrated in Figure 11.

Squared multiple correlations were also examined to measure the amount of variance estimated by the predictors of the dependent variable. The effect of academic involvement on research skills was statistically significant and positive ($\beta = 0.17$, $t = 8.83$, $p<.001$, $R^2 = 0.03$), indicating that the academic involvement latent variable explained 3% of the variance in research skills. The effect of academic initiative on research skills was statistically significant and positive ($\beta = 0.13$, $t = 5.61$, $p<.001$, $R^2 = 0.02$), indicating that the academic involvement latent variable explained 2% of the variance in research skills. The effect of class preparation on research skills was statistically significant and positive ($\beta = 0.07$, $t = 5.85$, $p<.001$, $R^2 = 0.005$), indicating that the class preparation latent variable explained 0.5% of the variance in research skills which was very small.

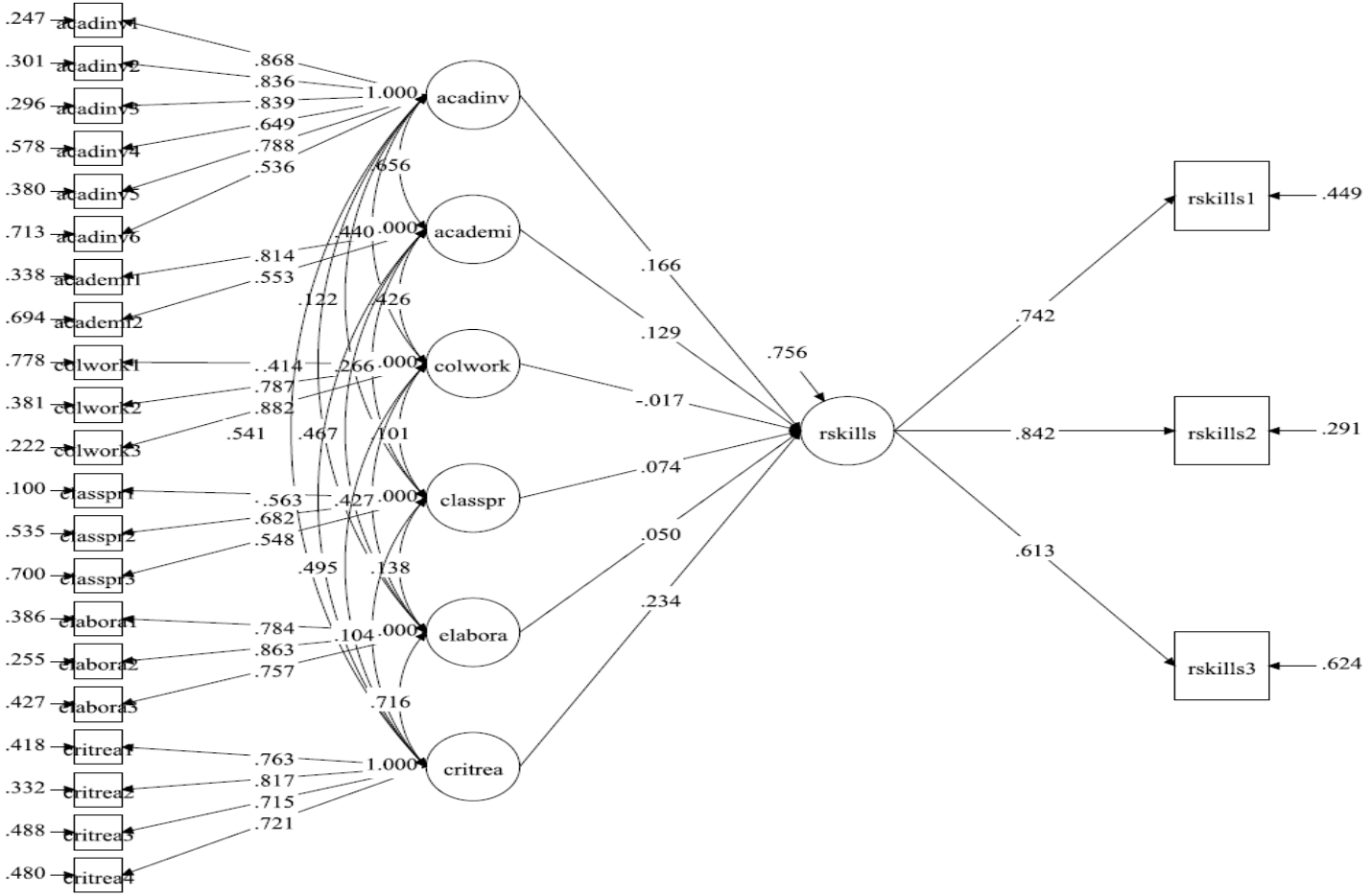

Figure 10. Structural Model 2 with Standardized Estimates

Note: Model Fit Indices CFI = .94, TLI = .93, RMSEA = .05, and SRMR = .05.

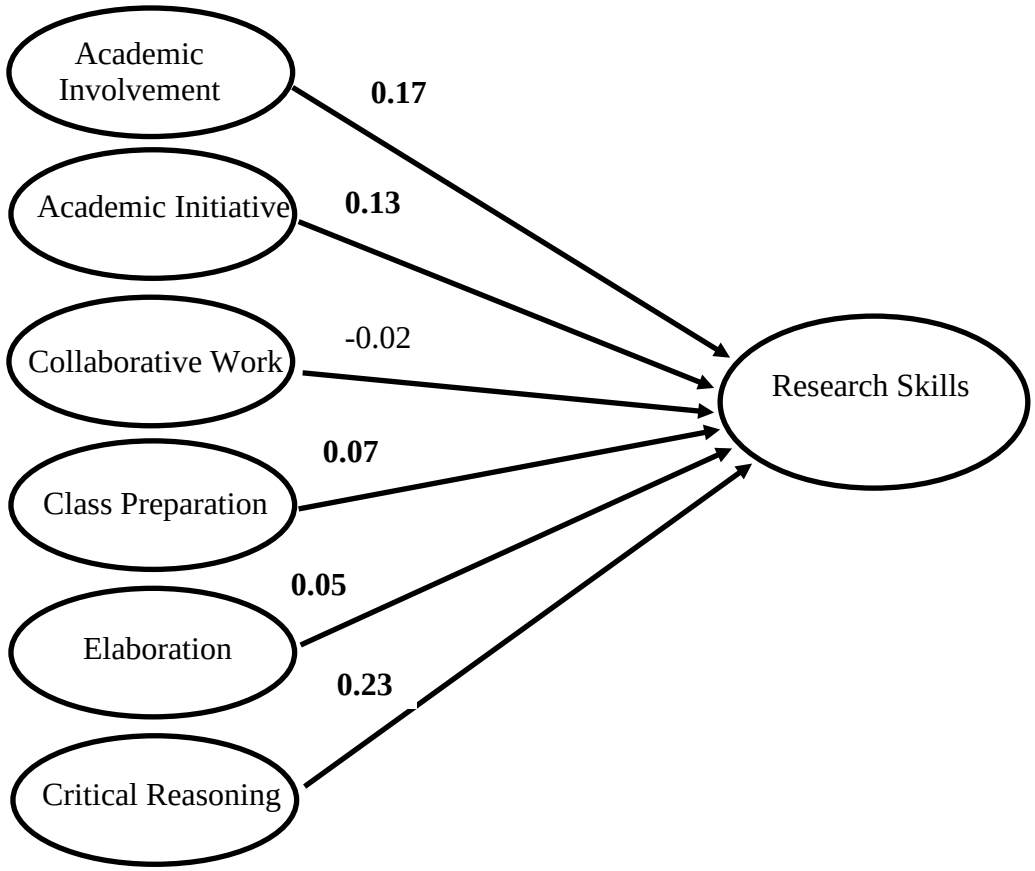

Figure 11. Structural Model 2 with Standardized Path Coefficients
Note: The bolded values indicate significant relationships.

The effect of elaboration on research skills was statistically significant and positive ($\beta = 0.05$, $t= 2.47$, $p<.001$, $R^2 = 0.003$), indicating that the elaboration latent variable explained only 0.3% of the variance in research skills. Similarly, the effect of critical reasoning on research skills was statistically significant and positive ($\beta = .23$, $t= 10.16$, $p<.001$, $R^2 = 0.05$), indicating that the critical reasoning latent variable explained 5% of the variance in research skills. In contrast, the collaborative work construct had a non-significant negative effect on research skills. ($\beta = -0.02$, $t= -1.11$). Consequently,

academic engagement and cognitive strategies explained 24% of the variance in research skills outcome (R^2 =.24). The standardized results revealed that all items yielded coefficients above 0.47. All estimates were significant (p<.001) and exhibited small to large effect sizes ranged from 0.22 to 0.75.

Figure 12 illustrates the six latent variables which predict cultural appreciation and standardized estimates for the observed indicators. Specifically, the researcher hypothesized that academic involvement, academic initiative, collaborative work, class preparation, elaboration, and critical reasoning would positively predict variability in cultural appreciation. The model yielded a statistically significant Chi-square, χ^2 = 5534.552; *df* = 231; $p < .001$. The fit indices were CFI = .95; TLI = .94; RMSEA = .05, and SRMR = .04, which indicated a good model fit. The standardized regression coefficients among the latent variables for the structural portion of the model were illustrated in Figure 13. Squared multiple correlations were also examined to measure the amount of variance estimated by the predictors of the dependent variable. The effect of academic initiative on cultural appreciation was statistically significant and positive (β= 0.11, t= 4.62, p<.001, R^2 =0.01), indicating that the academic involvement latent variable explained 1% of the variance in cultural appreciation. Similarly, the effect of critical reasoning on cultural appreciation was statistically significant and positive (β = .21, t= 8.94, p<.001, R^2 = 0.04), indicating that the critical reasoning latent variable explained 4% of the variance in cultural appreciation. In contrast, the effect of academic involvement on cultural appreciation was not statistically significant (β =0.003, t= 0.18).

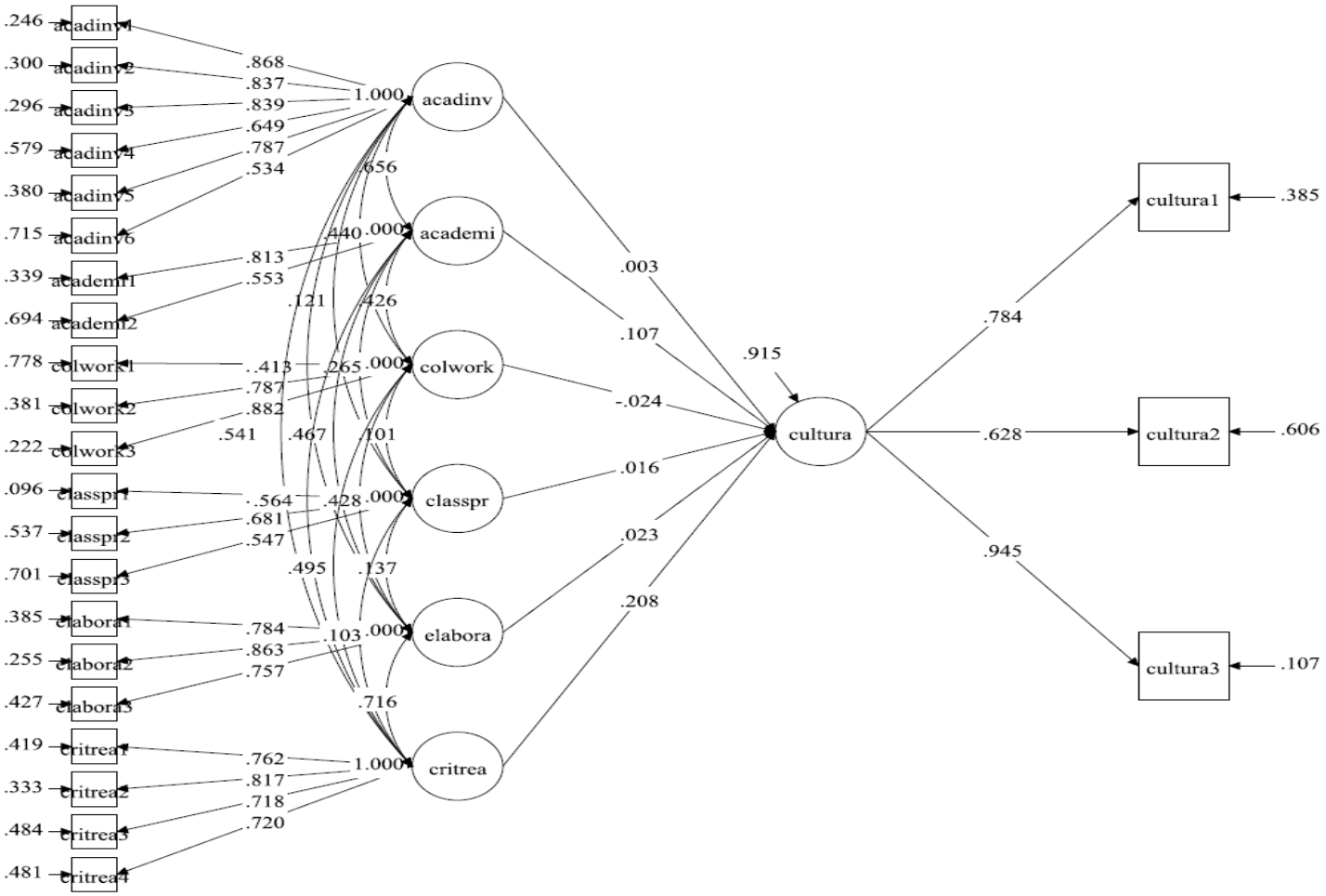

Figure 12. Structural Model 3 with Standardized Estimates

Note: Model Fit Indices CFI = .95, TLI = .94, RMSEA = .05, and SRMR = .04

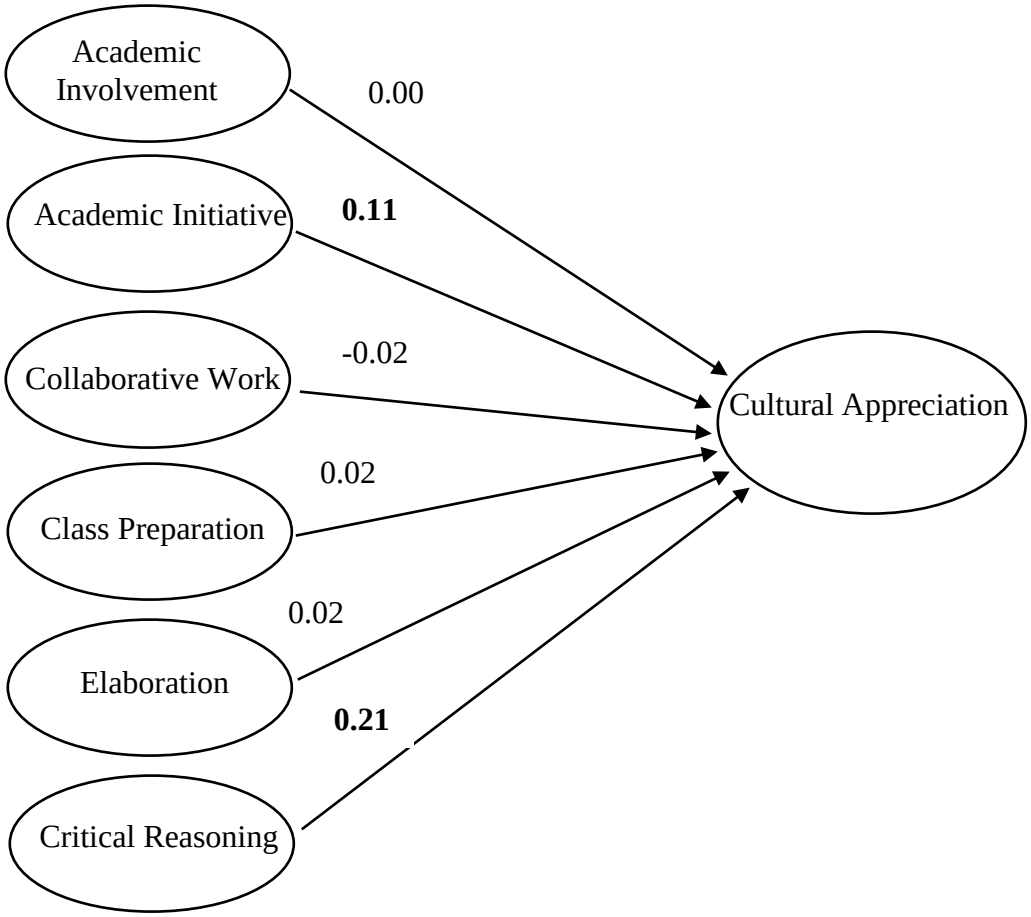

Figure 13. Structural Model 3 with Standardized Path Coefficients
Note: The bolded values indicate significant relationships.

The effect of class preparation on cultural appreciation was also not statistically significant (β = 0.02, t= 1.26). The effect of elaboration on cultural appreciation was non-significant (β = 0.02, t= 1.15). Similarly, the collaborative work construct had a non-significant negative effect on cultural appreciation. (β = -0.02, t= -1.59). Taken together, academic engagement and cognitive strategies explained 9% of the variance in cultural appreciation outcome (R^2 =.09). The standardized results revealed that all items

yielded coefficients above 0.47. All estimates were significant ($p<.001$) and exhibited small to large effect sizes ranged from 0.22 to 0.75.

CHAPTER V

DISCUSSION AND CONCLUSION

The current study examined the relationship between background characteristics, academic engagement, cognitive strategies and learning outcomes among undergraduate students. Firstly, the differences in academic engagement and learning outcomes by the students' background characteristics such as gender, ethnicity, matriculation status, first-generation status, social class were examined by using t-tests and one-way ANOVA. Then, a conceptual model of three latent variables, which were academic engagement, cognitive strategies, and learning outcomes, was tested by using SEM and a sample of undergraduate students at Texas A&M University in 2015.

Research question one examined the relationship between students' background characteristics, academic engagement, and learning outcomes. The researcher hypothesized that each of the study constructs would differ based on background characteristics. In terms of academic engagement, results showed significant differences in gender, ethnicity, matriculation status, first-generation status, and social class. Male students tended to report higher scores on academic involvement in class such as contributing to discussions and asking questions compared to female students. They also reported higher means on choosing challenging courses even though it might lower their GPA or finding a course so interesting that they do more work than required. On the other hand, female students reported a higher amount of frequencies on faculty interaction items such as interacting with faculty during lectures or seeking academic help from instructors. The results suggest that males and females did differ in terms of

the frequency of engagement. Moreover, they differ in the areas where they are engaged. The results partially support conclusions by Kuh (2003) that women are more engaged than men are.

For first-generation students, there were few significant results. Non-first generation students reported that they are more likely to collaborate with classmates. The first-generation students reported higher means only on going to class prepared. These findings partially support the findings that college experiences might have differential effects for first-generation students and traditional students (Terenzini et al., 1996). The first-generation students are often considered as disadvantaged in their educational experiences compared with non-first-generation. One positive finding was that first-generation students are engaged in educationally purposeful activities to an equivalent degree. The results revealed many significant findings for matriculation students. Transfer students reported higher means on academic involvement, class preparation, collaborative work, and academic initiative than non-transfer students. These results suggest that it is important to examine the engagement patterns of students who are matriculating (Kuh, 2003).

Findings based on ethnicity revealed that students significantly differ regarding their academic engagement. White students usually reported that they are more likely to engage in academically purposeful activities than Hispanic or African American students. These are consistent with the prior research that students of color experience college differently than White students (Kuh, 2003). In terms of social class, students differed on their academic engagement levels. Interestingly low-income students are

more academically engaged in class discussions. They are more likely to take challenging courses or do more work in some courses than required. Overall, my findings support that certain student background characteristics such as gender, race and ethnicity, parents' educational experience, and years in college influence the student engagement in educationally purposeful activities, which consequently affects their learning (Kuh et al., 2007; Hu & Kuh, 2002). However, the effect sizes for every item ranged from small to moderate in magnitude.

In terms of learning outcomes, female students reported higher ability levels on all research skills and cultural appreciation related items. Similarly, while first-generation students had higher means on cultural appreciation construct, overall non-first generation students had higher means on research skills and critical thinking abilities. Based on matriculation status, transfer students reported that they had higher ability levels for critical thinking and communication, research skills, and cultural appreciation factors. White students rated their ability level higher than other ethnic groups on almost every learning outcomes item. Finally, low-income students reported they had higher ability levels than middle-class, and middle-class students indicated higher levels than upper-middle class students.

Research questions two and three examined the direct effect of academic engagement and cognitive strategies on learning outcomes. It was hypothesized that engagement in academically purposeful activities and use of learning strategies have a direct effect on learning outcomes. The learning outcomes construct were divided into three subgroups as critical thinking and communication, research skills, and cultural

appreciation. In terms of critical thinking and communication, the study found a significant direct effect for academic involvement, academic initiative, class preparation, elaboration, and critical reasoning, but not collaborative work. Specifically, academic involvement and critical reasoning are the best predictors of critical thinking sand communication. Similarly, when considering research skills, there was a significant direct effect for academic involvement, academic initiative, class preparation, elaboration, and critical reasoning, but not collaborative work. Academic involvement and critical reasoning were the best predictors for research skills. In terms of cultural appreciation, there was a significant direct effect only for academic initiative and critical reasoning. However, it is reasonable to evaluate the relationship of academic engagement, cognitive strategies and cultural appreciation as weak since they are not directly correlated to each other. Prior research has indicated that both academic engagement and cognitive strategies have a positive effect on learning (Hattie et. al, 1996; Kuh et. al, 2005). Overall, my findings support the literature review. Interestingly, collaborative work was not a significant predictor for three of the learning outcomes. If more items included in collaborative work factor, the results may change. Regarding the theoretical framework, academic engagement and learning outcomes may be affected by students' background characteristics since the results support that engagement levels and learning gains differed for several groups of students. Also, the SEM analysis showed that academic engagement and cognitive strategies predicted learning outcomes with a good fit of the model.

Limitations

This study used self-report measures to gather perceptions regarding the studied variables. There is currently a debate over the validity of student survey questionnaires. One of the major problems with self-reported learning gains is that there is not a credible theory as to how students can accurately report how much they have learned in college (Porter, 2013). The students' responses to survey questions might not be related to their actual learning gains. Porter (2013) also argued that student's pre-college characteristics and experiences in their academic major might be considered when answering a self-reported learning gains question. Another limitation was the issue of missing data. In the current study, FIML was used to estimate parameters. The findings are limited to participants who responded to the study items.

Future Research

My study focused on students who responded to the SERU survey only at Texas A&M University. Future studies may include other participants from peer institutions as well to test the generalizability of this study. My study did not use all the items on the SERU survey related to academic engagement, cognitive strategies, and learning outcomes constructs. Future research focusing on SERU survey and those constructs would benefit from using more items in the analysis. Researchers interested in examining these constructs should consider other measures of academic engagement, cognitive strategies, and learning outcomes to ensure they are representing the latent constructs accurately. Furthermore, future studies should investigate whether the effects of academic engagement and cognitive strategies on learning outcomes are significantly

different based on students' background characteristics by incorporating those four constructs in the same structural model.

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