DISSERTATION

CRITICAL THINKING SKILLS IN COLLEGE STUDENTS IN MEXICO: A MIXED METHODS APPROACH

Submitted by

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ABSTRACT

CRITICAL THINKING SKILLS IN COLLEGE STUDENTS IN MEXICO: A MIXED METHODS APPROACH

Mexico recently adopted Critical Thinking Skills (CTS) as one of its primary goals in higher education. From now on, institutions are required by Mexican legislation to foster CTS in college students. This condition has brought concerns among scholars and practitioners, who still debate about the meaning of CTS, regarding to the way to bridge this legislation to actual CTS. Mainly, due to the lack of empirical research studying the factors leading Mexican college students to develop CTS.

This mixed methods study analyzed student-related variables (gender, age, GPA, parental education, enrollment status, and degree aspirations) that may be influential factors predicting CTS in college students, according to the current body of literature conducted in other populations. It also studied the effect of academic engagement and the association with critical thinking skills due to its emerging relevance in higher education literature. Moreover, it explored student perception regarding the academic experiences they had in college to better understanding of how perceptions may have contributed to developing CTS over college experience.

Statistical analyses indicated only GPA and parental education as effective predictors of CTS in college student in Mexico. These variables were able to explain only 9% of the variance of the CTS. The qualitative analysis suggests low academic rigor, teacher-centered teaching, and teaching absence in classes are constraining CTS gains in college students.

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CHAPTER I: INTRODUCTION

"The most important reason for making the enhancement of critical thinking skill as the primary objective of higher education is that the rest of the world has changed and is continuing to change at an accelerating rate" (Ennis R, 1989, p. 8).

Something seems to be out of balance in times when people are unemployed, but companies complain they cannot find a qualified workforce. Although several factors may explain this phenomenon, the skills that people display seems to be crucial to explain this condition. The skills matter, a recent study led by the Organization for Economic Co-Operation and Development ([OECD], 2016) reported that poor skills severely limit access to better-paying and more rewarding jobs. The study asserts, "Where large shares of adults have poor skills, it becomes difficult to introduce productivity-enhancing technologies and new ways of working, which in turn stalls improvements in living standards," (OECD, 2016, p. 23). Unsurprisingly, during the last decades, Critical Thinking Skills (CTS) became a primary education goal in higher education (OECD, 2016). In particular, because CTS act as a catalyst that enables students to go beyond of simply accumulating information, to gaining a rich understanding of the information presented to them (Dwyer, Hogan, & Stewart, 2012; Halpern, 2003). Thus, its most important contribution is both the promotion of good-decision making and problem-solving in real-world applications in individuals (Buttler et al. 2012; Halpern, 2003). This condition explains why some scholars, policymakers, and potential employers endorse CTS as an essential skill in individuals.

In this regard, the Association of American Colleges and Universities (AAC&U), reported that 95% of employers are interested in hiring skillful candidates, especially, in those

displaying good levels of CTS (AAC&U, 2015). Similarly, in Mexico, the National Skills Poll (ENCOP, by its Spanish acronym) reported that employers are concerned about the barriers the country faces to strengthen economic growth. In particular, employers explained the lack of CTS in job candidates is a growing problem that needs to be addressed in the public agenda by educational authorities (CONOCER, 2018, Díaz, 2017).

The global trend embracing CTS as the backbone for social and financial progress has led higher education institutions to evolve across several countries (Care, Kim, Anderson, & Gustafsson-Wright, 2017; Halpern, 2007; Ingle, 2007; OECD, 2012). Today, higher education institutions are seen as responsible not only for preparing individuals for adulthood and their work-related responsibilities but also to develop the ability to think critically. This new role in higher education has promoted considerable changes. First, institutions are experiencing a major shift in aspirations about how they should equip students for the future, from the cultivation of intellect to knowledge and skills production (Apple, 2007; Axelrod, 2002; OECD, 2008). Second, it has also changed the priority of universities to induce a small number of students into higher order skills to enablement of all of them with significant skills to succeed in a globalized world (Care et al., 2017; OECD, 2016). Although these changes aim to develop a better thinking in college students, stakeholders still need to be informed about the countless factors that may potentially trigger CTS in college; in particular about the institutional-related factors that must be adjusted in order to educate critical thinkers (Arum & Roksa, 2011; Care et al., 2017; Pascarella & Terenzini, 2005).

Following this trend in higher education, Mexico recently bestowed priority to the development of CTS in college students (Care et al., 2017). In 2016, the Secretary of Public Education (SEP, by its Spanish acronym), the entity responsible for providing and regulating

education in the country, substantially shifted higher education primary goals. The national educational model is now focused on fostering the skills that students need to succeed in a changing world rather than seeking to achieve nationwide coverage (Care et al., 2017). The Mexican government listed CTS, for the first time in its history, as one of the primary educational goals in higher education (SEP, 2017). According to the SEP (2017), higher education, in particular, must be treated as the best tool to ensure quality and access to a better quality of life for all. Therefore, the education provided by the state must assist society to shape the human talent required for the country's competitiveness and development.

Despite Mexico is finally aligning with worldwide views about the skills needed for the future, the endorsement of CTS at the policy level, does not ensure its successful implementation. For Mexico, this endorsement at policy level is just the beginning. In other words, policymakers need more and better information to make informed decisions while future strategies are both planned and implemented. In this regard, Bañuelos (2017) warns that Mexican stakeholders need to figure out how students will develop this level of thinking, and which strategies and teachings methods must be adopted to foster this kind of thinking in students. According to Bañuelos (2017), this paradigm shift in higher education in Mexico must be supported by scientific research.

Current literature scarcely reports empirical studies on CTS in Mexican college students. Supported by a trained librarian from Colorado State University, the search for studies that reported critical thinking skills in Mexican college students was conducted using Google Scholar (through 2018), ProQuest Dissertations, and Theses (1960-2017). To maximize the number of relevant studies found, the broad search terms "critical thinking skills in Mexico," "critical thinking skills in higher education in Mexico." This search found a very limited number of

empirical studies that reported on CTS scores of college students in Mexico (e.g., Nuñez-Lopez, Avila-Palet, & Olivares-Olivares, 2017; Olivares & Heredia, 2011). Although these studies shed light on the state of CTS in college students of Mexico, they fail in reporting on the different variables that may influence CTS gains in Mexican college students.

This chapter provides a review of relevant literature on the problem under study, introducing its major variables. The overarching research problem and specific research questions are also introduced. Delimitations, assumptions, limitations, and significance of the study are included as well. Finally, the researcher's perspective is discussed.

Current Context

Despite its relevance in a globalized world, CTS gains over college experience have been decreasing during the last decades (Arum & Roksa, 2011; Huber & Kuncel, 2016; Pascarella & Terenzini, 2005). Although the literature is unable to explain these declines, the academic environment that students experience seems to influence students' behaviors after college enrollment (Arum & Roksa, 2011; Astin, 1993, 1998; Babcock & Marks, 2011; Kuh, 1999; Marti, 2009; Whitt, Pascarella, Elkins, Martin, & Pierson, 2003). In this regard, Rosenshine (1982) explains that learning tends to be significant when the academic environment is structured to encourage active participation by students. Nonetheless, institutions cannot be pointed out as the only responsible for students' behaviors; on the contrary, students should be held accountable for what they do over college experience (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006).

Academic Engagement

The relevance of students' engagement has been highlighted by past studies (e.g., Arum & Roksa, 2011; Levin & Cureton, 1998, Kuh, 2009; Marti, 2009), where poor academic performance is explained as the result of the disengagement of traditional-aged students in

college. In this regard, Kuh, Hu, and Vesper (2000), after tracking 50,000 college students across 128 universities in the USA, reported that 18% of them did not engage at significant levels in educationally purposeful activities. The researchers found that discouraged students had had the poorest academic outcomes in the sample. For some scholars (Arum & Roksa, 2011; Babcock & Marks, 2011; Kuh, 1999; Marti, 2009), the association between students' disengagement and poor academic outcomes is quite predictable, as the lack of engagement leads college students to acquire a cumulative deficit in terms of attitudes, study habits, and academic skills.

Even though academic engagement is one of the most encompassing and frequently used constructs in studying student's relationship to their schools (Fredricks, Blumenfeld, & Paris, 2004; Sciarra & Seirup, 2008), a consistent definition has not been used in research. Whereas most scholars agree on defining academic engagement as a multidimensional construct, there is still a disagreement on the kind and number of dimensions of the construct. For example, Finn and Voelkl (1993) defined academic engagement as having "both a behavioral component, termed participation, and an emotional component termed identification" (p. 249). Fredericks et al. (2004) define academic engagement as having three dimensions: behavioral, emotional, and cognitive. Therefore, for the purpose of the present research, academic engagement is understood as a psychological process that involves the attention, interest, investment, and effort students spend on the work of learning, contained into two-dimensions: behavioral and emotional.

The behavioral aspect may comprise three components: learning, compliance, and participation. The first is behavior related to learning such as "effort, persistence, concentration, attention, asking questions, and contributions to class discussions" (Fredricks et al., 2004, p. 62). The second component is compliance as manifested in following school norms and rules, degree of disruptive behaviors, cutting classes, and getting into trouble (Finn & Voelkl,1993; Finn &

Rock, 1997). The third component of behavioral engagement is participation in extracurricular activities (Fredricks, Blumenfeld, & Paris, 2004).

The emotional aspect has to do with students' feelings about school and the degree to which they care about their school. Included are feelings of belongingness, safety, comfort, and pride in the institution (Oesterman, 2000). The emotional aspect also includes relationships with teachers and peers (Jimerson, Campos, & Greif, 2003). In other words, the more students experience their teachers as caring, respectful, approving, and encouraging, the greater the degree of emotional engagement (Greenwood, Horton, & Utley, 2002; Murray & Greenberg, 2001; Wentzel, 1997).

In Mexico, the literature is limited and does not report on the effects of the academic environment and academic engagement on the levels of CTS that college students display. However, in a similar vein, Salgado-Soto, Sevilla-Caro, and Berrelleza-Caro (2013) after studying college students in Mexico reported no association between academic engagement and academic outcomes (GPA). Regardless of these results, the extensive literature conducted in the U.S. led me to believe that academic engagement is the most important behavioral driver leading students to academic success and to develop a variety of skills fully. In other words, it is assumed that students' effort is necessary to stimulate students' intellect and to improve their academic growth. Nevertheless, students' effort must be not only stimulated but also encouraged by the academic community on campuses.

Academic Experiences

Although several institutional factors may affect student performance in college, the academic experiences are considered as the most influential on academic success (Kuh, Kinzie, Schuh, & Whitt, 2005; Pascarella & Terenzini, 2005). Classroom experience, however, must be

considered as the most important key factor leading student to succeed (DeRaad & Schouwenburg, 1996; Eryilmaz, 2014), as they have a lot to do with both the learnings gained and the academic success (Linnenbrink-Garcia, Rogart, & Koskey, 2011; Lombardi & Sinatra, 2013; Schutz, Cross, Hong, & Obson, 2007).

Given the relevance of classroom experience, Maldonado & Marín (2003) warn on the relevance of teacher-student interaction. The scholars assert the lack of healthy relations in classrooms between teachers-students oftentimes lead to students' academic failure. Whereas Mexican literature scarcely reports on the academic effects of the relationship between teachers and students (e.g., Lara-Barragán-Gómez, Aguiar-Barrera, Cerpa-Cortés, & Nuñez-Trejo, 2007; Maldonado & Marín, 2003; García-Rangel, García-Rangel, & Reyes- Angulo, 2014), some scholars (e.g., Eryilmaz, 2014; Goldstein & Benassi, 2006; Slavin, 2003) suggest that teacher's diligence seems to be helpful enhancing students' educational outcomes.

Considering all above, it seems like institutions around the world are charged with the mission to produce "the skills" that modern societies require to succeed. Mexican institutions, in particular, should put special attention to the variety of factors that might impact CTS gains in students. Drawing on the literature, I posit that, overall, when describing factors of success in higher education, three broad patterns are noticeable: (1) student-academic-related variables; (2) academic engagement; and (3) academic experiences.

Statement of the Research Problem

During the last decade, educating critical thinkers became a priority for higher education institutions around the world; especially after being considered one of the most important skills in the 21st century. This global trend in higher education has triggered a growing interest in CTS, and consequently, extensive research in the field (e.g., OECD, 2016; OECD, 2012). Past

literature has used either foundational cognitive or developmental theories for understanding the impact of college on students. As a result, the body of literature mostly reports on the association between teacher-related variables, student-related variables, and institutional-related variables and CTS scores. However, these studies only refer to demographic variables, teaching strategies, and institutional characteristics as influential variables affecting CT gains (e.g., McAbee & Oswald, 2013; Poropat, 2009; Trapmann, Hell, Hirn, & Schuler, 2007). Despite the plethora of studies, this body of research is unable to clearly explaining what factors may increase CTS gains in college students. Therefore, the way colleges and universities may effectively foster them remains unclear (Huber & Kuncel, 2016).

Research Questions

The present study adopted a mixed-methods explanatory sequential design (Creswell & Plano Clark, 2014). The quantitative strand investigated the association between the student-academic-related variables, academic engagement, and CTS. Then, the qualitative strand explored student perceptions about their academic experiences in Mexican classrooms. The overarching research question attempts to discover in what ways students' academic experiences in college contributed to the development of their CTS.

Specifically, there are three main research questions guiding this study:

(1) How do critical thinking skills relate to academic engagement?

(2) How well does the combination of students' demographics and students' academic engagement predict overall CTS in Mexican college students?

(3) From students' perspectives, how do academic experiences in college contributed to the development of their CTS?

Purpose of the Study

The purpose of this mixed methods study was to learn about the effects of demographic-academic-related variables and academic engagement on the overall CTS scores in college students in Mexico. Moreover, this study sought to gain a better understanding of the classroom's experiences that may be preventing/promoting CTS, from Mexican students' perspective. During the first phase, the quantitative, the California Critical Thinking Skills Test (CCTST) and the Academic Engagement Test were used to collect data from Mexican college students. These instruments assessed the relationship between college student-academic-related variables, academic engagement, and CTS scores. After analyzing validity and reliability, it was assumed that both instruments were capable of providing data to test the proposed model (see Figure 1.1). Specifically, I posited that both student-academic-related variables and academic engagement positively influence CTS scores in Mexican college students. Moreover, using in-depth semi-structured interviews, the qualitative strand explored students' perceptions on the effect of classroom experiences on their CTS gains over college experience. The reason for collecting both quantitative and qualitative data was to develop a more complete understanding of the state of critical thinking skills of college students in Mexico.

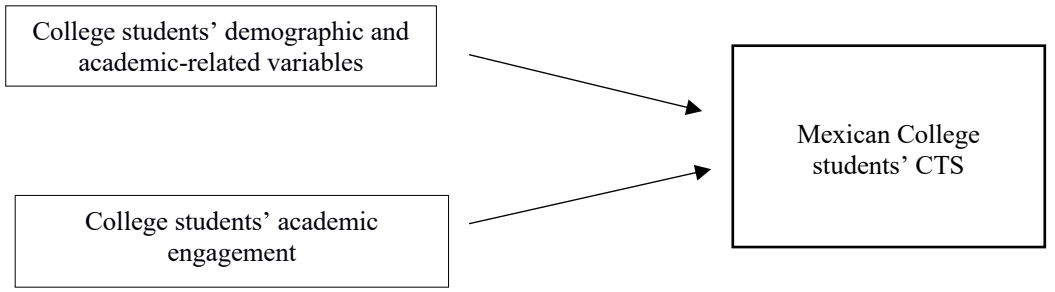

Figure 1.1. Proposed model to predict the overall critical thinking skills scores in college students in Mexico.

I acknowledge that recent demands placed on higher education have led Mexican policymakers, educators, academics, and society in general to endorse the adoption of CTS; however, there is a disconnect between the educational goal, the concept itself, and how the educational system should lead students to attain this goal (Care et al., 2017). Hence, this study aimed to build important knowledge to inform stakeholders about the factors that might impact future critical thinking gains in Mexican college students.

Operational Definitions

Academic engagement. Although the literature offers a variety of definitions in the field and scholars have not met an agreement on its definition, in this study, the term academic engagement is a psychological process that involves the attention, interest, investment, and effort students spend on the work of learning. Engagement implies both behavioral and emotional participation in the learning experience (Finn, 1989,1993).

Critical thinking. It is a self-regulatory judgment that results in interpretation, analysis, evaluation, and inference, as well as an explanation of the evidential, conceptual, methodological, criterion logical, or contextual considerations upon which that judgment is based. The overall strength in using reasoning to form reflective judgements about what to

believe and what to do. This skill predicts the capacity for success in educational or workplace settings that demand reasoned decision making and thoughtful problem solving (Facione, 1990; 1990e).

Critical Thinking Skills Test. The seven-scale version presents scale scores in all of the individual core critical thinking (analysis, inference, evaluation, deduction, induction, interpretation, explanation). This instrument was developed based on the Delphi Report's definition of critical thinking. The CCTST is 34 questions target to assess the strength or weakness of one's skill in making reflective, reasoned judgement about what to believe or what to do and includes the sum of analysis, inference, and evaluation (Facione, 2007).

Academic Engagement Test. The instrument was developed for the purpose of the present study. The researcher draws on the College Students Questionnaire Experiences (CSQE) (Pace & Kuh, 1998), and the recommendations from a panel of experts in Mexico to develop a one-dimension scale that aims to assess behaviors that reflect the college student's engagement within the Mexican context.

Significance of the Study

A study of the effects of student-academic-related variables and academic engagement on the overall CTS in Mexican college students is important for several reasons. First, the importance of this study is based not only on the premise of the need of CTS in college students but also in the spirit of seeing how higher education institutions may better prepare college graduates of Mexico to compete in a skills-based society. Although Mexico endorses the development of CTS as a primary educational goal in higher education, the SEP has failed in explaining how these skills are going to develop and mature in the way they do for traditional subjects (Bañuelos, 2017; Heredero-Rodriguez, 2018). Second, understanding the association

between the proposed variables and their relationship with students' expectations may shed light on future attempts to improve CTS gains in higher education across different populations. I believe that ignoring the influence of these variables may convert Mexican institutions' efforts to develop CTS into a simple pedagogical experiment with unexpected results. Third, due to the scarcity of empirical research in Mexico, the present study has the potential to inform policymakers about feasible strategies to bridge emerging legislation in Mexico to the improvement of CTS in college students and graduates.

Limitations and Delimitation

Limitations

The instruments adopted to collect data provided an opportunity to gather relevant information regarding the levels of CTS, academic engagement, and personal perspectives from a large number of college students in Mexico. I acknowledge validity and reliability issues may exist with the instruments used, especially because none of them had been applied in Mexican college students before. Although the CCTST is a broadly used instrument, as far as I know, this is the first time the instrument was applied to this population. Moreover, the Academic Engagement Test was the result of the adaptation of some items from the College Students Experiences Questionnaire (CSEQ) and the addition of some questions suggested by a panel of experts in Mexico. This instrument was designed for the specific purpose of this study. Thus, I admit reliability and validity issues may be present throughout the study. Although attention was given to ensuring that both instruments were capable to measure the sought constructs, cognitive and/or behavioral factors in Mexican students may result in significant differences in relation to the results obtained from other populations.

Another limitation is the sample used. Although the sampling approach was purposeful, ensuring the variation of participants was extremely difficult, especially in terms of gender. Therefore, I acknowledge that questions may exist about the accuracy of the recruitment of the targeted population. However, it is important to underline that in Mexico some fields are traditionally dominated by gender (e.g., education is a field dominated by women). Therefore, participation in students across the different fields presents a gender bias. Further, the posted invitation to participate in the study attracted mostly students from the second year of college. As a result, most of the participants are between 18-23 years old.

Concerning the qualitative strand, validity issues exist due to the limitation of perception of the researcher's bias. However, audio-recordings assisted in reducing the potential errors of coder bias during the final discussion portion of quantitative and qualitative strands. Nonetheless, there were inherent limitations in the interpretation of the content and context of the discussion. As a result, finding from this study should be considered carefully, as they cannot be generalized due in part to the research design itself, validity and reliability limitations, and the small number of participants from the single research site.

Delimitations

The delimitations utilized by the researcher in this study were determined by a desire to gain better an understanding of the relationship that exists between student-academic-related variables, academic engagement and CTS. Therefore, I determined to include college students from a medium-sized university located in the Northwest of Mexico. The inclusion criteria included two main conditions. First, research participants must be older than eighteen years old. Second, those students must have been enrolled for at least one year in college. The inclusion

criteria attempted to ensure that participants had enough exposure to college experience to perceive its effects on them. Finally, unlike other studies that have examined the effects of college on the overall CTS, this study did not incorporate the perspectives of teachers and administrators. The study prioritized the inherent relationship between some student-academic-related variables, academic engagement, and CTS scores.

Researcher's Perspective

This study is informed by both my background and the current state of higher education in Mexico. Although there may be countless experiences influencing my academic work, there are four factors that I consider as transformative, and that have reshaped my professional interests in several ways.

First, growing up as part of a family of teachers, early in my life, I understood the role of education enhancing human beings' lives. The legacy of my parents, who worked for more than forty years as educators in Mexico, inspired my brothers and myself to serve our country educating future generations. However, after several years in my journey as a teacher, and highly influenced by my parents' critical stance, I started questioning the role of the Mexican educational system on promoting social and economic progress. This was a turning point that led me to believe that the educational system in Mexico is, for better or worse, intentionally or unintentionally, perpetuating social gaps and the status quo in society. Therefore, my family's legacy and social awareness, led me to explore alternative ways to improve the educational system. The response was conducting scientific research. My family has been an important behavioral driver influencing my research interest; especially, after challenging my boundaries as a scholar. For these reasons, I do consider my "tribe" has not only informed my career choices but also has led, in many regards, to my research journey.

Second, my professional experiences have informed my interest in higher education and led me back to graduate school. In Mexico, I earned two bachelor's degrees: Mathematics secondary school teacher and public accountant. I was privileged enough to simultaneously practice both careers, working as an administrator and part-time teacher, after being hired by a Mexican university. In those years, I had the opportunity to engage with students from different populations: secondary education and college students. This experience brought countless questions into my mind, such as how well was secondary education preparing students to pursue higher education, if any? How well was college enabling students to get a job in the labor market, if any? Or, whether institutions were engaging students enough to make them work harder and succeed in higher education? My privilege as an insider in two different worlds enhanced my awareness about the role of education ensuring social and financial progress in Mexicans.

Third, the lack of useful literature to lead education policy in Mexico has been disappointing. My sincere interest in understanding the effects of education on social and financial progress, led me to learn that most of the empirical literature in Mexico had been produced by outsiders (e.g., OECD, UNICEF, UNESCO). Moreover, the available literature mostly referred to the unpleasant aftermaths within the education system, without explaining the systematic production of both poor educational outcomes and impoverished people in the country. As an insider, I noticed that to produce knowledge, both international scholars and Mexican administrators may have applied laws and theories that do not necessary fit the Mexican population, producing in this way, inaccurate findings. I do believe those studies informing policymakers and scholars in Mexico may be misleading them and their actions despite of their "good intentions."

This condition has brought costly and painful lessons for Mexico in terms of education. For instance, the government has passed four educational reforms during the last twenty-five years based on international agency recommendations (e.g., OECD, UNESCO). Although empirical and scientific knowledge led this policy, it did not bring the enhancement expected; on the contrary, it brought social polarization and confrontation across the country. As a social scientist, I rely on science; however, I also believe that reality might be influenced by countless variables across different populations. In the case of Mexico, I believe it is crucial to explore the variables that might be affecting its reality, regardless of the theory or law used to produce knowledge. After doing so, I believe scholars and policymakers will be able to understand the reality and positively influence the whole education system.

I believe the only way to advance Mexico from countless social issues is through an educational system of quality, which should necessarily be aligned with worldwide trends and standards. Therefore, understanding how human behaviors, skills, and contexts influence academic progress remains essential to leading human beings to advance their social and financial conditions. For this reason, I think there is no other topic that I would be more interested in exploring. I was captivated by the relevance of the topic since the very first time I explored it. Learning about critical thinking stimulates both my philosophical perspective and my moral ethics as a scholar. As Kurfiss (1988) did, I strongly also believe that "critical thinking contributes to a more rational and human society, its cultivation merits a significant expenditure of educator's collective time, wisdom, and effort" (p. 8). Therefore, after identifying the factors that promote or prevent the development of critical thinking skills in students, scholars may influence education policy.

Fourth, I acknowledge my privilege as an educated woman in a country that has considerable gender gaps in terms of higher education. I was born and raised by two educators who acknowledged the positive impact of education on human beings, regardless of gender. Despite coming from a conservative culture, my parents encouraged me to excel. For that reason, I was educated as an equal along with my two brothers. Luckily, my parents did not place the "traditional role of Mexican women" above my education; otherwise, as a Mexican middle-class woman, I would have never aspired to pursue graduate education abroad. Furthermore, being awarded by my country with an international scholarship gave me the opportunity to afford graduate school, while it also opened a small window that allowed me to see the world from a wider perspective. For me, having the opportunity to conduct research, coached by influential scholars in the field, has been a great opportunity that not many women have and that I recognize as a privilege. Finally, I consider this privilege as an amazing opportunity for personal and professional growth, but also as a huge commitment to contribute to the educational community and my home community.

Summary and Conclusions

Higher education institutions are considered as the place where talent, skill, and knowledge are implanted in future leaders (Gerald & Haycock, 2006; Haveman & Smeeding, 2006). This worldwide perspective has placed the prominent role of ensuring social and economic progress on institutions, increasing the pressure on them. This condition has led institutions to adopt worldwide educational trends. However, the effects of college seem to depend on the students, and universities and colleges has no control on who their students are, in special when they start college. Nevertheless, institutions may identify the factors that can be modified by the academic environments. Therefore, I expect this study may contribute to filling

the current gaps in the literature. The findings from the present study may also contribute to elucidate the potential variables associated to critical thinking gains in Mexican college students, but also it may shed light on the exploration of academic experiences in future research with different populations.

CHAPTER II: LITERATURE REVIEW

During recent years, societies have increased their claims for an education that prepares critical thinkers capable of succeeding in a globalized world. The recent movement of education systems toward a more explicit focus on the skills that 21st century society needs, and demands has positioned CTS as one of the primary educational goals in higher education. Stakeholders, scholars, and policymakers agree the acquisition of CTS is essential to advance societies around the world, socially and economically. Even though education systems have overtly endorsed CTS at the policy level, higher education institutions must bridge two important gaps. First, they must clearly explain how college students are doing in terms of critical thinking skills. Second, institutions must identify the factors that either promote or prevent critical thinking gains in higher education.

Critical Thinking Skills in Higher Education

Attempts to explain what college students can do in terms of CTS have led scholars to an endless debate about the meaning of critical thinking skills. In this regard, Barnett (1997) acknowledges "Critical thinking is one of the defining concepts in Western education, which enjoys wide endorsement, [and] yet we have no proper account of it" (p. 1). In a similar vein, Huber and Kuncel (2016) acknowledge that "another difficulty in the critical thinking literature is defining the construct itself" (p. 434). As expected, one of the major obstacles for scholars who conduct research is the definition of critical thinking.

The current variety of constructs in higher education may be creating more confusion than agreement among scholars in regard to the state of CTS in college students. For instance, whereas some scholars (Facione, 1990a; Gellin, 2003a, 2003b; Ortiz, 2007; Pascarella &

Terenzini, 2005) believe college students' CTS gains are the result of mere college exposure, a growing group of scholars (Arum & Roksa, 2011; McMillan, 1987; Pascarella, 1985; Tsui, 1998, 2002; Van Gelder, 2000) assert this exposure is not enough, as CTS gains over college experience have proven to be insufficient to meet global needs and demands. Moreover, modern universities have to deal with tensions that exist between educational and social perspectives (Davies & Barnett, 2015). In other words, today, institutions struggle to prepare citizens with technical and work skills, but at the same time to developing thoughtful citizens who are beneficial to society. Thus, educating critical thinkers cannot be seen as a standardized mission for higher education institutions, simply because when talking about CTS, institutions may be referring to different concepts.

Different Perspectives Defining CTS

The variety of philosophers (e.g., Facione, 1990b; Halpern, 2003; Paul, 1993) influencing the field of CTS has impacted the way research is conducted. As predicted by Dwyer, Hogan, & Steward (2014), "…the variety of domains can make it difficult for researchers and teachers to understand or agree on the key components of good critical thinkers" (p. 44). Such situation leads scholars to bring their own perspectives while conducting research. Consequently, it is not surprising that definitions and assessment instruments used to test CTS vary across campuses (Stassen, Herrington, & Henderson, 2011). This complex situation has also led some scholars to exclude theory while conducting research (see Dwyer, Hogan, & Steward, 2011). In this regard, too numerous researchers to mention (Abrami, Bernard, Borokhovsky, Wade, & Persson, 2014; Behar-Horenstein & Niu, 2011; Huber & Kuncel, 2016; McMillan, 1987; Tsui, 2002) warn that methodological flaws in past studies might have prevented researchers from making broad conclusions on the explored relationships.

Paul (2005) provides a good insight into the different meanings of CTS in higher education. He explains there are different perspectives or what he called "waves" that coexist in higher education (see Table 2.1). The first wave, based on critical theory, endorses the use of this philosophy to bolster curricular perspectives and approaches. The second wave sees critical thinking as a reflective thought process of assessing what people believe or do; therefore, it refers to cognitive and reasoning processes. The third wave is interested in critical action, which refers to the ability to make timely and mindful interventions once one has critically assessed thoughts, behaviors, and options.

Table 2.1

Critical Thinking Skills: Its Different Waves in Higher Education

Critical Theory- A Philosophy	Critical Thinking – A thought Process	Critical Action- Mindful and Timely Intervention
This wave is focused in addressing social conditions and critiquing how they create unequal power relations based on attributes like race, gender, social status, age, sexual orientation, physical ability, and so on. This wave is characterized by both challenging 'truth' that is advanced by dominant groups and seeking emancipation and the elimination of oppression in societies.	This wave seeks to reflect on assumptions and beliefs. It is characterized by critiquing self-thought and hunting assumptions. This thought process checks assumptions and sees things from different perspectives by connecting individual experiences to broader social conditions.	This wave takes individuals to take informed action. It is characterized by monitoring self and group processes. It seeks altering behaviors by making timely interventions.

Note. Information taken from the Palgrave Handbook of Critical Thinking in Higher Education, by Martin Davies & Ronald Barnett (2015).

A Stable and Testable Definition

In response to the variety of perspectives influencing the field of education, the American Philosophical Association (APA) asked Facione (1979) to find a stable and testable definition.

After leading a Delphi study, Facione and 46 leaders in the field of education and industry concluded CT has two dimensions: cognitive skills and effective disposition. They concluded:

> The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. (p. 3)

Factors Influencing CTS Gains in Higher Education

The relevance of CTS in higher education has triggered substantial research seeking to enhance college students' skills. Although there is a plethora of studies, most of them are focused on exploring teacher-related variables, student-related variables, or institution-related variables. Therefore, this review of the research is ordered based on these variables in the following section.

Teacher-related variables. Even though teachers are capable to teach CTS in classrooms (Chipman, Segal, & Glaser, 1985; Halpern, 2007; Pike, 2003), they do not share the its meaning (Paul, Elder, & Bartell, 1997; Pitchers & Soden, 1999; Raths, Wasserman, Jonas, & Rothstein, 1966; Sternberg, 1987). The literature consistently reports that teachers effectively endorse teaching CTS as the most important goal of undergraduate education (DeAngelo, Hurtado, Pryour, Kelly, & Korn, 2009; Huber & Kuncel, 2016); in general, are under the impression they teach CTS to their students (Alazzi, 2008; Choy & Cheah, 2009). However, teachers have faced issues that goes from pedagogy to political ones.

Moore and Stanley (2010) suggest only a few teachers were prepared to teach and apply high level thinking in classrooms, therefore, they are impeded to teach CTS to students. In this regard, Willingham (2008) believe teachers are "ill-equipped," just because critical thinking is not a skill that can be taught in the same way other academic subjects are taught. Robert Marzano (2007) believes teachers should not be blamed by this situation, as they are forced to teach under a traditional approach, which considers teachers as delivers of information, and to the student as a passive recipient of knowledge.

Student-related variables. Students enter college with a wealth of background characteristics and experiences with them. Thus, it is not surprising that literature reports a variety of student characteristics that were found to impact CTS. As noted in preceding sections, there is no agreement on what factors develop critical thinkers in college. However, the most relevant student-related variables being discussed in the literature are gender, age, race, parental education, and length of enrollment.

***Gender*.** Research underlines gender as a debated factor influencing CTS. Whereas the proportion of females enrolling in college is constantly growing, inconsistent support has been reported for gender as an influential factor impacting CTS gains. Facione (1990d), after testing 945 students (47.2% males, 52.8% females), reported males tend to acquire CTS better than females. Conversely, another study analyzed data from 3331 college students from 18 institutions and report females scored higher than males on assessment of critical thinking at the end of their third year in school, even after college characteristics have been controlled (Whitt, Pascarella, Nesheim, Pierson, & Marth, 2003). Contrasting both these findings, Arum and Roksa (2011) reported that males and females displayed similar levels of CTS at entry, and this parity persisted on their journeys through higher education. Similarly, German (2008) found no

significant difference between male and female students on CTS. Giddens and Gloeckner (2005) also reported no difference between CTS scores in male and female nursing students.

Age. Another factor broadly explored in the literature is age. Nonetheless, scholars reported mixed findings. For example, Whitmire (1998) tested nursing graduate students, using the California Critical Thinking Skills Test (CCTST) and found age was negatively associated with CTS scores. Similarly, Cox (2002), after testing physical therapy students found a negative association with changes in CTS as measured by both the CCTST and the California Critical Thinking Disposition Inventory (CCTDI). Conversely, a growing group of scholars (Pascarella, Wolniak, Pierson, & Terenzini, 2003; Tinto & Love, 1995) reported a positive association between CTS and age, after analyzing data from the National Study of Student Learning (NSSL). Therefore, based on the literature, inconsistent support is noted for age as a factor that impacts CT gains over the college experience.

Parental education. Parental education has also been reported in the literature related to CTS. There is an agreement among scholars about the effects of parental education. In this regard, Arum and Roksa (2011) referred to parental education as a pattern of persistent inequality in higher education. Also, Kena, Jhonson, Wang, Zhang, Rathbun, and Wilkinson (2014) also reported that parental level of education was related to students' cognitive growth (including CTS) in college.

Students' enrollment status. Another commonly discussed factor was the length of enrollment in educational programs. The level of education was important, as one of the primary goals in higher education is to improve students' ability to think critically. This assumption lead scholars to assume that the higher the level of education achieved, the greater the ability to think critically. After looking at undergraduate students, German (2008) found no association between

CTS and the number of years in an undergraduate program among athletic training students. Similarly, Pitchers and Soden (1999) compared CTS in graduate and undergraduate students in Scotland and Australia and found no significant difference between groups. Moreover, Rezaee, Farahian & Morad Ahmadi (2012), after looking at first-year and third-year college students, also found no difference in CTS. Contrary to those results, McCarthy, Schuster, Zehr, and McDougal (1999) assessed CTS in sophomore and senior nursing program students and reported that senior students scored significantly higher than sophomore students did. Similarly, Drennan (2010) tested 110 graduate students starting the master's degree in nursing and 222 who already had a master's degree in nursing reported graduates had significantly higher CT scores. Regardless of all the results discussed above, some scholars (McMillan, 1987; Pascarella & Terenzini, 1991, 2005) consider that one semester, or a quarter-long course experience may be too brief to produce any measurable impact.

Institution-related variables. While there are some mixed findings regarding teacher and student-related factors affecting critical thinking gains, researchers agree that college attendance facilitates cognitive gains, including CTS. Scholars believe that student-faculty interaction (Ishiyama, 2002; Kuh, 1995); service involvement (Astin & Sax, 1998; Eyler & Giles, 1999), and diversity engagement (Kitchener, Wood, & Jensen, 2000) are driving variables influencing CTS gains in college students. Some scholars (Gellin, 2003a; Kim, Edens, Iorion, Curtis, & Romero, 2015) believe these institutional factors can be reasonably associated with CTS gains. Therefore, evidence suggests that what happens to students on campuses has more impact on learning and change than the structural characteristics of the institutions that the students attend (Pascarella & Terenzini, 2005).

Theoretical Models in Higher Education

Despite the plethora of research conducted in the past, their results are unable to explain how institutions teach CTS to college students (Huber & Kuncel, 2016). As a consequence, this body of research is actually also unable to clearly identify the variables impacting CTS gains in students over college experience. Hence, past research seems to be limited in its ability to provide an overlook of what institutions can do to ensure the acquisition of CTS; researchers, however, agree on the consistent decline of CTS gains in college students compared to previous decades (Huber & Kuncel, 2016; Pascarella & Terenzini, 2005).

The exploration of CTS in college students has been conducted using two theoretical approaches: college-impact models and student-centered developmental models (Davis & Murrel, 1993). College-impact models emphasize change associated with the characteristics of the institutions that college students attend, or the experiences students have while enrolled. On the other hand, student-centered development theories address the nature, structure, and process of individual human growth, focusing on the nature and content of intra-individual change. The primary difference between these approaches lies in the attention they give to what changed in college versus how these changes occurred. In other words, whereas student-centered developmental models concentrate on the nature or content of student change (such as moral or cognitive development), college impact models focus on the source of change (such as institutional characteristics, students' experiences, interactions with students and faculty members).

Student-centered developmental theories face hard critics from sociologists (Dannefer, 1984; Feldman, 1972, 1994a; Feldman & Newcomb, 1979; Smart, Feldman, & Ethington, 2000) who try to explain the origin of change in students out of the internal world. Developmental

theory detractors argue the entire approach is flawed. Their reasons are based on the absence of environmental influences in students' change. Therefore, the exploration of developmental models is not in the scope of this review.

On the other hand, college impact models are focused on the environmental or sociologic origins of change in college students. Four scholars in particular have made significant contributions to the literature of college impact models over the last decades. First, Tinto, developed the most widely established theory of student departure from college. Second, Astin and his Cooperative Research Program (CIRP) and database (1985). Third, Pascarella (1985, 1991) offered a general causal model to assess college impact. While Weidman (1989), reflected on the environmental factors that lead college students to reinforce or replace their set of values, beliefs, goals, and commitments. Their contributions are reviewed further in the next sections.

Tinto's Departure Model

Tinto's model (1975) is one of the most cited models but has received criticism by some scholars as this model includes behavioral measures with perceptual measures (e.g. Terenzini & Pascarella,1980; Chapman & Pascarella, 1983). Tinto's Model (1975) focuses on predicting student retention or persistence through the incorporation of precollege students' characteristics, goals and institutional commitments, institutional context variables and social factors. Tinto asserted that student's background, as well as their initial intentions and aspirations towards college influence their academic and social integration, which in turn affect their persistence in academic endeavors. Using his model of student persistence and departure, Tinto supported the role of student involvement in promoting positive educational outcomes for college students. He emphasized the need to better understand the relationship between student involvement and the impact that involvement has on student persistence.

Although Tinto's model has been linked to departure and persistence, it has also been useful in a variety of research purposes. For example, Peterson (1993a) tracked 418 underprepared college students, and explored the relationship between student's career-decision making self-efficacy and their ability to execute relevant tasks in educational environment. Anderson (1988) was interested in environmental factors using the Tinto model by looking at the role of student's social and economic backgrounds, characteristics of the college they attended, and their roles and experiences after they entered college as determinants of achievement in college. Cabrera, Nora, and Castañeda (1993) were interested in the role of finances on college persistence and conducted a longitudinal study by analyzing a sample of 466 college students who attended a public institution in 1989. Despite the wide use of Tinto's model in the literature, Astin (1991) warned scholars should be careful about distinguishing behavioral and perceptual measures because each measured a different type of data. The logic to use this theory in alterative studies is based on the reasoning that institutions and their academic community lead to greater student integration and thus to persist.

Pascarella's General Model

Pascarella's General Model (1985) attempted to provide a holistic analysis. Therefore, it included the institution's structural characteristics and its environment, after considering students' background and precollege characteristics. Pascarella considered that students' background and precollege characteristics and organizational features, together shape college environment. Moreover, he asserted, these three sets of variables influence the frequency and content of students' interactions. The fifth variable, quality of student effort, is shaped by students' background traits, the institutional environment, and by the normative influences of peers and faculty members.

Weidman's Model

Weidman (1989) developed the Model of Undergraduate Socialization. Weidman hypothesized that students bring a set of important background characteristics to college with them (such as socioeconomic status, aptitudes, career preferences, aspirations, and values) as well as normative pressures from parents and other non-college reference groups (for example, peers, community, employers). These characteristics become a constraining force on students' choices and decisions in college. The model posits a crucial role of the socializing role for parents and other non-college reference groups; therefore, it encourages students to evaluate and balance these various normative influences in order to attain personal goals. This process requires students' decisions about maintaining or changing attitudes, values, or aspirations held at the time of matriculation.

The I-E-O Astin's Model

Astin's I-E-O Model attempts to assess college effects. According to this model, college outcomes are viewed as functions of three sets of elements: inputs (such as demographic characteristics, family background, and academic and social experiences that students bring to college); environment (the full range of people, programs, policies, cultures, and experiences that students encounter in college, whether on or off campus); and outcomes (students' characteristics, knowledge, skills, attitudes, values, beliefs, and behaviors as they exist after college). The studies adopting this model attempt to explain the effects of environmental influences on student change or growth, focusing on factors over which college faculty and administrators have some control.

As critical thinking skills became important in education a variety of instruments have been developed by scholars. However, despite the large number of available instruments to measure CTS, scholars in higher education mostly use four instruments to conduct scientific research:

Watson-Glaser Critical Thinking Appraisal (WGCTA)

The Watson-Glaser Critical Thinking Appraisal (WGCTA) was developed in 1964 by Goodwin Watson and Edward Maynard Glaser. This instrument has been used in education; however, its primary usage has been focused on the business industry as a tool for hiring and promoting screening (Watson & Glaser, 2007). The WGCTA has undergone numerous revisions during the last years and it is currently offered as form A, B and S. The WGCTA forms A and B consist of 80 questions to be completed in 60 minutes.

The three versions vary in length; however, all the versions are capable of measuring students' critical thinking skills through five subscales: inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments (Gadzella, Baloglu, & Stephens, 2002; Loo & Thorpe, 1999). The critical thinking definition, used by Watson and Glaser (1964) to develop their instrument reads as follows:

> Attitude of inquiry that involve the ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true; (2) knowledge of the nature of valid inferences, abstractions, and generalizations in which the weight or accuracy of different kinds of evidence are logically determined; and (3) skills in employing and applying the above attitudes and knowledge. (p. 9)

Validity and reliability have been reported in the literature. Gadzella, et al. (2006), reported reliability and validity statistics conducted by Watson & Glaser (1994), asserting "the split-half reliability correlated from 10 norm groups ranged from .69 to .85, test-retest reliability for 96 students' responses was .73, and alternate-form reliability for 228 students' responses to forms A and B was .75" (p. 620).

In 2001, Gadzella et al. reported an internal consistency of the WGCTA of .86 for 135 students, with a split-half reliability of .65. The concurrent validity for the students' grades and the total WGCTA was $r = .42$ ($p<.001$). The short version of the instrument, form S, was developed in 1994 and includes 40 questions to be completed in 45 minutes. (Gadzella et al., 2006) tested the S form after applying the test to 486 undergraduate students and reported a reliability coefficient of .92.

Cornell Critical Thinking Test (CCTT)

The Cornell Critical Thinking Test (CCTT) was developed in 1971 by Ennis and Millman. The test includes 50 multiple choice questions to be answered in 50 minutes. The CCTT was developed based on Ennis, Millman, and Tomko's (1985) definition of critical thinking, that reads as "the process of reasonably deciding what to believe and do" (p.1). Therefore, the test is capable to assess students' generic critical thinking skills through seven subscales: induction, deduction, value judgment, observation, credibility, assumptions, and meaning (Adam, Whitlow, Stover, & Jhonson, 1996).

The test is available in two levels, X and Z. Level X was developed for ages from 4-14 and Level Z was developed for college students and adults. The validity and reliability of the test has been constructed throughout the last decades. However, for this discussion, only level Z is

included. The correlations from split-half reliability testing for level Z range from .55 to .76 (Adam, Whitlow, Stover, & Jhonson, 1996).

Collegiate Assessment of Academic Proficiency (CAAP)

The Collegiate Assessment of Academic Proficiency (CAAP) was designed to assess general education outcomes at the end of the first two years or upon completion of general education requirements (Collegiate Assessment of Academic Proficiency, 2000). The CAAP is a standardized test for the assessment of postsecondary education which offers six individual test sections, i.e., reading, writing skills, writing essay, mathematics, science, and critical thinking (CAAP Technical Handbook). The critical thinking module measures students on clarifying, analyzing, evaluating, and extending arguments and then, it provides a total critical thinking score.

The critical thinking component consists of four separate passages that students are expected to read to respond 32 multiple choice questions within 40 minutes. The reliability of the CAAP has been established at .87 with a reliability coefficient of .92 (American College Testing, 2012).

California Critical Thinking Skills Test (CCTST)

The California Critical Thinking Skills Test (CCTST) is the most preferred instrument to assess critical thinking skills in college students. This instrument was developed adopting the definition resulting from the qualitative Delphi Method (Facione, 1990). The concept of critical thinking was developed after a group of forty-six multidisciplinary experts were gathered in 1988 with the only purpose of exploring and defining what critical thinking means (Facione, 1990e). The group conceptualized critical thinking as having two dimensions, cognitive skills and affective disposition arguing. Therefore, the CCTST is 34 questions test that aims to

measure both cognitive and affective disposition. The test can be administered in 45 minutes in either an online or paper format. Although results provide a total score about the strength or weakness of one's skill in making reflective, reasoned judgement about what to believe or what to do (Facione, 2007), the test also provides six different sub-scores of the different dimensions of critical thinking.

In order to build validity and reliability, Facione conducted four experiments to evaluate the reliability and validity of the CCTST and examined groups differences and predictors. His findings were published in four technical reports. The first reported on experimental validation and content validity of the test (Facione, 1990b). The second experiment examined the predictive factors of critical thinking (Facione, 1990a), and then a third one where gender, race, major, CT self-esteem and the CCTST (Facione, 1990d). The fourth report focused on interpreting the CCTST, group norms and sub-scores (Facione, 1990c).

The recent adoption of CTS as a primary educational goal in higher education makes clear the need for more information on CTS of students at the university level in Mexico. In this regard, Mexican scholars have expressed concern about the way college and universities may lead students to develop CTS over college experience. Currently, their interest is in knowing how to transform an educational legislation into action. Therefore, the need to inform scholars, policymakers, teachers, and administrators led to the efforts made in the present study. Therefore, this study had a threefold purpose. First, exploring the levels of CTS in college students in Mexico. Second, exploring the relation between demographic-academic-related variables that may potentially impact CTS in college students in Mexico. Third, exploring Mexican students' insights in regard to their expectation prior college enrollment and their academic experiences as well.

CHAPTER III: METHODOLOGY

Research Design

Although the literature suggests a strong association between student engagement and academic achievement, the experiences students face in college are shaping variables influencing their academic performance and success (Ewell & Jones, 1996; Kuh et al., 2005). Therefore, examining only the strength of the association between engagement and overall CTS scores might bring an incomplete explanation of the relationship explored. In this regard, Moghaddam, Walker, and Harre (2003) remind researchers that quantitative research typically detaches information from its "real-world" context, a phenomenon referred to as decontextualization by Viruel-Fuentes (2007). Therefore, qualitative research has the potential to examine the "whole person" holistically within a natural environment (Gelo, Braakman, Gerhard, & Benetka, 2008). As Plano Clark et al., (2008) suggest, the qualitative approach affords an in-depth analysis of complex human behavior in a manner that cannot be fully captured by measurement scales and multivariate models. Therefore, it is assumed that the combination of quantitative and qualitative within a mixed-methods design are capable of providing a better explanation of the effects of students' demographics-academic-related variables and academic engagement on their overall CTS scores.

A mixed-method explanatory sequential design is a two-phase study in which the collection and analysis of both quantitative and qualitative data are combined. The overall purpose of this design is that qualitative data help explain or build on initial quantitative results. It is expected that qualitative data will contribute to explaining significant (or nonsignificant) results, outlier results, or surprising results (Morse, 1991). Drawing on this design, the researcher

conducted a non-experimental study to examine the effect of student-academic-related variables and engagement on the overall CTS in Mexican college students. Creswell (2014) underlines that the purpose of including the qualitative data is tied to the primary purpose of the study to assess better understand quantitative results.

Research Design Rationale

The literature suggests a strong association among students-academic-related variables, academic engagement and, CTS. As discussed in chapter II, some demographic variables (age, gender, parental level of education, GPA, degree aspirations, and enrollment status) have proven to be good predictors of college students' academic performance. Academic engagement is also referred to as an important predictor of academic success. Therefore, this study has a particular interest in exploring the effects of student-academic-related variables and academic engagement on the overall CTS scores. Moreover, we are particularly interested in exploring students' academic experiences as they have proven to be important behavioral drivers leading students to be academically successful (Ewell & Jones, 1996; Kuh, 2011; Kuh et al., 2005).

As Friedrichs and Kratochwil (2009), I believe truth is constantly renegotiated, debated, and interpreted in light of its usefulness in new unpredictable situations. Therefore, examining only the strength of the association between college student-academic-related variables, and academic engagement, on CTS scores from Mexican college students, might bring an incomplete explanation of the proposed variables (Moghaddam et al., 2003). I assumed that for the purpose of the present study quantitative data was not sufficient to answer the research questions. Therefore, the qualitative strand intended to examine the "whole person" holistically and within the participants' natural environment (Gelo et al., 2008). Considering the context of the study, I posited that obtaining a general statistical picture of the proposed predictors of CTS scores in

Mexican college students (see Figure 1.1) and then exploring participants' perspectives would contribute to explaining how college experiences impacted CTS scores.

The idea of mixing both strands has inspired much interest and debate (Sandelowski 1996; Tashakkori & Teddlie, 1998); nevertheless, supporters of mixed-methods research argue that complexity of human phenomena requires more complex research designs to capture them (Sandelowski, 2000). This philosophical perspective led me to situate the study within a mixed-methods design. Although there are several definitions of mixed-methods (Burke, Johson, Onwuegbuzie, & Turner, 2007), the study adopts the definition provided by Creswell and Plano Clark (2011), who defined it as:

> A method, which focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central promise is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone. (p. 5)

The adoption of a mixed-method design requires not only a thoughtful planning but also a good reason to embrace this approach. It is important to consider these studies are not only mixtures, but they may also involve the adoption of one or more philosophical orientations (Creswell & Plano Clark, 2011). Although any post-positivist approach may fit in mixed-method designs; lately, it is associated with pragmatism, as this approach is focused on the consequences of research, the importance of the questions asked rather than methods (Creswell & Plano Clark, 2011). The pragmatic approach allows scholars to use techniques for generating useful knowledge such as abduction, seen as a "heuristic strategy… aiming at a kind of useful knowledge that should help us to find our way through the complexities of the social world" (Friedrichs & Kratochwil, 2009, p. 711). In conclusion, this approach draws on many ideas,

using “what works” and valuing both objective and subjective knowledge. Although this approach is still controversial among scholars, some of which do not consider it as a philosophy, its use is being gradually endorsed by scholars.

For the purpose of the present study, the researcher adopts the mixed-methods explanatory sequential design. It occurs in two distinct interactive phases (see Figure 3.1). This design starts with the collection and analysis of quantitative data, which has the priority for addressing the study questions. The first phase by the subsequent collection and analysis of quantitative data. The second, qualitative phase of the study is designed so that it follows from the results of the first, quantitative phase (Creswell & Plano Clark, 2011).

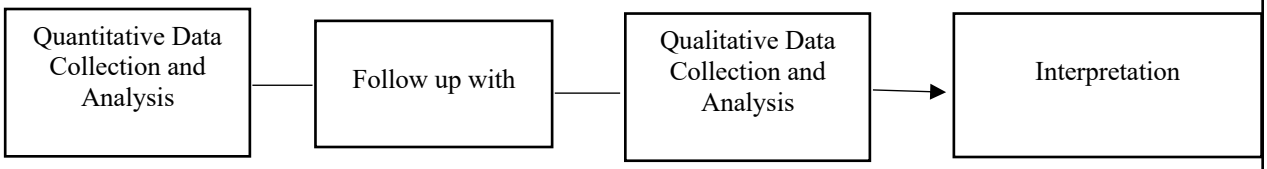

Figure 3.1. Mixed methods explanatory sequential design. Taken from *“Designing and conducting Mixed Methods Research*” (2nd edition) by John W. Creswell and Vicki L. Plano Clark (2011).

Theoretical Underpinning

Research assumptions and goals tend to impact which approach to theory researchers utilize (Gay and Weaver, 2011). Furthermore, “a good theory should include only the constructs and ideas that are necessary to better explain the phenomena under investigation” (Gelso, 2006, p. 90). Therefore, drawing on sociological perspectives (Bereiter, 1994), the theoretical foundation of this study adopted both General Systems Theory and the I-E-O Astin’s Theory, which are further explained in the following paragraphs.

General System Theory

The scholars' mission of elucidating the factors that lead individuals to succeed in higher education has been a partially met throughout the last decades. Although scientists have worked to develop a theory capable of unifying the many variables affecting development and change in academic environments (Evans, Forney, Guido, Patton, & Renn, 2010; MacKinnon & Floyd, 2016), there is a communication crisis among scholars from different fields (Boulding, 1956). The difficulty to establishing a fluent communication between disciplines becomes a barrier as "the Republic of Learning is breaking up into isolated subcultures with only tenuous lines of communication between them —a situation which threatens intellectual civil war (Boulding, 1956, p. 198). The more science breaks into sub-groups, and the less communication is possible among the disciplines; however, the greater chance there is that the total growth of knowledge is being slowed down by the loss of relevant communication. Whereas current efforts to create knowledge have fragmented the reality into a diverse specialization, traditions, and domains of discourse (Midgley, 2003; Rousseau, 2015), these traditions may have also ignored that world, institutions, and individuals are constantly affected by their realities (e.g., needs and challenges). The General System Theory (GST) aims to both develop generalized ears to enable specialists to catch relevant communication from others and to consider reality as a whole system.

The origins of GST date back to Ludwig von Bertalanffy (1972) when scientists, philosophers, and mathematicians began working to construct a theory capable of unifying the many branches of the scientific enterprise. The product of this effort brought a logico-mathematical discipline, which is in itself purely formal, but it applies to all sciences concerned with systems (Bertalanffy, 1950). To the date, GST is seen as a powerful framework for understanding both the natural and the human-constructed world. Its author refers to it as a way

of thinking about or an approach to studying complex systems. GST followers (e.g., Hammond, 2003; Hofkirchner & Rousseau, 2015; Laszlo, 1972) assert that the existence of laws of similar structure in different fields enables the use of systems which are simpler or better known as models for more complicated and less manageable ones. According to them, the GST has the potential to be an important means of controlling and instigating the transfer of principles from one field to another, potentially preventing scholars from duplicating or triplicating the discovery of the same principles in different fields isolated from each other. They also believe that general system laws apply to any system of a certain type, irrespective of the particular properties of the system or the elements involved.

For scientists adopting this approach, the concept of wholeness is broadly accepted. Such concept appears in all branches of science (e.g., biology, psychology, sociology) irrespective of whether inanimate things, living organisms or social phenomena are the objects of study (Bertalanffy, 1950). Bertalanffy insisted in studying organisms –or systems as he called them-- as wholes, where the scope of inquiry must include all the relevant factors. To explain this comprehensive framework, the author, referrers to laws of biology to support his point. This is particularly significant as in the past; society was considered as a sum of human individuals as social atoms; while, today, there is a tendency to consider society, an economy, or a nation, as a whole which is superordinate to its parts. As other influential waves (e.g., Nicolai Hartmann's theory, the doctrine of emergent evolution, and dialectic materialism) GST agrees in maintaining that principles of dynamic wholeness as basic in the modern conception of the world.

Moreover, under this approach the most effective means of achieving a specified end, included an evaluation of the process for determining goals, grounding technical rationality in the larger social and cultural context. As a result, individual's perception is not a reflection of

'real things', but instead the result of a complex interaction between the knower and the known that was dependent on biological, psychological, cultural, and linguistic factors. For instance, if we see a system as a complex of interacting elements P_1, P_2…P_n., interaction means that the elements stand in a certain relation, R, so that their behavior in R is different from their behavior in R and R' is not different, there is no interaction, and the elements behave independently with respect to the relations R and R'. Therefore, "the more tightly interwoven is the network, the more organized is the system comprised by the relations" (Rapoport, 1970; p.5). Similarly, human behavior cannot be explained without the individual's understanding of self in relation to the world (Bertalanffy, 1950). According to the author, humans are creatures of two worlds, biological organisms living in a universe of symbols. The unique characteristic of living systems is their organization; as a result, the importance of studying its interactive relationships is highly important (Hall & Fagan, 1956, p. 26).

Another important contribution from the GST is the treatment of change/growth. Bertalanffy considered growth as one of the fundamental problems in research. As usual, he draws on laws of biology to make his point. In specific, he generalized mathematically the basic idea that growth results from the interaction between anabolism and catabolism, the continuous processes of building up and breaking down that he considered fundamental to all aspects of life. While anabolism is related to metabolism and respiration and thus dependent on the shape and surface of the body, catabolism is dependent upon body weight. Since surface areas decreases relate to volume with increasing size, there is a natural tendency for organisms to stop growing as they reach certain characteristic size where anabolic and catabolic processes exactly balance each other in a steady state. In a similar vein, he asserts the growth of a system is directly proportional to the number of elements present. Depending on whether the constant X is positive

or negative, the growth of the system is positive or negative; however, change in each element depends only on that element itself. The variation of the total complex is the sum of the variations of its elements.

The characteristic state of the living organism is that they are changing all the time. If humans interact within a changing world, we, ourselves are not the same from one moment to the next. The organism is never in a state of equilibrium and maintains itself in a nonequilibrium state by taking in a continuous supply of energy and exchanging components with its environment. Any change in some element causes changes in all other elements and the total system. As the system behaves as a whole, the changes in every element depend on a causal mechanism involved. The GST posits that organisms are open systems, maintaining themselves in a nonequilibrium steady state through continual interaction with the environment. Therefore, organic systems maintain themselves in state of perpetual change of its components. This concept can be applied to the study of the human psyche, social institutions, and the global ecosphere, where laws of organization might apply.

Scientists adopting this framework are oftentimes guided here by the question of how the system under study actually works rather than assuming the system as an entity that exists for something. They assume that a 'system' comprises interacting parts, the sum of which exhibits behavior not localized in its constituent parts. In other words, this theory assumes that the whole is more than the sum of the parts (Laszlo, 1927). Its parts can be physical, biological, social, or symbolic; or it can be comprised of one or more of these. Under this approach, personal/community goals are important behavioral drivers influencing change; thus, the environment is the primary input of matter, information, and energy. GST attributes have encouraged scholars, especially from hard sciences researchers (e.g., computer sciences,

engineering, management) to adopt this framework over the last decades. Similarly, social science, have adopted it (e.g., Locker, 2006; Skyttner, 2005; Stephan, 2004). In the field of education, Gulyaev and Stonyer (2002) used an integrated approach base on the use of GST and the concept of 'mapping' scientific knowledge as an effort to understand science and its complexity in students.

Despite the GST attributes, this theory does not seek to establish a single, self-contained 'general theory of practically everything', which will replace all the special theories of particular disciplines (Boulding, 1956). In this regard, Boulding reminds us that the idea of adopting a general theory should be seen as an umbrella worldview that should be complemented with hi-low-level theories, carefully adopted by every single field of specialization. Otherwise, "we'll always pay for generality by sacrificing content, and all we can say about practically everything is almost nothing" (p.197).

For the purpose of this study, diversity, institutions, and culture are important factors leading to theory adoption. In this regard, Harro (2000) reminds us that human beings are different in many ways, based on gender, ethnicity, skin color, first language, age, ability, status, religion, sexual orientation, economic class, etc. All these categories contribute to defining individual identities through a pervasive socialization process. Harro asserts schools play a prominent role in the socialization process, as they constantly send massive messages about how to be, what rules to follow, what assumptions to make, and what to believe. Therefore, institutions have an influence on how people think, behave, and solve problems in their contexts (Harro, 2000). Sociological scholars (e.g., Dannefer, 1984a; Feldman, 1972, 1994a; Feldman & Newcomb, 1969; Smart, Feldman, & Ethington, 2000) believe that educational institutions socialize students through a series of experiences, which contribute to instilling knowledge,

attitudes, and skills through the influence of faculty, other students, and other socializing agents (Pascarella & Terenzini, 2005). It is assumed then, that institutions have considerable influence on student behaviors, attitudes, values, beliefs, interests, and even cognitive preferences.

Throughout the literature review, it became clear that there is a large amount of disparity in critical thinking research in regard to the factors leading college students to think critically. In viewing critical thinking as an active process, as defined by Brookfield (2012), it was evident the need to explore not only the individuals but also the environment that achieve its mission to socialize them. Therefore, it was assumed that the adoption of a college impact theory would contribute to understanding environment effects on students after exploring the experiences students had while enrolled in college (Pascarella & Terenzini, 2005).

I-E-O Model and the Theory of Involvement

College impact theories describe and investigate the ways students' identity, morals and values, cognition, and epistemological change over time and are influenced by the college environment and experiences. The Input-Environment-Output (I-E-O) model was originally developed by Alexander W. Astin (1970a, 1975; 1991;1993c) as a method to assist researchers in examining the factors influencing college student outcomes. This model was developed on the assumption that college students react and behave as a result from an acculturation process. The I-E-O model was constructed to be used in a variety of settings, contexts, and disciplines (Astin & Antonio, 2012).

The I-E-O model explores two-time points: pre-environment and post-environment to measure the effects of the college environment (environment) on selected outcomes (output) while controlling for students' background variables (input). The three components influence each other; in other words, students' inputs consistently predict their relationship to outcomes;

likewise, environments further influence the outcome (Astin & Antonio, 2012). The three elements of the model represent the category of factors that may influence the effects of college on students. Inputs are the demographics, personal, family, peer, social, and academic characteristics and experiences that students bring to college. This information allows the researchers to analyze how much of student outcomes are accounted for by variables they bring to college. The environment element represents the people, programs, policies, culture, and structure that students encounter after enrolling college; these reflect the range of experiences and factors that may affect student outcomes.

Emphasizing the I-E-O model is the complementary claim that students learn by becoming involved (Astin, 1985). Therefore, five postulates help to explain this theory: (a) involvement requires psychological and physical investment and energy; (b) involvement is varied and individual; (c) involvement ins both quantitative and qualitative; (d) how much learning and development occurs is proportional to the quantity and quality of involvement, and (e) the effectiveness of policy and practice is predicated on its ability to promote involvement (Astin, 1985).

The Astin's model and theory have endured and continue to be relevant to the study and practice of college impact (Pascarella & Terenzini, 2005). The adoption of scholars may be an effect of their flexibility, as inputs, environment, and outcomes are elements consistent across institutional type and student population (Ozaki, 2016). Whereas linear models of development are not adequate for the task of understanding how adults cope with college experiences (Cuyjet, Linder, Howard-Hamilton, & Cooper, 2016)**,** several scholars have used the Astin's model and theory to explore the effects of college on a variety of educational outcomes (e.g., Bryant, Gayles, & Davis, 2012; Norwani, Yosuf, & Abdullah, 2009; Strayhom, 2008; Umbach, 2007;

Yanto, Joseph, & Kavanagh, 2011). The I-E-O Model was revised and adapted to be used in a Mexican population (see Figure 3.2).

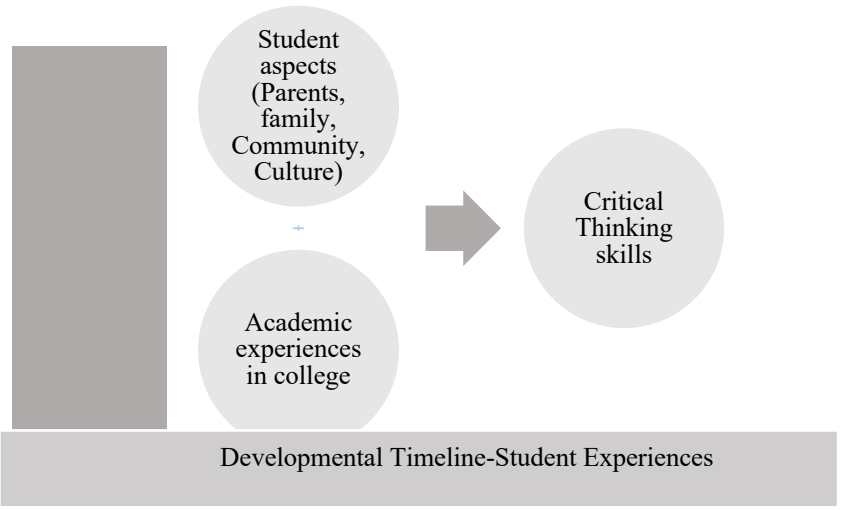

Figure 3.2. Theoretical Logic Model adopted to assess the effects of Bio-social aspects (gender, age, parental education, aspiration degree, and enrollment status) on the college experiences and consequently on the levels of critical thinking skills display by college students in Mexico.

Research Setting

The site of this study was a university located in a Northwest city in Mexico. This institution is a Mexican public institution considered as a medium-sized institution, which has a population that varies from 15,000-17,000 students per academic year. This university has five different campuses and offers 24 bachelor's degrees, which are clustered in four colleges: Engineering & Technology (BS), Social & Humanity sciences (BA), Economics & Administrative Sciences (BA), and Natural Resources (BS) (see Annex A). It also offers 13 master's degree programs, and three doctorate programs.

Since the research was conducted outside the United States, it complied with both U.S. and Mexican policies and regulations. Therefore, this study gained IRB approval in the U.S. and from the Research Commission of the Mexican University. The research commission in Mexico is an ethical commission aligned to the principles of the declaration of Helsinki—the European

Convention for the protection of human rights—and the universal declaration of the United Nations Educational, Scientific and Cultural Organization (UNESCO) on human rights. Even though the researcher is a bilingual person and a Spanish native speaker, the research process was supported by a Mexican faculty member who has expertise conducting research in Mexico. This collaboration ensured greater assistance in navigating the local regulations and policies, local infrastructure, and increasing community partnerships.

Sample and Sampling

Based on the literature, and the framework adopted in the present study, the researcher already identified key variables (student-academic-related variables, academic engagement) as predictor variables of CTS in college students in Mexico. Therefore, theoretical sampling was conducted. As theoretical sampling involves selecting participants based on specific characteristics (Saunders et al., 2017), the researcher attempted to draw on a subset of objects from a targeted population, as suggested by Tronchim (2005). For this reason, Mexican college students enrolled in this Mexican university who were older than 18 years old were invited to participate in the study. The researcher also sought to include only research participants who had been enrolled for at least two semesters in any educational program offered by the Mexican university.

Quantitative sampling. The purposeful quantitative data collection included 200 college students from the four different colleges (Engineer & Technology [50], Social & Humanity sciences [50], Economics & Administrative Sciences [50], and Natural Resources [50]). The first stage included 124 female respondents and 76 male respondents.

Qualitative sampling. Volunteers who expressed willingness to participate in the second strand, and who had previously participated in the quantitative strand provided personal contact

information (name, phone number, email) to get scheduled interviews. Only these participants signed a second consent letter. Although more than 30 individuals expressed their interest to participate, the researcher weighted on potential participants' characteristics. Then, purposive sampling was selected based on their bachelor's degree, length of enrollment, and gender, which were considered particularly relevant to the research (Gibson & Brown, 2013). The sample included 20 participants. Five females from social sciences, five females from administration and economics, five males from engineering and technology, three females and two males from natural resources. Participants were between the ages of 18 and 27 years old (M = 21.3; SD = 3.6). Interviews were conducted from November 2018 through December 2018. Table 3.1 illustrates the instruments used to collect the data that attempts to respond to the research questions. The study represented an anticipated minimal risk for participants. Participants responding tests and participating in interviews did not face any physical or psychological harm greater than those ordinarily encountered in daily life.

Table 3.1

Variables, Research Questions, and instruments

Variable	Research Question	Instrument
Dependent Variable: Critical Thinking Score	Used in inferential question 1 and 2	California Critical Thinking Skills Test
Independent variable: Academic Engagement	Used in inferential question 1 and 2	Academic Engagement Test
Independent variable: Demographics (age, gender, parental education)/ Academic variables (GPA, Enrollment status)	Used in both descriptive analysis and inferential question (2)	Self-reported data

Data collection protocol. Upon receiving both IRB approval and the Research Commission approval from Mexico, prior to recruitment, the head of education issues in Mexico was made aware of the study. The Co-Principal Investigator (Co-PI) spoke with each of the academic department heads (Engineering & Technology, Social & Humanity Sciences,

Economics & Administrative Sciences, and Natural Resources) prior to the start of recruitment to determine the terms of recruitment. Figure 3.3 displays the research protocol followed in the present study.

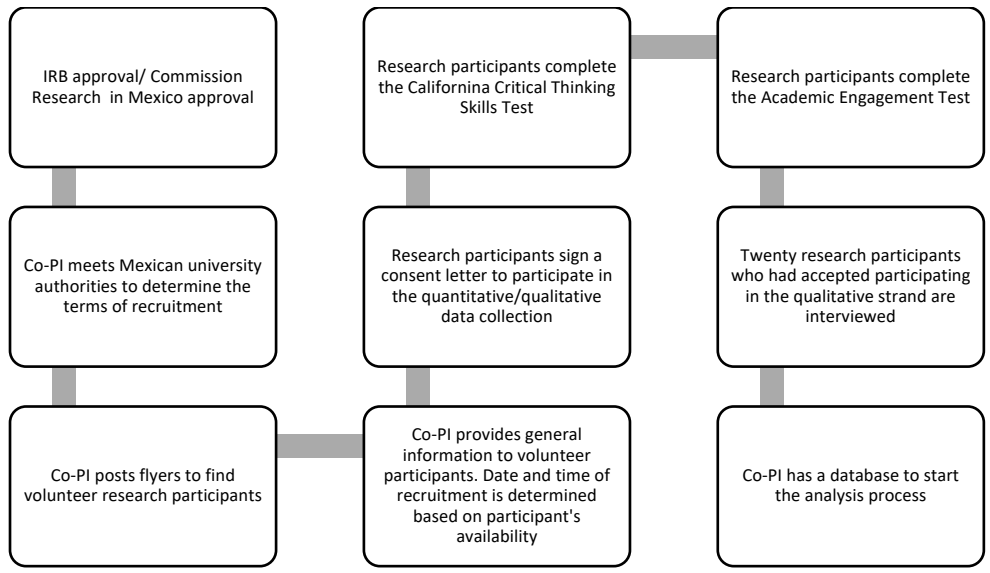

Figure 3.3. Data collection protocol shows the process followed to collect data outside of the U.S.A.

The recruitment process started with the posting of flyers across different campuses. The Co-PI designed a flyer in both English and Spanish languages. The flyer looking for volunteer research participants was posted in Spanish. The flyer informed potential participants about the overall research purpose; it also provided the Co-PI contact information. The search for volunteer participants continued until 200 participants were gathered (50 from each academic department). For those who accepted participating in the study signed a consent letter form to respond to the two instruments (CCTST and the Academic Engagement Test). Prior to participants' involvement, volunteers signed a consent form, written in Spanish which provided details about the purpose of the study and the nature of their participation. During this stage, the

Co-PI introduced herself and disclosed important information to research subjects needed to make an informed decision. Further, the Co-PI recruited potential participants for the qualitative data collection.

The application of the two tests was carried out at two different times, in an effort to protect research participants from fatigue and as an attempt to get more accurate responses. The administration of both instruments was carried out in four sessions as well, grouping college students from each college (50 students for administration). In the case of the CCTST, data collection adopted the browser-based option since this option is available for anyone with access to laptops and desktop devices. To ensure all the participants have access to a desktop device the university facilitated its computer labs. The academic engagement test adopted a paper and pencil option. The sampling was carried out in four different sessions as well. The process was supported by University staff members, who collaborated in logistic issues. Then, the Co-PI scheduled and conducted twenty semi-structured in-depth interviews with volunteers who previously accepted participating in follow-up interviews.

Instruments

The study adopted two different instruments to collect quantitative data. The CCTST is an instrument frequently adopted among scholars studying CTS. The second instrument was developed drawing on the CSQE, and the suggestions made by a panel of experts in Mexico. The qualitative strand adopted semi-structured in-depth interviews as a means to collect data.

California Critical Thinking Skills Test

Critical thinking skills were measured using the CCTST (Facione & Facione, 1992). This is a 34-item standardized test which seems to be capable of predicting the capacity to succeed in educational or workplace settings. The test is currently available in 16 languages, including

English and Spanish (Insight Assessment, 2018). The CCTST total score targets the strength or weakness of one's skill in making reflective, reasoned judgment about what to believe or what to do and includes the sum of analysis, inference, and evaluation (Facione & Facione, 2007).

The CCTST has been widely used by scholars conducting research in the field of critical thinking; its validity is derived from the cross disciplinary conceptual definition of critical thinking that emerged from the APA Delphi Research Study (1988-1990) and was replicated by the Department of Education, supported by the Penn State Research study in the mid 1990's. The Delphi panel overwhelming agreed (i.e., 95% consensus) that analysis, evaluation, and inference are the core skills in CTS (Facione, 1990b). In addition, recent research indicates strong relationships among these skills. Analysis and evaluation ($r = .40$, $p < .001$), analysis and inference ($r = .36$, $p < .001$), and evaluation and inference ($r = .48$, $p < .001$) were all significantly positively correlated (Dwyer, Hogan, & Stewart, 2011). Furthermore, criterion-related validity has been extensively reported. For instance, Haden, et al. (2010) tested 207 first-year dental hygiene students from seven Baccalaureate-level dental hygiene programs in the United States affiliated with a dental school. CCTST scores explained a statistically significant ($p < .05$) proportion of variance in students' initial clinical reasoning scores, acquired knowledge scores, and faculty ratings, above and beyond that explained by age, GPA, or college credit hours at program entry. Similarly, Denial (2008) applied the CCTST to optometry students after one year of clinical education critical thinking skills. Denial found that both the overall CTS scores and clinical rating were significantly related. Lower performing ($M = 15.5$), medium performing ($M = 19.3$), and high performing ($M = 22.9$). Therefore, CCTST has proved to be a good predictor of high order thinking. However, although the test has extensively reported to be a

valid and reliable instrument across different populations, it has not been tested validity and reliability on the Mexican population.

The CCTST has been widely used across several fields; however, its use seems to be highly associated with education and health care. In the field of higher education Facione (1990d) was a pioneer after applying the instrument to compare CTS gains over college experience between males and females. After testing 945 students (47.2% males, 52.8% females), Facione found males tend to acquire CTS better than females. In a similar vein, Giddens and Gloeckner (2005) analyzed the association between CTS and nursing students' performance on the NXCLEX-RN. The scholars reported the instrument was useful in the prediction of NCLEX-RN performance; contrary to Facione, the scholars did not find a significant difference between males and females' performance. Although several scholars (e.g., Whitmire, 1998; Cox, 2002) have looked at the association between gender, age and CTS using the CCTST, current literature presents inconsistent findings.

The examination of CCTST overall scores are reported on a 100-point version about:

Analysis: People with strong analytical skills attend to patterns and details. They identify the elements of a situation and determine how those elements interact. The analysis subscale reflects people's capacity to identify assumptions, reasons, and claims and to determine how those elements interact.

Interpretation: This skill is used to determine the precise meaning and significance of a message or signal; whether it is a gesture, sign, set of data, written or spoken words, diagram, icon, chart or graph.

Inference: This skill enables drawing conclusions from reasons and evidence. Inference skills indicate the necessary or the very probable consequences of a given set of facts and conditions.

Evaluation: This skill enables assessing the credibility of sources of information and the claims they make. Applying evaluation skills, the quality of analyses, interpretations, explanations, inferences, options, opinions, beliefs, ideas, proposals, and decisions can be judged.

Explanation: This skill enables describing the evidence, reasons, methods, assumptions, standards or rationale for those decisions, opinions, beliefs and conclusions.

Induction: People use inductive reasoning skills when drawing inferences about what must probably be true based on analogies, case studies, prior experiences, statistical analyses, simulations, hypotheticals, and familiar circumstances and patterns and behavior.

Deduction: Decision making highly depends on deductive reasoning skills. Deductive reasoning moves with exacting precision from the assumed truth of a set of beliefs to a conclusion which cannot be false if those beliefs are true.

Academic Engagement Test

Although several instruments were found to measure academic engagement, as Draeger et al. (2013), other well-known instruments were added to build a more appropriate one to measure a two-dimension construct into the Mexican context. In particular, we adopted the College Students Experiences Questionnaire (CSEQ; Pace & Kuh, 1998). The CSEQ has been broadly used (Astin, 1993; Kuh, 1995; Pascarella & Terenzini, 2005) as a thermometer to gauge the level of academic engagement at American higher education institutions throughout the last decades. The questionnaire draws on student perceptions of their own behavior as well as

broader institutional factors, such as course requirements and campus environment. Therefore, it was assumed the CSEQ would enable the researcher to understand college experience from students' perspective, after exploring both the processes of learning and progress toward desired outcomes of college (e.g., intellectual skills, interpersonal competence, and personal values) (Borden, 2001). The CSEQ test administrators authorized the usage, translation, and adjustment of items; moreover, they waived the fees related to its usage (see Appendix A to see authorization).

Originally, the entire instrument has 150+ items that contribute to a broad understanding of student experience; however, we decided to focus on twenty-five items from the CSEQ. Data from 25 items are clustered in two dimensions: behavioral (10 items), (e.g., Have you asked your teachers for advice to improve your writing?) and emotional (15 items) (Have you read additional material to strengthen your learnings?) (see Annex D). The decision to adopt a two-dimension construct was made considering our priority, understanding what college students in Mexico are doing in college and universities and how they feel (e.g., excited, forced to do something, willing to work, etc.) about their academic experiences in college.

Content validity. Content validity was assessed using two approaches to review the scale: (a) a panel of seven content experts with professional expertise in higher education, and (b) a focus group of 15 college students. According to Flick (2014), 6 to 9 experts are enough to assess the study construct and its items. Therefore, in order to assess content validity, seven experts were chosen. Six members were Spanish native speakers with expertise in higher education, who belong to the National Research System in Mexico (SNI by its Spanish acronym). The seventh member was an English native speaker journalist who strengthened the translation process.

After selecting the items that would be included, those were translated directly by the Co-PI, who is a bilingual and Spanish native speaker. The items adopted from the CSEQ were originally written in English then translated into Spanish by using the back-translation method as suggested by Brislin, Lonner, and Thondike (1973). Then, content experts from Mexico reviewed and suggested the improvement of the lexicon and sentence structures of the items included in the Academic Engagement instrument (see Appendix D). In addition to the improvement of items, the six experts collaborated to evaluate the Academic Engagement instrument based on a two-dimension definition and the Mexican context and culture.

Then, the Co-PI conducted a pilot study with fifteen Mexican college students in Mexico. This process aimed to verify the language accuracy and the comprehension of every item included in the Academic Engagement instrument. Based on students' responses, the instrument was adjusted once again and sent back to the six experts to review its accurateness and relevance. After going through this process, researchers strongly believed these 25 items compiled into a two-dimension construct would be able to measure the properties of Academic Engagement in Mexican college students (see annex D).

Construct validity. Item development for the academic engagement test for Mexican college students included an extensive review of the concept of academic engagement. Then, after extensive deliberation with Mexican faculty members, this study adopted a two-dimension definition, composed of behavioral and emotional aspects. Drawing from the CSQS, a total of 22 items measuring academic engagement were translated and adapted to the Mexican context. Additionally, three items were included as a result of suggestions made by the panel of experts. The final version of the instrument was then tested on the current sample. The items included in the test were screened for descriptive statistics (mean and standard deviation). The data were

additionally screened for normality measured by skewness and kurtosis, as suggested by Tabachnick and Fidell (2013).

The assumption of data normality must be determined for each item. According to some scholars (Morgan, Leech, Gloeckner, & Barret, 2013; Tabachnick & Fidell, 2013), skewness and values between -2 and +2 should be evidence that the data fall within an acceptable normal distribution range. The values for asymmetry and kurtosis between -2 and +2 are considered acceptable in order to prove a normal distribution (Field, 2009; George & Mallery, 2010; Trochim & Donnelly, 2006). For this study, acceptable values for skewness were between -2 and +2, and acceptable values for kurtosis were between -2 and +2. The results of the analysis are summarized in table 2. Based on the statistics presented in table 3.2, we noticed items 9, 10, 21, 24, and 25 showed asymmetry and kurtosis issues. These items were excluded from further analysis.

Table 3.2

Mean, Standard Deviation, Asymmetry, and Kurtosis of the Items to Measure Academic Engagement

Items	*M*	*SD*	Asymmetry	Kurtosis
1. Completed the assigned readings for class	4.19	.75	-.32	-1.17
2. Took detailed notes during class	4.06	.80	-.45	-.46
3. Contributed to class discussion	3.49	1.01	-.09	-.61
4. Summarized major points and information from your class notes or readings	3.96	.88	-.71	.38
5. Went to panel discussions, seminars, or conferences related to my classes.	2.63	1.09	.46	-.33
6. Thought about grammar, sentence structure, word choice, and sequence of ideas or points as you were writing. Was careful using right grammar, structure sentences, words, and ideas when I wrote my papers	4.34	.78	-.85	-.24
7. Used grammar books, manual about writing style to write my papers.	3.48	1.16	-.34	-.68
8. Asked an instructor or staff member for advice and help to improve your writing	2.57	1.27	.33	-1.02

Table 3.2 Continue

Items	*M*	*SD*	Asymmetry	Kurtosis
9. I have attended my classes, labs, seminars in a timely manner.	4.68	.66	-2.87	10.67
10. I fulfill my deadlines in a timely manner.	4.47	.78	-2.04	5.69
11. I have discussed classes related issues such as grades, projects, and general questions.	4.16	1.05	-1.37	1.72
12. Discussed your academic program or course selection with a faculty member.	2.48	1.26	.34	-.95
13. Discussed ideas for a term paper or other class project with a faculty member.	3.31	1.14	-.28	-.67
14. Discussed your career plans and ambitions with a faculty member.	2.53	1.25	.33	-.93
15. Worked harder as result of feedback from an instructor.	3.82	1.13	-.70	-.27
16. Socialized with a faculty member outside of class.	2.41	1.06	.28	-.46
17. Asked my instructor for comments and criticism about my academic performance.	2.64	1.13	.26	-.61
18. Worked harder than you thought you could to meet an instructor's expectations and standards.	3.38	1.19	-.50	-.48
19. Worked with a faculty member on a research project.	2.02	1.21	1.14	.49
20. Read additional material to strength my learnings.	3.25	1.03	.04	-.35
21. I do like my university	4.43	.81	-.61	2.63
22. If you could start over again, would you go to the same institution you are attending now?	4.25	1.04	-1.31	.85
23. My relationship with my classmates is positive.	4.65	.59	-1.45	1.09
24. My relationship with my professors is good.	4.67	.57	-1.50	1.27
25. My relationship with staff members is positive	4.6	.67	-1.92	3.23

Then, to determine whether the remaining items (20) should be grouped into a two-dimension construct the data was screened once again. Results show that a two-dimension model does not fit with the data (X^2 = 403.87, *df* = 165, $p < .000$; SRMR = .095; AGFI = .77; CFI = .75;

TLI = .71; RMSEA = .085, CI 90[.075, .096]. Moreover, findings suggest the two factors of the scale (behavioral and emotional) were highly correlated ($r = .93$, $p < .001$); therefore, a one-factor model of measurement the construct seems to be more accurate.

Based on the results, a one-factor model was calculated. The one-factor model with nine items adjusted fits with the data ($X^2 = 39.49$, $df = 24$, $p < .024$; SRMR = .05; AGFI = .92; CFI = .95; TLI = .92; RMSEA = .05, CI 90[.02, .08]. A cut off of 0.3 and value of modification indices loading was used to determine which items loaded onto the single factor (see Table 3.3).

Table 3.3

Factor loadings for the one-dimension Academic Engagement test for Mexican college students

Items	Factor loadings
1. Completed the assigned readings for class	.42
4. Summarized major points and information from your class notes or readings	.42
6. Thought about grammar, sentence structure, word choice, and sequence of ideas or points as you were writing. Was careful using right grammar, structure sentences, words, and ideas when I wrote my papers.	.35
7. Used grammar books, manual about writing style to write my papers.	.40
12. Discussed your academic program or course selection with a faculty member.	.55
14. Discussed your career plans and ambitions with a faculty member.	.62
19. Worked with a faculty member on a research project.	.46
20. Read additional material to strength my learnings.	.53

Reliability Estimates. The data was screened for interrater reliability. The value of Cronbach's alpha is .76. Some authors suggest values above .70 are quite acceptable (Morgan et al., 2013). The Average Variance Extracted (AVE) suggest that the latent factor under study characterizes what it is intended to measure. Acceptable values for AVE are above .40 (Dunn, Baguley, & Brunsden, 2014).

Table 3.4
Reliability Tests

Statistic Tests	Values
Cronbach's Alpha (α)	.76
McDonald Omega (Ω)	.83
Average Variance Extracted (AVE)	.52

Self-Reported Demographic-Academic-Related Variables

The demographic-academic-related variables were self-reported by research participants. However, Mexican universities use a different grading system to the U.S. Mexico has a ten-point grading system with corresponding numerical grades for academic work. In higher education, the passing grades are from seven to ten, where ten is the maximum grade. A grade of six or below is not a passing rate in higher education; therefore, research participants reported having at least seven as the average grade in their bachelor's degree program. Table 3.5 shows a comparison between the 0-10 scale used in Mexico and the 0-4 scale used in the USA. The researcher uses the equivalency to convert Mexican scales into the American grading system (GPA) (OECD, 2018; SEP, 2018).

Table 3.5

Grading System Equivalency Between Mexico and the US

Numerical grade	US Letter grade	Corresponding grade on 4.0 scale
9.0-9.4	A+	4.0
8.7-8.9	A-	3.7
8.4-8.6	B+	3.3
8.0-8.3	B	3.0
7.7-7.9	B-	2.7
7.4-7.6	C+	2.3
7.0-7.3	C	1.7

Note. Adopted from the Grade Point Average (GPA) guide released by the OECD (2018)

Semi-Structured In-Depth Interviews

As Holstein and Gubrium (1995) suggest, the Co-PI conducted "creative interviews, which entailed the production of a climate of mutual disclosure between interviewee and interviewer by allowing the latter to have a deep involvement in the conversational development" (p. 119). Data were derived from interviews with each of the twenty participants, for a total of twenty in-depth semi-structured interviews. Interviews ranged in length from 15 to 20 minutes. The interviewer followed an interview protocol which standardized both the data

collection process and the questions asked (see Annex E) to respond research question 3. Interviews were conducted in Spanish.

The qualitative data set attempts to expand the scope of the research, providing a better insight into how students' academic expectations and their academic experiences in college may have shaped students' academic engagement. The qualitative study was to be guided by the overarching research questions, as follows:

1. From your perspective, how academic experiences in college have contributed to developing of your CTS?
2. From your perspective, how do faculty members influence the development your CTS?
3. From your perspective, in what ways does the teaching approach in college influence the development CTS?
4. From your perspective, how do the programs and practices in college contribute to developing your CTS?

Data Analysis

Quantitative Data Analysis

Missing data were less than 3% across the different variables included in the study. In all cases, missing data were treated using the regression imputation model. First, Confirmatory Factor Analysis (CFA) was used as the researcher had a reason to believe a two-dimension construct was capable of measuring academic engagement in college students in Mexico. CFA was used to test this expectation against the data. The researcher used the Maximum Likelihood estimation (ML) with bootstrap (with 5000 replicates). Reliability tests included Alfa de Cronbach, Omega McDonald, and Average Extracted Variance. Then, descriptive analyses aimed to explain how the variables included in the study behaved. Later on, data were screened

for inferential analysis to explore the correlation among the different variables. Finally, data were screened once again to run a multiple regression model.

Qualitative Data Analysis

Inductive-deductive methods were used to code semi-structured in-depth interviews. The analysis process was driven by the data itself and literature-based information (Strauss & Corbin, 1998). Moreover, the investigator-triangulation method was used to determine final codes and main findings. Finally, findings were triangulated with literature reporting on the state of higher education.

Trustworthiness

Unlike quantitative research, qualitative studies are expected to make efforts to show trustworthiness in its design. Although there are different factors threatening trustworthiness in qualitative research, the method used to collect data led the researcher to foresee inaccurate self-reports. Specifically, student self-reports are subject to the halo effect (Pike, 1999), where students may slightly inflate certain aspects of their behavior or performance, such as the level of effort they put forth in certain activities. According to Pike, the halo effect is constant across different types of students and schools. Although the literature has shown the possibility that students intentionally report inaccurate information about their activities or feedback (Pace, 1985; Pike, 1999; 1974), self-reports are likely to be valid when they are requested under five general conditions. These conditions are: (1) when the information requested is known to the respondents; (2) the questions are phrased clearly and unambiguously; (3) the questions refer to recent activities; (4) the respondents think the questions merit a serious and thoughtful response; and (5) answering the questions do not threaten, embarrass, or violate the privacy of the respondent in socially desirable ways (Pace, 1985; Pike, 1999).

CHAPTER IV: RESULTS

The purpose of this study was threefold: (a) to explore the level of CTS in college students in Mexico; (b) to examine the effect of both demographic-academic-related variables and academic engagement on CTS in college students in Mexico; (c) I sought to explore the way the classroom experiences in college might have influenced the levels of CTS, from Mexican college students' perspective. This chapter provides a description of the findings of the statistical analyses conducted in this study using the methodologies delineated in Chapter III, and it is organized by sections and subsections corresponding to each of the research questions framing the study.

The presentation of the findings proceeds as follows: The quantitative strand presents (a) demographic and descriptive statistics for the respondents in the study, (b) comparative analysis of patterns of critical thinking skills of college students in Mexico in the study, and finally, (c) a Correlation Matrix for the variables included in the study to check the relationship for each pair of variables and tests of model fit. Regression analysis were run to explore the association between the included variables. Additional statistical analyses were run to better understand the effects of gender, GPA, academic engagement, and parental education on the CTS in college students in Mexico. Then, the qualitative strand explored students' perspectives in regard to the academic environment they experienced after college enrollment and its effects on CTS gains. The chapter concludes with a summary of analyses and findings.

Quantitative Strand (Phase One)

I started the quantitative strand running descriptive analyses, as suggested by Zechmeister & Posavac (2003). The descriptive analyses helped me to be sure that my database was clean and

free of errors. During this stage, I sought outliers or extreme values that could produce problems (e.g., skewness, kurtosis) during the inferential statistical analysis. Then, data were screened for inferential analysis to respond research question 1 and 2.

Descriptive Analysis

The demographic profile of college students participating in the CCTST study was analyzed based on variables related to demographic and academic characteristics of surveyed students. IBM SPSS version 22 was used to perform the descriptive analysis. Demographic characteristics included gender, age, mother's level of education, and father's level of education. Academic characteristics included degree aspirations, enrollment status, and self-reported GPA. The total number of student respondents in this study was 200. The two instruments were allowed to be administer to 205 undergraduate students. There were, however, 200 completed tests for a 98% response rate.

Demographics

There were 124 female respondents and 76 male respondents. Table 4.1 shows the relative frequencies and the response rate for each demographic variable included in the study. Note that more than half (62%) of the students were women and the rest were males (38%). The sample included 163 respondents (81.5%) who were between the ages of 18-23. There were 37 respondents (18.5%) were older than 23 years old, the traditional college age in Mexico (INEE, 2019). The sample included 53 respondents (26.5%) who reported their mothers have a bachelor's degree, whereas 65 of them (32.5%) reported their fathers have a bachelor's degree. Only four male respondents (3.5%) reported do not knowing whether their fathers have a bachelor's degree.

Table 4.1

Demographics Characteristics of Participants (n = 200)

Characteristic	*n*	%
Gender		
Male	76	38
Female	124	62
Age		
18-23	163	81.5
23+	37	18.5
Parental level of education		
Mothers with bachelor's degree	53	26.5
Mother without bachelor's degree	147	73.5
Fathers with bachelor's degree	65	32.5
Fathers without bachelor's degree	131	65.5
Do not know whether father has a bachelor's degree	4	2.0

Academic Characteristics

There were 50 respondents from each of the four different colleges (Economic and Administrative Sciences, Social and Humanity Sciences, Natural Resources, and Engineer and Technology). Table 4.2 shows the relative frequencies and the response rate for each academic variable included in the study. The sample included 97 respondents (48.5%) enrolled in the second year of the bachelor program. There were 60 respondents who reported were enrolled in the third year of college. Also, 32 respondents (16%) were enrolled in the fourth year of college. Only 11 respondents (5.5%) reported being enrolled for more than eight semesters in college. More than a half of the sample (54%) of the respondents (n = 108) reported having A's. There were 79 respondents (40%) reporting having B's. Only 12 respondents (6%) reported having C's. In regard to academic-related variables, Mexican students had an outstanding academic performance 8.92 (about A+), they showed high levels of academic engagement 3.27 in a scale from 1 to 4. Participants had overall a weak performance in terms of CTS (M = 66.98).

Table 4.2

Academic Characteristics of Participants (n = 200)

Characteristic	*n*	%
Degree aspirations		
Economic and Administrative	50	25
Sciences		
Social and Humanity Sciences	50	25
Natural Resources	50	25
Engineer and Technology	50	25
Enrollment status		
From 3-4 semesters	97	48.5
From 5-6 semesters	60	30
From 7-8 semesters	32	16
More than 8 semesters	11	5.5
*Self-reported GPA		
9.5-10 (A)	41	20.5
9.0-9.4 (A-)	67	33.5
8.7-8.9 (B+)	34	17.5
8.4-8.6 (B)	23	11.5
8.0-8.3 (B-)	22	11.0
7.7-7.9 (C+)	5	2.5
7.4-7.6 (C)	4	2.0
7.0-7.3 (C-)	3	1.5
	M	*SD*
GPA	8.92	0.58
Critical Thinking Score	66.98	4.78
Academic Engagement	3.27	0.61

Note: Self-reported GPA was converted from Mexican scale based on guidelines provided by the OECD (2018)

Due its relevance, descriptive statistics for the critical thinking skills of undergraduate students currently enrolled in a Mexican university are also presented in detail in Table 4.3. The score indicates that the average performance was either not manifested or weak (66.98). Based on the results, the subscales present similar behavior. The analysis subscale had 122 (61%) students with either weak or not manifested skills. There were 90 (45.5%) students who displayed either a weak or not manifested inference skills. In terms of evaluation skills, 143 (71.5%) students displayed either a weak or not manifested evaluation skills. Deduction skill was either weak or not manifested for 133 (66.5%) students. Interpretation skill was also weak or not manifested for 129 (64.5%) students. And explanation skills were either weak or not manifested

for 164 (82%) students. Unexpectedly, only one student showed superior skills in terms of analysis and deduction.

Table 4.3

Descriptive Analysis of Included Variable in the Study.

Variable	*M*	*SD*	No manifested		Weak		Moderate		Strong		Superior	
			n	%	*n*	%	*n*	%	*n*	%	*n*	%
Analysis	67.47	6.67	30	15.0	92	46.0	63	31.5	14	7.0	1	0.5
Inference	69.13	6.04	29	14.5	62	31.0	96	48.0	13	6.5	0	0
Evaluation	65.77	5.74	38	19.0	105	52.5	53	26.5	4	2.0	0	0
Induction	68.65	5.23	16	8.0	91	45.5	88	44.0	5	2.5	0	0
Deduction	68.05	5.87	27	13.5	106	53.0	55	27.5	11	5.5	1	0.5
Interpretation	66.78	6.20	37	18.5	92	46.0	63	31.5	8	4.0	0	0
Explanation	64.49	6.00	58	29.0	97	48.5	40	20	5	2.5	0	0
Overall CTS score	66.98	4.78	35	17.5	109	54.5	55	27.5	1	0.5	0	0

Inferential Analyses

Research question (1 and 2) How well does the combination of demographic (gender, age, parental academic education), academic (GPA, enrolment status, and degree aspirations), and Academic Engagement related variables predict the overall critical thinking score or sub scores in Mexican college students?

First, the data was screened for a descriptive-correlational analysis. The analysis was conducted to test if the variables included in the model (student-academic-related variables, academic engagement) significantly predicted Critical Thinking Skills in college students in Mexico. The means, standard deviations, and intercorrelations can be found in table 4.4. Results indicated that only GPA and mother bachelor's degree showed a significant correlation with CTS.

Table 4.4

Correlations for Critical Thinking and Predictor Variables (N=198)

Variable	1	2	3	4	5	6	7	8
1. Critical Thinking score	--	0.013	-.05	0.02	0.26**	0.16*	0.09	0.05
Predictors								
2. Gender		--	0.29**	0.37**	-0.19**	0.16*	0.12	-0.13
3. Age			--	0.40**	-0.16*	-0.12	-0.03	-0.02
4. Degree status				--	-0.12	0.16*	0.05	0.02
5. GPA					--	0.09	0.09	0.09
6. Mother bachelor's degree						--	0.26**	0.07
7. Father bachelor's degree							--	-0.05
8. Academic Engagement								--

In order to determine the effects of the GPA and Mother's level of education on the CTS, a regression model was run with the step by step method. The regression model resulted significant ($F = 9.12$, $p < 0.000$) explaining 9% of variance of CTS scores. Regression coefficient indicate that only GPA and mother's having a bachelor's degree is positively associated with CTS scores (see Table 4.5).

Table 4.5

Simultaneous Multiple Regression Analysis Summary for Mother's Education, and GPA Predicting Critical Thinking Scores (n= 200)

Variable	*B*	*SE B*	*β*	*t*	*p*
Mother's Education	1.73	0.73	0.15	2.01	0.040
GPA	2.01	0.55	0.25	3.61	< 0.000

Additional Analysis

Analyzing the correlation between the sub-constructs measuring the CTS construct. As this is the first time the CCTST was applied to a Mexican population, the researcher decided analyzing the correlation between sub-constructs measuring the overall Critical Thinking construct. Results indicated the correlations among the constructs measuring Critical Thinking Skills did not yield the expected pattern (see Table 4.6). The results indicate a weak correlation

in evaluation and explanation with dimensions of analysis, inference, and deduction. These results suggested that in this population both dimensions might have not measured the sought construct. In this regard, Morgan et al., (2013) remind us measurement validity is concerned with establishing evidence for the use of an instrument in a particular setting with a specific population for a given purpose. If constructs within the CTS are separate measures the low correlation between the constructs is not only expected but necessary to provide evidence that the CTS constructs are measuring different components of the Critical Thinking construct.

Table 4.6

Correlations for the Dimension of CTS

Variable	1	2	3	4	5	6	7
1. Analysis	--	0.55**	0.08	0.26**	0.67**	0.31**	0.13
2. Inference		--	0.10	0.40**	0.62**	0.35**	0.09
3. Evaluation			--	0.53**	0.12	0.14*	0.42**
4. Induction				--	0.18*	0.42**	0.45**
5. Deduction					--	0.50**	0.17*
6.Interpretation						--	0.22**
7. Explanation							--

*$p < 0.05$. **$p < 0.01$.

Analyzing the effects of gender. Although the current body of literature suggests that gender is not associated to CTS in college students, those studies refer to populations different to the Mexican students. Therefore, I explored gender effects on CTS scores. Table 4.7 shows that males and females scored differently on CTS ($p = .86$), however, this difference was not statistically significant. The inspection of the two means indicated that the average CTS score for female ($M = 66.93$) is slightly lower than the score ($M = 67.05$) for males. The difference is 0.12 points on a 100-point test. The effect size *d* is approximately .03, which is a smaller than a typical size for effects in the behavioral sciences (Morgan, Leech, Gloeckner, & Barret, 2013). Whereas males and females did not differ significantly on most sub-scales (CTS, analysis, inference, evaluation, induction, deduction, interpretation) female were significantly different

from male on deduction skills (p = .04). The effect size, *d*, is .30, which is considered as a small size.

Table 4.7

Comparison of Male and Female Critical Thinking Skills, Analysis, Inference, Evaluation, Induction, Deduction, Interpretation, and Explanation skills

Variable	*M*	*SD*	*t*	*df*	*p*	*q*
CTS			-.18	198	.86	.03
Females	66.93	4.69				
Males	67.05	4.95				
Analysis			-.62	198	.54	.09
Females	67.24	6.66				
Males	67.84	6.72				
Inference			-1.14	198	.26	.17
Females	68.75	6.01				
Males	69.75	6.07				
Evaluation			1.65	198	.10	.25
Females	66.29	6.09				
Males	64.92	5.03				
Induction			1.86	198	.06	.27
Females	69.19	5.25				
Males	67.78	5.13				
Deduction			-2.09	198	.04	.30
Females	67.37	5.65				
Males	69.14	6.09				
Interpretation			-.80	198	.43	.12
Females	66.51	6.33				
Males	67.22	5.99				
Explanation						

Analyzing the effects of mother's education on student CTS, academic engagement, and GPA. I screened the data once again to understand whether parental education has an effect on the overall CTS scores in research participants. Therefore, the researcher analyzed the effect of students' mother level of education. Table 4.8 shows that students who had a mother with bachelor's degree (n = 53) were significantly different (p = .03) from students whose mothers do not earned a bachelor's degree on CTS (n = 147). Inspection of the two means indicates that the average CTS score for students whose mothers have a bachelor's degree (M = 68.21) is higher than the score (M = 66.53) for students whose mothers did not have a bachelor's degree. The difference is 1.68 points on a 100-point test. The effect size d is approximately .37, which is a

smaller than a typical effect size in the behavioral sciences. In terms of academic engagement, students whose mothers graduated from college seemed to be slightly more engaged (M = 1.46) than those whose mothers did not (M = 1.45). The effect size d is approximately .12, which is a smaller than a typical effect size. Moreover, students whose mothers graduated from college (n = 53) had lower GPA (M = 2.52) than students whose mothers did not graduate from college (n = 147, M = 2.92); however, this was not a significant difference (p = .13). Its effects size is 0.26, which is considered as smaller than a typical in the behavioral sciences.

Table 4.8

Comparison of Students whose Mothers have/ have not Graduated from College on CTS, Academic Engagement, and GPA (n = 53 graduated, 147 did not graduate)

Variable	*M*	*SD*	*t*	*df*	*p*	*d*
CTS			2.21	198	.03	.37
Students whose mothers graduated	68.21	4.18				
Students whose mothers did not graduate	66.53	4.92				
Academic Engagement			.97	198	.33	.13
Students whose mothers graduated	1.46	0.07				
Students whose mothers did not graduate	1.45	0.10				
GPA			-1.54	198	.13	0.26
Students whose mothers graduated	2.52	1.28				
Students whose mothers did not graduate	2.92	1.71				

Analyzing the effects of father's education on CTS, academic engagement, and GPA.

Similarly, the effects of father's level of education on critical thinking skills were analyzed. Table 4.9 shows that students whose fathers have a bachelor's degree were not significantly different from students whose fathers did not have a bachelor's degree on CTS (p = .22). Inspection of the two means indicates that the average CTS score for students who their fathers have a bachelor's degree (M = 67.58) is higher than the score (M = 66.69) for students whom their fathers do not have a bachelor's degree. The difference is .89 points on a 100-point test. The effect size d is approximately .19, which is a smaller than a typical effect size in the behavioral sciences (Morgan, Leech, Gloeckner, & Barret, 2013). Father's level of education did not have any influence in terms of academic engagement, as both groups were equally engaged (M =

1.45). The effect size *d* is approximately 0.0. Moreover, students whose fathers graduated from college (n = 65) had lower GPA (M = 2.55) than students whose mothers did not graduate from college (n = 131, M = 2.98); however, this was not a significant difference (p = .28). Its effects size is 0.26, which is considered as a small effect in the behavioral sciences.

Table 4.9

Comparison of Students whose Fathers have/ have not Graduated from College on CTS, Academic Engagement, and GPA (n= 65 graduated, 131 did not graduate)

Variable	*M*	*SD*	*t*	*df*	*p*	*d*
CTS			1.22	195	.22	.19
Students whose fathers graduated	67.58	4.70				
Students whose fathers did not graduate	66.69	4.86				
Academic Engagement			-.29	195	.33	0.0
Students whose fathers graduated	1.45	0.07				
Students whose fathers did not graduate	1.45	0.09				
GPA			-1.73	195	.07	0.28
Students whose fathers graduated	2.55	1.28				
Students whose fathers did not graduate	2.98	1.75				

Analyzing the effects of degree aspirations on CTS and GPA. I ran a One-Way ANOVA to compare the four different majors on CTS and GPA. Results showed significant differences in CTS ($F = 6.40$, $p < 0.001$) and GPA ($F = 6.84$, $p < 0.001$) in students with different degree aspirations. Additionally, the analysis results indicated there is not a significant difference with academic engagement ($F = 2.53$, $p = 0.58$).

Post-hoc Bonferroni showed that Engineering, and Technology students showed higher levels of critical thinking; however, students with different degree aspirations did not show differences. In regard to GPA, results indicate that Natural Resources had lower grades than social sciences and Engineering and Technology students. No other differences were found (see Table 4.10).

Table 4.10

GPA and CTS in student with different degree aspirations

Variable	Social & Humanity sciences (1)		Economics & Administration (2)		Engineering & Technology (3)		Natural Resources (4)		Post hoc
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	
CTS	65.42	4.72	66.82	4.81	69.28	4.22	66.38	4.60	3 > 1,2,4
GPA	9.12	0.53	8.90	0.63	9.04	0.51	8.64	0.55	4 < 1,3

Qualitative Strand (Phase two)

Results from the quantitative phase were consistent with past literature (Huber & Kuncel, 2016; Pascarella & Terenzini, 2015). My findings suggested that the input variables (demographic-academic-related variables) were unable to explain the levels of critical thinking in college students in Mexico as well. Therefore, it was assumed, based on the Astin's I-E-O theory (1970a, 1975; 1991; 1993c) that other variables, different to input ones may be influencing the levels of CTS in college students in Mexico. Further, in viewing critical thinking as an active process, as defined by Brookfield (2012), it was evident the need to explore not only

the individuals but also their environment, which mission is to socialize them through a pervasive process (Harro, 2011).

In line with GST theory, results from the quantitative phase indicated the need to understand how the system works rather than assuming the system as an entity that exists for something. In other words, assuming that universities are transformative entities that systematically lead students to become critical thinkers, would be an imprecise assumption. Human behavior cannot be explained without the individual understanding of self in relation to the world (Bertalanffy, 1950). Moreover, because human beings are continually evolving as a result of their interaction with the environment. Therefore, student insights, in regard to the transformative effects of the college environment, remain as essential to provide the richest understanding of what factors might lead students to be better critical thinkers. At a theoretical level, the Astin's I-E-O theory (1970a; 1975; 1991; 1993c) assumes that college students react and behave as a result of an acculturation process by the means of college experiences, which are individually interpreted by every participant in the system (Bertalanffy, 1950).

Although college experiences may comprise countless factors, I decided to focus on the academic experience students had in classrooms, as Kuh, Kinzie, Buckley, Bridges, & Hayek, (2006) suggested. The Academic experiences explored included (a) the academic rigor that students faced in classrooms, (b) the teaching approach adopted by teachers in classrooms, and (c) teaching absence. Figure 4.1 displays the college experiences considered in the study.

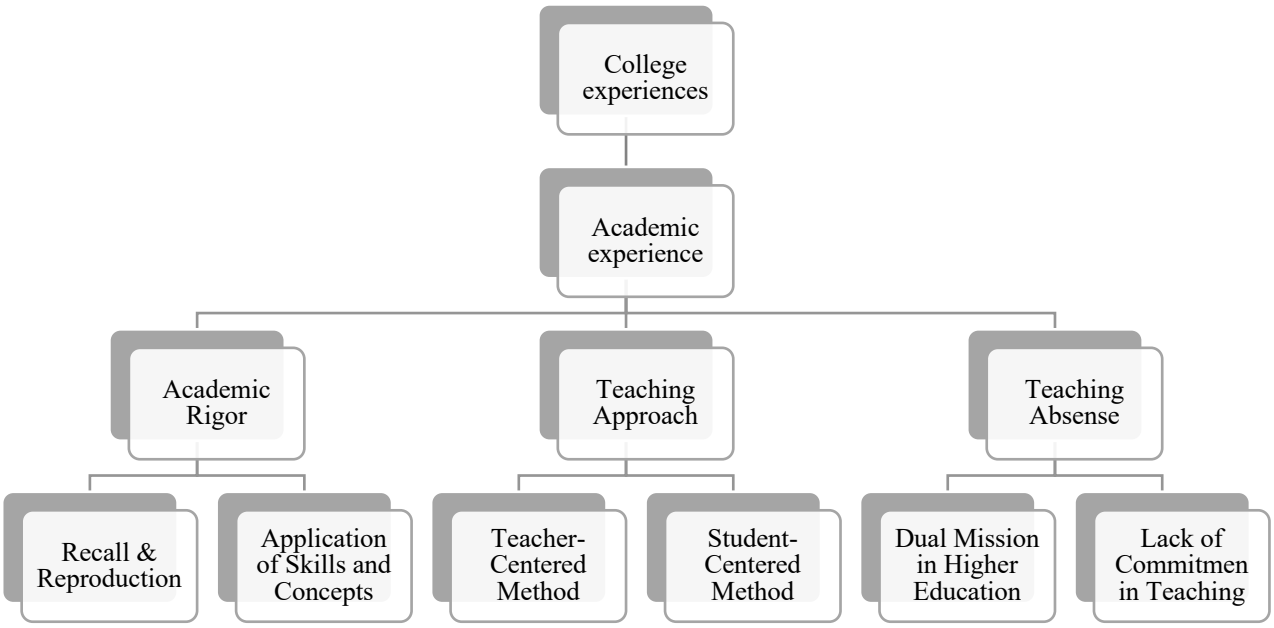

Figure 4.1. College experiences considered as the environmental factors that might have influenced the levels of CTS in college students in Mexico.

Research Settings

I decided to conduct a case study as my research method. As Woods and Catanzaro (1988), I believe it is the most accurate method to study a single individual, group, or community in which the researcher attempts to examine in-depth data related to several variables. In special because the holistic nature of individuals can be addressed (Sandelowski, 1996). The data collection was carried on by means of in-depth semi-structured interviews. I believe the interview is probably the most powerful qualitative research technique, as interviews work as dialogic explorations of topics by speakers, in which interviewers and interviewees argue, debate, and transform their understanding of topics via research conversations (Wolgemuth & Donohue, 2006). Twenty participants (see Table 4.11) were interviewed using an in-depth semi-structured format to discuss student experiences and perceptions of college experience—question

three of the present study. Data analysis continued until saturation was attained, as suggested by several scholars (Glaser & Strauss, 1967; Fusch & Ness, 2015; Morse, 2015).

The definitions of critical thinking and academic engagement were not provided prior to the interview to allow participants to offer definitions and examples in their own words. Research participants' names as they appear here are pseudonyms in an attempt to protect their anonymity.

Table 4.11

Research Participants in Qualitative Phase

Number of participants	Degree Aspiration	Gender	
		Female	Male
5	Social Sciences	5	0
5	Administration & Economics	5	0
5	Engineer & Technology	3	2
5	Natural Resources	3	2

The adoption of a college impact theory, the Astin's I-E-O model, allowed me to focus on specific themes related to the academic environment colleges offered to students. Some of the overarching questions asked in the individual interviews included:

1. From your perspective, how academic experiences in college have contributed to developing of your CTS?
2. From your perspective, how do faculty members influence the development your CTS?
3. From your perspective, in what ways does the teaching approach in college influence the development CTS?
4. From your perspective, how the programs and practices in college contribute to developing your CTS?

For the purpose of this study, four steps were followed to analyze and interpret interviews: (1) translate/transcription of interviews and field notes; (2) data reduction; (3) data re-organization; and (4) data representation (Flick, 2014). Each step is described in detail below.

Step 1: Translation/Transcription of Interviews and Field Notes

The twenty interviews were audio-recorded, then data were translated into English and transcribed without computer software, as a first attempt to initiate a conversation with the data (Corbin & Strauss, 2008). Later on, each interview was imported into Atlas ti 6.0, a computer-based data management program that facilitated organization and analysis of coded interviews. As Co-PI, I was the person who conducted the interviews in Spanish, my native language. However, being a native Spanish speaker did not erode my concerns about conveying the original meanings of the cultural and contextual nuances of research participants' accounts, especially after living abroad for the last four years. Collecting data through cross-cultural dialogue, led me to raise awareness about the relevance of hermeneutics, especially in the present

study. Specifically, as Soeffner (2004, p. 95) did, I was concerned about "the understanding of understanding itself". The re-conceptualization of research in a cross-cultural dialogue led me to question my own understanding and interpretation. Considering all the above, I made the decision to invite a faculty member from Mexico to participate in both the translation and the coding process. My collaborator has considerable expertise in higher education in Mexico. He is also more familiar with the Mexican college context than me. This decision was made as an attempt to clarify not only my interviews' translation but also to interpret the language used by research participants, which later on proved to be mediated by cultural context.

Even though the scope of the present study did not include the definition of concepts, since the beginning, due to its relevance, I was concerned about the meaning of some Spanish words with cultural nuances. I was curious about the meaning that Mexican college students may have given to both academic engagement and critical thinking.

In terms of academic engagement, research participants believed that being engaged is synonymous of 'doing homework' and 'attending classes/meetings'. In other words, interviewees seemed to embrace a one-dimension definition of academic engagement (behavioral) (Fredricks et al., 2004), rather than a three-dimension one (behavioral, cognitive, and emotional) (Finn, 1989, 1993). As a result, academic engagement, from participants perspective is a concept that comprises only behavioral aspects that excludes emotional and cognitive ones. On the other hand, critical thinking, proved to be a divergent concept, as it is in several populations (Abrami, Bernard, Borokhovsky, Wade, & Pearson, 2014; Huber & Kuncel, 2016; Kuncel, 2011; McMillan, 1987). Specifically, Mexican students related this concept to 'making better decisions', 'using better vocabulary when expressing personal opinions', 'making informed comments' 'using a scientific approach' and 'being critical about social issues.'

Step 2: Data Reduction

In the present study, the search for the phenomenon of interest adopted an inductive-deductive approach. Firstly, I looked at raw data and allowed the theory to emerge from the data (Strauss & Corbin, 1998). Then, I analyzed how categories and codes constructed from data might have related to the environment referred by the Astin's I-E-O theory. In other words, theoretical perspectives and research purposes also governed what I looked for in data. This study adopted an inductive method form analysis. As Saldaña (2013) says, coding is also heuristic—a method of discovering. I acknowledge that coding is likely to be a subjective and interpretative process as well (Blair, 2015). As there are no absolute hard-and-fast rules to coding, like other scholars (Blair, 2015; Greenbank, 2013) did, my data analysis process was likely to be influenced by my values. In this regard, I acknowledge my analysis was not a neutral pursuit, but it was permeated with my epistemological and ontological assumptions. As Chinn and Brewer (2001), I believe when scholars analyze data, "they construct a cognitive model of the data, according to the perspective of the person who is reporting the data" (p. 337). However, throughout the coding process, my goal was to be as honest as possible and to allow data to speak through me rather than at me. To do so, I tried to interpret my participants' insights; as a result, my reflexibility played a significant role in the whole analysis process.

Step 3: Data Re-Organization

As mentioned in step 1, the inclusion of a Mexican collaborator allowed the adoption of an 'investigator contribution' (Denzin, 1978; Carter, Bryant-Lukosius, DiCenso; Blythe, & Neville, 2014). The adoption of this method involved the two researchers meeting weekly to discuss interviews and reviewing the coding process. As some scholars (Kvale & Brinkmann, 2009; Rubin & Rubin, 2005) suggested, we analyzed interviews to generate themes or codes

adopting an analytic approach. During this process, the two researchers independently identified themes and possible codes for each interview. The weekly meeting continued until the two researchers agreed all information obtained from data could be coded using a coding manual (see Table 4.12) (Glasser & Strauss, 1967; Strauss & Cobin, 1998). The coding process involved identifying in the text themes of relevance to respond research questions until saturation occurred (Hennink, Kaiser, & Marconi, 2017; O'Reilly & Parker, 2013).

Table 4.12

Start List of Theoretically Driven Codes

Category	Codes	Abbreviation
Academic Rigor	AR: Recall and Reproduction	AR-RP
	AR: Application of skills and concepts	AR-SC
Teaching Approach	TA: Teacher-Centered Method	TA-TCM
	TA: Student-Centered Method	TA-SCM
Teaching Absence	TAB: Dual Mission of Teachers	TAB-DM
	TAB: Lack of Teacher Commitment	TAB-LTC

Note. The selection of codes was theoretically driven.

Derived themes were then reexamined to determine how they related to previous research findings (Roth & Cohen, 1986). As suggested by several scholars (Merriam, 1995; Pandey & Patnaik, 2014; Strauss & Corbin, 1998), the influence of previous literature contributed to confirm the consistency of my findings to past studies.

Step 4: Data Representation

Question (3). From students' perspectives, how does academic experience in college contribute to the development of their CTS?

In order to respond to question 3, I used the academic experience category, which is conditioned by both, the academic rigor students faced in classrooms, the teaching approach adopted by teachers and teaching absent. The codes were organized in a hierarchical fashion and included primary themes (Level 1 codes) that were further broken down into secondary sub-codes (Level 2 codes). Level 3 and 4 display the main findings after analyzing the database (see

Figure 4.2). It is important to mention that the quotes included provide personal opinion of research participants. Personal identifiers were removed, and pseudonyms are used to protect participants' anonymity.

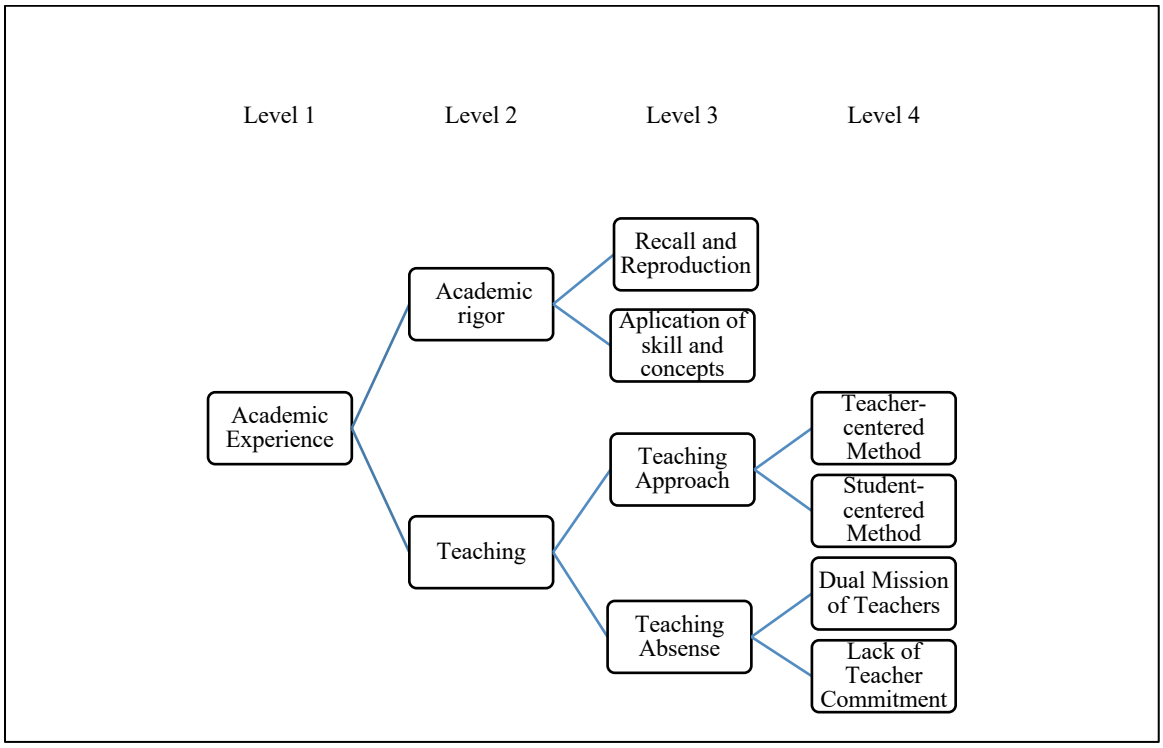

Figure 4.2. Coding hierarchy displays the three levels of student academic experience after analyzing the data through the inductive-deductive method.

Academic rigor. Although the concept has been operationalized as how frequently students carry out learning activities (e.g., Fredericks, Blumenfeld, & Paris, 2004; Kuh, Kinzie, & Buckley, 2006; Mac Iver et al., 2004), lately, has been suggested that student motivation to work on academic endeavors emerges from the interactions and dynamics between teachers and students (Bandura, 1986; Weiner, 1986, Kuh, Kinzie, & Buckley, 2006). In line with this social-cognitive perspective, research participants attitude to classwork seemed to be mediated by the academic challenge they faced in classrooms.

The academic rigor implies not only time-use but also a cognitive process aiming to accomplish a specific task. Considering all the above, I used the Depth of Knowledge (DoK) framework (Webb, 1997) to identify the level of rigor of classwork in Mexican classrooms. The DoK was developed by Norman Webb as an attempt to categorize activities according to the level of complexity of thinking required. Francis (2017) asserts this framework is suitable to understand the context in which students express the depth and extent of the targeted task. The use of this framework allowed me to identify two different levels of task complexity/rigor in Mexican classrooms: (a) Recall and reproduction of learnings, the model suggests at this level, task does not require any cognitive efforts beyond remembering the right response or formula, and (b) The application of skills and concepts, in this level, task requires more than one mental step, such as comparing, organizing, summarizing, predicting, and estimating.

Although most participants reported recalling and reproducing learnings in academic work, most participants reported recalling and reproducing learnings in academic work as other scholars Richards (2015), I considered not only the frequency of codes but also the relevance of codes to generate my findings. In this regard, Roberts (2008) underlines this approach oftentimes produces "… findings extraordinarily robust and difficult to beat…" (p.506). As Richards (2015) says "Coding should always be a purpose. It is never an end itself" (p.105). In line with this perspective, I weighed on the relevance of my participants' narratives that provided a more complete picture of the reality in Mexican classrooms. This condition encouraged me to include not only frequent voices but also relevant accounts emerging throughout my data. In this regard, therefore, remains as relevant underlying that only a few participants identified themselves applying skills and concepts while doing classwork.

Recall and reproduction. Research participants recalling and reproducing learnings while doing classwork acknowledged they did not make a great intellectual effort to pass most of their courses and to fulfill with academic endeavors. This non-rigorous classwork, however, resulted worthy for students, as they were rewarding in terms of grades and GPA (as reported in the quantitative stage), despite the modest efforts made by students. Although non-rigorous classwork is referred to as a time-consuming activity, most participants did not believe they contributed to the development of their CTS. The following paragraphs reflect their perspectives:

> *María:* Most of the times my classwork and homework were time-consuming but doable. I mean, I did not need help from my teachers or classmates, I did it by myself. Not a big deal. It was easy passing my classes, actually, I had really good grades at the end of the semester…I had not thought before whether these were supporting my critical thinking gains. But… I do not think so!
>
> *Alejandro:* My classwork was easy to do over the last semester, still is. I mean what can I say. I do not remember having problems with classwork. It was always something simple to do; unless they were final projects. Those were more time-consuming, I mean, not difficult, just time-consuming. Ok… responding to the other question… I do not think I am a better critical thinker by the means of my classwork.
>
> *Claudia*: I do not remember myself struggling with it (classwork). I mean, it was not difficult to do. Most of the times were simple things such as searches or practices of something that we have learned in classes. That's it… Well, classwork… I do not think so… it is just classwork, do not think it contributes to be a critical thinker.

Application of skills and concepts. A few participants referred to a different kind of classwork that stressed them out throughout the semester. Although the DoK model does not refer to these activities as rigorous, participants acknowledged struggling to complete these tasks. They had to figure out by themselves how to respond to more complex questions using the learnings gained in the classroom as cues to do it. Interestingly, students reported feeling accomplished, once they found themselves gaining more learning at the end of the semester. Contrary to students recalling and reproducing learnings, these students believed this kind of

classwork effectively contributes to the development of CTS. The statements included in the following paragraphs reflect respondents' insights:

> *Elda*: Last semester, I was taking a class with a teacher who stressed me all the time (throughout the last semester). In order to do my lab reports, I was used to doing something really simple, it was just a report! Well, this teacher asked me to include *at least* four scientific references. He also put special emphasis on checking if I was clearly stating the purpose of the practice, the process that I had followed, the materials that I had used… everything, everything. I had to reflect on what I was writing all the time. He was never happy with my reports, and I did not know what else to do. Over the last semester, all my classmates (including me) were complaining about him, but honestly, he was right. In the end, we learned a lot… Of course!... I think this classwork helped me out to be a better critical thinker because it forced me to be thoughtful…

> *Carlos*: Most of my classes were interesting. However, some classes in my field are dense and rigorous. I mean, talking about the last semester, right?... Ok, for some courses, we had to learn a lot of subjects, and class time was limited, most of the times… my teacher provided guidance, of course, but we had a lot of classwork to do by ourselves. That is why my friends and I spent a lot of time trying to figure out how to do our assignments. We spend a lot of time on campus, working at the library… I definitely believe this classwork contribute to developing my CTS, but also to my self-confidence. Now, I think that I can learn something by myself.

Teaching

The transition from high school to college is oftentimes a stressful stage for youths, as it represents an unknown academic world (Medrano & Olaz, 2008). Although institutional environment is the primary mechanism by which students develop their abilities and interests, academic success is often mediated by faculty members (Kuh, Kinzie, Schuh, & Whitt, 2005; Pascarella & Terenzini, 2005; Smart, Feldman, & Ethington, 2000); therefore, the teaching method adopted in classrooms is assumed to be a vital determinant for successful students. As I did when analyzed academic rigor, I weighed not only on the frequency of codes in order to present my findings but also on the relevance of data, as an attempt to provide a more complete picture of the environment in Mexican classrooms. Therefore, I made the decision to include an unexpected code, due to its relevance in the Mexican context, the teaching absence, as the result

of both the dual mission in higher education-- teaching and conducting research—and the lack of teacher commitment. These were factors underlined by students as detrimental factors on their critical thinking gains over college experience.

Teaching approach. The improvement of educational outcomes requires teachers to develop new skills and learnings. Thus, in order to bring desirable outcomes in college, teaching methods used by faculty members should be suitable for the subject matter. In this regard, Chang (2010) reminds us that teaching methods work effectively, only if they suit learners' needs. My analysis of data suggested most of the research participants were systematically exposed to Teacher-Centered Methods, which according to them, acted in detriment of their critical thinking gains. Furthermore, a few participants referred to some classes/teachers adopting a student-centered Method in classrooms, which according to them contributed to strengthen their critical thinking skills.

In teacher-centered methods, teachers are the source of knowledge. In other words, students obtain information from teachers without engaging with the subject being taught (Boud & Feletti, 1997). Under these methods, teachers control the transmission of knowledge, as a result, the interest and understanding of students get easily lost. This approach is more practical, theoretical, and memorizing (Teo & Wong, 2000) and does not apply activities aiming to encourage students to learn real-life problems from a critical perspective. The role of teachers adopting this model is often authoritarian. On the other hand, student-centered methods, teachers act like a coach, where both, students and teachers play an important role in the teaching-learning process. Teachers adopting this method promote student interest, analytical research, critical thinking, and enjoyment (Hesson & Shad, 2007). This method does not centralize the flow of knowledge from the lecturer to the student.

Teacher-centered methods. As reported in past studies (Teo & Wong, 2000; Zacaria, Chin, & Daud, 2010), my analysis suggested that teachers are the source of knowledge in Mexican classrooms. Having teachers delivering only theoretical content without applicable real-life examples brought undesirable effects on students, who got bored in class. In this regard, students counted that they never explored the different source of knowledge, therefore, the adoption of a critical perspective was not an option. The statements included in the following paragraphs reflect respondents' insights regarding their experiences with faculty members adopting a teacher-centered method:

> *Elisa*: Well, my teachers delivered their class, they brought to the classroom all the learnings that we had to absorb. Sometimes, it was so hard because they were talking, and talking, and talking about boring things. My classmates and I were falling asleep all the time. We were so tired after class… So, responding to your question… I do not think I am better critical thinker thanks to him!
>
> *Andrea:* Some classes are difficult, but especially some teachers. I remember one my last semester's courses… it was tough because the content was so boring and my teacher acted like a boss, you know what I mean? He told us (to the class) what to do, how to do everything… throughout the last semester, we always depended on him. We never discussed any of the topics, everything was in his way. Throughout the last semester, we (the class) were focused on pleasing him… Well, I do not know whether they are promoting critical thinking or not. I do not think so.
>
> *Adriana*: In one of my classes, my teacher was always talking about theories, ideas, and thinks like that… which I think are not related to my field or work. I mean, what I want to learn is something that I can apply in my field, in my future job, rather than learning something that is irrelevant to my career. Of course, I do not think those classes helped me to be a critical thinker person. Not at all.

Student-centered methods. Participants' accounts suggested that having teachers acting like coaches allowed them to collaborate with classmates in a more efficient way. It seems they learned how to communicate and collaborate effectively with classmates in order to complete academic endeavors. Also, students reported these teachers pushed them to reflect on what they were doing academic work; therefore, they had to be more analytic in their academic pursues.

Moreover, students counted being empowered after taking these classes, as they realized they can learn by themselves if needed. Their narratives suggest that the encouragement to gain knowledge by themselves promoted interest but also self-confidence in students as well. The following paragraphs provide some of their thoughts:

> *Liliana*: Here (in college), I had a teacher who was really humble while delivering his class. He treated us as we were on the same level (academically). He encouraged us all the time when someone made a mistake, it was never a problem. He actually made us feel like making mistakes is ok. I think that is the reason why I felt confident in asking so many questions in class.
>
> *Marla:* After entering college I am more aware of so many issues like poverty, disadvantage, the role of politics… thanks to we had some discussions about it. My classmates and I really enjoyed those discussions; however, sometimes, I feel disappointed, angry about social justice issues to be honest. I wish I could do more in the future. I definitely believe this class helped me to be a better critical thinker, especially due to the content that was discussed throughout the semester and the knowledge that I gained.
>
> *Sergio*: My class was enjoyable, most of the times but also exhausting, as we had to lead the class sometimes. So, we spent so much time working to do it. Especially, because my teacher always wanted us looking for different sources of information to reinforce what we were learning in class… he asked so many questions in this regard. I was so tired… but I think that class was helpful in developing my critical thinking skills… think so!

Teaching absent. Although the notion of what a school looks like has changed substantially over the last decades, especially by the flourishing of online education, the interaction between students and teachers remains as the most significant promoter of learning (Chickering & Gamson, 1987; Dewey, 1933; Vygotsky, 1978). Naturally, classrooms are the places where learning can reach deep and learnings can be integrated and transformative (Bain, 2004); thus, teachers play a significant role in classrooms facilitating the acquisition of learnings and promoting the development of skills in students. Therefore, teacher presence in classrooms is vital. In this regard, there is a significant growing issue threatening the achievement of educational outcomes in Mexican classrooms, teaching absent. According to participants'

accounts teaching absence is the result either of the dual mission of teachers or the lack of teacher commitment in classrooms.

As other scholars (Robles, 2016; Smith, 2011) did, I adopted the scarcity model (Moore, 1963) to identify the three dimensions that can be in conflict: time, energy, and commitment. The model contends that "given the scarcity of time and energy, the probability of role conflict for the multiple joiner is somewhat more abstract and hypothetical" (p.108). In other words, those who are productive in research tend to spend more time and energy in research and less time in teaching, and similarly, those productive in teaching tend to spend more time in teaching and less in research. This claim is the basis for explaining why the correlation between teaching and research should be negative or at least zero (Hattie & Marsh, 1996). However, the model also posits that commitment may be a variable affecting the expected teacher performance.

Dual mission of teachers in higher education. Although teacher absence may be explained by several factors, including management practices and personal needs, it seems that current policies governing higher education in Mexico are shaping a dual role of teachers in higher education (teaching and research). These policies may be functioning to the detriment of student education outcomes by the means of teacher absence in classrooms. In this regard, Trice (1992) suggests, faculty members have oftentimes to choose to invest time and energy either teaching or conducting research; especially because both are intensive labors and it is nearly impossible for individuals to excel in both domains.

The narrative of my participants constantly referred to the workload of some academics, who gave priority to research activities, leaving teaching in a second place. Although participants seemed to ignore that the academic world oftentimes depends on research performance, they perceived this dual mission (research and teaching) as a pervasive problem in classrooms. In this

regard, students regretted having bright and successful researchers as teachers, who, according to them, did show commitment neither in teaching nor in students. However, they could have helped students to develop critical thinking skills by the means of their teaching. The following statements reflect their perceptions:

> *Adriana*: There are some teachers who are really good, and ones think 'if I were a teacher, I'd like to be like her/him.' However, most of these teachers are highly engaged in their research projects and do not deliver their classes; so, ones think 'ok, he/she is so brilliant, but he/she is not here'. I think if they were teaching the class, they would help us to be more competitive… as you said, better critical thinkers.
>
> *Alondra*: Last semester I had two wonderful teachers here (in college). I mean, they taught us, they supported us to be good professionals, competitive, I mean, in the future. However, they were always so busy. As I know, they are teachers who renowned researchers in my field... that is awesome… but they were skipping classes all the time. They always sent someone else to replace them in class, but one thinks 'ok, they are great teachers, so brilliant, but they are absent'. I certainly do not know whether they would help us to be better critical thinkers… but yeah, I think so!
>
> *Romina:* I had a teacher, who is a well-known researcher, but honestly, I was kind of disappointed about him. When we were working in the lab, he was all the times working on something else. He did not care about us; actually, one of his doctoral students helped us with our practices. My teacher was always busy…it was really hard reaching him over the last semester. … if I think he would help us to better critical thinkers? … yeah, I think so. I mean he seems to be smart…

Lack of teacher commitment. Teacher commitment is conceptualized as a multi-dimensional concept that comprises at least five dimensions: (a) commitment to the learner, (b) commitment to the society, (c) commitment to the profession, (d) commitment to achieve excellence, and (e) commitment to basic human values (Cohen, 2000; Firestone & Pennell, 1993; Somech & Bogler, 2002). However, for the purpose of this study, I focused on the commitment to the learner, which is conceptualized as the willingness an individual enacts in investing personal resources to the teaching task (Lortie, 1975). Teaching task overall comprises classroom management, delivering of content knowledge, and application of organizational skills.

The narrative of participants reflected disappointment about some teachers who, according to their perspectives did not commit to teaching. From participants' perceptions, the performance of these teachers did not contribute to engage them with the different courses nor to develop their critical thinking skills. The following statements reflect their perceptions:

> *Adriana*: There are some teachers who one does not why they are teaching in higher education. Let me explain you… they do not know even how to explain the class… they are repeating and repeating the same content. In fact, there are interesting classes, but teachers delivering those classes do not inspire us (students) to do homework or even worst…to attend the class itself. No, of course not!!! They barely teach something, so how they help us to be better critical thinkers?
>
> *Sergio*: Last semester, I had a teacher who gave us a lot of hard copies about the different topics, she also posted several resources to 'strength our learnings', but she used to forget about these readings. So, she resent us the same readings or new ones… everybody was confused throughout the last semester. She never followed the syllabus; the class was a mess!... Respectfully, I do not think that teachers like her may help students to be critical thinkers; I mean, do not want to be rude, but teachers like her should not being teaching.
>
> *Irma*: Sometimes I felt so frustrated… because one of my teachers want us preparing presentations for the class. I agree on participating in class, but he was also responsible for preparing classes as well… I mean to support our presentations, at least. So, we ended up leading the class and everybody (classmates) was either falling asleep, checking their phones, or talking in every single class. This teacher ever said a word in this regard! That class was a nightmare! No, I do not think taking classes like this will help me to be a critical thinker, at all.

Summary

The quantitative phase included students from four different fields (Social Sciences and Humanities, Economic and Administrative Sciences, Engineer and Technology, and Natural Resources). The sample included 50 students from the different fields who had been enrolled in college for more than two semesters. Research participants comprised 124 females (62%) and 76 males (38%). After screening data, results indicated that almost three quarters of the research

participants (72%) had a weak performance (*M*= 66.98) in the California Critical Thinking Skills Test.

After screening data for inferential statistical analyses, results indicated that none of the variables included in the model (gender, age, enrollment status, degree aspirations, academic engagement) resulted in significant predictors of CTS, except by GPA and mother's level of education. The regression model determined that both GPA and mother's level of education resulted in significant predicting CTS; however, they only explained 9% of its variance.

The analysis of gender effects suggested that females scored slightly better (*M* = 67.05) than males (*M* = 66.93). Parental education had an effect on CTS as well. In this regard, results indicated that students whose mothers graduated from college did score better (*M* = 68.21) than students whose mothers did not graduate (*M* = 66.53). Similarly, students whose fathers graduated from college performed better (*M* = 67.58) than those whose fathers did not graduate (*M* = 66.69). After analyzing the effects of degree aspirations, results indicated that engineering and technology performed better on CTS, academic engagement, and GPA.

Moreover, the analysis of the correlation among constructs measuring CTS did not show a strong correlation. These results suggested the seven-construct measuring CTS did not show evidence to ensure the instrument is effectively measuring CTS in the sample studied. It is important to remember, however, when "we address the issue of measurement validity with respect to a particular test, we are addressing the issue of evidence for the validity of the scores on that test for a particular purpose, and not the validity of the test in general" (Morgan, et al., 2013, p. 110). Moreover, as Rosnow & Rosenthal (1989) suggest, these conventions should be used with caution as a small or even trivial effect in one context may be a large effect in another context.

The qualitative phase included 20 research participants who previously participated in the quantitative phase. The adoption of a case study method allowed the exploration of the academic environment that students faced after college enrollment. The data analysis identified three relevant codes related to CTS gains in college in words of research participants: (a) academic rigor, (b) teaching approach, and (c) teaching absence.

In terms of academic engagement, participant narratives suggested college students in Mexico had not taken rigorous classes over college experience. The use of DoK framework facilitated the understanding of the levels of effort that students made in order to accomplish classwork. Although according to the DoK framework, the effort that Mexican students make cannot be considered as rigorous or abstract, it seems that classwork assigned in some classrooms led students to assume themselves as better critical thinkers. In this regard, most participants reported just recalling and reproducing learnings acquired in classrooms to do classwork; according to research participants, these activities did not lead them to be better critical thinkers. On the other hand, the student applying skills and concepts while doing classwork, considered these demands led them to be better critical thinkers, despite those are not rigorous activities, according to the DoK framework.

Teaching categories emerged across the collected data. In the study, data analysis allowed the emergence of the teaching approach and teaching absence as factors leading students to be better critical thinkers. Although most students counted the teaching approach adopted in classes was aligned to teacher-centered methods, a condition that, according to them limited the acquisition and development of CTS, there were also some voices counting that classrooms adopted student-centered approach resulting on quite opposite results, the development of CTS. However, students also referred to teaching absence in classes as result of two main reasons (a)

the dual mission of faculty members (teaching and research) and (b) the lack of commitment in the teaching of teachers. Their narratives suggested that teaching is perceived by students as a decisive factor mediating the acquisition and development of critical thinking skills in college students in Mexico.

CHAPTER V: DISCUSSION

In the preceding chapter, the presentation and analysis of data have been reported. Chapter V consists of a summary of the study, discussion of findings, implications for practice, recommendations for further research, and conclusions. The purpose of the following sections is to expand upon the concepts that were studied to provide a new understanding of their possible influence on the levels of CTS in college students in Mexico. Finally, a synthesizing statement is offered to capture the substance and scope of what has been attempted in this research.

Summary of the Study

In this mixed-methods study, undergraduate students in Mexico exhibited a weak level of critical thinking. Weak performance, according to Facione (2013), means that test-takers had weaknesses in several of the seven dimensions (analysis, interpretation, inference, evaluation, explanation, induction, and deduction) addressed by the critical thinking holistic concept tested in the study. This result is predictive of difficulties with educational and employment related demands for reflective problem solving and reflective decision making (Insight Assessment, 2016).

As other scholars, I was interested not only in exploring the levels of CTS in students but also in exploring some factors (age, gender, parental education, enrollment status, degree aspirations, and academic engagement), that according to the literature, may influence CTS scores in students after college enrollment. The results of this study, however, found that the factors explored here only account for 9% of the variance in CTS, indicating 91% was not explained by most of the factors examined in the study. Only GPA and parental education resulted in significant predictors of CTS in college students in Mexico. Therefore, neither age,

gender, degree aspirations, nor academic engagement seems to be good predictors of CTS in this population. Even though the academic engagement did not correlate to CTS, it proved to be a concept with cultural nuances, which due to its emerging relevance in the higher education literature, will be discussed further in the discussion section.

Results from the quantitative stage confirm what GST posits; human behavior should not be seen as something that exists and grows in the abstract, on the contrary, human behavior grows by the receipt of meaningful information (Boulding, 1956). In this regard, as many social scientists, I believe what students bring to college with them matters. However, to better understand student performance, the exploration of their interactions within the college environment remains as fundamental. Those interactions have the potential to become a critical behavioral driver influencing academic performance. In particular, if one sees critical thinking as an active process (Brookfield, 2012), potentially affected by college experiences, which socialize students through a pervasive process (Harro, 2011). In this study, the need to explore variables, other than student-academic-related variables became even more evident after the quantitative phase. Therefore, the adoption of a college effect model, the I-E-O Astin's model, was not only suitable but necessary to explore the most critical environmental interaction, teacher-student. The qualitative stage explored two essential factors (a) the academic rigor in classwork and educational tasks and (b) the teaching approach adopted by teachers. In the words of my participants, the low academic rigor they faced in classrooms did not contribute to developing their critical thinking skills. Moreover, participants' narratives suggest the low academic rigor in both classwork and homework may have been fueled by teachers adopting teacher-centered methods in classrooms. These conditions worked on the detriment of their CTS gains. On the other hand, participants who experienced teachers adopting a student-centered method felt more

optimistic about their CTS gains. Additionally, a third important code emerged throughout the data; I called it 'teaching absence.' In this regard, participants pointed out teaching absence as another factor preventing their CTS gains in classrooms.

Discussion of the Findings

Previous researchers (e.g., Abrami, Bernand, Borokhovsky, Wade, & Pearson, 2014; Arum & Roksa, 2011; Behar-Horestein & Niu, 2011; Pascarella & Terenzini, 2005) studied extensively what phenomena affect and ultimately predict CTS scores in college students. Nevertheless, it remains unclear what student-institutional-related variables predict CTS in higher education (Huber & Kuncel, 2016). Therefore, there were three main goals in the present study. First, explore the level of CTS in college students in Mexico. Second, to study the factors that may be statistically significant in CTS scores in college students in Mexico. Third, exploring students' insights regarding their academic experiences. This section discusses the implications of the relevant findings.

The Association Between Academic Engagement and CTS

Results indicate a positive but weak relationship between CTS and academic engagement ($r = .04$, $p = .58$) (Cohen, 1998). It was an unexpected result, as it contradicts to what other scholars (Kuh, 2009; Marti, 2009; McClenney, 2006; McCormick & McClenney, 2011; Pike, 2006; Tinto, 2006) have reported. The adoption of a mixed-method approach resulted suitable to provide a possible explanation for this result.

The instrument to measure academic engagement was developed for the purpose of this study. Validity and reliability analyses confirmed it effectively measures the sought construct. However, data from interviews led me to hypothesize the small association between academic engagement and CTS may be explained by the conceptualization of academic engagement in

Mexican students. Respondents share a common definition of academic engagement, which is associated with the fulfillment of academic tasks. In other words, participants refer to academic engagement as a one-dimension construct (behavioral) rather than as three-dimension construct one (cognitive, emotional, and behavioral) (Ames,1992; Dweck & Leggett, 1988; Finn, 1989) For research participants, being academically engaged means 'doing homework', 'attending classes', and 'accomplishing with academic endeavors.'

My findings confirm what literature has reported. Studies conducted in Latin American countries indicate that college students associate academic engagement to the fulfillment of educational tasks (Caballero, Abello, & Palacio, 2007; Vélez & Chaparrós, 2000). The scarce empirical research conducted in Mexico also suggests that Mexican college students tend to see academic engagement as a concept comprising only behavioral aspects. In this regard, the work conducted by Salgado-Soto, Sevilla-Caro, and Berrelleza-Caro (2013) shed light on this association. The scholars identified three different behavioral drivers of academic engagement: enthusiasm with college, commitment to fulfill university requirements, and the absorption of knowledge. Salgado-Soto, Sevilla-Caro, and Berrelleza-Caro found that students who were enthusiastic and committed to college, worked harder in classwork and homework, whereas students who were focused on absorbing as much knowledge as possible, did not put a lot of attention to academic tasks, as they were concentrated in gaining learnings and developing skills.

Interestingly, students who showed enthusiasm and commitment to college had better grades (GPA) than students focused on gaining learning and developing skills. Using the Performance-Goal Theory, I posit, the academic context in Mexico may be sending a message to college students, suggesting that goal-oriented performance is more rewarding in terms of GPA than mastery-oriented performance. Therefore, unsurprisingly, academic engagement is

perceived as a behavioral construct rather a multidimensional one comprising emotions, behavior, and cognitive engagement as well. As a result, students are focused on accomplishing academic tasks rather than gaining learnings or developing CTS.

The adoption of a behavioral concept may also be explained by the characteristics of the Mexican educational system itself, which has systematically encouraged students to adopt a performance-goal orientation in students. Mainly, because it results more rewarding, in terms of GPA, as mentioned above. According to Santiago, McGregor, Nusche, Ravela, & Toledo (2012), the Mexican educational system is characterized by adopting a traditional teaching approach where the teacher is the owner of knowledge and students are containers that may be filled with it. They assert teaching, learning and assessment still take place in a somewhat "traditional" setting with the teacher leading his/her classroom. Teachers in Mexico are seen as "the authority" who define assessment criteria and methods in classrooms; therefore, the long-lasting tradition of adopting teacher-centered practices in classrooms may be prompting students to choose a performance-goal orientation, conditions that limit the acquisition and development of CTS.

As discussed by Harro (2011), I believe schools continuously send messages to students about what rules to follow, what roles to play, what assumptions to make, what to believe, and what to think. Harro also suggests institutions create rules, roles, and assumptions, which are part of a structure that it is enforced through benefits or punishment to their members. In line with the cycle of socialization theory, I believe Mexican college students are more focused on pleasing teachers rather than gaining knowledge and developing CTS. This results from the messages they have received in classrooms, where the adoption of goal-oriented performance is systematically reinforced through rewarding GPA's, despite the modest academic effort made by students.

In summary, I posit the adoption of teacher-centered methods in Mexican classrooms, fueled by a traditional educational system, is leading students to believe they are academically engaged only for the accomplishment of academic endeavors, which most of the times do not involve any academic challenge. This condition may be to the detriment of their levels of critical thinking, despite high levels of academic engagement reported by students. In this regard, Vargas-Hernández & Reza Noruzi (2010) suggest the Mexican educational model must recognize the centrality of the student and the recognition of individual differences in learning processes in order to enhance the actual effects of higher education.

Demographic-Academic-Related Variables as Predictors of CTS in Mexican College Students

Gender. Although the literature presents inconclusive results in terms of gender, my findings are consistent with those reported by Facione (1990d), who found males displayed better CTS than females. My results indicate males performed slightly better (M = 67.05, SD = 4.94) than females (M = 66.93, SD = 4.69) in terms of CTS. This result contrast to findings reported by Whitt, Pascarella, Nesheim, Marth & Pierson (2003) who report females scored higher than males on the assessment of CTS. These results may also be associated to the fact that female participants were mostly enrolled in soft sciences (Social sciences & Humanities and Economic Administrative sciences), who scored slightly lower than hard sciences students (Engineering and Technology and Natural Resources) students--these results are discussed in the following section. Although no studies known to the author have analyzed both gender and degree aspirations, I discuss in-depth their implications in the following section.

Degree Aspirations. Prior research has not met a consensus regarding the effects of degree aspirations. Although some scholars have suggested that specific majors may produce

more significant gains in critical thinking than others, current literature is lacking any comprehensive comparison of such programs (Huber & Kuncel, 2016); in this regard, Pascarella and Terenzini's (2005) review failed to find strong evidence for differential gains across majors. By contrast, Ortiz's (2007) meta-analysis suggests that philosophy students may develop better critical thinking skills than students from other fields. My results indicate students from soft sciences students (Social & Humanities Sciences and Economic Administrative sciences) scored lower (M = 66.82, M = 65.42) than hard sciences students (Engineering and Technology and Natural Science) students (M = 66.38; M = 69.78).

Age. I found students from 18-23-year-old (M = 67.10, SD = 4.57) performed better than students older than 23-year-old (M = 65.65, SD = 5.40). Contrary to previous research, my findings showed an inconclusive association between age and CTS scores in college students. Whereas some scholars (Cox, 2002; Facione, 1990a) reported a negative association between these variables, others (Loken, 2005; Pascarella, Wolniak, Pierson, & Terenzini, 2003; Tinto & Love, 1995) reported finding age as an insignificant predictor of CTS scores. Thus, based on these results, age cannot be considered as a consistent predictor of CTS scores in the tested sample.

Enrollment status. Although the literature is inconsistent regarding the association between enrollment status, our findings suggest the higher level of education achieved, the greater level to think critically. In this regard, previous studies (German, 2008; Pitchers & Soden, 1999; Razaee, Farahian, & Morad-Ahmadi, 2012) did not find a significant difference between CTS and enrollment status; however, others (Drennan, 2010; McCarthy, Schuster, Zehr, & McDougal, 1999) reported evidence supporting enrollment status as a consistent predictor of CTS scores. Results indicated that students enrolled more than eight semesters in college

performed better (*M* = 67.55, *SD* = 4.30) than students enrolled from 3-4 semesters (M = 66.95, SD = 5.05), students from 5-6 semesters (M = 66.85, SD = 4.90), and students enrolled from 7-8 semesters (M = 67.05, SD = 4.00). Although several scholars (Facione, 1990a; Huber & Kuncel, 2016; Gellin, 2003a, 2003b; Ortiz, 2007) believe CTS gains in college students are the result of college exposure, recently, individuals' maturation has attracted the attention of scholars. After more than three decades tracking college effects on students, Pascarella and Terenzini (2005) conclude that maturation during college years is holistic in nature and embraces multiple facets of individual change. In specific, the scholars found college students become more critical, reflective, and sophisticated thinkers. Therefore, the combination of both individual's maturation and college exposure may explain our results in terms of age and enrollment status. In other words, it seems not enough either age neither enrollment status to predict CTS scores.

Parental education. My findings confirm parental education as a pattern of persistent inequality in college students. Although student learning is influenced by many factors (e.g., expectations and motivation), the support that Mexican students receive from their parents seems to be determining. Consistent with previous literature (Arum & Roksa, 2011; Glick, Randrianarisoa, & Sahn, 2011; Kena et al., 2014; Matute-Villaseñor, Saenz-Marin, Gumá-Díaz, Rosselli & Ardilla, 2009; Robledo-Ramón & García-Sánchez, 2009), my findings disclosed that parental education is related to students' academic achievement. In specific, I notice students whose mothers had a bachelor's degree performed better (*M* = 68.21, *SD* = 4.18) than those whose mothers did not have a bachelor's degree (*M* = 66.53, *SD* = 4.92). Similarly, students whose fathers had a bachelor's degree (*M* = 67.58, *SD* = 4.70) performed slightly better than those whose their fathers did not have a bachelor's degree (*M* = 66.68, *SD* = 4.81). Other scholars (Hamrick & Stage, 2004; McCarthy & Kuh, 2006) reported a similar pattern in terms of

the effects of parental education. They found that students whose fathers completed college are three times more likely than their classmates to succeed in college was their educational goal; respondents whose mothers completed college were twice likely.

Like other scholars, (Cano, 2007; Gil, 2009; UNESCO, 2004; Vera, González, & Hernández, 2014), I believe the intellectual environment at home is responsible for promoting interest and discussion, motivating children to get engaged in academic tasks, and to perform better. Worth noting, however, as reported by other scholars (Denner & Dunbar, 2004; McBride, Dyer, Liu, Brown, & Hong, 2009), my results show that mothers had a higher influence than fathers had on student performance. Therefore, my results contradict other studies (Hamrick & Stage, 2004; McCarthy & Kuh, 2006), which reported fathers' education having a stronger association with student performance. The higher influence of mother in my results may be explained by the cultural context in Mexico, where they represent both the main role model and support for children (Jiménez, Ito, & Macotela, 2010; Matute-Villaseñor, Sanz-Martín, Gumá-Díaz, Rosselli, & Ardila, 2009; Valdés-Cuervo & Urias-Murrieta, 2011; Valdés-Cuervo, Urias-Murrieta, Wendlandt-Amézaga, & Torres-Acuña, 2014). Overall, Mexican women are expected to be self-denying so that they can dedicate themselves to the family; regardless they are also employed or not. In this regard, Jiménez, Ito, & Macotela (2010) underlines a 'good Mexican mother' often feels a sense of pride and fulfillment in raising good citizens and smart children.

The role of academic experience in the development CTS

Low academic rigor. The majority of interviewees reflected on the efforts they made to accomplish with classwork and homework after college enrollment. Most respondents admitted they recalled and reproduced learnings acquired in class to fulfill with academic tasks. As a result, participants ended up doing less than what they had expected before enrolling college to

be academically successful. There were also a few respondents who reported applying concepts and skills acquired in classrooms to accomplish class requirements. In this regard, the first group believed those activities did not contribute to the development of CTS, whereas the second group asserted those activities led them to be better critical thinkers. Regardless of participant's opinions, the adoption of the WoK framework allowed me to conclude neither of the two groups faced academic rigor in classrooms. I noticed my research participants could have been influenced by the environment to form competence perceptions.

My results match with previous studies (Savitz-Romer, Jager-Hyman, & Coles, 2009; Meyer, Spencer, & Nathaniel, 2009) reporting students expecting more rigorous courses in college to maximize learning gains over college experience. Nonetheless, the academic environment they found led them to invest less effort than expected prior to enrollment. In this regard, Sillas-Casillas (2011), after exploring high school students from different states in Mexico, argues Mexican students tend to idealize college, prior enrollment. Overall, they assume college would represent a rigorous and competitive place where they will gain the learnings and skills needed for professional purposes (Ibarra-Uribe & Fonseca-Bautista, 2013; Sillas-Casillas, 2012; Hernández-Hernández & Fernández-Pérez, 2010). Nevertheless, their actual academic experiences mismatch their overall expectation, in terms of academic rigor.

I posit that after going through an acculturation process, students' interpretations of the effort needed for a course may be inaccurate to gain and develop CTS over college experience. In this regard, Deci and Ryan (1985) suggest an individual's perception of competence develops from exploring, learning, and adapting to different situations. Using the Self-Determination Theory (SDT) as a framework to analyze interviewees' responses, I noticed students not only entered college with high expectations in terms of academic demand (influenced by family

members and high school references) but also, they seem to be willing to commit with academic pursues. Nonetheless, after enrollment, they realized college was not as rigorous as their initial perceptions; therefore, the effort invested in academic endeavors declined. They acknowledged doing less than what they had expected to navigate college, according to their narratives. This experience reshaped the sense of academic competence they had brought to college with them. Moreover, the need to fit in this new academic world ended up socializing students to modify the level of effort in academic activities as suggested by Pascarella & Terenzini (1991).

Teaching approach. The Mexican educational system has a traditional approach that promotes the adoption of teacher-centered methods in classrooms (Brunner, 2007; Santiago et al. 2012). Consistent with previous research (Chipas, 1995; Girot, 1995; Schaefer & Zygmont, 2003; Sellappah, Hussey, Blackmore, & McMurray, 1998), my findings suggest despite the adoption of student-centered teaching methods produce more significant critical thinking gains than teacher-centered methods, faculty members in Mexico feel more comfortable leading classes under a traditional approach. I posit Mexican educators may find it difficult to know how to teach under a student-centered method, especially, because they have to foster independence, creative problem-solving skills, and critical thinking skill (Schaefer & Zygmont, 2003). In particular, the challenge to teach CTS may be intimidating as CT is still a debated concept among scholars and practitioners in Mexico. Thus, faculty members may find it challenging to teach something they are not confident about it. Another important and simple reason may be "teachers teach as they are taught" (Blume, 1971).

Teaching absence. Teaching absence was an unexpected code emerging throughout my data. In this regard, participants' narratives suggest teaching absence may be pondered as one of the most significant constraints of CTS gains over college experience. As reported by other

scholars (Arechavala-Vargas, 2011; Fondón, Madero, & Sarmiento, 2010; Hénard & Roseveare, 2012), my findings suggest higher education institutions in Mexico face a growing challenge affecting quality teaching, the dual mission of teaching and conducting research.

The claim that universities exist for both teaching and research is highly debated through the literature. Whereas scholars like Cummings & Shin (2013) believe that teaching universal knowledge is the primary role of universities, others like Barnett (1997)believe that teachers do not exist for the sake of the student, on the contrary, both teacher and student have their justification in the common pursuit of knowledge. However, in real life, faculty members in Mexico have to deal with the different functions of higher education institutions, which are striving to fulfill the requirement of global trends in higher education (Brunner, 2007; Estevez-Nenninger et al., 2018). As expected, faculty members are in the middle of requirements of curricula and the scholarly interests of the departments but also in the middle of the publicly declared and the actual operating functions of college and universities (Hattie & Marsh, 1996). Therefore, faculty members have to choose to invest time and energy either teaching or conducting research; especially because both are intensive labors and it is nearly impossible for individuals to excel in both domains (Trice, 1992). In Mexico, however, the preference for research activities may have a simple explanation, these are better pondered for career advancement and remuneration purposes (Fondón, Madero, & Sarmiento, 2010; Arechavala-Vargas, 2011).

Nevertheless, teaching absence cannot be only explained as a result of the faculty's dual mission, from my participants' perspective. As reported by other scholars (Guzmán, 2011), my findings suggest the lack of commitment in teaching represents an obstacle to achieve academic goals in higher education. Participants' accounts refer to teachers attending to classes, who

despite being present, did not deliver a class or whose teachings were deficient in developing CTS in students.

Although this phenomenon may be related to several factors such as lack of content knowledge, lack of classroom management, lack of organizational skills, and the lack of professionalism, the widespread existence of such deficit in higher education should be considered as an important factor disturbing teaching activity in classrooms (Cooperman, 2014; Guzmán, 2011; Estevez-Nenninger, et al., 2018). In this regard, some scholars (Brunner, 2007; Bruno, 2012) underline the struggles that Mexican universities face hiring competent teachers to educate a growing number of students coming to college is an issue that needs to be addressed by the Mexican government. As a result, colleges and universities frequently end up hiring unqualified teachers willing to accept part-time jobs under a low payment system. These conditions complicate the guarantee of the teaching of quality in Mexican classroom, which is also perceived as teaching absence by college students.

Implications for Practice

Research participants' accounts suggest the academic rigor they faced in classrooms was not appropriate to develop CTS. The lows academic demands that students faced after entered college resulted in fewer efforts to make academic progress in their educational programs. However, the preparation of graduates who possess the ability to think critically requires an academic environment where intellectual challenge and debate are encouraged. Therefore, to improve the quality effort, faculty members should empower students in a rigorous educational environment, using classwork and homework assigned to students as necessary means to foster both academic success and the development of CTS.

The dual mission of faculty members in Mexico seems to constraint CTS gains in college students from Mexico. The priority that faculty members give to research activities over teaching, results from the benefits that the education system has bestowed ON research activities during the last years in Mexico. Therefore, colleges and universities need to find a balanced combining both significant activities to demonstrate a strong academic and research leadership. Thus, higher education institutions should commit all the required sources, showing operational flexibility, and building a supportive institutional culture for both activities.

Participant narratives disclosed students had high academic expectations from college, which led them in commit in academic endeavors prior to enrollment. The reality students faced in college, however, decreased their commitment as a result of low academic demands. Whereas there is an agreement on the relevance of student expectations on academic performance (Ewell & Jones, 1996; Kuh, Gonyea, & Williams, 2005), Mexican colleges and universities must do more to keep students committed in academic endeavors. They should enhance student academic experience through student-centered teaching methods in classrooms. The adoption of student-centered approaches seems to be necessary at the institutional level; thus, institutions should be careful hiring skillful teachers capable of adopting student-centered methods in classrooms to respond to academic demands.

Recommendations for Further Research

Mexican higher education institutions are finally aligned to world educational trends. As a result, the recent adoption of CTS as one of the primary educational goals has led teachers and policymakers to require information that leads them to bridge legislation to actual CTS scores. The present study explored student-academic-related variables and valuable information about how this specific population behaves was obtained. Even though GPA and parental education

resulted in good predictors of CTS, those student-related variables cannot be manipulated by teachers and policymakers. Nonetheless, they still can influence institutional-related factors. In this regard, it is essential to highlight that students from Engineering and Technology performed better than their peers with different degree aspirations. Therefore, if this field of knowledge produces larger gains of CTS than the others, an analysis of the factors that produce larger gains would be useful. Firstly, because this knowledge would enable scholars to strengthen curricular programs; further, it would also contribute to understanding the features this gain-producing major has to replicate them in other educational programs. This information may inform future attempts to improve critical thinking gains in other majors not only in Mexico but in different contexts as well.

Furthermore, qualitative research should be conducted to understand which effective practices must be implemented to switch from teacher-centered teaching to student-centered teaching, given the traditional approach adopted by the Mexican educational system. Also, there is a need to study the levels of academic challenge needed in Mexican classroom to foster the development of critical thinking skills across the different fields. Finally, further research is required to find the strategies needed to provide a balance between teaching and research activities, given the Mexican context.

Limitations

The goal of this study was to investigate the relationship between student-academic-related variables, academic engagement, and CTS scores in college students in Mexico. Moreover, it explored student perspectives regarding the effect of academic experiences on the development of CTS. Data was collected to test three research questions relating to this goal. Some significant findings resulted from the examination of data. The findings, although

significant, have some limitations. First of all, it is a transversal design that does not allow to establish causal relationships between the variables. It is suggested to use longitudinal or experimental designs that will enable to study the causal relationships of the variables.

Moreover, this sample comes from a particular region; therefore, it is not representative of the diversity of students of Mexico. Another significant limitation is that findings explain only a small proportion of the activities that may be affecting the development of CTS in college students in Mexico. Finally, the study emphasizes studying only students' perspectives and ignores other stakeholders (faculty members, administrators). By only studying students, the researcher cannot assert the conclusions drawn from the qualitative strand are accurate.

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APPENDIX A: UNDERGRADUATE PROGRAMS OFFERED BY TECHNOLOGIC INSTITUTE OF SONORA

Bachelor's Degree in Spanish	Translation	College
Licenciatura en Administración	Licentiate in Administration	Economic and Administrative sciences
Licenciatura en Administración de Empresas Turísticas	Licentiate in Tourism Management	Economic and Administrative sciences
Licenciatura en Ciencias de la Educación	Licentiate in Education	Social and Humanity sciences
Licenciatura en Ciencias del Ejercicio Físico	Licentiate in Physical Education Sciences	Social and Humanity sciences
Licenciatura en Contaduría Pública	Licentiate in Accounting	Social and Humanity sciences
Licenciatura en Dirección de la Cultura Física y el Deporte	Licentiate in Physical Culture and Sports Management	Social and Humanity sciences
Licenciatura en Diseño Gráfico	Licentiate in Graphic Design	Social and Humanity sciences
Licenciatura en Economía y Finanzas	Licentiate in Economic and Finances	Economic and Administrative sciences
Licenciatura en Educación Infantil	Associate Degree in Childhood Development	Social and Humanity sciences
Licenciatura en Gestión y Desarrollo de las Artes	Licentiate in Arts Management and Development	Social and Humanity sciences
Licenciatura en Psicología	B.A in Psychology	Social and Humanity sciences
Licenciatura en Tecnología de Alimentos	B.S in Food Technology	Natural Resources
Ingeniería en Biosistemas	B.S Bio-systems Engineering	Engineer & Technology
Ingeniería en Biotecnología	B.S Biotechnology Engineering	Engineer & Technology
Ingeniería en Ciencias Ambientales	B.S Environmental Engineering	Engineer & Technology
Ingeniería Civil	B.S Civil Engineering	Engineer & Technology
Ingeniería Electromecánica	B.S Electro-Mechanic Engineering	Engineer & Technology
Ingeniería en Electronica	B.S Electronics Engineering	Engineer & Technology
Ingeniería Industrial y de Sistemas	B.S Industrial and Systems Engineering	Engineer & Technology
Ingeniería en Manufactura	B.S Manufacturing Engineering	Engineer & Technology
Ingeniería en Mecatronica	B.S Mechatronic Engineering	Engineer & Technology
Ingeniería en Química	B.S Chemical Engineering	Engineer & Technology
Ingeniería en Software	B.S Software Engineering	Engineer & Technology
Médico Veterinario Zootecnista	B.S Veterinary, Medicine, and Zootechnics.	Natural Resources

APPENDIX B: DEMOGRAPHIC VARIABLES OPERATIONALIZATION

Predictor variable	Variable operationalization	Considerations
Age	1=From 18-22 2=From 23-26 3=From 27-30 4=From 30- (+)	Open question
Gender	-Male -Female -Other_____	Open question
Current GPA		Open question
Degree Aspiration		Open question
Parental education Did your mother graduate from college?	1=No 2=Yes 3=Don't know	Open question
Parental education Did your father graduate from college?	1=No 2=Yes 3=Don't know	Open question
Enrollment Status How long have you been enrolled in your bachelor program?	1=From 1-2 semesters 2=From 3-4 semesters 3=From 4-6 semesters 4=From 7-8 semesters 5= Other_____	This variable was gathered from the student service database

APPENDIX C: STUDENTS' ACADEMIC ENGAGEMENT OPERATIONALIZATION

Sub-construct	Variable operationalization		Considerations
Academic demand	During the last semester, about how many classes ask you to read more than 40 pages per week?	1=None 2=From 1-2 3=From 3-4 4=From 5-6 5=All of them	Item 1
	During the last semester, about how many classes asked you to write a major paper—20 (+) pages--over the semester?	1=None 2=From 1-2 3=From 3-4 4=From 5-6 5=All of them	Item 2
	During the last semester, about how many teachers made you work harder as result of their feedback?	1=None 2=From 1-2 3=From 3-4 4=From 5-6 5=All of them	Item 3
Student's effort	During the last semester, about how many hours a week did you usually spend outside on activities related to your academic programs, such as reading, writing, lab work, study meetings, studying by yourself, rehearsing, etc.?	1=From 1-5 2=From 5-10 3=From 11-20 4=From 21-30 5=From 31-40 6=More than 40	Item 1

APPENDIX D: ITEMS OF INSTRUMENT

Never	Seldom	Sometime	Often	Always
Ⓐ	Ⓑ	s Ⓒ	Ⓓ	Ⓔ

1	(C) Completed the assigned readings for class
2	(L) Took detailed notes during class
3	(P) Contributed to class discussion
4	(L) Summarized major points and information from your class notes or readings
5	(L) Went to panel discussions, seminars, or conferences related to my classes topics
6	(C) Thought about grammar, sentence structure, word choice, and sequence of ideas or points as you were writing. Was careful using right grammar, structure sentences, words, and ideas when I wrote my papers.
7	(L) Used grammar books, manual about writing style to write my papers
8	(L) Asked an instructor or staff member for advice and help to improve your writing
9	(C) I have attended my classes labs, seminars in a timely manner.
10	(C) I fulfill my deadlines in a timely manner
11	I have discussed classes related issues such as grades, projects, and general questions.
12	Discussed your academic program or course selection with a faculty member
13	Discussed ideas for a term paper or other class project with a faculty member
14	Discussed your career plans and ambitions with a faculty member
15	Worked harder as result of feedback from an instructor
16	Socialized with a faculty member outside of class
17	Asked your instructor for comments and criticism about my academic performance
18	Worked harder than you thought you could to meet an instructor's expectations and standards-
19	Worked with a faculty member on a research project
20	Read additional material to strength my learnings.
21	I do like my university
22	If you could start over again, would you go to the same institution you are attending now?
23	My relationship with my classmates is positive
24	My relationship with my professors is good
25	My relationship with staff members is positive

APPENDIX E: SEMI-STRUCTURED IN-DEPTH INTERVIEW

1. Did your take the CCTST?
2. How it was so far?
3. Do you think is it a challenging test? Why?
4. How would you describe your critical thinking ability? Good, bad, regular?
5. How you would define a critical thinker?
6. How difficult or easy you found college?
7. Do you believe college contributes to improve your critical thinking skills? In what ways?
8. How different is college from high school in terms of demands and challenge?
9. Before entering college, what was your expectations related to college faculty?
10. Before entering college, what did you expect from your peer interactions?
11. Let's think retrospectively, please explain in which ways your college experience has met and has not met your expectations?
12. Comment on what you expected from the college facilities and how changes in facilities might help your learning.
13. How would you define your academic engagement in college?
14. How have you changed, if at all, your reading, studying, and academic day to day processes since entering college?

APPENDIX F: RECOMMENDED PERFORMANCE ASSESSMENT FOR THE OVERALL SCORE ON THE CCTST

CCTST	Not Manifested	Weak	Overall Score Moderate	Strong	Superior
Overall Score 100-point version	50-62	63-69	70-78	79-85	86 or Higher

APPENDIX G: USAGE AGREEMENT PROPOSAL

Item Usage Agreement Proposal
College Student Experiences Questionnaire
Assessment Program

Contact information:

Gene W. Gloeckner, Ph.D.
Last Name, First Name — Title

Co-Director School of Education; Chair Social, Behavioral, and Educational Research (IRB) Committee, Colorado State University
Office — Institution

1586 Campus Delivery. Fort Collins, CO. 80523-1588
Address

Fort Collins — CO — 80523-1588 — Unites States of America
City — State — Zip or Postal Code — Country

(970) 491 7667; (970) 412 0499 (cell) — gene.gloeckner@colostate.edu — February 16th, 2018
Phone — E-mail — Date

Please answer the following questions:

1. From which survey are you interested in adapting items?

   CSEQ, 4th Edition *CSXQ, 2nd Edition*

2. Briefly state the objective of your study:

   The purpose of this study is to collect, examine and analyze data from college students in Mexico to understand how student engagement (purposeful student-faculty contact; active and collaborative learning; and institutional environment perceived by students) and students' expectations relate their Critical Thinking Skills (CTS). The research will primarily focus on the relation between contributing variables (Astin, 1991; Chickering and Gamson, 1987; Chickering and Reiser, 1993; Kuh et al., 1991; Pascarella and Terenzini, 2005) that may influence educational outcomes.

3. Identify the specific item(s) to be used:

   Our interest is understanding how Mexican universities contribute to develop CTS college students and how student's engagement influences that development. Therefore, we consider appropriate the use of some college activities (Library, Computer and Info tech., Course learning, Writing experience, Experience with faculty, and Scientific and Quant. Exp.); Readings (both items), and the College environment (both items).

4. List your expected start and end dates for survey administration.

   We may be starting our data collection on the late of May.

Indiana University Center for Postsecondary Research
1900 East Tenth Street • Eigenmann Hall, Suite 419 • Bloomington, IN 47406-7512
Phone: (812) 856-5825 • Fax: (812) 856-5150
E-mail: cseq@indiana.edu • Web: **cseq.iub.edu**

CSEQ <cseq@indiana.edu>

Reply all

Tue 2/20, 11:00 AM

Parra Perez,Liz
Inbox

Good morning Liz,

I hope this email finds you well.

According to the CSEQ Director, there is no problem if you need to translate the items into Spanish. As for the cost, we do not charge graduate students for the CSEQ licensing.

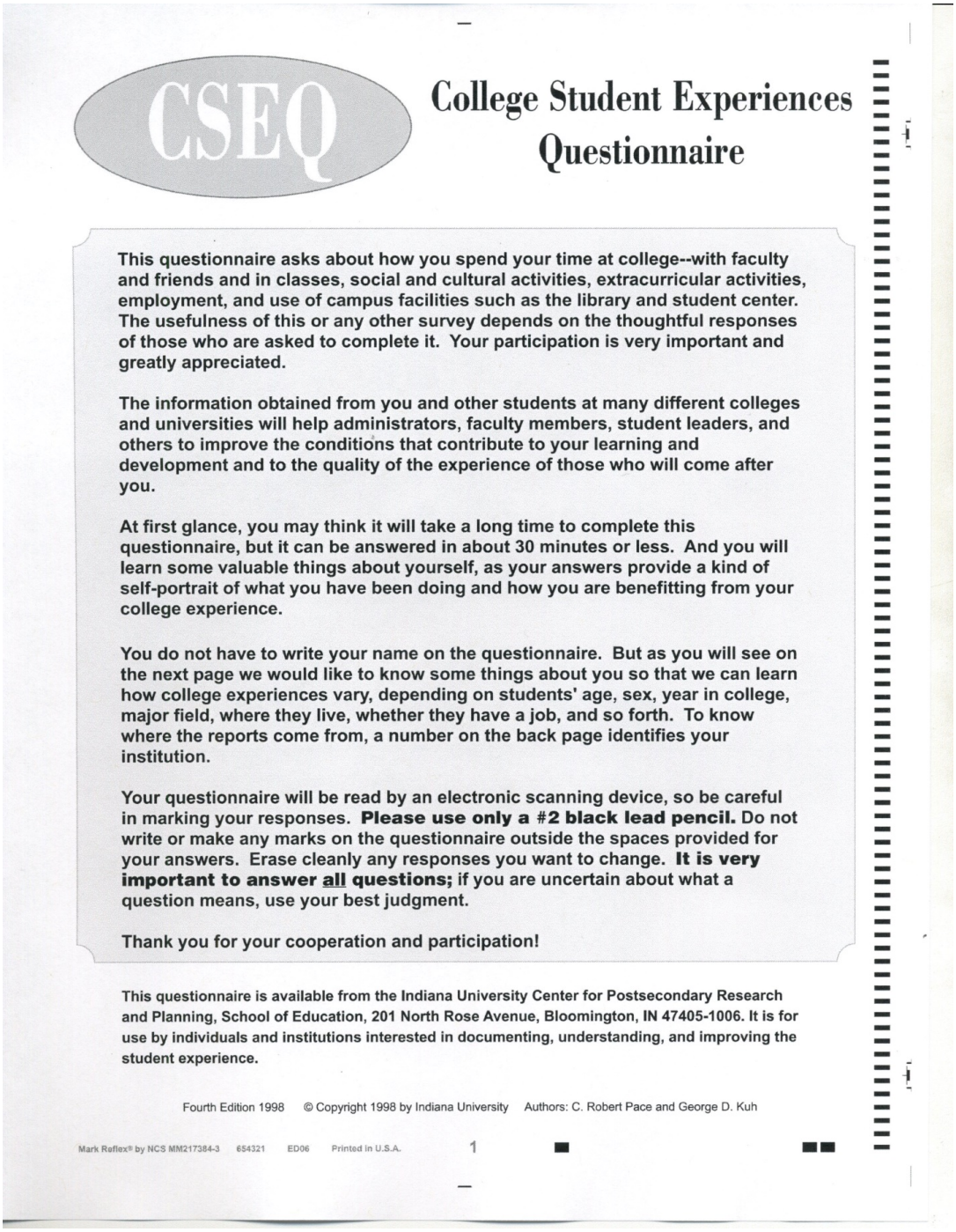
Anyway, you might be interested in looking at our main project, NSSE, as it has already had the Spanish version (for Puerto Rico).

If you have any questions, please let me know. Otherwise, I look forward to reading your proposal.

Best,

Defta

APPENDIX H: STUDENT QUESTIONNAIRE



CSEQ

College Student Experiences Questionnaire

This questionnaire asks about how you spend your time at college--with faculty and friends and in classes, social and cultural activities, extracurricular activities, employment, and use of campus facilities such as the library and student center. The usefulness of this or any other survey depends on the thoughtful responses of those who are asked to complete it. Your participation is very important and greatly appreciated.

The information obtained from you and other students at many different colleges and universities will help administrators, faculty members, student leaders, and others to improve the conditions that contribute to your learning and development and to the quality of the experience of those who will come after you.

At first glance, you may think it will take a long time to complete this questionnaire, but it can be answered in about 30 minutes or less. And you will learn some valuable things about yourself, as your answers provide a kind of self-portrait of what you have been doing and how you are benefitting from your college experience.

You do not have to write your name on the questionnaire. But as you will see on the next page we would like to know some things about you so that we can learn how college experiences vary, depending on students' age, sex, year in college, major field, where they live, whether they have a job, and so forth. To know where the reports come from, a number on the back page identifies your institution.

Your questionnaire will be read by an electronic scanning device, so be careful in marking your responses. **Please use only a #2 black lead pencil.** Do not write or make any marks on the questionnaire outside the spaces provided for your answers. Erase cleanly any responses you want to change. **It is very important to answer all questions;** if you are uncertain about what a question means, use your best judgment.

Thank you for your cooperation and participation!

This questionnaire is available from the Indiana University Center for Postsecondary Research and Planning, School of Education, 201 North Rose Avenue, Bloomington, IN 47405-1006. It is for use by individuals and institutions interested in documenting, understanding, and improving the student experience.

Mark Reflex® by NCS MM217384-3 654321 ED06 Printed in U.S.A.

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BACKGROUND INFORMATION

DIRECTIONS: Indicate your response by filling in the appropriate oval next to the correct answer.

Age

- ○ 19 or younger
- ○ 20 - 23
- ○ 24 - 29
- ○ 30 - 39
- ○ 40 - 55
- ○ Over 55

Sex

- ○ male
- ○ female

What is your marital status?

- ○ not married
- ○ married
- ○ divorced
- ○ separated
- ○ widowed

What is your classification in college?

- ○ freshman/first-year
- ○ sophomore
- ○ junior
- ○ senior
- ○ graduate student
- ○ unclassified

Did you begin college here or did you transfer here from another institution?

- ○ started here
- ○ transferred from another institution

Where do you now live during the school year?

- ○ dormitory or other campus housing
- ○ residence (house, apartment, etc.) within walking distance of the institution
- ○ residence (house, apartment, etc.) within driving distance
- ○ fraternity or sorority house

With whom do you live during the school year? (Fill in all that apply)

- ○ no one, I live alone
- ○ one or more other students
- ○ my spouse or partner
- ○ my child or children
- ○ my parents
- ○ other relatives
- ○ friends who are not students at the institution I'm attending
- ○ other people: who? ↘

Do you have access to a computer where you live or work, or nearby that you can use for your school work?

- ○ yes
- ○ no

What have most of your grades been up to now at this institution?

- ○ A
- ○ A-, B+
- ○ B
- ○ B-, C+
- ○ C, C-, or lower

Which of these fields best describes your major, or your anticipated major? You may indicate more than one if applicable.

- ○ Agriculture
- ○ Biological/life sciences (biology, biochemistry, botany, zoology, etc.)
- ○ Business (accounting, business administration, marketing, management, etc.)
- ○ Communication (speech, journalism, television/radio, etc.)
- ○ Computer and information sciences
- ○ Education
- ○ Engineering
- ○ Ethnic, cultural studies, and area studies
- ○ Foreign languages and literature (French, Spanish, etc.)
- ○ Health-related fields (nursing, physical therapy, health technology, etc.)
- ○ History
- ○ Humanities (English, literature, philosophy, religion, etc.)
- ○ Liberal/general studies
- ○ Mathematics
- ○ Multi/interdisciplinary studies (international relations, ecology, environmental studies, etc.)
- ○ Parks, recreation, leisure studies, sports management
- ○ Physical sciences (physics, chemistry, astronomy, earth science, etc.)
- ○ Pre-professional (pre-dental, pre-medical, pre-veterinary)
- ○ Public administration (city management, law enforcement, etc.)
- ○ Social sciences (anthropology, economics, political science, psychology, sociology, etc.)
- ○ Visual and performing arts (art, music, theater, etc.)
- ○ Undecided
- ○ Other: What? ↘

Did either of your parents graduate from college?

- ○ no
- ○ yes, both parents
- ○ yes, father only
- ○ yes, mother only
- ○ don't know

Do you expect to enroll for an advanced degree when, or if, you complete your undergraduate degree?

- ○ yes
- ○ no

How many credit hours are you taking this term?

- ○ 6 or fewer
- ○ 7 - 11
- ○ 12 - 14
- ○ 15 - 16
- ○ 17 or more

During the time school is in session, about how many hours a week do you usually spend outside of class on activities <u>related to your academic program,</u> such as studying, writing, reading, lab work, rehearsing, etc.?

- ○ 5 or fewer hours a week
- ○ 6 - 10 hours a week
- ○ 11 - 15 hours a week
- ○ 16 - 20 hours a week
- ○ 21 - 25 hours a week
- ○ 26 - 30 hours a week
- ○ more than 30 hours a week

During the time school is in session, about how many hours a week do you usually spend working on a job for pay? To provide information about your work experiences on and off campus, fill in one oval in each column.

	ON-CAMPUS	OFF-CAMPUS
None; I don't have a job	○	○
1 - 10 hours a week	○	○
11 - 20 hours	○	○
21 - 30 hours	○	○
31 - 40 hours	○	○
More than 40 hours	○	○

If you have a job, how does it affect your school work?

- ○ I don't have a job
- ○ My job does not interfere with my school work
- ○ My job takes some time from my school work
- ○ My job takes a lot of time from my school work

How do you meet your college expenses? Fill in the response that best approximates the amount of support from each of the various sources.

	None	Very Little	Less Than Half	About Half	More Than Half	All or Nearly All
Self (job, savings, etc.)	○	○	○	○	○	○
Parents	○	○	○	○	○	○
Spouse or partner	○	○	○	○	○	○
Employer support	○	○	○	○	○	○
Scholarships and grants	○	○	○	○	○	○
Loans	○	○	○	○	○	○
Other sources	○	○	○	○	○	○

What is your racial or ethnic identification? (Fill in all that apply)

- ○ American Indian or other Native American
- ○ Asian or Pacific Islander
- ○ Black or African American
- ○ Caucasian (other than Hispanic)
- ○ Mexican-American
- ○ Puerto Rican
- ○ Other Hispanic
- ○ Other: What?

COLLEGE ACTIVITIES

DIRECTIONS: In your experience at this institution during the current school year, about how often have you done each of the following? Indicate your response by filling in one of the ovals to the right of each statement.

Library	Never	Occasionally	Often	Very Often
Used the library as a quiet place to read or study materials you brought with you.	○	○	○	○
Found something interesting while browsing in the library.	○	○	○	○
Asked a librarian or staff member for help in finding information on some topic.	○	○	○	○
Read assigned materials other than textbooks in the library (reserve readings, etc.).	○	○	○	○
Used an index or database (computer, card catalog, etc.) to find material on some topic.	○	○	○	○
Developed a bibliography or reference list for a term paper or other report.	○	○	○	○
Gone back to read a basic reference or document that other authors referred to.	○	○	○	○
Made a judgment about the quality of information obtained from the library, World Wide Web, or other sources.	○	○	○	○

Computer and Information Technology	Never	Occasionally	Often	Very Often
Used a computer or word processor to prepare reports or papers.	○	○	○	○
Used e-mail to communicate with an instructor or other students.	○	○	○	○
Used a computer tutorial to learn material for a course or developmental/remedial program.	○	○	○	○
Participated in class discussions using an electronic medium (e-mail, list-serve, chat group, etc.).	○	○	○	○
Searched the World Wide Web or Internet for information related to a course.	○	○	○	○
Used a computer to retrieve materials from a library not at this institution.	○	○	○	○
Used a computer to produce visual displays of information (charts, graphs, spreadsheets, etc.).	○	○	○	○
Used a computer to analyze data (statistics, forecasting, etc.).	○	○	○	○
Developed a Web page or multimedia presentation.	○	○	○	○

DIRECTIONS: In your experience at this institution during the current school year, about how often have you done each of the following? Indicate your response by filling in one of the ovals to the right of each statement.

	Never	Occasionally	Often	Very Often
Course Learning				
Completed the assigned readings for class.	○	○	○	○
Took detailed notes during class.	○	○	○	○
Contributed to class discussions.	○	○	○	○
Developed a role play, case study, or simulation for a class.	○	○	○	○
Tried to see how different facts and ideas fit together.	○	○	○	○
Summarized major points and information from your class notes or readings.	○	○	○	○
Worked on a class assignment, project, or presentation with other students.	○	○	○	○
Applied material learned in a class to other areas (your job or internship, other courses, relationships with friends, family, co-workers, etc.).	○	○	○	○
Used information or experience from other areas of your life (job, internship, interactions with others) in class discussions or assignments.	○	○	○	○
Tried to explain material from a course to someone else (another student, friend, co-worker, family member.)	○	○	○	○
Worked on a paper or project where you had to integrate ideas from various sources.	○	○	○	○
Writing Experiences				
Used a dictionary or thesaurus to look up the proper meaning of words.	○	○	○	○
Thought about grammar, sentence structure, word choice, and sequence of ideas or points as you were writing.	○	○	○	○
Asked other people to read something you wrote to see if it was clear to them.	○	○	○	○
Referred to a book or manual about writing style, grammar, etc.	○	○	○	○
Revised a paper or composition two or more times before you were satisfied with it.	○	○	○	○
Asked an instructor or staff member for advice and help to improve your writing.	○	○	○	○
Prepared a major written report for a class (20 pages or more).	○	○	○	○

	Never	Occasionally	Often	Very Often
Experiences with Faculty				
Talked with your instructor about information related to a course you were taking (grades, make-up work, assignments, etc.).	○	○	○	○
Discussed your academic program or course selection with a faculty member.	○	○	○	○
Discussed ideas for a term paper or other class project with a faculty member.	○	○	○	○
Discussed your career plans and ambitions with a faculty member.	○	○	○	○
Worked harder as a result of feedback from an instructor.	○	○	○	○
Socialized with a faculty member outside of class (had a snack or soft drink, etc.).	○	○	○	○
Participated with other students in a discussion with one or more faculty members outside of class.	○	○	○	○
Asked your instructor for comments and criticisms about your academic performance.	○	○	○	○
Worked harder than you thought you could to meet an instructor's expectations and standards.	○	○	○	○
Worked with a faculty member on a research project.	○	○	○	○
Art, Music, Theater				
Talked about art (painting, sculpture, artists, etc.) or the theater (plays, musicals, dance, etc.) with other students, friends, or family members.	○	○	○	○
Went to an art exhibit/gallery or a play, dance, or other theater performance, on or off the campus.	○	○	○	○
Participated in some art activity (painting, pottery, weaving, drawing, etc.) or theater event, or worked on some theatrical production (acted, danced, worked on scenery, etc.), on or off the campus.	○	○	○	○
Talked about music or musicians (classical, popular, etc.) with other students, friends, or family members.	○	○	○	○
Attended a concert or other music event, on or off the campus.	○	○	○	○
Participated in some music activity (orchestra, chorus, dance, etc.) on or off the campus.	○	○	○	○
Read or discussed the opinions of art, music, or drama critics.	○	○	○	○

DIRECTIONS: In your experience at this institution during the current school year, about how often have you done each of the following? Indicate your response by filling in one of the ovals to the right of each statement.

	Never	Occasionally	Often	Very Often
Campus Facilities				
Used a campus lounge to relax or study by yourself.	○	○	○	○
Met other students at some campus location (campus center, etc.) for a discussion.	○	○	○	○
Attended a cultural or social event in the campus center or other campus location.	○	○	○	○
Went to a lecture or panel discussion.	○	○	○	○
Used a campus learning lab or center to improve study or academic skills (reading, writing, etc.)	○	○	○	○
Used campus recreational facilities (pool, fitness equipment, courts, etc.).	○	○	○	○
Played a team sport (intramural, club, intercollegiate).	○	○	○	○
Followed a regular schedule of exercise or practice for some recreational sporting activity.	○	○	○	○
Clubs and Organizations				
Attended a meeting of a campus club, organization, or student government group.	○	○	○	○
Worked on a campus committee, student organization, or project (publications, student government, special event, etc.).	○	○	○	○
Worked on an off-campus committee, organization, or project (civic group, church group, community event, etc.).	○	○	○	○
Met with a faculty member or staff advisor to discuss the activities of a group or organization.	○	○	○	○
Managed or provided leadership for a club or organization, on or off the campus.	○	○	○	○
Personal Experiences				
Told a friend or family member why you reacted to another person the way you did.	○	○	○	○
Discussed with another student, friend, or family member why some people get along smoothly, and others do not.	○	○	○	○
Asked a friend for help with a personal problem.	○	○	○	○
Read articles or books about personal growth, self-improvement, or social development.	○	○	○	○
Identified with a character in a book, movie, or television show and wondered what you might have done under similar circumstances.	○	○	○	○
Taken a test to measure your abilities, interests, or attitudes.	○	○	○	○
Asked a friend to tell you what he or she really thought about you.	○	○	○	○
Talked with a faculty member, counselor or other staff member about personal concerns.	○	○	○	○

	Never	Occasionally	Often	Very Often
Student Acquaintances				
Became acquainted with students whose interests were different from yours.	○	○	○	○
Became acquainted with students whose family background (economic, social) was different from yours.	○	○	○	○
Became acquainted with students whose age was different from yours.	○	○	○	○
Became acquainted with students whose race or ethnic background was different from yours.	○	○	○	○
Became acquainted with students from another country.	○	○	○	○
Had serious discussions with students whose philosophy of life or personal values were very different from yours.	○	○	○	○
Had serious discussions with students whose political opinions were very different from yours.	○	○	○	○
Had serious discussions with students whose religious beliefs were very different from yours.	○	○	○	○
Had serious discussions with students whose race or ethnic background was different from yours.	○	○	○	○
Had serious discussions with students from a country different from yours.	○	○	○	○
Scientific and Quantitative Experiences				
Memorized formulas, definitions, technical terms and concepts.	○	○	○	○
Used mathematical terms to express a set of relationships.	○	○	○	○
Explained your understanding of some scientific or mathematical theory, principle or concept to someone else (classmate, co-worker, etc.)	○	○	○	○
Read articles about scientific or mathematical theories or concepts in addition to those assigned for a class.	○	○	○	○
Completed an experiment or project using scientific methods.	○	○	○	○
Practiced to improve your skill in using a piece of laboratory equipment.	○	○	○	○
Showed someone else how to use a piece of scientific equipment.	○	○	○	○
Explained an experimental procedure to someone else.	○	○	○	○
Compared the scientific method with other methods for gaining knowledge and understanding.	○	○	○	○
Explained to another person the scientific basis for concerns about scientific or environmental issues (pollution, recycling, alternative sources of energy, acid rain) or similar aspects of the world around you.	○	○	○	○

5

CONVERSATIONS

DIRECTIONS: In conversations with others (students, family members, co-workers, etc.) outside the classroom *during this school year*, about how often have you talked about each of the following?

Topics of Conversation	Never	Occasionally	Often	Very Often
Current events in the news.	○	○	○	○
Social issues such as peace, justice, human rights, equality, race relations.	○	○	○	○
Different lifestyles, customs, and religions.	○	○	○	○
The ideas and views of other people such as writers, philosophers, historians.	○	○	○	○
The arts (painting, poetry, dance, theatrical productions, symphony, movies, etc.).	○	○	○	○
Science (theories, experiments, methods, etc.).	○	○	○	○
Computers and other technologies.	○	○	○	○
Social and ethical issues related to science and technology such as energy, pollution, chemicals, genetics, military use.	○	○	○	○
The economy (employment, wealth, poverty, debt, trade, etc.).	○	○	○	○
International relations (human rights, free trade, military activities, political differences, etc.).	○	○	○	○

Information in Conversations	Never	Occasionally	Often	Very Often
Referred to knowledge you acquired in your reading or classes.	○	○	○	○
Explored different ways of thinking about the topic.	○	○	○	○
Referred to something one of your instructors said about the topic.	○	○	○	○
Subsequently read something that was related to the topic.	○	○	○	○
Changed your opinion as a result of the knowledge or arguments presented by others.	○	○	○	○
Persuaded others to change their minds as a result of the knowledge or arguments you cited.	○	○	○	○

READING/WRITING

During this current school year, about how many books have you read? Fill in one response for each item listed below.	More than 20	Between 10 and 20	Between 5 and 10	Fewer than 5	None
Textbooks or assigned books	○	○	○	○	○
Assigned packs of course readings	○	○	○	○	○
Non-assigned books	○	○	○	○	○

During this current school year, about how many exams, papers, or reports have you written? Fill in one response for each item listed below.	More than 20	Between 10 and 20	Between 5 and 10	Fewer than 5	None
Essay exams for your courses	○	○	○	○	○
Term papers or other written reports	○	○	○	○	○

OPINIONS ABOUT YOUR COLLEGE OR UNIVERSITY

How well do you like college?

- ○ I am enthusiastic about it.
- ○ I like it.
- ○ I am more or less neutral about it.
- ○ I don't like it.

If you could start over again, would you go to the same institution you are now attending?

- ○ Yes, definitely
- ○ Probably yes
- ○ Probably no
- ○ No, definitely

THE COLLEGE ENVIRONMENT

Colleges and universities differ from one another in the extent to which they emphasize or focus on various aspects of students' development. Thinking of your experience at this institution, to what extent do you feel that each of the following is emphasized? The responses are numbered from 7 to 1, with the highest and lowest points illustrated. Fill in the oval with the number that best represents your impression on each of the following seven-point rating scales.

Emphasis on developing academic, scholarly, and intellectual qualities

Strong Emphasis ⑦ ⑥ ⑤ ④ ③ ② ① Weak Emphasis

Emphasis on developing aesthetic, expressive, and creative qualities

Strong Emphasis ⑦ ⑥ ⑤ ④ ③ ② ① Weak Emphasis

Emphasis on developing critical, evaluative, and analytical qualities

Strong Emphasis ⑦ ⑥ ⑤ ④ ③ ② ① Weak Emphasis

Emphasis on developing an understanding and appreciation of human diversity

Strong Emphasis ⑦ ⑥ ⑤ ④ ③ ② ① Weak Emphasis

Emphasis on developing information literacy skills (using computers, other information resources)

Strong Emphasis ⑦ ⑥ ⑤ ④ ③ ② ① Weak Emphasis

Emphasis on developing vocational and occupational competence

Strong Emphasis ⑦ ⑥ ⑤ ④ ③ ② ① Weak Emphasis

Emphasis on the personal relevance and practical value of your courses

Strong Emphasis ⑦ ⑥ ⑤ ④ ③ ② ① Weak Emphasis

The next three ratings refer to relations with people at this college. Again, thinking of your own experience, please rate the quality of these relationships on each of the following seven-point rating scales.

Relationships with other students

Friendly, Supportive, Sense of belonging ⑦ ⑥ ⑤ ④ ③ ② ① Competitive, Uninvolved, Sense of alienation

Relationships with administrative personnel and offices

Helpful, Considerate, Flexible ⑦ ⑥ ⑤ ④ ③ ② ① Rigid, Impersonal, Bound by regulations

Relationships with faculty members

Approachable, Helpful, Understanding, Encouraging ⑦ ⑥ ⑤ ④ ③ ② ① Remote, Discouraging, Unsympathetic

Go to next page

ESTIMATE OF GAINS

DIRECTIONS: In thinking about your college or university experience up to now, to what extent do you feel you have gained or made progress in the following areas? Indicate your response by filling in one of the ovals to the right of each statement.

	Very Little	Some	Quite a Bit	Very Much
Acquiring knowledge and skills applicable to a specific job or type of work (vocational preparation).	○	○	○	○
Acquiring background and specialization for further education in a professional, scientific, or scholarly field.	○	○	○	○
Gaining a broad general education about different fields of knowledge.	○	○	○	○
Gaining a range of information that may be relevant to a career.	○	○	○	○
Developing an understanding and enjoyment of art, music, and drama.	○	○	○	○
Broadening your acquaintance with and enjoyment of literature.	○	○	○	○
Seeing the importance of history for understanding the present as well as the past.	○	○	○	○
Gaining knowledge about other parts of the world and other people (Asia, Africa, South America, etc.).	○	○	○	○
Writing clearly and effectively.	○	○	○	○
Presenting ideas and information effectively when speaking to others.	○	○	○	○
Using computers and other information technologies.	○	○	○	○
Becoming aware of different philosophies, cultures, and ways of life.	○	○	○	○
Developing your own values and ethical standards.	○	○	○	○

	Very Little	Some	Quite a Bit	Very Much
Understanding yourself, your abilities, interests, and personality.	○	○	○	○
Developing the ability to get along with different kinds of people.	○	○	○	○
Developing the ability to function as a member of a team.	○	○	○	○
Developing good health habits and physical fitness.	○	○	○	○
Understanding the nature of science and experimentation.	○	○	○	○
Understanding new developments in science and technology.	○	○	○	○
Becoming aware of the consequences (benefits, hazards, dangers) of new applications of science and technology.	○	○	○	○
Thinking analytically and logically.	○	○	○	○
Analyzing quantitative problems (understanding probabilities, proportions, etc.).	○	○	○	○
Putting ideas together, seeing relationships, similarities, and differences between ideas.	○	○	○	○
Learning on your own, pursuing ideas, and finding information you need.	○	○	○	○
Learning to adapt to change (new technologies, different jobs or personal circumstances, etc.)	○	○	○	○

ADDITIONAL QUESTIONS

1. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	8. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	15. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
2. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	9. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	16. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
3. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	10. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	17. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
4. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	11. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	18. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
5. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	12. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	19. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
6. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	13. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	20. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
7. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	14. Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ	

OTHER ID#, If Requested

THANK YOU FOR YOUR PARTICIPATION!

PLEASE DO NOT WRITE IN THIS AREA