AN INVESTIGATION OF CRITICAL THINKING OUTCOMES IN AN ONLINE DEVELOPMENTAL PSYCHOLOGY LEARNING ENVIRONMENT

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Abstract

An Investigation of Critical Thinking Outcomes in an Online

Developmental Psychology Learning Environment

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Critical thinking (CT) has become a hot topic in academic and mainstream media, where the development of these skills may influence efficacy and productivity in educational and career environments, potentially impacting academic success, employability, and even routine decisions encountered in everyday life. Since the learning environment is germane to reinforcement of CT skills and as institutions shift towards online learning, the online classroom has potential for influencing CT skills and cultivating technically adept high-quality college graduates. The current project sought to investigate relationships between CT and course outcomes within multiple semesters of an online Developmental Psychology course. Data were comprised of the Halpern Critical Thinking Assessment, student metrics and course performance measures across eight course sections of the online course. Relationships were revealed for student majors, levels of student participation, and changes in CT measures through the course progression. Differences in CT measures were revealed by major, and course performance differed by major and the expectation of completing discussion posts. CT measures were predominantly correlated across the duration of the semester, and several performance measures were also correlated with CT measures. Contrary to the hypothesized effects, discussion postings were inversely related to CT and course performance, such that students who did not participate in discussion postings had higher performance (against the perceptions of educators). As a whole, the results suggest potential influences of CT skills in online learning, but further investigation is needed to refine CT interventions and to identify students most likely to benefit from such activities.

Keywords: Critical Thinking, Online Learning, Critical Thinking through Online Learning

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Dedication

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Chapter One: Introduction

Researchers argue about the origins of critical thinking and the implementation of critical thinking principles in learning environments, but the intellectual underpinning of this conceptual argument has been persisting for millennia at the very least:

"Learning without thinking is wasteful, thinking without learning is dangerous."

–Confucius, *Analects*, Chapter II

Adverse Impact of Critical Thinking Deficits

Consider a novice nurse unsure of how to proceed with patient care amidst conflicting orders from physicians: while contradictory, an immediate critical decision must be made in order to preserve the life of a patient. For example, post-cardiac patient care (e.g. fluid load for blood pressure versus renal flow) or narcotic-reversal treatment (e.g. overdose, withdrawal, ACLS) can present conflicting courses of action from physicians monitoring the patient, but inaction can also potentially lead to injury or death of the patient (Howlett, Gonzalez, Yerram, & Faley, 2016; Lavonas et al., 2015; Peberdy et al., 2010). Reliance on the rote memorization of standard procedures, unfortunately, is often insufficient for effective decision-making (Lee et al., 2013; McClead et al., 2014; Thompson, Aitken, Doran, & Dowding, 2013). While nursing education includes vast theoretical and practical applications of knowledge, reasoning through "real world" scenarios is often inconsistent with previously encountered examples and requires critical thinking (CT) skills for such "real world" decisions.

In recent years, nursing educators have consistently strived to address CT deficits (Andreou, Papastavrou, & Merkouris, 2014; Borglin, 2012; Colucciello, 1999; Dwyer, Hogan, & Stewart, 2014; Eales-Reynolds, Gillham, Grech, Clarke, & Cornell, 2012; Fisher & King, 2010; Hunter, Pitt, Croce, & Roche, 2014; Kantar, 2014; Kong, Qin, Zhou, Mou, & Gao, 2014; Ku &

Ho, 2010; Ku, 2009; Means, Toyama, Murphy, Bakia, & Jones, 2009; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Sullivan, 2012). However, deficits in CT skills are not exclusive to nursing, as the business and technology sectors are also adversely affected (Black, 2012; Heijltjes, van Gog, Leppink, & Paas, 2014; Webster, 2015). As research on CT skills primarily focuses on the identification and development of these skills, a factor that encompasses the reinforcement of these skills in educated professionals must be considered: the learning environment. With the shift towards elements of online learning (Allen, Seaman, Poulin, & Straut, 2016; Allen & Seaman, 2008), investigations between the development of CT skills and online learning, become critically important in understanding how to reinforce such skills.

Critical Thinking

Despite the various definitions of critical thinking (Black, 2012; Colucciello, 1999; Dewey, 1933; Fascione, 1990; Halpern, 1998, 2001; Ku & Ho, 2010; Kwan & Wong, 2015; Watson & Glaser, 1942), collectively, the body of research presents an aggregated framework to define, develop, explore, and evaluate critical thinking (CT). While criteria differ in research, CT represents faculties related to the identification, evaluation, and execution of decisions based on evidence (or the lack thereof). Beyond the foundations of John Dewey's "reflective thinking" (Dewey, 1924, 1933; Rogers, 2002) and the Watson-Glaser ideology of CT skills (Burton & Joel, 1945; Watson & Glaser, 1942), two researchers in recent history have substantially contributed to the understanding of CT skills: Peter Fascione and Diane Halpern. These researchers differ from their predecessors through a single crucial point: the argument of evaluating CT skills with constructed-response (i.e. free-response) items, as opposed to only using closed-choice (i.e. multiple-choice) items (Fascione, 1990; Halpern, 2001). This is important in the evaluation of CT skills, because the effective evaluation of such skills requires consideration of the context in which these skills are applied. In other words, merely selecting a closed-choice item does not give insight into how an individual had drawn conclusions for a scenario, but free-response items allow for a greater chance of insight into an individual's thinking. If evaluated against standardized criteria such as a rubric (e.g. if a respondent considered multiple perspectives prior to making a conclusion), then this provides a framework for validation in the evaluation of CT skills through the thinking process. Despite tendency to label CT as evidence-based decision-making, such a definition is insufficient in that CT skills rely on acquisition and interpretation of potentially novel information and the subsequent ability to apply such knowledge in context.

When considering factors influential to the development of CT skills, evidence routinely suggests that these skills can be reinforced through the learning environment (Bensley & Spero, 2014; Dwyer et al., 2014; Dwyer, Hogan, & Stewart, 2015; Halpern, 2001; Heijltjes et al., 2014; Heijltjes, van Gog, Leppink, & Paas, 2015; Hunter et al., 2014; Kong et al., 2014; Niu, Behar-Horenstein, & Garvan, 2013). However, evidence also suggests that the efficacy of interventions within learning environments targeting critical thinking development may differ by educational disciplines, especially in health-related fields (Andreou et al., 2014; Borglin, 2012; Kantar, 2014; Kwan & Wong, 2015; Niu et al., 2013; Sullivan, 2012). As a possible explanation, students in health-related disciplines may have a greater tendency towards reliance on rote memorization (anatomy, physiology, best-practice guidelines, etc.), so it might be that the structure of these learning environments that could hinder the reinforcement of CT skills.

This idea of deficits in CT skills resulting from classroom environments is not foreign, as evidence suggests that such phenomena may represent an unintended consequence of course design (Andreou et al., 2014; Sullivan, 2012). Moreover, these reported deficits in health-related education could be explained by a lack of effective implementation of CT interventions within these respective course programs (Andreou et al., 2014; Borglin, 2012; Eales-Reynolds et al., 2012; Kantar, 2014; Kwan & Wong, 2015; Niu et al., 2013; Petchtone, Puangtong, Chaijaroen, & Sumalee, 2012; Sullivan, 2012). The research on CT skills is only further complicated when techniques identified as effective for the development of these skills (Butler, 2012; Butler et al., 2012; de Bie, Wilhelm, & van der Meij, 2015; Halpern, 2001; Ku, 2009), are sometimes deemed irrelevant by the actual students (Saadé, Morin, & Thomas, 2012). Given the complexity of CT interventions within learning environments, it naturally follows to consider the roles of different learning environments, specifically online learning.

Online Learning

As research offers a wealth of potential learning improvement strategies, research has been biased towards “face-to-face” learning as opposed to online learning. In basic terms, online learning consists of any substantive portion of a course requiring online resources, which may include content, discussions, quizzes, assignments, and even exams. While online learning has a tendency to be considered online-only courses, many traditionally-styled courses incorporate online elements to become so-called “blended” (also called “hybrid”) learning environments (Garrison & Kanuka, 2004). Contrary to first impressions, the use of online elements requires a different skillset for educators: successful online instruction cannot be achieved by simply uploading materials in a laissez-faire manner (Paechter, Maier, & Macher, 2010; Paechter & Maier, 2010; Tempelaar, Niculescu, Rienties, Gijselaers, & Giesbers, 2012). Rather, effective online instruction requires deliberate planning in order to capture the student perspective for digital media through the consideration of the delivery and structure of course content. For example, research suggests that voice-overs used in presentations (captured audio embedded within a presentation) should be slightly incongruent with the text included within presentations for maximum efficacy (Yue, Bjork, & Bjork, 2013). Similarly, even something as subtle as the visual composition of course presentations has a significant role in subsequent student outcomes (D'Mello & Graesser, 2012; D'Mello, Lehman, Pekrun, & Graesser, 2014; Magner, Schwonke, Aleven, Popescu, & Renkl, 2014; Paechter et al., 2010). The consideration of such factors can become of paramount importance in absence of a face-to-face instructor.

Beyond the instructor, research infers that effective online learners may represent a different type of learner altogether, when compared to students enrolled in traditional face-to-face classroom environments (Artino & Jones, 2012; Artino, 2009, 2010; Autrey, 2009; Marchand & Gutierrez, 2012; Tempelaar et al., 2012). When comparing students between online and face-to-face learning environments, research suggests that students, who have a preference towards online learning and perform optimally, have higher self-efficacy, more positive value judgments, and a greater number of characteristics associated with self-regulated learning, such as greater employment of metacognitive processes (Artino & Jones, 2012; Artino, 2009, 2010; Marchand & Gutierrez, 2012; Tempelaar et al., 2012). While these characteristics are consistent across education levels, from technical training programs to graduate education, the relationships between these so-called "achievement emotions" (boredom, frustration, satisfaction, task value, anxiety, etc.) are more complex when distinguishing the two types of learners. In the general sense, online learners are both more resilient to detrimental achievement emotions and more receptive to processes that reinforce self-regulated learning (Artino & Jones, 2012; Kostons, van Gog, & Paas, 2012; Marchand & Gutierrez, 2012; Paechter et al., 2010; Tempelaar et al., 2012). While gender accounts for differing achievement emotions (males with boredom and females with anxiety), the effects on performance are irrespective of gender (Tempelaar et al., 2012).

As self-regulated learning makes use of metacognitive processes where the learner actively seeks the information related to an educational goal (Zimmerman, 1990), it can be inferred that self-regulated learning may overlap with the personality construct of "Need for Cognition" (NFC). In addition to evidence suggesting that NFC is related to "reflective learning" and integrative learning (Wang, 2013), NFC has also been identified as being related to both higher-order learning and critical thinking (Bensley & Spero, 2014; Heijltjes et al., 2014; Ku & Ho, 2010; Ku, 2009; Wang, Pascarella, Nelson Laird, & Ribera, 2015; Wang, 2013). Given this predisposition to self-regulated learning for successful online learners, this leads to consideration of how the online learning process influences CT skills.

Critical Thinking and Online Learning

According to research by the US Department of Education, when comparing studies of online and traditional learning, the use of student self-reflection has shown to improve learning outcomes (Means et al., 2009). As self-reflection serves as a behavioral component of self-regulated learning behaviors, and as these behaviors are related to CT skills, then relationships between CT and online learning become critical. However, educational institutions still struggle to adapt existing educational environments beyond traditional pedagogical methods, even with the incorporation of online learning elements (Andreou et al., 2014; Eales-Reynolds et al., 2012; Greenlaw & Deloach, 2003; Lehman, D'Mello, & Graesser, 2012; Means et al., 2009; Meyer, 2004; Petchtone et al., 2012). Currently, effective online pedagogy targeting CT skills is still reportedly lacking (Allen et al., 2016).

A recent meta-analysis comparing lecture styles and CT, reported a key finding that problem-based learning improved CT skills compared to traditional lecture styles (Kong et al., 2014). Furthermore, an interpretation of the body of research has also emphasized the need for a so-called “academic literacies model” which employs hybrid learning models in order to address deficits in CT skills and analytical writing ability (Borglin, 2012). Yet, evidence suggests that such programs still neglect course designs that reinforce CT skills (Kantar, 2014). The standard intervention for approaching online learning and CT skills is through discussion postings, but such studies typically fail to provide rubrics to students, which would logically suggest a lack of clear expectations communicated through self-regulated feedback (Greenlaw & Deloach, 2003; Meyer, 2004; Ramos & Yudko, 2008; Ting & Rashied, 2015). Consequentially, these studies tend to rate their success with discussion postings as untenable. As such, interventions targetting improvement to CT and learning outcomes drastically need effective enhancement strategies.

Learning Environment Enhancement

Numerous studies report enhancements to the learning environment, and investigations in course settings show consistent results (Ku & Ho, 2010; Means et al., 2009; Schaap, Baartman, & de Bruijn, 2012; Wang, 2013). Through the body of literature, three primary factors increase course performance: (1) practice effects, (2) course design, and (3) perceptions.

Practice effects. While the term “practice effects” typically refers to a set of confounds in research methods, it also describes the rehearsal of spaced task performance through effects of testing and/or studying (Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006). The “testing effect” is a phenomenon where the actual testing process results in improved task performance. This effect has been observed in learners both correctly answering items across testing sessions (Halamish & Bjork, 2011; Peterson, Sales, Rees, & Fivush, 2007; Roediger & Karpicke, 2006a, 2006b), and incorrectly answering items from prior testing, and then correctly answering these items at later testing (Kornell, Hays, & Bjork, 2009). A plausible explanation suggests that actively engaged learners may process items with more effort at test compared to those simply guessing (Marsh, Roediger, Bjork, & Bjork, 2007), which infers effortful learning during testing. At first glance, the idea of the testing effect contradicts the notion of studying as the primary route of production for quality performance, and as some researchers have noticed, suggestions of increased testing has been met with opposition from some educators (Roediger & Karpicke, 2006b). However, a critical clarification provided by Roediger and Karpicke (2006a) explained that *increased* testing does not mean *increased* standardized testing. Moreover, increased testing is most effective when incorporating critical thinking (CT) features (for more information see Sternberg, 2015). It has also been suggested that testing effects can also reinforce CT skills (Halpern et al., 2012).

Studying is another factor that predicts learning performance, as research suggests that knowledge retention (i.e. “transference”) differs between open- and closed-book testing: open-book testing initially increases performance, but further testing favors closed-book testing, likely due to effortful studying (Peterson et al., 2007). The relationships of studying on performance and retention are contingent upon the amount and frequency of studying. In terms of amount, mass studying (i.e. cramming) benefits initial performance, but at the cost of transference (E. L. Bjork & Bjork, 2009; R. A. Bjork, Dunlosky, & Kornell, 2013; Hays, Kornell, & Bjork, 2010; Kornell et al., 2009). Regarding frequency, scheduled studying (or “blocking”) greatly improves performance and retention in learning outcomes (E. L. Bjork & Bjork, 2009; R. A. Bjork & Linn, 2006; deWinstanley & Bjork, 2002; Lehman et al., 2012; Pashler, McDaniel, Rohrer, & Bjork, 2008; Richland, Bjork, Finley, & Linn, 1988). However, striated (or “interleaved”) studying, which incorporates a randomized order for topics at study, is the most effective studying strategy (E. L. Bjork & Bjork, 2009; Kornell & Bjork, 2007, 2008, 2009; Richland et al., 1988). A plausible explanation suggests that interleaved studying may introduce an element of “desirable difficulties” benefitting learners (E. L. Bjork & Bjork, 2009; R. A. Bjork et al., 2013;

R. A. Bjork & Linn, 2006; Kornell & Bjork, 2007; Peterson et al., 2007; Richland et al., 1988; Roediger & Karpicke, 2006a; Yue et al., 2013). Considering the effects of testing and studying, evidence suggests a role of cultivating effortful learning for improved course performance. However, these practice effects are influenced by testing intervals (Cepeda et al., 2006; Rohrer & Pashler, 2010), and ultimately, course design has a substantial role in the profiting from these effects (Rohrer & Pashler, 2010).

Course design. The instructor is critical in establishing an environment conducive to enhanced learning performance through effective course design. The frequency of testing, the allocation of time for studying (time between testing), and even the course content itself (e.g. factors as rudimentary as shapes and colors), affect course performance (Plass, Heidig, Hayward, Homer, & Um, 2014; Rohrer & Pashler, 2010). If the elements of self-regulated studying and effortful learning show impacts on learning performance, then it logically follows that the patterns of reinforcement from the instructor should also have an effect. According to research, this has been observed for both feedback during testing and studying (R. A. Bjork, 1994; Núñez-Peña, Bono, & Suárez-Pellicioni, 2015; Roediger & Karpicke, 2006a, 2006b). However, to consider efficacy, it is important to distinguish the type of feedback and the testing process, as absence of feedback also shows increased performance in environments only using multiple-choice testing (Hays et al., 2010). Furthermore, feedback is most effective when focusing on the learning process rather than the course content (Panadero, Alonso-Tapia, & Reche, 2013), this is especially the case when concise instructions are provided and metacognitive processes are cultivated within learners (Panadero, Tapia, & Huertas, 2012).

In similar fashion, rubrics provide a structure for self-regulated feedback to evaluate performance and facilitate learning through prompts that provide concise expectations for a task (e.g. a “test” in the context of learning). Studies on the efficacy of rubrics show that while rubric items are reliable, the items are not necessarily valid (Jonsson & Svingby, 2007; Rezaei & Lovorn, 2010). Specifically, validity suffers when improperly trained graders evaluate a rubric item or if the rubric contains convoluted items or instructions. To avoid any diminished efficacy, rubrics should provide: (1) clear and concise instructions, (2) exemplars directed at learning outcomes, and (3) reinforcement of learner metacognitive processes (Jonsson & Svingby, 2007). Thus, providing clear expectations may enhance performance through self-regulated learning by considering the student environment. Nevertheless, even with meticulous planning, subjective elements such as perceptions, still considerably influence student performance.

Perceptions. Learner and instructor perceptions both show considerable influence on the learning process. Specifically, when students perceive material as relevant (high “task value”), performance increases (Artino & Jones, 2012; Artino, 2009, 2010; Marchand & Gutierrez, 2012; Pekrun et al., 2011). Yet, perceptions of learning confidence consistently fail to predict positive relationships on performance (R. A. Bjork et al., 2013; Hays et al., 2010; Koriat & Bjork, 2005, 2006; Koriat, Ma’ayan, Sheffer, & Bjork, 2006; Kornell & Bjork, 2009; Pekrun et al., 2011; Roediger & Karpicke, 2006a). These perceptions suggest optimal student performance occurs when students attribute higher task value to material without overconfidence in their abilities.

Another perceptual effect showing benefits (and simultaneously, serious deficits) relates to so-called “mindsets” of intelligence (i.e. “growth” or “fixed”). These differing perceptions define an individual’s intelligence as either from incremental effort (growth) or as an immutable property (fixed). Students with a growth theorist mindset exhibit greater pro-learning behaviors compared to those with a fixed mindset (Claro, Paunesku, & Dweck, 2016; Dweck, 2010; Yan, Thai, & Bjork, 2014). For example, the population surveyed by Yan and colleagues (2014), identified that growth theorists: (a) see quizzes as an opportunity to learn about correct and incorrect choices (compared to learning value for correct-only, incorrect-only, or no value at all), (b) revisit old course materials, and (c) have higher intrinsic motivation (compared to fixed theorists who are highly extrinsically motivated). On the other hand, fixed theorists are far more rigid in their attitudes towards learning, and according to the work of Yan and colleagues (2014), fixed beliefs by education level represent: (a) 36% of those below a bachelor's degree, (b) 46% of those with a bachelor's degree, and (c) 57% of those with a graduate degree. While this might not seem initially problematic, if one considers educators as students who achieved academic credentialing, then such educators with this fixed mindset might provide less shepherding of their respective student-learning environments, thus, perpetuating non-optimal learning environments. For this reason, reinforcing the growth perception could have tremendous educational benefits.

Rationale for the Current Investigation

Learning research is inherently difficult due to the abstract nature of learning, and the necessary distinction between learning and performance (Kornell & Bjork, 2007). Specifically, learning research focuses on task performance through short-duration experiments testing short-term knowledge, which does not necessarily overlap with education environments. Ignoring this subtle difference between learning and performance may actually lead to the perpetuation of applying reported findings without adequate context (E. L. Bjork & Bjork, 2009). Researchers have provided "educationally relevant" research through more classroom-based studies (Bensley & Spero, 2014; R. A. Bjork, 1994; Dwyer et al., 2015; Eales-Reynolds et al., 2012; Heijltjes et al., 2014; Kuh, 2009; Kwan & Wong, 2015; Magner et al., 2014; Paechter & Maier, 2010; Peterson et al., 2007; Richland et al., 1988; Roediger & Karpicke, 2006a, 2006b; Yan et al., 2014), but quantitative studies on CT skills and online course performance are lacking compared to case studies or exploratory surveys.

Furthermore, instead of benefitting from techniques identified in the research, educators frequently prefer methodologies for which empirical evidence fails to offer support (Rohrer & Pashler, 2010), like the “meshing hypothesis” of learning styles (Pashler et al., 2008), or the sustained use of traditional lecture approaches (McGivern & Coxon, 2015; Schmidt, Wagener, Smeets, Keemink, & Van Der Molen, 2015). It has also been suggested that instructors may have reluctance towards implementing more effective teaching styles due to: (a) inherent instructor biases, (b) a decrease in professional learning and training experience, and (c) a perceived lack of research showing benefits (Sleeter, 2012). Perhaps this reluctance might be best explained by the preoccupation of instructor performance metrics (e.g. research grants or teaching evaluations), which inhibits time for course redesigns with more effective approaches (Greenwood, 2012). Thus, research investigating enhanced learning performance through CT interventions may provide proximal benefits to overburdened educators and exert an influence towards targeting the downstream problem of CT deficits.

However, the onus of CT deficits is not exclusive to those influencing educational policy, as students have a considerable role as well. Specifically, when students evaluate components of their learning environments, they determine items as vitally important, but their own perceptions of these same items highlight misconceptions about learning (Magner et al., 2014; Núñez-Peña et al., 2015; Núñez-Peña, Suárez-Pellicioni, & Bono, 2013; Yan et al., 2014; Yue et al., 2013). For example, textbooks are consistently rated as important by students, but these same students also indicate limited use, if any use at all (Magner et al., 2014; Núñez-Peña et al., 2015, 2013). In addition, learners also evaluate items such as rubrics, self-testing, lecture format, and reviewing studied materials as offering little value to learning and CT skills, but the evidence indicates that these items actually offer considerable improvement (Núñez-Peña et al., 2015, 2013; Yan et al., 2014). These distorted perspectives are troublesome when considering research has identified that non-optimal learning behavior and maladaptive perceptions transfer beyond education to employment (E. L. Bjork & Bjork, 2009; R. A. Bjork, 1994; Kornell & Bjork, 2007; Yan et al., 2014). Thus, beyond the consideration of course design, it is imperative to reinforce pro-learning behavior in students taking courses for the development of CT skills.

Considering the demand for skilled competent workers and the reported lack of such traits in college graduates (Cappelli, 2014; Halpern, 1998; Schaap et al., 2012; United States Department of Education, 2012; Webster, 2015), CT deficits might manifest from an impaired ability for students to cultivate and transfer these skills. As such, a meta-analysis of effective CT interventions identified course design and instructor pedagogical approach as primary factors that affect the enhancement of CT skills (Abrami et al., 2008). Reviewing the current learning and CT literature suggests a different role for educators: the role of a learning facilitator. In other words, educators should strive to facilitate environments for active student learning engagement instead of passive reliance on traditional teaching methods. This idea of a learning facilitator is congruent with the principles of active learning (Freeman et al., 2014). Thus, in the first steps to address the societal problem of CT deficits, research should focus on how CT skills within online learning environments affect CT skills and learning performance outcomes.

Hypotheses

The purpose of the current project is to contribute to the understanding of critical thinking (CT) skills implicated in the online learning environment. As such, this involves the exploration of factors associated with CT skills and learning performance within multiple semesters and course sections of an online developmental psychology course. As course and CT performance differences have been identified between student majors (Ackerman, Kanfer, & Beier, 2013; Keating, 1990), major was considered a relevant factor in examining group differences and key relationships. Specifically, through archival analyses, two specific aims and their related hypotheses have been investigated:

Aim 1: Identification of critical thinking and online learning characteristics.

H_1. As CT skills are enhanced by practice effects and differences in CT dispositions are found between educational disciplines, it is hypothesized that CT assessments differ by participation in discussion postings and by major. Specifically, psychology and interdisciplinary majors should differ in CT scores compared to other majors, and higher participation should reflect higher CT scores.

H_2. As practice effects are routine for course performance, it is hypothesized that performance should differ by discussion participation and major. Specifically, psychology and nursing majors should differ in course performance compared to others and greater participation should reflect higher performance.

Aim 2: Examine relationships between CT skills and course performance measures.

H_3. Considering the structure of the CT instrument and the course, it is hypothesized that CT scores are positively correlated between beginning and end measures.

H_4. Given reported relationships between CT and student performance, it is hypothesized that CT measures are positively correlated with performance.

H_5. If the previously hypothesized relationships are substantiated, it is hypothesized that the relationships between CT assessments and student performance should be positively mediated through end of semester CT scores.

Chapter Two: Method

The current research utilizes data collected from an original quality enhancement plan (QEP) study using two versions of the Halpern Critical Thinking Assessment (HCTA), through the Fall 2010 and Spring 2012 semesters. This QEP study involved collaborations with other investigators via portions of the data to evaluate the HCTA (Butler, 2012; Butler et al., 2012). Yet, course performance measures and the second HCTA version were not originally assessed.

Participants

With the obtained data, a consistent and robust sample of observations were available ($N = 690$). In general, these data from the original QEP study (see Figure 1 for Infographic of QEP study) were mostly consistent across the available time points (see Table 1), but different from other course-related studies from the UT Arlington Department of Psychology regarding major and academic rank (Autrey & Mann, 2008; Autrey, 2009). Specifically, previous studies used sequential sophomore-level courses required for psychology majors, but the current data used a junior-level Developmental Psychology course required for nursing majors. The students in this course had a median age at enrollment of 22.54 years ($M = 24.52$, $SE = .21$), with 63.62% of students having full-time enrollment status, and over 96% of the students had Sophomore ($n = 198$), Junior ($n = 223$), or Senior ($n = 228$) academic rank during the enrolled semesters (see Figure 2 for a distribution of academic rank). The students represented majors across various colleges at UT Arlington: (a) College of Science ($n = 122$), (b) College of Nursing ($n = 209$), (c) College of Education ($n = 78$), (d) College of Liberal Arts ($n = 43$), (e) College of Urban and Public Affairs ($n = 51$), (f) University College ($n = 124$), (g) "Undeclared" major status ($n = 36$), and (e) Business, Engineering, Social Work, and other colleges ($n = 27$). Specific department majors of interest beyond the respective colleges were: Psychology ($n = 67$), Kinesiology from the Department of Education (*n* = 56), Biology or Chemistry (*n* = 55), and Education from the Department of Education (n = 22). The breakdown of major suggests an interest in the course across disciplines, despite being an upper-division Department of Psychology course (see Figure 3 and Figure 4 for distributions of majors).

The sample was composed of more females (*n* = 552) than males (*n* = 146), such that 79.08% of the sample was female. Similar studies of undergraduate populations consistently report more female participants: (a) 66.40% (Butler, 2012), (b) 79.58% (de Bie et al., 2015), (c) 57.92% (Giancarlo & Facione, 2001), (d) 79.07% (Gwazdauskas, McGilliard, & Corl, 2014), (e) 77.20% (Núñez-Peña et al., 2013), (f) 72.89% (Núñez-Peña et al., 2015), (g) 61.98% (Paechter et al., 2010), (h) 84.06% (Panadero et al., 2013), and (i) 70% and 55% respectively across two studies (Rezaei & Lovorn, 2010). Additionally, exploratory short surveys were collected on attitudes, perceptions, and behaviors related to the online learning experience within the Developmental Psychology course. However, across the four surveys, the ten constructs did not indicate high levels of reliability (see Table 2). This was likely due to: (a) the limited number of assessment items (*n* = 4) per construct, (b) the differing item constructs between the surveys (see Appendix A for individual short survey items), and (c) the substantial amount of missing short survey data, as the formula for Cronbach’s alpha is sensitive to such influences (Cronbach, 1951). Median responses to short survey items have been provided in Table 3, and additional demographic characteristics of the student academic ranking, have been provided in Table 4.

Measurements

Predictor variables consisted of declared major and student participation measures. The primary outcome measures were the Halpern Critical Thinking Assessment (HCTA), and specific course performance measures collected within each semester.

Majors. Categorically, majors were recoded for theoretical importance as research has reported differential effects of critical thinking (CT) skills and course performance by major status. Specifically, science majors have shown advantages in CT skills and course outcome measures (Ackerman et al., 2013), and other research has implicated higher CT skills in those with broader domains of content knowledge, which might suggest the importance of majors with an interdisciplinary style (Keating, 1990). At the time of initial data collection, UT Arlington had two colleges addressing interdisciplinary approaches: the University College (university studies) and the College of Urban and Public Affairs (interdisciplinary studies). The main distinction between these two majors was that university studies allowed for a broad combination of content areas and interdisciplinary studies focused on a specialization between two disciplines. Finally, as the course under study was a requirement for nursing majors and considering previous emphasis placed on CT skills in nursing education, nursing was also of theoretical importance. With the consideration of these factors, the following categories at the college-level were produced: Science (n = 122), Nursing (n = 209), interdisciplinary approaches (n = 175), Other (n = 148), and Undeclared (n = 36). Additionally, as the course was from the Department of Psychology, the following major classification was also generated to investigate the role of specific majors: Psychology (n = 67), Nursing (n = 209), singular majors associated with traditional career paths (n = 203), interdisciplinary majors, entailing multiple disciplines (n = 175), and undeclared majors (n = 36).

Student participation. During each course section, students had the opportunity to participate in up to two discussion postings, nine quizzes, four short surveys, and two CT assessments (see Table 5). As discussion postings were the primary method to reinforce the application of free-response CT skills on course content, the number of completed discussion postings was a primary factor of interest in the current study. In addition, during the original QEP study, students in two out of the eight sections had mandatory discussion postings compared to every other section having an optional discussion posting policy. Inclusion of this categorical condition of discussion posting policy was intended to provide an ability to differentiate self-selecting participant effects from the intervention of discussion postings. As the behavioral components of student engagement or active participation reflect “sustained behavioral involvement in learning activities” (Skinner & Belmont, 1993), a secondary means of assessing student performance was developed. Given the high quiz completion rates for available grade center data (31.72% of students completed at least eight out of nine quizzes, and 68.28% completed all nine quizzes), quiz participation alone did not provide adequate variability to assess student participation. Thus, an index of student participation was computed based on the participation or lack of participation in all available course activities: HCTAs, short surveys, discussion postings, and quizzes. As the final exam was comprehensive for the course material, it was not included in the activities associated with student participation.

HCTA. Measures of critical thinking were from the HCTA (Halpern, 2010), which was an ecologically validated (internationally and across education levels) scale with a high reliability (Cronbach’s $\alpha = .88$) for critical thinking (Butler, 2012; Butler et al., 2012; de Bie et al., 2015; Halpern, 2010, 2012; Ku & Ho, 2010). The development of the HCTA utilized an operational definition of critical thinking as “the deliberate use of [cognitive] skills and strategies that increase the probability of a desirable outcome” (Halpern, 1998). One of the more important features of the HCTA was the use of both forced-choice and constructed-response items to evaluate the following domains of critical thinking: (a) verbal reasoning, (b) argument analysis, (c) hypothesis testing, (d) likelihood and uncertainty, and (e) problem solving. The use of both types of responses was congruent with independent research on the accurate assessment of critical thinking (Ku, 2009). In addition to total critical thinking scores for constructed-response and forced-choice items (which together produce the total critical thinking composite score), each of the components (verbal reasoning, argument analysis, etc.) also have total, constructed-response, and forced-choice scores (see Table 6 for example HCTA data for a respondent). Data obtained from these assessments were automatically scored for forced-choice items and manually scored for constructed-response items using a rubric and prompts via the Vienna Test System (Halpern, 2010). Regarding the currently obtained data, a high level of reliability was determined for both version A (Cronbach's α = .75) and version B (Cronbach's α = .78).

Between the two versions of the HCTA, primary differences were: (1) alternate wording for scenarios (e.g. an item using a sports-related scenario in one version would use a workplace scenario in the other) and (2) a minimally altered point structure (version A totals 193 points, whereas version B totals 194 points). While students had the opportunity to complete both versions of the HCTA, some students only completed version A or version B (see Table 5 for frequency data of HCTA version completion). Concerning the original HCTA order condition from the original QEP study, the sections between the Fall 2011 and Spring 2012 semesters (version B then version A; n = 370) only had five students complete the end of semester version A assessment, and only two students who completed both versions. For this reason, HCTA scores had been converted to standardized scores and re-coded in the respective order of assessments (time1 vs. time2), which were used to compare CT parameters, independent of the HCTA version condition (see Table 6 for an example of student HCTA data). Considering the time component of the assessments, scores at the beginning of the semester (n = 337) provide a baseline CT measure, and scores at the end of the semester (n = 207) could offer insight into how CT skills have changed because of course participation.

Course performance. Four measurements of student performance were available from each course section: discussion posting points, quiz points, final exam points, and the total points for the course. Specially, discussion postings offered free-response testing with feedback both through the rubric (refer to Appendix B) and from two graders (inter-rater reliability was reportedly greater than 90%). A key difference in discussion postings between the original study and previous research lies in the use of rubrics: while many studies use rubrics to assess discussion postings, they do not provide them to the students before the task (Greenlaw & Deloach, 2003; Meyer, 2004; Ramos & Yudko, 2008; Ting & Rashied, 2015). Both quiz and final exam grades offer closed-response testing of the concepts covered in the course. Quizzes covered specific sections of course material and the final exam was comprehensive for the course. In addition, quizzes, discussion postings, and final exam grades were computed into a total point score in order to provide an overall measure of course performance. Final course grades were determined by substituting the lowest two quiz grades with discussion posting points and additionally dropping the lowest quiz or discussion posting, then assigning the letter grade based on percentage. Refer to Table 4 for frequency data on course performance across semesters and see Table 6 for descriptive statistics on course performance across semesters.

Official student metrics. Several additional measures were obtained from the UT Arlington Institutional Effectiveness and Reporting (IER). These measures included semester GPA (at the time of enrollment), cumulative GPA, grades from a two part sequence of English composition courses (A, B, or C grades only), and college entrance examination scores (ACT composite, ACT English, ACT mathematics, SAT verbal, and SAT mathematics). These measures may also provide insight into relationships between CT skills and course performance. In addition, the data provided from the IER office also served as the authoritative data source for cases due to providing student names, ID numbers and demographic information (gender, major, enrollment status, etc.).

Procedure

Original study. In the original QEP study, each semester (Fall 2010, Spring 2011, Fall 2011, and Spring 2012) had two course sections with each section assigned conditions for HCTA version order and discussion posting policy (refer to Figure 1 for a visual depiction of the original study). Through each course section during the four-semester period, students were provided with an opportunity to take two versions of the HCTA: once at the beginning of the term and the corresponding alternate version at the end of the term. During the course, students had nine 22-point multiple-choice quizzes and a 38-point comprehensive final exam (multiple-choice), which were used to determine course grade. The covered course material was derived from a textbook that: (a) targeted life-span developmental psychology, (b) explicitly included material on critical thinking, and (c) structured the material in order to address the APA goal of critical thinking skills in Psychology (Santrock, 2012). Throughout the course, three discussion posting topics were available for completion (argumentative, reflective, or creative), which required an APA-formatted response using a structured rubric (see Appendix B for the rubric provided to students, and Appendix C for discussion posting texts). Students could only complete two out of any three discussion posting topics, where these postings were graded (reportedly, with a high level of inter-rater reliability, $r > .90$) and individualized feedback was provided to the student. While the discussion-postings were optional for most course sections, they were mandatory for one section respectively during both the Spring 2011 and Fall 2011 semesters (again, refer to Figure 1). Students were also given four ten-item short-surveys, intended to explore student characteristics during the course; completion of the survey was necessary to access the quiz for the respective week. Finally, each course section had an embedded course librarian through Blackboard for expedient student resource access. Portions of these original data were analyzed and presented at the UTA Engaging Students Conference (Mann, Hough, & Natishyn, 2013).

Data sources. Data were composed of raw file exports via Blackboard grade centers, SurveyMonkey (short survey data), official student metrics provided by the UT Arlington Office of Institutional Effectiveness and Reporting (IER), and HCTA data obtained from the Vienna Testing System (VTS). SurveyMonkey files (short survey data) from the second survey of the Spring 2011-003 section, the first survey of the Spring 2011-004 section, and from the entire Fall 2011-003 and Fall 2011-004 semesters were damaged beyond repair, leading to missing data.

Data processing. Acquired data had been consolidated into a single dataset using a semi-automated process providing expedient aggregation of data with minimal human error in data entry and cleaning: a standard practice when working with large heterogeneous datasets (Irvy, 2013; Jaffe, 2014; Zwilling, 2015). First, the original data files were obtained in MS Excel (Version 2010) format, and these files were subjected to modifications that ensured that column order was consistent across groups of data files. These files were then exported into tab-delimited text format in order to be parsed through a custom Perl script that grouped data by semesters using the official course records from IER. This parsing script (see Appendix D), numerically coded raw text data and generated an inventory file with both de-identified case numbers for each student and variables that indicated the presence or absence of specific measures for data verification. Finally, with the generated inventory file as the authoritative list, these data were processed through another Perl script (see Appendix E) that generated a de-identified dataset in CSV format with an accompanying SPSS syntax file that automatically imported data, codes values, accounted for missing data, and coded for SPSS variables, labels, and value labels. These scripts were written using standard Perl (Version 5.22.1), without modules, for use independent of specific operating environment. After the dataset was imported into IBM SPSS (Release 19.0.0.2), analyses were performed (see Appendix F for full syntax file) for assumption testing, specific statistical tests, and testing for moderation, mediation, and moderated-mediation using the Hayes Process macro (Version 2.15) for SPSS (Hayes, 2016).

Chapter Three: Results

Given the precipitous volume of data for analyses, adequate context was necessary to evaluate the sample under study for the hypotheses tested. To assist the reader, analytic strategies and the generated results have been organized into preliminary analyses, the first research aim, and the second research aim.

Preliminary Analyses

Age and gender. As prior research has not reported effects of age or gender on CT skills, these factors were assessed within the current sample (N = 690) to identify any relevant influence on the hypotheses investigated. A series of preliminary analyses examined: (a) age and gender differences by course section, (b) relationships between CT skills and age, (c) relationships between age and course performance, (d) CT differences by gender, and (e) course performance differences by gender.

First, a 2 (*gender*: male, female) X 8 (*course sections*: Fall 2010-003, Fall 2010-004, Spring 2011-003, Spring 2011-004 Fall 2011-003, Fall 2011-004, Spring 2012-003, Spring 2012-004) factorial between-subjects Analysis of Variance (ANOVA) was used to evaluate age across gender and course sections. A main effect of gender was revealed, $F(3,674) = 17.42$, $p < .001$, $\eta^2_p = .03$; and also for course section, $F(7,674) = 2.18$, $p = .035$, $\eta^2_p = .02$; but the interaction was not significant, $F(7,674) = .81$, $p = .577$, $\eta^2_p = .01$. Post hoc testing with a Bonferroni correction indicated that males were older than females, and only sections Fall 2010-003 and Spring 2012-003 indicated a significant age difference. For descriptive statistics on age by gender and course section, see Table 9.

Second, Pearson's correlations were used to evaluate relationships between CT measures and age. Across time 1 CT measures, significant weak positive correlations were identified for total CT, total CT constructed-response, total verbal reasoning, verbal reasoning constructed-response, hypothesis testing force-choice, total problem solving, problem solving force-choice, and problem solving constructed-response. However, at time 2, only a significant weak negative correlation was revealed between age and verbal reasoning forced-choice. Since the subsequent analyses tested by the hypotheses use both time 1 and time 2 CT measures, these correlations were repeated with the restriction of those students who completed both HCTAs. Only significant weak positive relationships were revealed between age and CT measures for: time 1 critical thinking constructed response, likelihood and uncertainty constructed-response at time 1, and time 2 verbal reasoning constructed-response; no other correlations were significant. See Table 10 for a correlation summary table on age and CT measures.

Third, correlations of age on performance measures (quiz, discussion, final exam, and total course points), produced significant weak negative relationships for quiz points, $r(515) = -.14$, $p = .001$; discussion points, $r(246) = -.14$, $p = .025$; and total course points, $r(517) = -.16$, $p < .001$. No significant relationship was revealed between age and final exam points, $r(490) = -.07$, $p = .136$. In addition, when repeated with restriction to those who completed both HCTAs, no significant correlations were revealed between age and course performance measures of: (a) quiz points, $r(515) = .06$, $p = .626$; (b) discussion points, $r(246) = -.03$, $p = .844$; (c) final exam points, $r(490) = .17$, $p = .152$; or (d) total course points, $r(517) = .06$, $p = .591$.

Fourth, using independent samples t tests to compare CT scores by gender, significant differences were revealed favoring males for time 1 measures of: verbal reasoning forced-choice, hypothesis testing forced-choice, likelihood and uncertainty forced-choice, and likelihood and uncertainty constructed-response. However, significant differences identified for time 2 measures, favored females over males in: total argument analysis, argument analysis forced-choice, and argument analysis constructed-response. Repeating these tests within those students who completed both HCTAs, significant differences favored males for time 1 CT measures of: total CT forced-choice, verbal response forced-choice, total hypothesis testing, and hypothesis testing forced-choice. However, within this subset, no significant differences were revealed for any time 2 CT measures. For a summary of CT measures by gender, see Table 11 for time 1 measures and Table 12 for time 2.

Finally, to identify any differences in course performance measures by gender, independent samples t tests were used. No significant gender differences were revealed for any performance measure (quiz, discussion, final exam, or total course points). To verify the lack of differences in performance measures by gender, these independent t tests were performed on the students who completed both HCTAs, and again, no significant differences were revealed. For course performance measures by gender, please see Table 13.

Exploring any age effects by student participation, a Pearson's correlation was examined between age and the student participation index. A significant weak negative correlation was revealed between age and student participation, $r(688) = -.15$, $p < .001$, for the overall sample, but within students who completed both HCTAs, no significant correlation was revealed, $r(84) = -.14$, $p = .203$. For age differences by major and discussion postings, a 3 (*discussion posting*: none, one, two) X 4 (*major*: psychology, nursing, interdisciplinary, traditional) factorial between-subjects ANOVA was assessed on age. A significant main effect of major was revealed by the ANOVA, and post hoc testing with a Bonferroni correction, revealed that Interdisciplinary majors ($M = 27.27$, $SE = .54$) were older than psychology ($M = 24.02$, $SE = .80$), nursing ($M = 21.90$, $SE = .39$), and other traditional majors ($M = 24.33$, $SE = .44$). In addition, traditional majors were older than nursing majors, but no other group differences were revealed. However, as with the correlation between student participation and age, after restricting the factorial ANOVA model to only those who completed both HCTAs, no significant main effects or interactions were revealed. For factorial ANOVA summaries, see Table 14.

Official student metrics. Beyond age and gender, analyses were performed to explore potential influences due to additional factors related to the student experience. As short surveys items and student metrics (GPA, SAT, and ACT) provided exploratory information about the student experience in the course, a series of Pearson’s correlations were performed on aggregated short survey categories (e.g. median response for academic confidence items across all four time points) and student metrics towards relationships with course performance, participation, and CT components. For student participation and short survey items, no significant correlations were identified for either discussion posting activity (no, yes), or student engagement index scores. Between student metrics and course participation, cumulative GPA was positively correlated with discussion posting activity and with the student engagement index. Current semester GPA was also positively correlated with the student participation index, but no other student metrics revealed significant relationships with participation measures. For a summary of student participation correlations, see Table 15.

With course performance measures, however, significant correlations were identified between several short survey items: Academic confidence had weak positive correlations with quiz performance and total course points. Topic importance was positively correlated with quiz points, final exam performance, and total course performance. Topic knowledge was positively correlated with quiz performance, final exam performance, and total course performance. In addition, both learning motivation and final exam scores (positively), and confidence in skills and discussion points (negatively), revealed significant correlations. Regarding student metrics, several significant correlations of differing magnitude were identified. Specifically, semester GPA was strongly positively correlated with quiz points, final exam grades, and total course points, but moderately positively correlated with discussion points. Cumulative GPA was strongly positively correlated with quiz points, and total course points, and moderately positively correlated with discussion points, and final exam points. ACT composite scores were moderately positively correlated with quiz performance, and total course performance, but only weakly positively correlated with final exam performance. However, ACT English scores were moderately positively correlated with quiz pointsand total course points, and the ACT mathematics portion was weakly positively correlated with quiz points, and total course points. Discussion points were moderately positively correlated with SAT verbal, and SAT quantitative scores. See Table 16 for correlation summary table on course performance measures.

Regarding correlations between CT components and short survey items in the sample (n = 172), significant correlations were revealed for academic confidence, technology confidence, topic importance, confidence in skills, CT characteristics, and resource use. For academic confidence, significant positive correlations included total CT, argument analysis, argument analysis constructed-response, and hypothesis testing. Topic importance revealed significant positive correlations with total CT, argument analysis, argument analysis forced-choice, argument analysis constructed-response, problem solving, and problem solving constructed-response. Confidence in skills was correlated with total CT, total CT constructed-response, argument analysis, argument analysis forced-choice, and likelihood and uncertainty constructed-response. In terms of resource use, significant negative correlations were identified for verbal reasoning, verbal reasoning constructed-response, and argument analysis forced-choice. In addition, significant relationships were also revealed for CT characteristics and problem solving (positive), and technology confidence and likelihood and uncertainty constructed-response (negative). See Table 17 for a correlation summary covering CT components and academic confidence, technology confidence, technology attitudes, and topic importance. For topic knowledge, learning motivation, and studying/testing habits and CT measures, see Table 18, and see Table 19 for a correlation summary between CT components and confidence in skills, CT characteristics, and resource use. Relating to student metrics (GPA, ACT scores, and SAT scores) and CT components, across the 126 correlations of specific interest, only 20 correlations were not significant and all other correlations indicated significant positive relationships. The strongest of these significant positive correlations between student characteristics and CT components were ACT measures and SAT verbal scores. For a table of correlations between CT scores and student metrics, see Table 20.

As course grades for English composition courses were also available for some students, (English composition 1, n = 152; English composition 2, n = 193), a series of 3 (English composition 1 grade: A, B, C) X 3 (English composition 2 grade: A, B, C) factorial between-subjects ANOVAs were tested individually for course outcome measures and t2 CT measures. Significant main effects were revealed for the first English composition course on argument analysis and argument analysis forced-choice. Post hoc analyses with a Bonferroni correction indicated that students with a letter grade of “B” in the first English composition course had higher total argument analysis scores (M = .84, SE = .27) than students with a letter grade of “A” (M = -.64, SE = .35), but no differences were identified between comparsons with “C” students (M = .03, SE = .41). For argument analysis forced-choice scores by first English composition course letter grades, “B” students (M = .92, SE = .27) had substantially higher argument analysis forced-choice scores than either “A” students (M = -.46, SE = .36), or “C” students (M = -.37, SE

= .47), with no differences between “A” and “C” students. A significant interaction was revealed for LU between English composition grades, but simple effects analysis with a Bonferroni correction failed to identify any group differences. See Table 21 for factorial ANOVA summary tables on course performance and CT measures by English composition grades. However, due to violations of the assumption of homogeneity of variance, models for total CT, total CT constructed-response, verbal reasoning, argument analysis, argument analysis constructed-response, argument analysis forced-choice, hypothesis testing forced-choice, problem solving, and problem solving constructed-response, each of these models were inspected using variance spread plots. Each plot for these aforementioned models suggested that the interpretations of differences might be too liberal, thus the reported effects should be interpreted with caution.

Finally, assessing participation measures of discussion posting activity (no, yes) and the student participation index scaled from (0) to (17), Pearson’s correlations were used to assess relationships between participation measures and course outcomes in the number of students who completed both HCTAs (n = 86). For engaging in discussion postings, no significant correlations were revealed between discussion posting activity and either final exam points, $r(70) = -.10$, $p = .420$; or total course points, $r(71) = -.21$, $p = .082$. Discussion posting activity was obviously correlated with discussion points, $r(37) = .49$, $p = .001$; but discussion posting activity was also inversely correlated with quiz points, $r(71) = -.25$, $p = .036$. However, when considering the student engagement index, positive significant correlations were identified for quiz points, $r(71) = .24$, $p = .037$; discussion points, $r(37) = .34$, $p = .034$; and for total course points, $r(71) = .24$, $p = .043$; but not final exam points, $r(70) = -.04$, $p = .719$.

Given the results of these preliminary analyses, additional factors were isolated for consideration in the hypothesized analyses. Specifically, age, gender, and student metrics (GPA, SAT, ACT, and English composition grades) revealed considerably greater influence than anticipated. As such, age and gender were selected as primary covariates for the investigated hypotheses, and additionally, GPA and English composition grades were also selected as covariates. However, as ACT and SAT scores were substantially limited in the sample, and the HCTA was developed with these standardized tests in consideration, these factors were not retained for further testing in the hypotheses under investigation.

Aim 1: Identification of critical thinking and online learning performance.

Through hypothesized categorical differences between the primary factors of influence (major and discussion posting behavior) on CT skills and course performance, the role of major predispositions and the efficacy of the discussion posting intervention are assessed through the following two hypotheses.

Hypothesis 1

For the first hypothesis (H_1) that CT skills will differ by discussion postings and major, a 2 (*discussion condition*: optional, mandatory) X 3 (*discussion posting*: none, one, two) X 4 (*major*: psychology, nursing, interdisciplinary, traditional) X 2 (*time: time 1, time 2*) factorial mixed-model ANCOVA was intended to be used on the within-subjects factor of time 1 and time 2 CT scores, and controlling for gender and age. However, due to no cases with both time 1 and time 2 CT scores from the mandatory discussion posting condition, the discussion posting condition was removed from the model, and the available sample was analyzed (N = 86). No significant within-subjects effects were revealed (for mixed-model ANCOVA summary tables by discussion posts and department major, see Table 22). Only one between-subjects effect was revealed: department major for hypothesis testing constructed-response, where nursing majors (M = .32, SE = .16, 95% CI[.002, .64]), had higher scores than traditional majors (M = -.38, SE

= .20, 95% CI [-.78, .02]), but no other differences were identified between groups, including interdisciplinary majors (*M* = -.38, *SE* = .20, 95% CI [-.50, .26]) or psychology majors (*M* = -.38, *SE* = .20, 95% CI [-.14, 1.59]).

To identify if any differences were found by using college major classifications instead of departmental majors of interest, the factorial mixed-model ANCOVA was tested with college major classifications replacing department major. No significant within-subjects effects were identified (for mixed-model ANCOVA summary tables on discussion postings by college major, refer to second half of Table 22). As with department major classification, a significant main effect was identified for hypothesis testing constructed-response by college major, where nursing students (*M* = .36, *SE* = .17, 95% CI [.02, .70]) had higher scores than other majors, (*M* = -.13, *SE* = .20, 95% CI [-.52, .26]), but no differences between science (*M* = .36, *SE* = .35, 95% CI [-.33, 1.06]), or interdisciplinary (*M* = -.13, *SE* = .20, 95% CI [-.52, .26]). For both sets of models (department major and college major), violations of homogeneity tests were identified and spread plots for variance were inspected within the respective models. These plots suggested that if differences had been identified for CT forced-choice, hypothesis testing forced-choice, argument analysis forced-choice, argument analysis constructed-response, total problem solving, problem solving forced-choice and problem solving constructed-response, such tests would have been too liberal, thus the conclusion of no differences is most likely correct. No assumptions were violated for models of hypothesis testing constructed-response.

Hypothesis 2

In the second hypothesis (H_2) that course outcomes differ by discussion postings and by major, a series of 2 (*discussion condition*: optional, mandatory) X 3 (*discussion posting*: none, one, two) X 4 (*major*: psychology, nursing, interdisciplinary, traditional) factorial between-subjects ANCOVAs were conducted separately on quiz points, final exam points, and total course points (each controlling for age and gender). In similar fashion, to evaluate differences in discussion points while controlling for age and gender, a 2 (*discussion condition*: optional, mandatory) X 4 (*major*: psychology, nursing, interdisciplinary, traditional) factorial between-subjects ANCOVA was used. Across these four ANCOVA models, significant differences between discussion conditions were revealed for quiz points and discussion points (refer to Table 23 for ANCOVA summary across performance measures). Post hoc testing with a Bonferroni correction indicated that quiz points were higher in the mandatory condition (M = 162.79, SE = 4.15) than the optional condition (M = 152.60, SE = 2.83); and similarly, discussion points were higher in the mandatory condition (M = 16.69, SE = .98) than optional (M = 12.63, SE = .87). However, it should be noted that the model for discussion points violated the assumption of homogeneity of variance, so despite inspection of the variance plot suggesting too conservative of an estimate, this effect should still be interpreted cautiously. Further investigating differences by major, in lieu of department major, college major was substituted in the models and the same patterns of results were produced (refer to Table 23 again for ANCOVA summaries).

Because GPA and prior English composition grades revealed potential associations with course outcomes, both sets of analyses (department major and college major) were repeated with these factors added as covariates (see Table 24 for ANCOVA model summaries controlling for GPA and English composition grades). For total course points, the interaction between number of discussion posts and department major was significant, where interdisciplinary majors with no discussion postings had higher total points than traditional majors with no discussion postings (see Table 25 for descriptive statistics regarding discussion posting and major interaction on total points). Moreover, for discussion points a significant discussion posting condition by department major interaction was revealed, where (via Bonferroni corrected post hoc testing) traditional students had higher discussion points in the mandatory condition (*M* = 20.16, *SE* = 2.94), compared to traditional students in the optional condition (*M* = 7.36, *SE* = 4.40). No other differences were observed between the other major classifications: optional psychology (*M* = 18.66, *SE* = 5.82), mandatory psychology (*M* = 10.21, *SE* = 5.25), optional nursing (*M* = 16.17, *SE* = 2.05), mandatory nursing (*M* = 14.86, *SE* = 2.27), and optional interdisciplinary (*M* = 8.67, *SE* = 3.32). However, caution should also be applied to this result as no interdisciplinary students were in the mandatory condition. In addition, using college major within course performance models controlling for age, gender, English composition grades, and GPA, a significant main effect of discussion posting was revealed on total course points. Specifically, after controlling for the additional covariates, students in the optional condition (*M* = 208.17, *SE* = 4.73) had greater course points than students in the mandatory condition (*M* = 190.44, *SE* = 6.68). Finally, to evaluate any association between the discussion conditions and the number of completed discussion postings, a chi-square test of independence was conducted. A significant association was identified, $\chi^2(2, N = 690) = 76.38$, $p < .001$, V = .33. Using standardized residuals, categorical frequency differences appeared to be driven by fewer students than expected completing both discussion postings in the optional condition ($z = -3.81$), whereas more students than expected completed both in the mandatory condition ($z = 6.67$), and fewer students than expected completed no discussion postings in the mandatory condition ($z = -3.59$).

Aim 2: Examine relationships between CT skills and course performance measures.

The secondary aim of the current research was to examine how CT skills and course performance were related. Specifically, relationships were evaluated between CT skills across assessments (time1 and time2), and towards course outcomes. The following three hypotheses allowed for the generation of an inclusive model of CT skills on course performance through confirming relationships between CT scores by time, CT scores and performance, and the mediation of course performance through changes in CT skills during the course.

Hypothesis 3

The third hypothesis (H_3) attempted to identify if CT scores were positively correlated between assessments at time1 and time2 (15 weeks apart), which utilized a series of Pearson's correlations (see Table 26 for a correlation summary of CT measures across times). Strong positive correlations were identified for total CT, CT forced-choice, CT constructed-response, and total likelihood and uncertainty. Moderate positive correlations were revealed between measures for total verbal reasoning, verbal reasoning forced-choice, verbal reasoning constructed-response, argument analysis forced-choice, total hypothesis testing, hypothesis testing forced-choice, hypothesis testing constructed-response, likelihood and uncertainty forced-choice, likelihood and uncertainty constructed-response, total problem solving, and problem solving forced-choice. Lastly, a weak positive correlation was revealed for argument analysis constructed-response, and no correlation was found for problem solving constructed-response.

Given these relationships between CT measures, a series of secondary analyses were conducted in order to identify effects on CT scores through: (a) student participation (discussion posting activity and the student participation index), (b) moderating influences by discussion posting or major, and (c) differences in the respective CT scores when accounting for time 1 measures. Specifically, the secondary analyses respectively utilized: (a) Hotelling's t-tests for correlation coefficients between student participation and CT scores, (b) moderated regression analyses (see Figure 5), and (c) a 3 (*discussion posting*: none, one, two) X 4 (*major*: psychology, nursing, interdisciplinary, traditional) factorial between-subjects ANCOVA on the difference scores between respective standardized CT scores. These specific analyses expand on how relationships between CT measures at time 1 and time 2 are affected by factors identified through the first research aim, while investigating an exploratory measure (student participation), and also providing context for moderated effects, which offers a basis for inclusion in a final moderated-meditation model as expanded in Hypothesis 5 (H_5).

Student participation. First, as significant correlations were revealed between time1 and time 2 CT measures, Pearson's correlation analyses were performed on CT measures between both discussion posting behavior (none or at least one) and the computed student engagement index. Tests of magnitude differences across the correlation coefficients by time points (between CT component and the respective participation measure) were performed using a Hotelling's t-test, which controlled for the correlation between CT components. All correlations and coefficient testing were restricted to students who completed both time 1 and time 2 of the HCTA (n = 86). Correlations between student engagement and CT measures only revealed significant negative correlations for likelihood and uncertainty, and likelihood and uncertainty constructed-response for time 1 measures, and the differences between these coefficients across time points were significant (see Table 27 for student engagement and CT correlations and coefficient tests). Using simple linear regression to predict student engagement on likelihood and uncertainty, a significant model was revealed, $F(1,84) = 4.36$, $p = .040$, $R^2 = .05$. Student engagement was a significant predictor, $b = -.07$, $SE = .03$, $t(84) = -2.09$, $p = .040$; which suggests higher levels of student engagement were associated with lower time 1 likelihood and uncertainty scores in students who completed both HCTAs. Using student engagement and time 1 likelihood and uncertainty scores to predict time 2 likelihood and uncertainty scores, a significant model was also produced, $F(2,83) = 19.97$, $p < .001$, $R^2 = .33$. For time 2 likelihood and uncertainty scores, student engagement, $b = .07$, $SE = .03$, $t(83) = 2.57$, $p = .012$; and time 1 likelihood and uncertainty, $b = .56$, $SE = .09$, $t(83) = 6.20$, $p < .001$; were significant predictors. These results suggests that increases in student engagement and increasing time 1 likelihood and uncertainty predict greater likelihood and uncertainty time 2 scores. Similarly, with likelihood and uncertainty constructed-response, a significant model was also revealed for time 1 by student engagement, $F(1,84) = 6.13$, $p = .015$, $R^2 = .07$; where student engagement was a significant predictor of time 1 likelihood and uncertainty constructed-response scores, $b = -.08$, $SE = .03$, $t(84) = -2.48$, $p = .016$. This also suggests that higher levels of student engagement were associated with lower time 1 likelihood and uncertainty constructed-response scores in students completing both HCTAs. For time 2 likelihood and uncertainty constructed-response scores predicted by time 1 measures and student engagement, a significant model was also produced, $F(2,83) = 12.28$, $p < .001$, $R^2 = .23$. Student engagement, $b = .07$, $SE = .03$, $t(83) = 2.45$, $p = .017$; and time 1 likelihood and uncertainty constructed-response scores, $b = .47$, $SE = .10$, $t(83) = 4.80$, $p < .001$; were significant predictors of the time 2 measure. This also suggests that increasing student engagement and time 1 likelihood and uncertainty constructed-response scores predicted increases in time 2 scores.

For discussion posting as a participation activity, significant negative correlations were revealed between discussion postings and several time 1 CT measures (total CT, total CT constructed-response, verbal reasoning, verbal reasoning constructed-response, hypothesis testing, hypothesis testing constructed-response, likelihood and uncertainty, and likelihood and uncertainty constructed-response), but none were revealed for time 2 CT measures. Hotelling's t-test between time 1 and time 2 for these correlations indicated significant differences in the magnitude of correlations for total CT, verbal reasoning, and verbal reasoning constructed-response (see Table 28 for correlations and coefficient tests between discussion posting and CT measures). Follow-up with simple linear regression, revealed significant models for: (a) total CT, $F(1,84) = 4.43$, $p = .038$, $R^2 = .05$; (b) verbal reasoning, $F(1,84) = 9.70$, $p = .003$, $R^2 = .10$; and (c) verbal reasoning constructed-response, $F(1,84) = 12.87$, $p = .001$, $R^2 = .13$. Discussion posting was a significant predictor in each of these models, respectively: (a) total CT, $b = -.39$, $SE = .19$, $t(84) = -2.10$, $p = .038$; (b) verbal reasoning, $b = -.62$, $SE = .20$, $t(84) = -3.11$, $p = .003$; and (c) verbal reasoning constructed-response, $b = -.71$, $SE = .20$, $t(84) = -3.59$, $p = .001$. All of which suggest that increases in these time 1 CT measures were predicted by nonparticipation in discussion posting activities. While significant models were generated for these time 2 CT measures predicted by discussion posting and the respective time 1 measures, discussion posting was not a significant predictor in any of the models for time 2 measures.

Moderated effects. Moderated regression analyses used time 1 CT measures to predict time 2 measures with number of discussion postings and major classification as potential moderators. Two sets of moderated regression analyses were performed: those using college major classification and those using departmental classifications (see Table 29 for moderated regression models by outcome measures). However, only one model produced a moderated effect: argument analysis, $F(7,72) = 4.00$, $p = .001$, $R^2 = .28$. Specifically, department major moderated the relationship between time points for argument analysis scores, which appears to be due to differences between psychology majors and interdisciplinary majors (see Figure 6 for scatterplot, and Appendix G for direct effects of predictors prior to inclusion of moderation interactions). In addition, due to the categorical differences by gender and the correlations with age, a second set of moderation models were tested with age and gender entered as covariates.

No significant moderated effects were found after controlling for age or gender (see Table 30, for moderation summary with age and gender added).

CT differences. For the final secondary analyses related to the third hypothesis, factorial ANCOVA models on CT difference scores while controlling for age and gender failed to reveal any significant effects (see Table 31 for factorial ANCOVA summaries on difference scores). A different approach to investigating categorical differences between changes in CT measures, used a series of 3 (*discussion posting*: none, one, two) X 4 (*major*: psychology, nursing, traditional, interdisciplinary) factorial between-subjects Analysis of Covariance (ANCOVA) on time 2 CT scores, controlling for age, gender, and time1 CT scores (both CT measures using standardized scores). For the majority of models produced, the covariate of the respective time 1 CT measure (e.g. time 1 verbal reasoning on time 2 verbal reasoning), was significant (see Table 32, for an ANCOVA summary table); the only exceptions were models with argument analysis constructed-response and problem solving constructed-response. In addition, only one significant main effect was revealed for hypothesis testing constructed-response; no other main effects or interactions were significant. After controlling for time 1 hypothesis testing constructed-response scores on time 2 hypothesis testing constructed-response, post hoc testing using a Bonferroni correction revealed that nursing majors (M = .43, SE = .18) had higher scores than traditional majors (M = -.40, SE = .23), and no other differences were revealed between psychology (M = -.19, SE = .49) or interdisciplinary majors (M = -.04, SE = .21). Several models violated assumptions of homogeneity of variance: total CT forced-choice, argument analysis, hypothesis testing forced-choice, problem solving, and problem solving forced-choice. Inspections of the respective spread plots suggested that even if these models had revealed any significant effects, any differences would have been too liberal in interpretation.

Hypothesis 4

Regarding the fourth hypothesis (H_4) that CT scores (both time1 and time2) would be positively correlated with course outcome measures (quiz points, discussion points, final exam points, and total course points), a series of Pearson's correlations were used. For time 1 CT measures (*n* = 125), significant weak positive correlations were identified between time 1 CT measures and course performance measures (for a correlation summary for time 1 CT measures, see Table 33). Regarding students with time 2 CT measures on course performance measures (*n* = 419), significant moderate and weak positive correlations were revealed (see Table 34 for time 2 CT measures correlation summary). The majority of CT components were significantly correlated with quiz points, final exam scores, and total course points. As the frequency and magnitude of correlations appeared to differ between time 1 and time 2 CT assessments, these correlations were tested again after restricting the sample to students with both time 1 and time 2 CT assessments (*n* = 86), in addition to the respective course performance measure. After performing these secondary correlations in the respective subsamples, significance testing on the difference in magnitude of correlational coefficients was performed using a Hotelling's t-test. While significant moderate to strong relationships were identified for quiz points (*n* = 73) on several time 1 CT measures and the majority of time 2 CT measures, no significant differences were identified in the change of correlations, except for the relationships between time 1 and time 2 likelihood and uncertainty forced-choice scores. This finding indicates an increase in magnitude between the time 1 and time 2 relationships with quiz points (see Table 35 for subsample correlations and coefficient testing). Discussion posting points (*n* = 37), however, did not reveal any significant correlations and likewise, no significant differences in the magnitude of correlations were revealed (see Table 36 for a summary of correlations and coefficient testing for discussion points). While significant positive correlations were identified between time 1 and time 2 CT measures with final exam scores (*n* = 72), no significant differences were identified between the magnitudes of the respective relationships (summary of correlations and coefficient testing in Table 37). Lastly, correlations between time1 and time 2 CT measures with total course points (*n* = 73) revealed significant positive relationships, but only the relationships between likelihood and uncertainty forced-choice and total points revealed a significant increase from time1 to time 2 (for a summary of coefficient testing and correlations regarding total points, see Table 38).

Additionally, to evaluate any moderated effects by discussion posting or classification of major on the relationships between CT measures and course outcomes, a series of moderated regression models were performed. Given the volume of predictors and outcomes, the models were tested for moderating effects using the Hayes Process Model 3 (see Figure 7), which accounts for the individual contribution of the respective moderators, the respective influence on the outcome measure, and the inclusion of both factors as a predictor on the outcome measure. As categorical differences have been identified within the different classifications of major, one set of moderated regression models were performed with department major categories, and a second set used college-level classifications of major. Both sets of moderated regression analyses included age and gender as covariates in the respective models (see Appendix H for a summary of moderated regression models regarding CT measures on course performance measures while controlling for age and gender). In the college major models, moderated effects were identified for 18 of the 72 models tested and the models using department major suggested 29 out of 72 models indicating moderation (see Table 39 for a brief summary of moderated effects). The moderated effects revealed within these sets of models suggest that higher CT component scores and increased course performance were influenced by the number of completed discussion postings and specific disciplinary lines for specific CT constructs.

Higher CT component scores paired with discussion posting activity predicted increased quiz, final exam, and total course performance across several CT measures. Increased quiz performance by higher CT component scores with no discussion postings were observed for total CT, total CT forced-choice, verbal reasoning forced-choice, argument analysis, argument analysis foced-choice, hypothesis testing, hypothesis testing forced-choice, hypothesis testing constructed-response, problem solving, and problem solving-forced choice. Final exam performance increased with increasing CT component scores and no discussion postings for total CT, total CT forced-choice, verbal reasoning forced-choice, argument analysis, argument analysis forced-choice, and problem solving-forced choice. Total course performance was also augmented by no discussion postings and increasing CT component scores for total CT, total CT forced-choice, verbal reasoning forced-choice, argument analysis, argument analysis foced-choice, hypothesis testing, hypothesis testing constructed-response, likelihood and uncertainty forced-choice, problem solving, and problem solving-forced choice. In addition, completion of a single discussion posting also showed moderated effects of higher CT component scores on course performance, namely for: (a) quiz performance by total CT, total CT forced-choice, verbal reasoning forced-choice, argument analysis, and argument analysis foced-choice; (b) final exam performance by argument analysis foced-choice, (c) discussion posting performance by hypothesis testing forced-choice, and (d) total course performance by total CT, total CT forced-choice, verbal reasoning forced-choice, argument analysis, argument analysis forced-choice, hypothesis testing, and likelihood and uncertainty forced-choice.

For categories of major, the effect of major on increasing CT components predicting increased course performance was predominantly observed in psychology majors. Specifically, psychology majors exhibited greater course performance through increasing CT components for: (a) quiz points by verbal reasoning forced-choice and hypothesis testing constructed-response, (b) final exam scores by total CT forced-choice, argument analysis, argument analysis forced-choice, and problem solving; and (c) total course points by verbal reasoning forced-choice, hypothesis testing, and hypothesis testing constructed-response. Similarly, nursing students indicated increased performance by increasing CT component scores for quiz points by problem solving and problem solving forced-choice, and for total course performance by total CT, verbal reasoning forced-choice, problem solving, and problem solving forced-choice. For all other traditional majors (excluding psychology, nursing, and interdisciplinary majors), increased quiz performance by higher CT scores were observed for argument analysis constructed-response, hypothesis testing, and hypothesis testing constructed-response, and increased overall course performance (total points) were influenced by higher levels of total CT, argument analysis constructed-response, hypothesis testing, and hypothesis testing constructed-response. Regarding moderated effects as related to interdisciplinary majors, no advantages in course performance were identified for interdisciplinary students, but instead, the moderated effects identified within the models tested suggest that all other majors performed better than interdisciplinary majors as a function of increasing CT components. This phenomenon was observed for quiz performance by total CT, total CT forced-choice, argument analysis, argument analysis forced-choice, hypothesis testing, and problem solving forced-choice, and also for total course performance by total CT forced-choice, argument analysis, and argument analysis forced-choice. Lastly, relating to classification with science majors (psychology majors and any other science major from the traditional majors group), moderated effects were identified for: (a) quiz points by hypothesis testing, hypothesis testing forced-choice, and problem solving forced-choice; (b) final exam points by argument analysis and argument analysis forced-choice, and (c) total course points by hypothesis testing constructed-response and problem solving constructed-response. Interestingly, the majority of moderated effects indicating increased CT measures predicting increased performance were also revealed within the designation for psychology majors, with the exception of hypothesis testing on quiz performance.

As relationships between student metrics and course performance measures were also identified, the same moderated regression models were then produced with GPA and English composition grades included as covariates in the models (see Appendix I for a table of moderated regression summaries regarding CT measures on course performance, controlling for age, gender, English composition grades, and GPA). Specifically, models suggesting moderation were: (a) total CT, total CT forced-choice, total CT constructed-response, hypothesis testing, hypothesis testing forced-choice, likelihood and uncertainty, and likelihood and uncertainty constructed-response on total course points; (b) argument analysis constructed-response on quiz points, (c) hypothesis testing forced-choice on discussion points, and (d) likelihood and uncertainty constructed-response on final exam points (the only significant college major classification model). The number of models that suggested moderation were substantially reduced after controlling for English composition grades and GPA: only 9 out of 72 department major models and only one college major model. Moderated effects of discussion posting revealed that completion of at least one discussion posting and increasing CT component scores predicted greater course performance for quiz points by argument analysis constructed-response, and for total course points by total CT and total CT constructed-response. In addition, final exam performance was enhanced by completion of no discussion postings by increasing likelihood and uncertainty constructed-response scores. Regarding major, moderated effects were driven by nursing majors with increasing CT components scores on total course performance by total CT forced-choice, hypothesis testing, hypothesis testing forced-choice, likelihood and uncertainty, and likelihood and uncertainty constructed response. In addition, it was also revealed that for nursing students, increasing argument analysis constructed-response scores predicted greater quiz performance. However, given the severely limited number of observations for quiz points (n = 28), final exam points (n = 23), and total course points (n = 28), in the inclusive models, these effects should interpreted with caution. For the direct effects of predictors in significant moderated models, see Appendix G.

Hypothesis 5

For the final hypothesis (H_5) that the significant relationships identified between CT scores and performance were mediated through time2 CT scores, mediation analyses were conducted using the Hayes PROCESS macro, with final exam performance individually assessed within separate mediation models (see Figure 8). The following five effects were used to evaluate mediation: (1) the predictor to the outcome measure (C-path or total effect), (2) the predictor to the mediator (A-path), (3) the mediator to the outcome measure (B-path), (4) the predictor to the outcome measure through the mediator (indirect path), and (5) the predictor to the outcome controlling for the mediator (C'-path or direct path). To determine mediation, the following criteria needed to be met: the A-path, B-path, and C-path produced significant models with the respective predictor or mediator significantly predicting the respective mediator or outcome measure, and the indirect path accounted for a significant portion of variance. Finally, if the direct path (C'-path) retained significance, then it was inferred as partial mediation, but if the C'-path was no longer significant, full mediation was inferred.

The results of this statistical approach failed to identify any significant mediation models between time 1 CT measures and final exam performance through time 2 CT measures (see Table 40, for a summary of the mediation models tested with model summaries and coefficients). When changing the models to account for age and gender effects in the model (see Figure 9 for schematic diagram), again, no significant mediation models were identified (see Table 41 for mediation summary tables accounting for age and gender). Additionally, as no mediated effects were identified, moderated-mediation models were not included.

Chapter Four: Discussion

The presented research may contribute to the understanding of how critical thinking (CT) skills are involved within the online learning process, and the results of the hypotheses tested may have the potential to affect future research and the application of CT concepts. Given the concerns about CT deficits, the current research may provide insight into how CT skills are targeted through online learning environments and how to target the development of CT skills through course performance. However, the correlational approach for this project necessitates context for the appropriate interpretation and application to future research.

Implications

Regarding age and gender differences inherent to the sample studied, males were typically older than females, and the mean age differed between only two out of eight sections (all other group comparisons were not different). Initially, age had influences on course outcomes and CT measures in the sample, such that increases in age were weakly correlated with several CT measures and age had weak negative correlations with course outcomes, but after restricting correlational analyses to students who completed both HCTAs, age was no longer associated with course performance and only associated with total CT constructed-response, likelihood and uncertainty constructed-response, and verbal reasoning constructed-response. These findings are incongruent with prior research which have reported no demographic influences on CT skills by age and gender (Butler et al., 2012; Kuh, 2009). As age and CT skills were mostly associated with time 1 measures and weak at best, this might suggest older nontraditional students might have a slight advantage in baseline CT skills from prior coursework or life experience. However, as observed, student engagement was revealed to be negatively correlated with age, and the students with greatest performance on course items and CT skills were nursing students, who represented the youngest group of cohorts.

Beyond the scope of the hypothesized effects, analyses identified relationships between course performance, CT components, short survey characteristics and other metrics (GPA, ACT, and SAT scores). Participation in the course (discussion posting and overall student participation) was weakly correlated with GPA measures, but no other relationships were identified. Weak correlations were also revealed between course performance and some short survey constructs, but most notably topic importance and topic knowledge. GPA had substantially stronger associations with performance; standardized testing was moderately associated with course performance (ACT with quiz, final, and total points, and SAT with discussion posting). Also, an array of correlations were revealed between CT component scores and both ACT and SAT measures. Although small effects , these relationships between topic importance and course performance and CT measures are consistent with prior research showing higher task value as motivation for performance (Artino & Jones, 2012; Artino, 2009, 2010; Marchand & Gutierrez, 2012; Pekrun et al., 2011). In addition, correlations between standardized college entrance examinations are consistent with the design of the HCTA (Halpern, 2010).

Relating to the investigated hypotheses, studies have demonstrated practice effects on course outcomes and CT performance (Halpern, 1998, 2001; Halpern et al., 2012; Williams, Oliver, Allin, Winn, & Booher, 2003), but the results from the first two hypotheses are inconsistent with prior research. The first hypothesis that CT skills should differ by educational discipline and student participation in discussion postings, was partially supported by differences between majors, but no support was identified for discussion postings being a factor. As prior research has demonstrated differences in CT skills by educational discipline (Giancarlo &

Facione, 2001; Wang, 2013), these effects were driven by nursing majors, suggesting that nursing majors had an advantage in CT skills. A possible explanation for this effect could be that nursing students might have a greater investment in the course in order to pursue BSN credentialing. Another possible explanation was that nursing students could already have some critical thinking exposure as some students may represent RN to BSN students and nursing education has consistently tried to reinforce principles of CT skills (Andreou et al., 2014; Borglin, 2012; Colucciello, 1999; Dwyer et al., 2014; Eales-Reynolds et al., 2012; Fisher & King, 2010; Hunter et al., 2014; Kantar, 2014; Kong et al., 2014; Ku & Ho, 2010; Ku, 2009; Means et al., 2009; Pekrun et al., 2011; Sullivan, 2012). However, given that nursing students were the youngest and had the least transfer credits, this explanation seems unlikely, yet as nursing programs emphasize critical thinking, this could represent expectancy effects from nursing students. The lack of other pronounced differences between majors might also be due to the classification of student majors (science majors classified with non-science majors within departmental major categories). The anticipation of discussion postings as a practice effect on CT skills, had no noticeable effect on CT scores, which is incongruent with prior research (Halpern et al., 2012; Lehman et al., 2012). Furthermore, overall CT scores between the beginning and end of the semester did not significantly differ. A practical explanation for such phenomena could be that this might represent a history effect: end of semester assessments may not accurately reflect the student's CT performance, amidst other end of semester activities affecting their performance.

For the second hypothesis that course performance should differ between participation in discussion postings and by major, the results partially supported this hypothesis. Students in the mandatory discussion posting conditions had greater quiz and discussion points, suggesting that the expectation of performance in discussion posting activity led to increased performance in these measures, likely representing a practice effect, when considering the frequency differences identified in categories of discussion posting completion by discussion posting conditions. Logically, completion of both discussion postings would lead to greater course performance, but this effect of discussion posting condition influencing quiz points suggests results consistent with previous literature on practice effects (R. A. Bjork, 1994; Jonsson & Svingby, 2007; Núñez-Peña et al., 2015; Panadero et al., 2012; Roediger & Karpicke, 2006a, 2006b). In addition, as overall student engagement was correlated with student performance, these results are congruent with prior research implying effects of effortful student engagement on student performance through practice effects (McGivern & Coxon, 2015; Schmidt et al., 2015; Wang, 2013). While effects of major were not observed until controlling for student metrics (GPA etc.), the effects of major classification were neither driven by psychology or nursing students (contrary to hypothesized directions). Instead, increased course performance (via total course points) was observed in interdisciplinary students compared to traditional majors, when neither students completed discussion postings. Furthermore, the effect of discussion posting condition on discussion points was most pronounced in traditional majors between optional and mandatory conditions. In speculation, this could suggest that the students most likely to complete discussion postings are students from disciplines within traditional majors that are more likely to represent a more stringently defined academic career path requiring greater compliance. For example, an undergraduate student pursuing a bachelor’s degree in chemistry or in education might be more compliant as a nature of their program in order to become a chemist or educator, or even to improve chances to proceed towards graduate education. Conversely, this might also suggest that other more flexible or interdisciplinary-styled majors (including psychology), have motivations beyond success in the course due to the specific tailoring of their courses for their degrees. In other words, perhaps these interdisciplinary-minded students are less concerned with success in a course, but rather prefer an understanding of the concepts from the course or perhaps they see their performance in the course as not particularly relevant to their academic career goals. It also bears repeating that the University of Texas at Arlington has two groups of interdisciplinary majors: University studies and Interdisciplinary studies. The key difference between these programs is that interdisciplinary majors are required to identify and focus on a particular group of disciplines that lead to specialized degree, and university studies provides a more general overlap across educational disciplines (typically using the amassed credits from their academic career). This subtle difference may account for differences in student engagement and potentially affect CT and course performance profiles.

Regarding the third hypothesis that CT scores would be positively correlated between time 1 and time 2 assessments, the hypothesis was mostly supported. All CT measures supported this hypothesis with the exception of problem solving constructed-response. This also suggests reliability between the time points for all CT components except for the element of problem solving constructed-response. While most studies with the HCTA show these measures to be reliable and correlated (Halpern, 1998, 2001; Halpern et al., 2012; Williams et al., 2003), the paradigm presented with the online developmental psychology class might affect this particular construct. As developmental psychology is an upper division course at this institution, students might have already acquired or reinforced certain CT skills from previous courses, or the format of this course does not necessarily tap into this CT component. Regarding the significant change in the magnitude between correlations of student engagement and CT measures, it might suggest that a portion of students completing both HCTAs reflected an increase in engagement with lower initial CT component scores, and that these CT componenets improved by the end of the semester with increased student engagement. This could suggest that students with initial deficits were more inclined to participate in class and thereby improved these CT traits by the end of the semester. For moderated influences between CT measures, only one effect was identified: between argument analysis scores appearing to be most pronounced for psychology majors when compared to interdisciplinary majors. The only other effect of major was revealed between hypothesis testing constructed-response measures where after controlling for time 1 scores, nursing students revealed an advantage in this component CT score at time2 compared to traditional majors. Between the primary and secondary analyses, the results provide evidence of: (a) reliability between CT versions within the sample under study, (b) associations between participation and CT skills, and (c) changes in CT skills across the semester for individuals completing both assessments through the course.

The majority of the results obtained supported the fourth hypothesis that CT measures were positively correlated with course outcomes. Overall, CT measures were consistently associated with quiz, final exam, and total course performance, and discussion posting performance. However, when restricting analyses to only those students who completed both HCTAs, no significant correlations were revealed between discussion posting points and any CT skills. Furthermore, the strength of association between likelihood and uncertainty forced-choice scores and quiz points and likelihood and uncertainty forced-choice scores and total course points was greater at the second assessment than at the first assessment. Moreover, a plethora of moderated effects were revealed between CT measures and specific course outcomes, typically for quiz and total course performance by discussion postings and major, which provided the basis for subsequent inclusive model testing. While drastically reduced in number after controlling for student metrics like GPA and performance in English composition courses, significant moderated effects were still revealed. As a whole, the investigation of moderated effects provides a new set of questions about predispositions to CT interventions through coursework. Specifically, as discussion postings were not effective in augmenting CT skills in the general sense, but moderated effects were typically driven by psychology and nursing students; in speculation, students might benefit most from CT interventions within courses relevant to their disciplinary interests. It is also possible that in order to reap benefits for constructed-response CT skills and learning outcomes, students may need a greater number of opportunities to enhance these skills. Furthermore, perhaps making half of the course grade contingent on such constructed-response activities could bolster a greater level of compliance and effortful learning paired with the CT skills reinforcement. Nevertheless, the relationships and effects identified in the primary and secondary analyses of the fourth hypothesis may imply that student performance and CT skills are differentially affected by specific CT components tapped into in the course, which leads to testing an inclusive model across CT measures influencing course performance.

Regarding the fifth hypothesis that CT skills at the beginning of the semester predict course outcomes at the end of the semester, through end of semester CT scores, the results failed to support the hypothesis. When changing the models to account for effects of age and gender, the results still failed to support the hypothesis. While prior research has shown additive effects of CT skills on course performance(Halpern et al., 2012; Richland et al., 1988), compliance of the sample respondents or the nature of the 15 week course might have impacted the ability to identify effects that supported the hypothesized relationships. Yet, prior research has shown that the HCTA can detect subtle changes in CT dispositions across studies with matched- participants designs (age, gender, etc.) that only differ in CT performance (Butler, 2012; Butler et al., 2012; de Bie et al., 2015; Halpern, 1998; Halpern et al., 2012; Marin & Halpern, 2011).

Overall, support for the investigated hypotheses was mixed, as general effects supported the hypotheses presented, but the directional effects or specific group differences were not as foreseen. It is possible that the advantages that nursing students had in CT skills and course performance were consistent with the Pygmalion effect in that nursing students were motivated to be prime candidates for the competitive BSN program at UT Arlington, and this course was a pre-requisite for that program. Yet, nursing students within the course studied may not accurately reflect online learners as many taking this course did not necessarily choose to be online learners. Nevertheless, differences in CT scores and noncompliance in course participation might be reflective of the convenience of taking an online course. However, it is also possible that noncompliance in course activities could represent student competencies in CT skills and a self-regulation of their efforts geared towards only completing requirements to achieve a desired grade. For example, many of the moderated-effects identified with discussion posting participation were negatively related to outcome measures (i.e. no discussion postings predicted greater CT and course performance). A potential explanation for these effects could be that students proficient in CT skills were more deliberate in planning their activities and only providing the necessary effort to complete the course as efficiently as possible. Such a phenomenon is congruent with findings showing that discussion posting compliance does not necessarily predict performance (Autrey, 2009; Greenlaw & Deloach, 2003; Means et al., 2009; Meyer, 2004; Ramos & Yudko, 2008; Ting & Rashied, 2015). In addition, other recent research with similar data for UT Arlington online developmental psychology has shown that students participating in optional constructed-response activities had overall lower course performance measures (GPA) compared to students who did not participate in the same activities (Watkins, 2016). This research by Watkins (2016) emphasized a critical speculation: that optional self-reflective constructed-response activities might be influenced in unintended ways by the context of the learning environment, such as the type of activity or the level of online learning (online, “hybrid”, or traditional classroom). Another factor to consider is that the students within the current study might represent an exhaustion effect where these students were less attentive in their performance and CT skills evaluations by the end of the semester. Regardless, the key differences identified in the current research does provide insight into how specific CT components might be modulated through the progression of an online course, and the relationships and differences may suggest a different role for CT and classroom performance.

Future Directions

In general, as CT skills predicted subtle differences in greater course performance, then this could provide evidence to assist in the creation of a framework for future interventions on learning (especially online) through an integrated model for CT skills and course performance. However, future work should investigate the relationships between specific learning environments (traditional, online, and “hybrid”) and CT skills, but most importantly, future research will need to replicate the findings from the current research with additional control groups. Specifically, future work should extend the current research by comparing learning environments with and without the use of discussion postings, with a traditional environment lacking discussion postings as the control condition (see Figure 10 for schematic of future work). Additional factors for consideration that could benefit future research might include constructs that overlap with CT components such as numeracy, especially in STEM-related courses (Coben, 2003; Cokely & Kelley, 2009; Reyna, Nelson, Han, & Dieckmann, 2009). Moreover, as active learning reinforces classroom learning through active student participation, attendance may also provide considerable insight into CT interventions within courses across the online learning spectrum (Schmidt et al., 2015). Furthermore, use of big data approaches should also be considered for insight into the profile of online learners and the general online learning environment through complex metrics only accessible with advanced technological approaches (Civitas Learning, 2016). Such big data approaches allow for the identification of patterns of behavior (e.g. clicks within online learning platforms across time points), which may go unnoticed with traditional research methods and could even provide estimates of semester to semester retention. Beyond considering these additional factors, future CT interventions should also identify how to tap into a specific CT component (e.g. verbal reasoning), then investigate if augmentation occurs at the detriment of others CT skills over time. Since the results from the current research suggest efficacy in enhancing specific CT skills (e.g. argument analysis, likelihood and uncertainty, and hypothesis testing), then future work should also identify potential longitudinal changes beyond a single course. In addition, as upper-division courses later in academic careers tend to become more homogenous regarding academic major, comparisons should also be made to consider heterogenous and homogenous populations differ. Finally, research should also evaluate course CT interventions in graduated students obtaining employment to advance the pragmatic goal of effective CT skills in the workplace.

Advancing towards the goal of addressing societal CT deficits, both assessments and interventions for learning and CT skills should be applied to educational and industrial contexts. Such assessments from both sectors could provide invaluable insight into how CT components relate to specific job competencies and, ultimately, lead to a formal structure for the development and training of competent workers. Incorporating such an approach would be relevant when considering the current employee selection process in the modern era: In response to a purported "skills gap" (Cappelli, 2014), industries have shifted towards outsourced and automated recruiting processes that utilize applicant tracking software (Weber, 2012). Despite evidence contradicting this "skills gap" (Cappelli, 2014), recruitment of candidates focuses on explicit prior experience and specific metrics for e-recruiting systems which, at best, only offer superficial assessments of aptitude and abilities for individual applicants. Vocational education programs, which provide explicit experience and certifications that meet these metrics, might influence the selection of qualified applicants, as evidenced reports from the U.S. Department of Education. These reports suggest that despite the decline in career and technical education course credits in high school students (United States Department of Education, 2013), postsecondary occupational training programs foster a high percentage of full time employment (United States Department of Education, 2012). While vocational education does provide valuable training and explicit experience for specific industry jobs, research suggests that vocational education relies on rote memorization, which does not routinely provide for optimal learning performance or the reinforcement of CT skills (Conklin, 2005; Delmotte & Sels, 2008; Raiborn, Butler, & Massoud, 2009; Schaap et al., 2012). When considering a system in place which preferentially selects individuals with minimal (if any) assessments on aptitude or abilities, extensions from future research could lead towards the development of improved methods to screen qualified applicants or even target applicants for CT interventions.

According to a USA Today article covering technology, learning, and employment, Stan Litow, President of the IBM International Foundation, offered the following statement, "Entry-level workers lack critical thinking skills, writing and presentation skills, the ability to work as a team and -- sometimes - the ability to show up…." (Webster, 2015). These concerns about the development and transfer of CT skills from education to the workplace have been a major factor in CT research (Halpern, 1998), but given the industry trends, renewed efforts to integrate, reinforce, and transfer CT skills from academic environments to industry, should be a primary concern in the academic sector. Given the shift towards elements of online learning, the current research contributes to the needed perspective on CT skills and online learning. The findings from the research presented add to the understanding of CT skills through online learning; however, the goal of future research should emphasize CT skills development and the potential to influence future academic and professional performance.

Conclusion

In summation, the current investigation has provided evidence of relationships between CT skills and course performance, and that some of these relationships may affect CT skills development. In addition, categorical differences and moderated effects by student major and course participation suggest a potential benefit of tailoring course design to improve course performance and CT outcomes based on specific demography of students. Future research should attempt to validate and further identify these observed effects, while also improving the identification of students more likely to be influenced by such paradigms.

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Tables

Table 1.

Mean Age and Frequency Data for Gender and Major by Course Section.

Semester		Fall 2010		Spring 2011		Fall 2011		Spring 2012	
Section		003	004	003	004	003	004	003	004
Age (*SE*) [a]		25.75 (.65)	25.44 (.66)	23.68 (.50)	24.29 (.62)	24.97 (.60)	24.34 (.62)	23.27 (.47)	24.65 (.67)
Gender	Male	17	16	17	19	19	18	22	17
	Female	59	66	66	60	72	75	72	75
Colleges	Science	13	14	11	14	18	18	19	15
	Nursing	25	21	24	34	29	29	22	25
	Education	6	7	8	13	12	6	17	9
	Liberal Arts	3	5	5	2	4	11	7	6
	URPA	12	7	7	3	4	4	8	6
	Other [b]	0	7	1	2	5	2	3	7
	University College	14	11	20	9	18	18	13	21
	Undeclared Major	3	10	7	2	1	5	5	3
Departments	Psychology [c]	7	8	4	8	8	8	15	9
	Biology or Chemistry [c]	6	6	7	6	10	10	4	6
	Kinesiology [d]	6	3	4	8	12	4	13	6
	Education-Instruction [d]	0	4	4	5	0	2	4	3
Total Students		77	82	84	82	91	94	95	93

Note. Values reported represent data collected from official student records via UT Arlington IER (N = 690).

[a] – Standard error of the sample mean provided in parentheses.

[b] – includes Architecture (n = 4), Business (n = 11), Engineering (n = 1), and Social Work (n = 12).

[c] – out of College of Science.

[d] – out of College of Education.

Table 2.

Internal Consistency Coefficients for Items on the Four Short Surveys.

Item	Sample with Short Surveys (*n* = 216)	Number of items
Academic Confidence	.42	4
Technology Confidence	.45	4
Technology Attitudes	.74	4
Topic Importance	.52	4
Topic Knowledge	.36	4
Learning Motivation	.41	4
Studying/Testing Habits	.27	4
Confidence in Skills	.53	4
CT Characteristics	.15	4
Resource Use	.48	4

Note. Cronbach's alpha used as measure of internal consistency between the four time points.

Table 3.

Median Short Survey Responses by Item Type for Course Sections.

Semester	Overall	Fall 2010		Spring 2011		Fall 2011		Spring 2012	
Section	-	003	004	003	004	003	004	003	004
Academic Confidence	4 (4 - 4)	4 (3 - 4)	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	-	-	4 (4 - 4)	4 (3 - 4)
Technology Confidence	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	-	-	4 (4 - 4)	4 (4 - 4)
Technology Attitudes	4 (3 - 4)	4 (4 - 4)	4 (3 - 4)	4 (4 - 4)	4 (3 - 4)	-	-	4 (3 - 4)	4 (3 - 4)
Topic Importance	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	-	-	4 (3.5 - 4)	4 (3.5 - 4)
Topic Knowledge	4 (3 - 4)	4 (3 - 4)	4 (3.63 - 4)	4 (4 - 4)	4 (4 - 4)	-	-	4 (3 - 4)	4 (3 - 4)
Learning Motivation	3.5 (3 - 4)	3.5 (3 - 4)	3.5 (2.5 - 4)	4 (3 - 4)	3 (3 - 4)	-	-	3.5 (3 - 4)	3.5 (3 - 4)
Studying/Testing Habits	4 (3 - 4)	4 (3.5 - 4.5)	3.5 (3.13 - 4)	4 (3 - 4)	4 (3 - 4)	-	-	3.5 (3 - 4)	4 (3 - 4)
Confidence in Skills	4 (3.5 - 4)	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	4 (3 - 4)	-	-	4 (3 - 4)	4 (3.5 - 4)
CT Characteristics	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	4 (4 - 4)	-	-	4 (3 - 4)	4 (3 - 4)
Resource Use	2 (1 - 3)	2 (1.50 - 3)	2 (1 - 2.88)	3 (1 - 4)	2 (1 - 3)	-	-	2 (1 - 3)	2 (1 - 3)

Note. All responses were coded from (1) least value to (5) greatest value; no items were reverse-coded. For specific response items, see Appendix A.

Table 4.

Additional Frequency Data and Descriptive Statistics by Course Section.

Semester		Fall 2010		Spring 2011		Fall 2011		Spring 2012	
Section		003	004	003	004	003	004	003	004
Academic Rank	Freshman	1	2	2	2	2	4	5	3
	Sophomore	20	26	18	23	26	31	33	24
	Junior	24	24	27	34	30	26	23	37
	Senior	29	28	34	20	29	30	33	28
	Fifth Year	3	2	3	3	4	3	1	1
Enrollment Type	Less than Half-time	6	9	2	2	1	3	2	4
	Half-Time	28	29	22	27	33	33	26	24
	Full-Time	42	44	59	50	57	57	66	64
Ethnicity	White	41	31	28	31	42	43	47	42
	Black/African American	11	21	15	11	20	18	17	14
	Hispanic/Latino	12	15	24	17	14	15	16	16
	Asian	6	8	11	12	11	11	8	15
	American Indian/Alaska Native	0	0	0	0	1	0	0	0
	Foreign National	1	0	0	2	1	2	2	2
	Not Specificied	3	5	1	3	0	2	1	1
	Native Hawaiian/Other Pacific Islander	0	0	0	0	1	1	0	1
	Multiracial	2	2	4	3	1	1	3	1
Median	Enrolled Hours	12	12	12	12	12	12	12	13
	Completed Hours	35	33.5	39	37.5	30	37	37	32
	Transfer Hours								

Table 5.

Frequency data for course activities.

		Fall 2010		Spring 2011		Fall 2011		Spring 2012	
Measure		003	004	003	004	003	004	003	004
Short Survey	None	11	8	9	10	91	93	17	15
	Three	0	0	74	69	0	0	0	0
	Four	65	74	0	0	0	0	77	77
HCTA	None	15	12	27	30	35	42	37	34
	Version A	21	14	0	0	0	3	0	1
	Version B	6	6	56	49	56	47	56	57
	Both	34	50	0	0	0	1	1	0
Quizzes [a]	One	50	58	29	37	76	77	74	81
	Two	49	59	29	35	74	79	74	78
	Three	54	63	28	37	78	81	75	80
	Four	51	60	28	36	74	73	68	79
	Five	51	60	27	32	76	80	61	71
	Six	51	55	28	37	77	75	71	76
	Seven	46	60	29	37	76	75	72	77
	Eight	49	58	29	35	73	81	72	77
	Nine	48	59	29	34	76	81	72	79
Discussion Postings	None	44	53	71	43	27	71	58	68
	One	20	13	10	9	30	18	27	20
	Two	12	16	2	27	34	4	9	4
Final Exam [a]		48	60	29	37	76	80	71	77
Total Students		76	82	83	79	91	93	94	92

Note. [a] – Values reflect the number of students in the course section that completed the item.

Table 6.

Example of Scored HCTA Data for a Respondent from the First HCTA Order Condition.

	Version A Points		Version B Points	
Component	Available	Obtained	Available	Obtained
Critical Thinking (CT)	193	95	194	106
Forced Choice (CTF)		52		62
Constructed Response (CTR)		43		44
Verbal Reasoning (VR)	22	10	22	11
Forced Choice (VRF)		5		5
Constructed Response (VRR)		5		6
Argument Analysis (AA)	41	22	41	24
Forced Choice (AAF)		8		12
Constructed Response (AAR)		14		12
Hypothesis Testing (HT)	45	20	46	24
Forced Choice (HTF)		14		16
Constructed Response (HTR)		6		8
Likelihood and Uncertainty (LU)	24	6	24	9
Forced Choice (LUF)		3		3
Constructed Response (LUR)		3		6
Problem Solving (PS)	61	37	61	38
Forced Choice (PSF)		22		26
Constructed Response (PSR)		15		12

Note. In this case, Version A represents time 1 and Version B represents time 2.

Table 7.

Mean Points for Course Outcomes by Course Section: Fall 2010 and Spring 2011.

		F2010				S2011			
		003		004		003		004	
Item	Assessment	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Discussion Posting [a]	One	8.57	.57	9.38	.68	11.80	1.16	11.67	.92
	Two	8.67	.89	9.69	1.21	5.00	2.00	10.45	.95
	Three	9.50	2.72	8.18	.89	11.75	1.44	11.73	.90
Quiz [b]	One	17.48	.42	17.43	.39	18.17	.36	18.84	.41
	Two	18.61	.40	18.63	.37	19.69	.37	18.80	.64
	Three	16.93	.42	17.00	.32	17.71	.41	16.81	.42
	Four	19.90	.27	19.57	.30	20.39	.27	19.69	.55
	Five	20.12	.35	19.52	.42	21.07	.51	20.84	.44
	Six	19.76	.46	20.47	.34	21.32	.41	20.92	.43
	Seven	18.54	.39	18.33	.36	19.52	.42	19.32	.45
	Eight	19.18	.31	19.29	.34	20.76	.40	20.20	.38
	Nine	21.92	.33	21.47	.35	22.52	.26	22.76	.20
Final Exam [c]		32.04	.39	31.32	.49	32.83	.48	33.05	.42
Total		179.44	8.11	190.17	6.51	218.72	2.99	188.71	4.79
Percent Grade		81.20	2.48	86.14	1.25	91.25	1.25	87.65	2.04

Note. [a] – only two postings were eligible for completion.
[b] – up to 22 points were available per quiz.
[c] – up to 38 points available.

Table 8.

Mean Points for Course Outcomes by Course Section: Fall 2011 and Spring 2012.

		F2011				S2012			
		003		004		003		004	
Item	Assessment	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Discussion Posting [a]	One	10.03	.74	7.93	1.37	12.69	1.82	9.07	1.58
	Two	9.51	1.06	9.00	2.76	12.40	1.05	7.57	2.02
	Three	8.67	1.14	5.00	1.26	8.46	1.16	8.73	2.00
Quiz [b]	One	17.08	.38	16.06	.39	15.21	.62	16.13	.40
	Two	18.69	.37	18.47	.32	16.95	.62	18.43	.53
	Three	18.65	.24	18.48	.25	15.93	.55	17.63	.38
	Four	18.18	.39	17.68	.37	14.89	.78	17.33	.48
	Five	19.83	.27	19.68	.32	14.18	.94	16.24	.76
	Six	18.77	.31	18.84	.37	15.68	.69	16.65	.59
	Seven	19.42	.33	19.28	.37	16.43	.68	18.61	.59
	Eight	19.53	.37	19.44	.33	15.48	.67	16.98	.54
	Nine	21.28	.26	21.04	.25	18.90	.76	19.79	.50
Final Exam [c]		32.34	.39	31.90	.37	28.49	1.22	31.28	.93
Total		209.39	4.80	191.75	4.57	182.77	5.79	196.38	4.01
Percent Grade		87.24	2.00	79.90	1.90	76.15	2.41	81.82	1.67

Note. [a] – only two postings were eligible for completion.
[b] – up to 22 points were available per quiz.
[c] – up to 38 points available.

Table 9.

Age by gender and course section in the total sample.

Factor		*N = 690*	*M*	*SE*	95% CI *LLCI*	95% CI *ULCI*
Gender		Male	26.28	.46	25.37	27.19
		Female	24.10	.24	23.63	24.57
Course section		Fall 2010 section 003	27.07	.77	25.57	28.58
		Fall 2010 section 004	25.68	.78	24.15	27.20
		Spring 2011 section 003	24.08	.76	22.59	25.56
		Spring 2011 section 004	24.47	.73	23.03	25.91
		Fall 2011 section 003	25.77	.72	24.36	27.18
		Fall 2011 section 004	25.12	.73	23.69	26.56
		Spring 2012 section 003	23.72	.68	22.39	25.05
		Spring 2012 section 004	25.61	.75	24.14	27.08
Gender X section	Male	Fall 2010 section 003	29.47	1.35	26.82	32.12
		Fall 2010 section 004	26.06	1.39	23.33	28.79
		Spring 2011 section 003	24.66	1.35	22.01	27.31
		Spring 2011 section 004	24.92	1.28	22.42	27.43
		Fall 2011 section 003	27.15	1.28	24.64	29.66
		Fall 2011 section 004	26.29	1.31	23.72	28.87
		Spring 2012 section 003	24.51	1.19	22.18	26.84
		Spring 2012 section 004	27.16	1.35	24.51	29.81
	Female	Fall 2010 section 003	24.68	.73	23.25	26.10
		Fall 2010 section 004	25.29	.69	23.95	26.64
		Spring 2011 section 003	23.49	.69	22.14	24.83
		Spring 2011 section 004	24.02	.72	22.61	25.43
		Fall 2011 section 003	24.39	.66	23.10	25.68
		Fall 2011 section 004	23.95	.64	22.69	25.21
		Spring 2012 section 003	22.92	.66	21.63	24.21
		Spring 2012 section 004	24.06	.64	22.80	25.32

Note. Values represent estimated marginal means (*M*), standard error of the estimated marginal mean (*SE*), and the lower limit (*LLCI*) and upper limit (*ULCI*) 95% confidence interval of the computed mean.

Table 10.

Correlations between age and CT measures.

	Students with CT measures				Students with both CT measures			
	Time 1 (*n* = 337)		Time 2 (*n* = 207)		Time 1 (*n* = 86)		Time 2 (*n* = 86)	
Item	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
CT	.15	.007	.01	.884	.19	.078	.13	.252
CTF	.10	.075	.02	.806	.09	.394	.09	.390
CTR	.16	.004	.00	.987	.22	.040	.13	.250
VR	.19	.001	.03	.631	.14	.203	.16	.145
VRF	.08	.132	-.14	.040	.06	.558	-.07	.520
VRR	.19	.000	.11	.118	.14	.193	.23	.031
AA	.01	.824	-.05	.485	.07	.496	.03	.812
AAF	-.03	.638	-.05	.520	-.03	.769	-.06	.603
AAR	.04	.464	-.04	.598	.15	.159	.10	.379
HT	.08	.136	.03	.670	.08	.442	.09	.415
HTF	.12	.024	.07	.333	.17	.126	.10	.368
HTR	.01	.922	-.03	.696	-.03	.775	.03	.762
LU	.06	.279	-.05	.462	.21	.055	.05	.657
LUF	-.05	.414	-.11	.120	-.04	.715	.01	.940
LUR	.10	.071	.00	.995	.28	.010	.06	.575
PS	.19	< .001	.05	.482	.18	.105	.15	.169
PSF	.13	.019	.09	.218	.09	.419	.17	.117
PSR	.20	< .001	-.02	.748	.19	.088	.05	.633

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 11.

Time 1 CT measures by gender.

	Students with CT measures				Students with both CT measures			
	Male (n = 55)		Female (n = 282)		Male (n = 16)		Female (n = 70)	
Measure	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
CT	103.67	2.47	101.00	.96	113.13	3.93	107.90	1.69
CTF	64.87	1.13	62.50	.51	68.19	1.82	63.36	.89
CTR	38.80	1.58	38.50	.61	44.94	2.34	44.54	1.11
VR	11.27	.50	10.72	.20	12.75	.71	11.93	.41
VRF	4.15	.17	3.74	.07	4.75	.21	4.07	.14
VRR	7.13	.42	6.98	.16	8.00	.62	7.86	.33
AA	22.24	.81	21.73	.33	24.94	1.49	24.54	.58
AAF	12.05	.42	11.55	.19	12.69	.71	11.56	.38
AAR	10.18	.51	10.18	.22	12.25	.88	12.99	.36
HT	24.53	.60	23.67	.27	26.31	.93	23.64	.57
HTF	17.53	.35	16.53	.18	18.56	.68	16.00	.32
HTR	7.00	.34	7.15	.16	7.75	.54	7.64	.33
LU	9.93	.42	8.42	.19	10.94	.92	9.17	.40
LUF	4.67	.18	4.22	.08	4.81	.32	4.24	.14
LUR	5.25	.35	4.20	.15	6.13	.75	4.93	.32
PS	35.71	.81	36.45	.37	38.19	1.19	38.61	.56
PSF	26.47	.53	26.45	.24	27.38	.94	27.49	.41
PSR	9.24	.45	10.00	.20	10.81	.59	11.13	.35

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 12.

Time 2 CT measures by gender.

	Students with CT measures				Students with both CT measures			
	Male (*n* = 51)		Female (*n* = 156)		Male (*n* = 16)		Female (*n* = 70)	
Measure	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
CT	90.88	3.14	97.06	1.46	98.88	4.90	97.53	2.10
CTF	56.88	1.78	60.55	.81	63.00	2.69	61.20	1.20
CTR	34.00	1.66	36.51	.82	35.88	2.89	36.33	1.19
VR	9.63	.52	10.46	.25	11.13	1.02	9.97	.32
VRF	3.61	.18	3.77	.10	4.00	.33	3.60	.16
VRR	6.02	.41	6.69	.21	7.13	.78	6.37	.27
AA	18.43	.82	20.99	.42	19.50	1.39	20.94	.59
AAF	10.37	.49	11.59	.25	11.31	.86	11.43	.35
AAR	8.06	.47	9.40	.27	8.19	.79	9.51	.38
HT	22.25	.78	23.04	.39	24.31	1.07	23.39	.60
HTF	15.29	.54	15.69	.26	17.31	.66	16.00	.44
HTR	6.96	.39	7.35	.22	7.00	.61	7.39	.33
LU	8.18	.45	8.01	.24	9.00	.77	7.96	.39
LUF	3.98	.21	4.26	.12	4.25	.32	4.20	.18
LUR	4.20	.31	3.76	.17	4.75	.54	3.76	.29
PS	32.39	1.21	34.56	.56	34.94	1.99	35.27	.80
PSF	23.63	.84	25.24	.39	26.13	1.55	25.97	.58
PSR	8.76	.54	9.31	.28	8.81	.94	9.30	.38

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with "F" and free-response are designated with "R".

Table 13.

Student performance measures by gender.

	Students with performance measures						Both CT measures and performance measures					
	Male			Female			Male			Female		
Measure	*n*	*M*	*SE*	*n*	*M*	*SE*	*n*	*M*	*SE*	*n*	*M*	*SE*
Quiz points	106	154.70	3.69	411	156.79	1.75	13	159.92	8.13	60	169.82	2.55
Discussion points	45	13.04	1.26	203	14.62	.61	8	12.63	2.80	31	11.94	.94
Final exam points	100	31.05	.73	392	31.48	.30	13	31.15	.95	59	31.78	.40
Total course points	108	187.18	5.03	411	195.16	2.21	13	199.62	9.01	60	209.95	2.97

Table 14.

ANOVA Summary Tables for Age by Major and Discussion Posting.

Model	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
Age (*N* = 654)	Discussion posts	18.56	2	9.28	.35	.704	.00
	Department major	1785.67	3	595.22	22.54	.000	.10
	Discussion posts X Department major	161.95	6	26.99	1.02	.410	.01
	Error	16955.03	642	26.41			
	Total	20660.52	653				
Age with both HCTAs (*n* = 80)	Discussion posts	10.46	2	5.23	.14	.867	.00
	Department major	25.62	3	8.54	.23	.873	.01
	Discussion posts X Department major	165.54	5	33.11	.90	.484	.06
	Error	2529.78	69	36.66			
	Total	2809.65	79				

Table 15.

Correlations between participation and short survey items and student metrics.

		Discussion posting		Student Engagement	
Item	*n*	*r*	*p*	*r*	*p*
Academic Confidence	383	-.06	.287	-.01	.812
Technology Confidence	383	-.10	.054	.00	.978
Technology Attitudes	383	-.03	.573	-.01	.883
Topic Importance	383	.05	.297	-.02	.664
Topic Knowledge	383	.05	.336	.03	.529
Learning Motivation	383	-.06	.227	-.06	.213
Studying/Testing Habits	383	-.02	.644	.05	.305
Confidence in Skills	383	-.01	.890	.00	.979
CT Characteristics	383	.04	.485	-.02	.707
Resource Use	383	-.05	.369	-.03	.600
Semester GPA	665	.03	.423	.18	< .001
Cumulative GPA	683	.10	.010	.20	< .001
ACT Comp	147	.01	.876	.00	.990
ACT Math	147	.02	.829	.03	.691
ACT English	147	.01	.924	-.06	.464
SAT Verbal	290	-.01	.846	.02	.693
SAT Math	291	-.02	.726	.02	.702

Note. Discussion posting represents completing at least one discussion posting and student engagement represents the computed student engagement index with values from (0) to (17).

Table 16.

Correlations between course performance measures and short survey items, and course performance measures and student metrics.

	Quiz Points			Discussion Points			Final Exam Points			Total Course Points		
Item	*r*	*n*	*p*	*r*	*n*	*p*	*r*	*n*	*p*	*r*	*n*	*p*
Academic Confidence	.15	289	.009	.05	133	.605	.09	271	.124	.16	289	.005
Technology Confidence	.09	289	.130	-.07	133	.428	-.04	271	.474	.06	289	.286
Technology Attitudes	.02	289	.688	-.07	133	.406	.00	271	.957	.02	289	.717
Topic Importance	.12	289	.036	.09	133	.280	.12	271	.047	.13	289	.023
Topic Knowledge	.26	289	< .001	-.12	133	.155	.22	271	< .001	.22	289	< .001
Learning Motivation	.07	289	.249	-.17	133	.051	.12	271	.044	.07	289	.226
Studying/Testing Habits	.02	289	.687	.03	133	.771	.06	271	.344	.05	289	.356
Confidence in Skills	.02	289	.772	-.24	133	.005	.00	271	.948	.05	289	.420
CT Characteristics	-.10	289	.099	-.05	133	.575	-.02	271	.755	-.10	289	.087
Resource Use	.00	289	.988	-.09	133	.302	-.04	271	.509	.03	289	.566
Semester GPA	.80	501	< .001	.36	247	< .001	.50	484	< .001	.78	502	< .001
Cumulative GPA	.63	511	< .001	.37	246	< .001	.34	487	< .001	.62	513	< .001
ACT Comp	.32	111	.001	.20	63	.126	.21	110	.032	.32	111	.001
ACT Math	.28	111	.003	.24	63	.058	.16	110	.089	.28	111	.003
ACT English	.32	111	.001	.07	63	.574	.18	110	.056	.31	111	.001
SAT Verbal	.10	225	.149	.31	102	.001	.10	219	.136	.11	225	.113
SAT Math	.13	226	.051	.36	103	< .001	.06	220	.403	.11	226	.102

Note. Discussion posting represents completing at least one discussion posting and student engagement represents the computed student engagement index with values from (0) to (17).

Table 17.

Correlation summary table between CT measures and short survey items.

	Academic Confidence		Technology Confidence		Technology Attitudes		Topic Importance	
CT component	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
CT	.16	.040	-.07	.335	.07	.372	.16	.032
CTF	.15	.058	-.05	.537	.08	.277	.15	.050
CTR	.14	.070	-.09	.254	.04	.604	.15	.055
VR	.05	.531	-.05	.550	.00	.962	.09	.246
VRF	.05	.524	-.11	.144	-.05	.484	.10	.175
VRR	.04	.639	.00	.970	.03	.692	.06	.434
AA	.18	.021	-.02	.775	.13	.085	.24	.001
AAF	.09	.236	-.02	.757	.12	.104	.22	.004
AAR	.20	.008	-.01	.869	.10	.214	.19	.014
HT	.16	.039	-.01	.878	.04	.627	.10	.180
HTF	.12	.107	.04	.624	.09	.265	.09	.254
HTR	.14	.077	-.07	.394	-.03	.654	.08	.297
LU	.03	.702	-.12	.123	.05	.539	-.04	.565
LUF	.05	.530	.03	.709	.07	.378	-.07	.361
LUR	.01	.908	-.18	.015	.02	.787	-.02	.845
PS	.14	.070	-.10	.208	.04	.628	.16	.039
PSF	.14	.069	-.09	.267	.04	.627	.11	.135
PSR	.09	.243	-.08	.300	.02	.753	.17	.029

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 18.

Correlation summary table between CT measures and short survey items.

	Topic Knowledge		Learning Motivation		Studying/Testing Habits	
CT component	*r*	*p*	*r*	*p*	*r*	*p*
CT	.01	.930	-.05	.551	.00	.995
CTF	.07	.392	-.02	.803	.03	.687
CTR	-.06	.466	-.07	.399	-.03	.666
VR	-.01	.876	-.09	.268	-.10	.214
VRF	.01	.929	-.07	.348	-.03	.655
VRR	-.02	.813	-.07	.357	-.10	.185
AA	.03	.676	-.07	.386	.00	.956
AAF	.05	.483	-.07	.397	-.02	.832
AAR	.00	.990	-.05	.552	.01	.902
HT	-.06	.411	-.03	.736	.03	.657
HTF	.02	.850	-.06	.465	.07	.401
HTR	-.13	.090	.02	.795	-.02	.842
LU	.01	.919	-.08	.331	-.11	.145
LUF	.07	.362	.00	.958	-.10	.211
LUR	-.04	.640	-.11	.162	-.09	.228
PS	.04	.626	.01	.866	.06	.404
PSF	.07	.353	.05	.517	.07	.386
PSR	-.03	.728	-.05	.541	.04	.622

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 19.

Correlation summary table between CT measures and short survey items.

	Confidence in Skills		CT Characteristics		Resource Use	
CT component	*r*	*p*	*r*	*p*	*r*	*p*
CT	.17	.024	.12	.121	-.12	.133
CTF	.12	.109	.10	.190	-.11	.142
CTR	.19	.012	.12	.133	-.10	.213
VR	.11	.170	.10	.192	-.18	.020
VRF	.03	.678	.05	.498	-.08	.286
VRR	.12	.134	.10	.197	-.18	.017
AA	.17	.024	.07	.377	-.14	.075
AAF	.15	.049	.02	.816	-.19	.014
AAR	.14	.073	.10	.211	-.04	.617
HT	.13	.089	.03	.668	-.06	.404
HTF	.08	.330	.04	.650	-.06	.462
HTR	.14	.060	.02	.819	-.05	.536
LU	.14	.066	.09	.232	-.07	.353
LUF	.03	.745	.12	.109	-.03	.702
LUR	.18	.018	.05	.548	-.08	.296
PS	.13	.092	.15	.048	-.05	.517
PSF	.10	.198	.13	.102	-.05	.480
PSR	.13	.091	.14	.074	-.03	.740

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 20.

Correlation summary table between CT measures and GPA, ACT scores, and SAT scores.

	Semester GPA (*n* = 203)		Cumulative GPA (*n* = 206)		ACT Comp (*n* = 41)		ACT Math (*n* = 41)		ACT English (*n* = 41)		SAT Verbal (*n* = 91)		SAT Math (*n* = 91)	
CT component	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
CT	.35	< .001	.37	< .001	.55	< .001	.54	< .001	.60	< .001	.50	< .001	.32	.002
CTF	.34	< .001	.34	< .001	.50	.001	.49	.001	.52	.001	.41	< .001	.31	.003
CTR	.30	< .001	.33	< .001	.49	.001	.49	.001	.55	< .001	.51	< .001	.28	.007
VR	.28	< .001	.34	< .001	.58	< .001	.45	.004	.60	< .001	.47	< .001	.33	.002
VRF	.13	.069	.20	.004	.49	.001	.40	.009	.47	.002	.25	.018	.19	.075
VRR	.28	< .001	.32	< .001	.47	.002	.34	.029	.50	.001	.46	< .001	.32	.002
AA	.28	< .001	.24	< .001	.43	.005	.46	.002	.54	< .001	.43	< .001	.30	.004
AAF	.26	< .001	.24	.001	.54	< .001	.56	< .001	.55	< .001	.43	< .001	.38	.000
AAR	.21	.003	.17	.015	.26	.105	.29	.063	.43	.006	.29	.005	.13	.224
HT	.27	< .001	.28	< .001	.47	.002	.50	.001	.49	.001	.45	< .001	.28	.007
HTF	.27	< .001	.26	< .001	.44	.004	.43	.005	.46	.003	.33	.002	.26	.012
HTR	.16	.024	.20	.005	.35	.025	.41	.008	.36	.022	.43	< .001	.20	.064
LU	.31	< .001	.32	< .001	.54	< .001	.51	.001	.63	< .001	.49	< .001	.30	.004
LUF	.33	< .001	.30	< .001	.35	.024	.26	.100	.48	.001	.31	.003	.18	.092
LUR	.21	.002	.25	< .001	.49	.001	.51	.001	.52	.001	.50	< .001	.31	.003
PS	.28	< .001	.31	< .001	.26	.095	.28	.080	.23	.141	.30	.004	.17	.103
PSF	.24	.001	.26	< .001	.19	.225	.21	.199	.19	.244	.23	.027	.14	.194
PSR	.22	.001	.27	< .001	.26	.102	.27	.091	.21	.194	.31	.003	.17	.103

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 21.

ANOVA Summaries between English composition grades on course outcomes and CT measures.

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
Quiz Points	ENGL1	4558.00	2	2279.00	2.52	.086	.05
	ENGL2	2296.33	2	1148.17	1.27	.285	.03
	ENGL1 X ENGL2	3275.20	4	818.80	.91	.464	.04
	Error	80362.20	89	902.95			
	Total	97053.28	97				
Discussion Points	ENGL1	99.76	2	49.88	.97	.390	.06
	ENGL2	12.21	2	6.11	.12	.888	.01
	ENGL1 X ENGL2	144.65	4	36.16	.70	.596	.08
	Error	1697.88	33	51.45			
	Total	2001.64	41				
Final Exam Points	ENGL1	79.39	2	39.70	.91	.407	.02
	ENGL2	43.42	2	21.71	.50	.610	.01
	ENGL1 X ENGL2	102.30	4	25.57	.59	.674	.03
	Error	3757.65	86	43.69			
	Total	3967.31	94				
Total Course Points	ENGL1	1708.23	2	854.12	.43	.649	.01
	ENGL2	1320.23	2	660.11	.34	.716	.01
	ENGL1 X ENGL2	7547.35	4	1886.84	.96	.434	.04
	Error	177088.06	90	1967.65			
	Total	192448.32	98				
CT	ENGL1	929.94	2	464.97	1.13	.340	.08
	ENGL2	895.80	2	447.90	1.09	.353	.08
	ENGL1 X ENGL2	2849.72	4	712.43	1.73	.176	.22
	Error	10317.09	25	412.68			
	Total	16380.24	33				
CTF	ENGL1	324.67	2	162.34	1.42	.261	.10
	ENGL2	290.59	2	145.29	1.27	.299	.09
	ENGL1 X ENGL2	589.11	4	147.28	1.29	.302	.17
	Error	2864.43	25	114.58			
	Total	4190.27	33				
CTR	ENGL1	252.99	2	126.49	1.09	.351	.08
	ENGL2	204.07	2	102.04	.88	.427	.07
	ENGL1 X ENGL2	928.72	4	232.18	2.01	.124	.24
	Error	2892.70	25	115.71			
	Total	4810.62	33				

Note. Critical thinking (CT) measures with forced-choice only (F) and constructed response only (R) items.

Table 21 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
VR	ENGL1	14.73	2	7.36	.52	.603	.04
	ENGL2	1.66	2	.83	.06	.944	.01
	ENGL1 X ENGL2	84.78	4	21.20	1.49	.236	.19
	Error	356.25	25	14.25			
	Total	472.62	33				
VRF	ENGL1	.36	2	.18	.07	.929	.01
	ENGL2	1.18	2	.59	.24	.789	.02
	ENGL1 X ENGL2	8.82	4	2.21	.89	.483	.13
	Error	61.79	25	2.47			
	Total	74.62	33				
VRR	ENGL1	12.08	2	6.04	.72	.499	.05
	ENGL2	1.96	2	.98	.12	.891	.01
	ENGL1 X ENGL2	59.14	4	14.78	1.75	.171	.22
	Error	211.38	25	8.46			
	Total	292.47	33				
AA	ENGL1	302.26	2	151.13	5.85	.008	.32
	ENGL2	164.96	2	82.48	3.19	.058	.20
	ENGL1 X ENGL2	87.71	4	21.93	.85	.508	.12
	Error	646.38	25	25.86			
	Total	1182.47	33				
AAF	ENGL1	112.06	2	56.03	6.19	.007	.33
	ENGL2	22.60	2	11.30	1.25	.304	.09
	ENGL1 X ENGL2	23.40	4	5.85	.65	.634	.09
	Error	226.18	25	9.05			
	Total	373.77	33				
AAR	ENGL1	65.68	2	32.84	3.24	.056	.21
	ENGL2	67.01	2	33.50	3.31	.053	.21
	ENGL1 X ENGL2	29.35	4	7.34	.72	.584	.10
	Error	253.16	25	10.13			
	Total	441.53	33				
HT	ENGL1	20.86	2	10.43	.39	.683	.03
	ENGL2	37.25	2	18.63	.69	.510	.05
	ENGL1 X ENGL2	175.02	4	43.76	1.62	.199	.21
	Error	673.45	25	26.94			
	Total	990.50	33				

Note. Verbal reasoning (VR), argument analysis (AA), and hypothesis testing (HT) measures with forced-choice (F) and constructed-response (R) items.

Table 21 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
HTF	ENGL1	1.91	2	.95	.10	.909	.01
	ENGL2	26.17	2	13.09	1.32	.286	.10
	ENGL1 X ENGL2	28.86	4	7.21	.73	.582	.10
	Error	248.28	25	9.93			
	Total	318.97	33				
HTR	ENGL1	16.73	2	8.36	1.16	.329	.09
	ENGL2	8.98	2	4.49	.63	.544	.05
	ENGL1 X ENGL2	65.47	4	16.37	2.28	.089	.27
	Error	179.67	25	7.19			
	Total	298.47	33				
LU	ENGL1	2.67	2	1.33	.18	.841	.01
	ENGL2	5.97	2	2.98	.39	.681	.03
	ENGL1 X ENGL2	85.41	4	21.35	2.80	.048	.31
	Error	190.95	25	7.64			
	Total	300.47	33				
LUF	ENGL1	.10	2	.05	.03	.975	.00
	ENGL2	1.57	2	.78	.39	.683	.03
	ENGL1 X ENGL2	12.09	4	3.02	1.49	.235	.19
	Error	50.68	25	2.03			
	Total	69.53	33				
LUR	ENGL1	2.30	2	1.15	.28	.757	.02
	ENGL2	2.21	2	1.10	.27	.765	.02
	ENGL1 X ENGL2	38.63	4	9.66	2.37	.080	.28
	Error	101.83	25	4.07			
	Total	147.77	33				
PS	ENGL1	168.63	2	84.31	1.22	.313	.09
	ENGL2	182.58	2	91.29	1.32	.285	.10
	ENGL1 X ENGL2	480.89	4	120.22	1.74	.173	.22
	Error	1729.46	25	69.18			
	Total	2597.53	33				
PSF	ENGL1	86.74	2	43.37	1.80	.186	.13
	ENGL2	52.51	2	26.25	1.09	.352	.08
	ENGL1 X ENGL2	206.09	4	51.52	2.14	.106	.26
	Error	602.45	25	24.10			
	Total	901.44	33				

Note. Hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS) measures with forced-choice (F) and constructed-response (R) items.

Table 21 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
PSR	ENGL1	13.53	2	6.76	.40	.673	.03
	ENGL2	39.30	2	19.65	1.17	.327	.09
	ENGL1 X ENGL2	82.04	4	20.51	1.22	.328	.16
	Error	420.58	25	16.82			
	Total	605.56	33				

Note. Problem solving constructed-response (PSR) measures.

Table 22.

Mixed-model ANOVA Summaries between Major and Discussion Posting on CT scores.

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
CT	Within	CT	.34	1	.34	1.13	.291
		CT X Age	.08	1	.08	.28	.601
		CT X Gender	.64	1	.64	2.09	.153
		CT X Department Major	.12	3	.04	.14	.939
		CT X Discussion Posts	.45	2	.23	.75	.478
		CT X Department Major X Discussion Posts	.68	5	.14	.45	.813
		Error	20.34	67	.30		
	Between	Intercept	.00	1	.00	.00	.959
		Age	4.24	1	4.24	2.90	.093
		Gender	1.22	1	1.22	.84	.364
		Department Major	4.04	3	1.35	.92	.437
		Discussion Posts	.79	2	.39	.27	.765
		Department Major X Discussion Posts	2.33	5	.47	.32	.901
		Error	98.20	67	1.47		
CTF	Within	CTF	.79	1	.79	2.04	.158
		CTF X Age	.02	1	.02	.05	.820
		CTF X Gender	1.71	1	1.71	4.42	.039
		CTF X Department Major	1.11	3	.37	.96	.417
		CTF X Discussion Posts	.72	2	.36	.94	.398
		CTF X Department Major X Discussion Posts	.60	5	.12	.31	.905
		Error	25.93	67	.39		
	Between	Intercept	.23	1	.23	.16	.693
		Age	2.15	1	2.15	1.50	.226
		Gender	2.53	1	2.53	1.76	.189
		Department Major	2.24	3	.75	.52	.670
		Discussion Posts	1.09	2	.55	.38	.685
		Department Major X Discussion Posts	.56	5	.11	.08	.995
		Error	96.30	67	1.44		
CTR	Within	CTR	.06	1	.06	.13	.721
		CTR X Age	.28	1	.28	.63	.431
		CTR X Gender	.04	1	.04	.08	.777
		CTR X Department Major	.56	3	.19	.42	.741
		CTR X Discussion Posts	.08	2	.04	.08	.920
		CTR X Department Major X Discussion Posts	1.02	5	.20	.45	.809
		Error	30.05	67	.45		
	Between	Intercept	.27	1	.27	.21	.647
		Age	4.50	1	4.50	3.51	.065

Note. Critical thinking (CT) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
		Gender	.22	1	.22	.17	.681
		Department Major	7.05	3	2.35	1.83	.149
		Discussion Posts	2.16	2	1.08	.84	.435
		Department Major X Discussion Posts	6.25	5	1.25	.98	.440
		Error	85.89	67	1.28		
VR	Within	VR	.02	1	.02	.04	.838
		VR X Age	.01	1	.01	.02	.885
		VR X Gender	.06	1	.06	.12	.733
		VR X Department Major	.44	3	.15	.28	.839
		VR X Discussion Posts	1.47	2	.73	1.40	.253
		VR X Department Major X Discussion Posts	.50	5	.10	.19	.965
		Error	34.98	67	.52		
	Between	Intercept	.12	1	.12	.10	.748
		Age	1.75	1	1.75	1.47	.230
		Gender	2.57	1	2.57	2.16	.146
		Department Major	2.87	3	.96	.80	.496
		Discussion Posts	2.82	2	1.41	1.18	.313
		Department Major X Discussion Posts	9.23	5	1.85	1.55	.186
		Error	79.77	67	1.19		
VRF	Within	VRF	.23	1	.23	.35	.559
		VRF X Age	.20	1	.20	.30	.589
		VRF X Gender	.37	1	.37	.55	.460
		VRF X Department Major	2.57	3	.86	1.29	.285
		VRF X Discussion Posts	.02	2	.01	.01	.987
		VRF X Department Major X Discussion Posts	2.37	5	.47	.72	.614
		Error	44.40	67	.66		
	Between	Intercept	2.11	1	2.11	1.69	.198
		Age	.07	1	.07	.06	.811
		Gender	4.70	1	4.70	3.77	.057
		Department Major	2.05	3	.68	.55	.652
		Discussion Posts	1.12	2	.56	.45	.642
		Department Major X Discussion Posts	7.57	5	1.51	1.21	.313
		Error	83.70	67	1.25		
VRR	Within	VRR	.00	1	.00	.00	.981
		VRR X Age	.11	1	.11	.18	.675
		VRR X Gender	.30	1	.30	.51	.480
		VRR X Department Major	.11	3	.04	.06	.979
		VRR X Discussion Posts	2.41	2	1.20	2.04	.137

Note. Verbal reasoning (VR) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
		VRR X Department Major X Discussion Posts	1.30	5	.26	.44	.817
		Error	39.42	67	.59		
	Between	Intercept	.06	1	.06	.05	.822
		Age	2.24	1	2.24	2.07	.155
		Gender	.93	1	.93	.85	.359
		Department Major	2.04	3	.68	.63	.599
		Discussion Posts	2.99	2	1.50	1.38	.259
		Department Major X Discussion Posts	6.85	5	1.37	1.26	.290
		Error	72.66	67	1.09		
AA	Within	AA	.70	1	.70	1.43	.235
		AA X Age	.03	1	.03	.05	.817
		AA X Gender	.59	1	.59	1.22	.273
		AA X Department Major	.37	3	.12	.26	.858
		AA X Discussion Posts	.33	2	.16	.34	.715
		AA X Department Major X Discussion Posts	2.92	5	.58	1.20	.319
		Error	32.64	67	.49		
	Between	Intercept	.06	1	.06	.05	.827
		Age	1.34	1	1.34	1.08	.302
		Gender	.01	1	.01	.00	.948
		Department Major	5.36	3	1.79	1.44	.240
		Discussion Posts	1.06	2	.53	.43	.654
		Department Major X Discussion Posts	4.07	5	.81	.65	.659
		Error	83.28	67	1.24		
AAF	Within	AAF	.51	1	.51	1.00	.320
		AAF X Age	.04	1	.04	.07	.791
		AAF X Gender	.60	1	.60	1.20	.278
		AAF X Department Major	.79	3	.26	.52	.668
		AAF X Discussion Posts	.09	2	.05	.09	.911
		AAF X Department Major X Discussion Posts	3.38	5	.68	1.34	.257
		Error	33.73	67	.50		
	Between	Intercept	.49	1	.49	.33	.569
		Age	.07	1	.07	.05	.827
		Gender	1.45	1	1.45	.98	.326
		Department Major	4.45	3	1.48	1.00	.399
		Discussion Posts	1.17	2	.59	.39	.676
		Department Major X Discussion Posts	1.73	5	.35	.23	.947
		Error	99.51	67	1.49		
AAR	Within	AAR	.53	1	.53	.81	.372
		AAR X Age	.13	1	.13	.20	.655

Note. Argument analysis (AA) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
		AAR X Gender	.34	1	.34	.52	.472
		AAR X Department Major	.20	3	.07	.10	.960
		AAR X Discussion Posts	.40	2	.20	.31	.737
		AAR X Department Major X Discussion Posts	1.83	5	.37	.56	.734
		Error	44.12	67	.66		
	Between	Intercept	1.05	1	1.05	1.16	.286
		Age	2.43	1	2.43	2.67	.107
		Gender	1.45	1	1.45	1.60	.210
		Department Major	3.59	3	1.20	1.32	.277
		Discussion Posts	.83	2	.41	.45	.637
		Department Major X Discussion Posts	4.23	5	.85	.93	.467
		Error	60.94	67	.91		
HT	Within	HT	.41	1	.41	.83	.366
		HT X Age	.01	1	.01	.01	.911
		HT X Gender	1.02	1	1.02	2.06	.156
		HT X Department Major	1.34	3	.45	.90	.445
		HT X Discussion Posts	.48	2	.24	.49	.618
		HT X Department Major X Discussion Posts	1.72	5	.35	.70	.628
		Error	33.15	67	.50		
	Between	Intercept	.30	1	.30	.20	.656
		Age	2.70	1	2.70	1.82	.182
		Gender	3.79	1	3.79	2.57	.114
		Department Major	8.49	3	2.83	1.91	.136
		Discussion Posts	1.48	2	.74	.50	.609
		Department Major X Discussion Posts	1.17	5	.23	.16	.977
		Error	99.07	67	1.48		
HTF	Within	HTF	.20	1	.20	.38	.540
		HTF X Age	.38	1	.38	.71	.402
		HTF X Gender	2.43	1	2.43	4.54	.037
		HTF X Department Major	1.37	3	.46	.85	.472
		HTF X Discussion Posts	1.30	2	.65	1.21	.305
		HTF X Department Major X Discussion Posts	1.09	5	.22	.41	.842
		Error	35.92	67	.54		
	Between	Intercept	.40	1	.40	.30	.586
		Age	4.43	1	4.43	3.31	.073
		Gender	6.67	1	6.67	4.98	.029
		Department Major	9.00	3	3.00	2.24	.091
		Discussion Posts	.20	2	.10	.08	.928
		Department Major X Discussion Posts	1.68	5	.34	.25	.938

Note. Hypthesis testing (HT) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
HTR	Within	HTR	.39	1	.39	.65	.424
		HTR X Age	.28	1	.28	.45	.505
		HTR X Gender	.00	1	.00	.00	.949
		HTR X Department Major	3.23	3	1.08	1.76	.163
		HTR X Discussion Posts	.08	2	.04	.06	.940
		HTR X Department Major X Discussion Posts	2.31	5	.46	.76	.584
		Error	40.87	67	.61		
	Between	Intercept	.06	1	.06	.04	.834
		Age	.24	1	.24	.19	.669
		Gender	.25	1	.25	.19	.663
		Department Major	13.76	3	4.59	3.48	.021
		Discussion Posts	3.85	2	1.93	1.46	.239
		Department Major X Discussion Posts	5.29	5	1.06	.80	.552
		Error	88.35	67	1.32		
LU	Within	LU	.07	1	.07	.12	.731
		LU X Age	.99	1	.99	1.80	.185
		LU X Gender	.30	1	.30	.55	.463
		LU X Department Major	.24	3	.08	.14	.933
		LU X Discussion Posts	1.87	2	.94	1.70	.191
		LU X Department Major X Discussion Posts	1.25	5	.25	.45	.810
		Error	36.97	67	.55		
	Between	Intercept	.53	1	.53	.30	.586
		Age	2.91	1	2.91	1.64	.204
		Gender	6.42	1	6.42	3.62	.062
		Department Major	3.20	3	1.07	.60	.617
		Discussion Posts	3.16	2	1.58	.89	.415
		Department Major X Discussion Posts	5.62	5	1.12	.63	.675
		Error	118.86	67	1.77		
LUF	Within	LUF	.30	1	.30	.58	.451
		LUF X Age	.01	1	.01	.01	.907
		LUF X Gender	1.32	1	1.32	2.52	.117
		LUF X Department Major	2.63	3	.88	1.68	.181
		LUF X Discussion Posts	3.13	2	1.57	3.00	.057
		LUF X Department Major X Discussion Posts	3.77	5	.75	1.44	.221
		Error	35.01	67	.52		
	Between	Intercept	1.24	1	1.24	.85	.361
		Age	.02	1	.02	.01	.916
		Gender	2.35	1	2.35	1.60	.210
		Department Major	1.51	3	.50	.34	.794

Note. Likelihood and uncertainty (LU) measures with forced-choice only (F) and constructed-response only (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
		Discussion Posts	1.61	2	.81	.55	.580
		Department Major X Discussion Posts	5.00	5	1.00	.68	.640
		Error	98.36	67	1.47		
LUR	Within	LUR	.41	1	.41	.58	.447
		LUR X Age	1.57	1	1.57	2.22	.141
		LUR X Gender	.00	1	.00	.00	.980
		LUR X Department Major	.34	3	.11	.16	.923
		LUR X Discussion Posts	.45	2	.23	.32	.727
		LUR X Department Major X Discussion Posts	3.21	5	.64	.91	.480
		Error	47.32	67	.71		
	Between	Intercept	.13	1	.13	.08	.777
		Age	5.20	1	5.20	3.24	.076
		Gender	6.27	1	6.27	3.91	.052
		Department Major	3.56	3	1.19	.74	.532
		Discussion Posts	5.89	2	2.95	1.84	.167
		Department Major X Discussion Posts	7.70	5	1.54	.96	.448
		Error	107.32	67	1.60		
PS	Within	PS	.15	1	.15	.35	.556
		PS X Age	.00	1	.00	.01	.920
		PS X Gender	.14	1	.14	.34	.564
		PS X Department Major	.88	3	.29	.69	.563
		PS X Discussion Posts	.15	2	.07	.18	.840
		PS X Department Major X Discussion Posts	.53	5	.11	.25	.939
		Error	28.46	67	.43		
	Between	Intercept	.87	1	.87	.72	.399
		Age	3.34	1	3.34	2.77	.101
		Gender	.20	1	.20	.17	.685
		Department Major	1.93	3	.64	.53	.662
		Discussion Posts	1.81	2	.91	.75	.476
		Department Major X Discussion Posts	.77	5	.15	.13	.986
		Error	80.82	67	1.21		
PSF	Within	PSF	.36	1	.36	.67	.418
		PSF X Age	.59	1	.59	1.10	.297
		PSF X Gender	.10	1	.10	.19	.666
		PSF X Department Major	2.04	3	.68	1.27	.292
		PSF X Discussion Posts	1.53	2	.76	1.42	.248
		PSF X Department Major X Discussion Posts	1.61	5	.32	.60	.699
		Error	35.94	67	.54		
	Between	Intercept	.59	1	.59	.45	.505

Note. Problem solving (PS) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
		Age	1.94	1	1.94	1.48	.229
		Gender	.27	1	.27	.20	.655
		Department Major	2.08	3	.69	.53	.665
		Discussion Posts	3.51	2	1.75	1.33	.271
		Department Major X Discussion Posts	.91	5	.18	.14	.983
		Error	88.16	67	1.32		
PSR	Within	PSR	.00	1	.00	.00	.993
		PSR X Age	.67	1	.67	.99	.322
		PSR X Gender	.10	1	.10	.15	.704
		PSR X Department Major	1.24	3	.41	.62	.607
		PSR X Discussion Posts	.80	2	.40	.60	.554
		PSR X Department Major X Discussion Posts	1.64	5	.33	.49	.783
		Error	44.88	67	.67		
	Between	Intercept	.60	1	.60	.60	.442
		Age	2.68	1	2.68	2.66	.108
		Gender	.04	1	.04	.04	.837
		Department Major	3.23	3	1.08	1.07	.369
		Discussion Posts	.14	2	.07	.07	.935
		Department Major X Discussion Posts	3.53	5	.71	.70	.625
		Error	67.53	67	1.01		
CT	Within	CT	.52	1	.52	1.75	.190
		CT X Age	.05	1	.05	.18	.676
		CT X Gender	.81	1	.81	2.75	.102
		CT X College Major	.66	3	.22	.75	.528
		CT X Discussion Posts	.87	2	.43	1.47	.238
		CT X College Major X Discussion Posts	1.47	6	.25	.83	.551
		Error	19.53	66	.30		
	Between	Intercept	.01	1	.01	.01	.921
		Age	3.90	1	3.90	2.66	.108
		Gender	1.93	1	1.93	1.32	.255
		College Major	5.13	3	1.71	1.17	.329
		Discussion Posts	1.34	2	.67	.46	.635
		College Major X Discussion Posts	3.03	6	.51	.34	.911
		Error	96.86	66	1.47		
CTF	Within	CTF	1.04	1	1.04	2.75	.102
		CTF X Age	.01	1	.01	.02	.885
		CTF X Gender	2.16	1	2.16	5.73	.020
		CTF X College Major	1.93	3	.64	1.71	.174
		CTF X Discussion Posts	1.37	2	.69	1.82	.170

Note. Critical thinking (CT) measures with forced-choice only (F) and constructed-response only (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
		CTF X College Major X Discussion Posts	1.36	6	.23	.60	.728
		Error	24.88	66	.38		
	Between	Intercept	.51	1	.51	.35	.558
		Age	2.03	1	2.03	1.39	.242
		Gender	3.29	1	3.29	2.26	.138
		College Major	3.04	3	1.01	.70	.558
		Discussion Posts	.41	2	.21	.14	.868
		College Major X Discussion Posts	.34	6	.06	.04	1.000
		Error	96.22	66	1.46		
CTR	Within	CTR	.12	1	.12	.28	.599
		CTR X Age	.15	1	.15	.33	.567
		CTR X Gender	.04	1	.04	.10	.753
		CTR X College Major	.43	3	.14	.32	.810
		CTR X Discussion Posts	.14	2	.07	.16	.852
		CTR X College Major X Discussion Posts	1.73	6	.29	.65	.692
		Error	29.34	66	.45		
	Between	Intercept	.18	1	.18	.14	.705
		Age	4.09	1	4.09	3.22	.077
		Gender	.56	1	.56	.44	.508
		College Major	8.14	3	2.71	2.13	.104
		Discussion Posts	4.71	2	2.35	1.85	.165
		College Major X Discussion Posts	7.42	6	1.24	.97	.451
		Error	83.92	66	1.27		
VR	Within	VR	.09	1	.09	.18	.676
		VR X Age	.01	1	.01	.02	.898
		VR X Gender	.02	1	.02	.03	.862
		VR X College Major	.64	3	.21	.42	.743
		VR X Discussion Posts	1.60	2	.80	1.55	.219
		VR X College Major X Discussion Posts	1.47	6	.25	.47	.825
		Error	34.07	66	.52		
	Between	Intercept	.17	1	.17	.14	.708
		Age	1.63	1	1.63	1.33	.252
		Gender	2.71	1	2.71	2.22	.141
		College Major	3.43	3	1.15	.94	.427
		Discussion Posts	5.22	2	2.61	2.14	.126
		College Major X Discussion Posts	9.44	6	1.57	1.29	.273
		Error	80.41	66	1.22		

Note. Verbal reasoning (VR) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
VRF	Within	VRF	.13	1	.13	.19	.664
		VRF X Age	.22	1	.22	.32	.571
		VRF X Gender	.33	1	.33	.48	.491
		VRF X College Major	2.12	3	.71	1.04	.382
		VRF X Discussion Posts	.05	2	.03	.04	.961
		VRF X College Major X Discussion Posts	2.01	6	.33	.49	.813
		Error	44.93	66	.68		
	Between	Intercept	2.29	1	2.29	1.81	.183
		Age	.01	1	.01	.01	.922
		Gender	4.38	1	4.38	3.47	.067
		College Major	1.98	3	.66	.52	.669
		Discussion Posts	1.73	2	.87	.69	.508
		College Major X Discussion Posts	7.99	6	1.33	1.05	.399
		Error	83.41	66	1.26		
VRR	Within	VRR	.05	1	.05	.09	.768
		VRR X Age	.11	1	.11	.18	.671
		VRR X Gender	.15	1	.15	.25	.616
		VRR X College Major	.69	3	.23	.40	.755
		VRR X Discussion Posts	2.19	2	1.09	1.91	.157
		VRR X College Major X Discussion Posts	2.83	6	.47	.82	.557
		Error	37.90	66	.57		
	Between	Intercept	.04	1	.04	.03	.859
		Age	2.29	1	2.29	2.05	.157
		Gender	1.10	1	1.10	.98	.325
		College Major	3.02	3	1.01	.90	.445
		Discussion Posts	6.00	2	3.00	2.69	.075
		College Major X Discussion Posts	6.72	6	1.12	1.00	.431
		Error	73.60	66	1.12		
AA	Within	AA	.76	1	.76	1.54	.219
		AA X Age	.02	1	.02	.04	.836
		AA X Gender	.56	1	.56	1.14	.289
		AA X College Major	.48	3	.16	.32	.808
		AA X Discussion Posts	.13	2	.06	.13	.881
		AA X College Major X Discussion Posts	3.16	6	.53	1.07	.392
		Error	32.58	66	.49		
	Between	Intercept	.00	1	.00	.00	.997
		Age	1.33	1	1.33	1.07	.306
		Gender	.12	1	.12	.10	.759
		College Major	6.94	3	2.31	1.85	.147

Note. Argument analysis (AA) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
		Discussion Posts	1.51	2	.76	.61	.549
		College Major X Discussion Posts	5.00	6	.83	.67	.677
		Error	82.51	66	1.25		
AAF	Within	AAF	.58	1	.58	1.17	.284
		AAF X Age	.00	1	.00	.00	.996
		AAF X Gender	.81	1	.81	1.64	.205
		AAF X College Major	1.89	3	.63	1.28	.289
		AAF X Discussion Posts	.36	2	.18	.37	.696
		AAF X College Major X Discussion Posts	4.36	6	.73	1.48	.200
		Error	32.51	66	.49		
	Between	Intercept	.94	1	.94	.63	.429
		Age	.09	1	.09	.06	.809
		Gender	2.31	1	2.31	1.56	.216
		College Major	5.36	3	1.79	1.20	.316
		Discussion Posts	1.75	2	.87	.59	.558
		College Major X Discussion Posts	3.61	6	.60	.41	.873
		Error	98.03	66	1.49		
AAR	Within	AAR	.55	1	.55	.85	.360
		AAR X Age	.03	1	.03	.04	.837
		AAR X Gender	.19	1	.19	.29	.592
		AAR X College Major	.19	3	.06	.10	.961
		AAR X Discussion Posts	.32	2	.16	.25	.782
		AAR X College Major X Discussion Posts	2.84	6	.47	.73	.629
		Error	42.88	66	.65		
	Between	Intercept	.80	1	.80	.88	.353
		Age	2.37	1	2.37	2.60	.112
		Gender	.68	1	.68	.75	.390
		College Major	4.49	3	1.50	1.64	.188
		Discussion Posts	.60	2	.30	.33	.721
		College Major X Discussion Posts	4.76	6	.79	.87	.520
		Error	60.10	66	.91		
HT	Within	HT	.60	1	.60	1.23	.272
		HT X Age	.00	1	.00	.00	.971
		HT X Gender	1.46	1	1.46	2.96	.090
		HT X College Major	1.44	3	.48	.98	.410
		HT X Discussion Posts	.79	2	.40	.81	.451
		HT X College Major X Discussion Posts	2.49	6	.42	.84	.540
		Error	32.44	66	.49		
	Between	Intercept	.28	1	.28	.18	.673

Note. Hypothesis testing (HT) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
		Age	3.17	1	3.17	2.08	.154
		Gender	4.97	1	4.97	3.26	.076
		College Major	6.42	3	2.14	1.40	.250
		Discussion Posts	3.23	2	1.62	1.06	.352
		College Major X Discussion Posts	.78	6	.13	.09	.997
		Error	100.70	66	1.53		
HTF	Within	HTF	.38	1	.38	.72	.399
		HTF X Age	.34	1	.34	.64	.428
		HTF X Gender	3.20	1	3.20	5.99	.017
		HTF X College Major	2.23	3	.74	1.39	.254
		HTF X Discussion Posts	1.38	2	.69	1.29	.283
		HTF X College Major X Discussion Posts	1.53	6	.26	.48	.822
		Error	35.26	66	.53		
	Between	Intercept	.32	1	.32	.23	.633
		Age	4.92	1	4.92	3.59	.063
		Gender	6.90	1	6.90	5.03	.028
		College Major	8.00	3	2.67	1.94	.131
		Discussion Posts	.17	2	.08	.06	.941
		College Major X Discussion Posts	2.07	6	.35	.25	.957
		Error	90.51	66	1.37		
HTR	Within	HTR	.45	1	.45	.75	.391
		HTR X Age	.44	1	.44	.73	.395
		HTR X Gender	.02	1	.02	.03	.868
		HTR X College Major	1.82	3	.61	1.00	.398
		HTR X Discussion Posts	.58	2	.29	.48	.620
		HTR X College Major X Discussion Posts	3.37	6	.56	.93	.480
		Error	39.95	66	.61		
	Between	Intercept	.08	1	.08	.06	.803
		Age	.37	1	.37	.28	.601
		Gender	.91	1	.91	.68	.412
		College Major	13.58	3	4.53	3.39	.023
		Discussion Posts	8.39	2	4.19	3.14	.050
		College Major X Discussion Posts	4.88	6	.81	.61	.722
		Error	88.15	66	1.34		
LU	Within	LU	.00	1	.00	.00	.953
		LU X Age	.91	1	.91	1.64	.205
		LU X Gender	.45	1	.45	.81	.371
		LU X College Major	.29	3	.10	.18	.913
		LU X Discussion Posts	1.56	2	.78	1.40	.254

Note. Likelihood and uncertainty (LU) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
		LU X College Major X Discussion Posts	1.50	6	.25	.45	.843
		Error	36.70	66	.56		
	Between	Intercept	.53	1	.53	.30	.589
		Age	2.28	1	2.28	1.27	.264
		Gender	6.28	1	6.28	3.50	.066
		College Major	3.98	3	1.33	.74	.532
		Discussion Posts	5.52	2	2.76	1.54	.222
		College Major X Discussion Posts	7.08	6	1.18	.66	.683
		Error	118.33	66	1.79		
LUF	Within	LUF	.52	1	.52	1.03	.315
		LUF X Age	.00	1	.00	.01	.929
		LUF X Gender	1.37	1	1.37	2.70	.105
		LUF X College Major	.12	3	.04	.08	.970
		LUF X Discussion Posts	1.92	2	.96	1.89	.159
		LUF X College Major X Discussion Posts	5.36	6	.89	1.76	.121
		Error	33.49	66	.51		
	Between	Intercept	.99	1	.99	.68	.413
		Age	.14	1	.14	.10	.758
		Gender	1.65	1	1.65	1.13	.292
		College Major	4.03	3	1.34	.92	.436
		Discussion Posts	5.24	2	2.62	1.79	.174
		College Major X Discussion Posts	7.04	6	1.17	.80	.571
		Error	96.38	66	1.46		
LUR	Within	LUR	.22	1	.22	.32	.575
		LUR X Age	1.22	1	1.22	1.74	.192
		LUR X Gender	.01	1	.01	.02	.892
		LUR X College Major	.65	3	.22	.31	.819
		LUR X Discussion Posts	.68	2	.34	.48	.619
		LUR X College Major X Discussion Posts	4.25	6	.71	1.01	.426
		Error	46.24	66	.70		
	Between	Intercept	.18	1	.18	.11	.738
		Age	4.73	1	4.73	2.92	.092
		Gender	6.82	1	6.82	4.21	.044
		College Major	4.22	3	1.41	.87	.461
		Discussion Posts	7.79	2	3.89	2.41	.098
		College Major X Discussion Posts	8.25	6	1.38	.85	.536
		Error	106.79	66	1.62		

Note. Likelihood and uncertainty (LU) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome		Factor	*SS*	*df*	*MS*	*F*	*p*
PS	Within	PS	.18	1	.18	.42	.520
		PS X Age	.02	1	.02	.04	.850
		PS X Gender	.14	1	.14	.34	.564
		PS X College Major	1.05	3	.35	.81	.491
		PS X Discussion Posts	.44	2	.22	.51	.602
		PS X College Major X Discussion Posts	.97	6	.16	.38	.892
		Error	28.31	66	.43		
	Between	Intercept	.47	1	.47	.39	.535
		Age	2.64	1	2.64	2.19	.144
		Gender	.07	1	.07	.06	.811
		College Major	1.91	3	.64	.53	.665
		Discussion Posts	1.99	2	.99	.82	.444
		College Major X Discussion Posts	1.72	6	.29	.24	.963
		Error	79.75	66	1.21		
PSF	Within	PSF	.47	1	.47	.89	.350
		PSF X Age	.67	1	.67	1.27	.265
		PSF X Gender	.16	1	.16	.30	.585
		PSF X College Major	2.83	3	.94	1.77	.161
		PSF X Discussion Posts	2.36	2	1.18	2.22	.117
		PSF X College Major X Discussion Posts	2.65	6	.44	.83	.553
		Error	35.17	66	.53		
	Between	Intercept	.17	1	.17	.12	.726
		Age	1.72	1	1.72	1.30	.259
		Gender	.04	1	.04	.03	.855
		College Major	2.38	3	.79	.60	.618
		Discussion Posts	2.94	2	1.47	1.11	.336
		College Major X Discussion Posts	1.23	6	.21	.16	.987
		Error	87.53	66	1.33		
PSR	Within	PSR	.00	1	.00	.00	.966
		PSR X Age	.62	1	.62	.91	.343
		PSR X Gender	.05	1	.05	.07	.789
		PSR X College Major	1.20	3	.40	.59	.625
		PSR X Discussion Posts	.67	2	.33	.49	.616
		PSR X College Major X Discussion Posts	1.61	6	.27	.40	.880
		Error	44.99	66	.68		
	Between	Intercept	.59	1	.59	.59	.444
		Age	1.82	1	1.82	1.83	.180
		Gender	.06	1	.06	.06	.814

Note. Problem Solving (PS) measures with forced-choice (F) and constructed-response (R) items.

Table 22 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*
	College Major	3.07	3	1.02	1.03	.384
	Discussion Posts	.61	2	.31	.31	.736
	College Major X Discussion Posts	5.73	6	.96	.96	.456
	Error	65.39	66	.99		

Table 23.

ANOVA summaries for course performance measures by major and discussion postings.

Outcome	Factor/Covariate	*SS*	*df*	*MS*	*F*	*p*	η^2_p
Quiz Points	Age	3445.25	1	3445.25	2.76	.097	.01
	Gender	412.22	1	412.22	.33	.566	.00
	Discussion Posts	87.17	2	43.58	.04	.966	.00
	Department Major	9454.60	3	3151.53	2.52	.057	.02
	Discussion condition	5137.58	1	5137.58	4.11	.043	.01
	Discussion Posts X Department Major	2253.84	6	375.64	.30	.936	.00
	Discussion Posts X Discussion condition	4095.46	2	2047.73	1.64	.195	.01
	Department Major X Discussion condition	580.07	3	193.36	.16	.927	.00
	Discussion Posts X Department Major X Discussion condition	3517.92	6	586.32	.47	.831	.01
	Error	579501.92	464	1248.93			
	Total	625068.00	489				
Quiz Points	Age	3314.49	1	3314.49	2.66	.104	.01
	Gender	263.25	1	263.25	.21	.646	.00
	Discussion Posts	97.43	2	48.71	.04	.962	.00
	College Major	8373.83	3	2791.28	2.24	.083	.01
	Discussion condition	6848.38	1	6848.38	5.49	.020	.01
	Discussion Posts X College Major	3075.84	6	512.64	.41	.872	.01
	Discussion Posts X Discussion condition	4796.39	2	2398.20	1.92	.147	.01
	College Major X Discussion condition	654.21	3	218.07	.18	.913	.00
	Discussion Posts X College Major X Discussion condition	2501.79	6	416.97	.33	.919	.00
	Error	578874.33	464	1247.57			
	Total	625068.00	489				

Table 23 (Cont.).

Outcome	Factor/Covariate	SS	df	MS	F	p	η^2_p
Total Course Points	Age	8352.35	1	8352.35	4.10	.044	.01
	Gender	133.65	1	133.65	.07	.798	.00
	Discussion Posts	12208.74	2	6104.37	3.00	.051	.01
	College Major	11506.23	3	3835.41	1.88	.132	.01
	Discussion condition	3084.66	1	3084.66	1.51	.219	.00
	Discussion Posts X College Major	9621.44	6	1603.57	.79	.581	.01
	Discussion Posts X Discussion condition	10414.07	2	5207.04	2.55	.079	.01
	College Major X Discussion condition	2145.75	3	715.25	.35	.789	.00
	Discussion Posts X College Major X Discussion condition	4782.37	6	797.06	.39	.885	.01
	Error	949893.23	466	2038.40			
	Total	1044795.21	491				
Total Course Points	Age	7775.66	1	7775.66	3.78	.052	.01
	Gender	34.78	1	34.78	.02	.897	.00
	Discussion Posts	9411.58	2	4705.79	2.29	.102	.01
	Department Major	12189.64	3	4063.22	1.98	.117	.01
	Discussion condition	2744.29	1	2744.29	1.34	.248	.00
	Discussion Posts X Department Major	4470.63	6	745.11	.36	.902	.01
	Discussion Posts X Discussion condition	9116.58	2	4558.29	2.22	.110	.01
	Department Major X Discussion condition	1286.47	3	428.82	.21	.890	.00
	Discussion Posts X Department Major X Discussion condition	5351.40	6	891.90	.43	.856	.01
	Error	957557.89	466	2054.85			
	Total	1044795.21	491				

Table 23 (Cont.).

Outcome	Factor/Covariate	SS	df	MS	F	p	η^2_p
Final Exam	Age	5.47	1	5.47	.14	.713	.00
	Gender	11.05	1	11.05	.27	.601	.00
	Discussion Posts	22.78	2	11.39	.28	.754	.00
	Department Major	162.05	3	54.02	1.34	.261	.01
	Discussion condition	81.53	1	81.53	2.02	.156	.01
	Discussion Posts X Department Major	54.54	6	9.09	.23	.968	.00
	Discussion Posts X Discussion condition	23.36	2	11.68	.29	.749	.00
	Department Major X Discussion condition	74.51	3	24.84	.62	.605	.00
	Discussion Posts X Department Major X Discussion condition	121.56	6	20.26	.50	.807	.01
	Error	17859.92	443	40.32			
	Total	19112.92	468				
Final Exam	Age	1.33	1	1.33	.03	.856	.00
	Gender	7.31	1	7.31	.18	.670	.00
	Discussion Posts	21.43	2	10.71	.27	.766	.00
	College Major	185.22	3	61.74	1.54	.203	.01
	Discussion condition	92.82	1	92.82	2.32	.129	.01
	Discussion Posts X College Major	53.39	6	8.90	.22	.970	.00
	Discussion Posts X Discussion condition	54.42	2	27.21	.68	.508	.00
	College Major X Discussion condition	71.38	3	23.79	.59	.620	.00
	Discussion Posts X College Major X Discussion condition	112.46	6	18.74	.47	.832	.01
	Error	17761.94	443	40.10			
	Total	19112.92	468				

Table 23 (Cont.).

Outcome	Factor/Covariate	SS	df	MS	F	p	η^2_p
Discussion Points	Age	92.34	1	92.34	1.34	.249	.01
	Gender	7.08	1	7.08	.10	.749	.00
	Department Major	208.12	3	69.38	1.00	.392	.01
	Discussion condition	669.66	1	669.66	9.70	.002	.04
	Department Major X Discussion condition	428.17	3	142.72	2.07	.106	.03
	Error	15541.82	225	69.08			
	Total	18018.26	234				
Discussion Points	Age	73.80	1	73.80	1.06	.304	.01
	Gender	12.16	1	12.16	.18	.676	.00
	College Major	251.21	3	83.74	1.20	.309	.02
	Discussion condition	1202.00	1	1202.00	17.29	.000	.07
	College Major X Discussion condition	263.83	3	87.94	1.27	.287	.02
	Error	15642.25	225	69.52			
	Total	18018.26	234				

Table 24.

ANOVA summaries for course performance measures by major and discussion postings controlling for GPA and English grades.

Outcome	Factor/Covariate	*SS*	*df*	*MS*	*F*	*p*	η^2_p
Quiz Points	Age	54.54	1	54.54	.18	.675	.00
	Gender	37.75	1	37.75	.12	.727	.00
	ENGL1	1383.94	1	1383.94	4.51	.037	.06
	ENGL2	39.95	1	39.95	.13	.719	.00
	Semester GPA	30755.28	1	30755.28	100.21	.000	.60
	Discussion Posts	369.81	2	184.90	.60	.550	.02
	Department Major	1421.18	3	473.73	1.54	.211	.07
	Discussion condition	53.86	1	53.86	.18	.677	.00
	Discussion Posts X Department Major	2964.39	6	494.06	1.61	.158	.13
	Discussion Posts X Discussion condition	1469.04	2	734.52	2.39	.099	.07
	Department Major X Discussion condition	456.86	2	228.43	.74	.479	.02
	Discussion Posts X Department Major X Discussion condition	1271.94	2	635.97	2.07	.134	.06
	Error	20563.01	67	306.91			
	Corrected Total	70461.03	90				
Quiz Points	Age	.69	1	.69	.00	.961	.00
	Gender	134.09	1	134.09	.46	.499	.01
	ENGL1	1375.49	1	1375.49	4.73	.033	.07
	ENGL2	.72	1	.72	.00	.960	.00
	Semester GPA	31517.17	1	31517.17	108.47	.000	.62
	Discussion Posts	338.55	2	169.28	.58	.561	.02
	College Major	1530.98	3	510.33	1.76	.164	.07
	Discussion condition	148.65	1	148.65	.51	.477	.01
	Discussion Posts X College Major	2596.98	6	432.83	1.49	.195	.12
	Discussion Posts X Discussion condition	1036.89	2	518.45	1.78	.176	.05
	College Major X Discussion condition	909.54	2	454.77	1.57	.217	.05

Table 24 (Cont.).

Outcome	Factor/Covariate	*SS*	*df*	*MS*	*F*	*p*	η^2_p
	Discussion Posts X College Major X Discussion condition	652.16	2	326.08	1.12	.332	.03
	Error	19467.44	67	290.56			
	Corrected Total	70461.03	90				
Total Course Points	Age	815.26	1	815.26	1.40	.240	.02
	Gender	238.91	1	238.91	.41	.524	.01
	ENGL1	6045.84	1	6045.84	10.40	.002	.13
	ENGL2	819.52	1	819.52	1.41	.239	.02
	Semester GPA	68738.80	1	68738.80	118.24	.000	.64
	Discussion Posts	2635.83	2	1317.92	2.27	.111	.06
	Department Major	1131.98	3	377.33	.65	.586	.03
	Discussion condition	1766.15	1	1766.15	3.04	.086	.04
	Discussion Posts X Department Major	8354.99	6	1392.50	2.40	.037	.17
	Discussion Posts X Discussion condition	2179.60	2	1089.80	1.88	.161	.05
	Department Major X Discussion condition	732.97	2	366.48	.63	.535	.02
	Discussion Posts X Department Major X Discussion condition	1380.81	2	690.41	1.19	.311	.03
	Error	39531.21	68	581.34			
	Corrected Total	148373.22	91				
Total Course Points	Age	1367.42	1	1367.42	2.62	.110	.04
	Gender	17.79	1	17.79	.03	.854	.00
	ENGL1	5022.65	1	5022.65	9.64	.003	.12
	ENGL2	1339.23	1	1339.23	2.57	.114	.04
	Semester GPA	62830.31	1	62830.31	120.56	.000	.64
	Discussion Posts	3074.53	2	1537.27	2.95	.059	.08
	College Major	634.88	3	211.63	.41	.749	.02
	Discussion condition	3163.38	1	3163.38	6.07	.016	.08
	Discussion Posts X College Major	6543.32	6	1090.55	2.09	.065	.16
	Discussion Posts X Discussion condition	801.39	2	400.70	.77	.468	.02

Table 24 (Cont.).

Outcome	Factor/Covariate	*SS*	*df*	*MS*	*F*	*p*	η^2_p
	College Major X Discussion condition	2113.51	2	1056.76	2.03	.140	.06
	Discussion Posts X College Major X Discussion condition	179.25	2	89.62	.17	.842	.01
	Error	35439.36	68	521.17			
	Corrected Total	148373.22	91				
Final Exam	Age	2.17	1	2.17	.09	.768	.00
	Gender	8.15	1	8.15	.33	.569	.01
	ENGL1	109.20	1	109.20	4.40	.040	.06
	ENGL2	147.50	1	147.50	5.95	.018	.08
	Semester GPA	664.16	1	664.16	26.77	.000	.29
	Discussion Posts	12.22	2	6.11	.25	.782	.01
	Department Major	14.48	3	4.83	.19	.900	.01
	Discussion condition	.88	1	.88	.04	.852	.00
	Discussion Posts X Department Major	136.97	6	22.83	.92	.486	.08
	Discussion Posts X Discussion condition	64.62	2	32.31	1.30	.279	.04
	Department Major X Discussion condition	34.01	2	17.00	.69	.508	.02
	Discussion Posts X Department Major X Discussion condition	57.26	2	28.63	1.15	.322	.03
	Error	1612.80	65	24.81			
	Corrected Total	2788.25	88				
Final Exam	Age	10.28	1	10.28	.50	.482	.01
	Gender	7.81	1	7.81	.38	.540	.01
	ENGL1	123.43	1	123.43	6.01	.017	.09
	ENGL2	251.26	1	251.26	12.24	.001	.16
	Semester GPA	595.19	1	595.19	28.98	.000	.31
	Discussion Posts	33.16	2	16.58	.81	.450	.02
	College Major	30.31	3	10.10	.49	.689	.02
	Discussion condition	1.96	1	1.96	.10	.758	.00
	Discussion Posts X College Major	185.66	6	30.94	1.51	.190	.12

Table 24 (Cont.).

Outcome	Factor/Covariate	*SS*	*df*	*MS*	*F*	*p*	η^2_p
	Discussion Posts X Discussion condition	83.58	2	41.79	2.04	.139	.06
	College Major X Discussion condition	64.86	2	32.43	1.58	.214	.05
	Discussion Posts X College Major X Discussion condition	95.05	2	47.52	2.31	.107	.07
	Error	1334.82	65	20.54			
	Corrected Total	2788.25	88				
Discussion Points	Age	4.40	1	4.40	.10	.760	.00
	Gender	50.67	1	50.67	1.09	.305	.04
	ENGL1	9.95	1	9.95	.21	.647	.01
	ENGL2	1.43	1	1.43	.03	.862	.00
	Semester GPA	24.11	1	24.11	.52	.477	.02
	Department Major	121.08	3	40.36	.87	.468	.08
	Discussion condition	4.44	1	4.44	.10	.759	.00
	Department Major X Discussion condition	333.67	2	166.84	3.60	.040	.20
	Error	1345.69	29	46.40			
	Corrected Total	1994.49	40				
Discussion Points	Age	12.57	1	12.57	.25	.621	.01
	Gender	19.26	1	19.26	.38	.541	.01
	ENGL1	11.72	1	11.72	.23	.633	.01
	ENGL2	7.51	1	7.51	.15	.702	.01
	Semester GPA	11.79	1	11.79	.24	.632	.01
	College Major	129.13	3	43.04	.86	.475	.08
	Discussion condition	18.46	1	18.46	.37	.549	.01
	College Major X Discussion condition	191.21	2	95.61	1.90	.167	.12
	Error	1457.37	29	50.25			
	Corrected Total	1994.49	40				

Table 25.

Descriptive statistics on total course points by discussion posts and department major.

				95% CI	
Discussion Posts	Department Major	*M*	*SE*	*LLCI*	*ULCI*
None	Psychology	187.91	14.45	159.08	216.75
	Nursing	196.36	13.05	170.31	222.41
	Traditional majors	168.64	12.62	143.46	193.82
	Interdisciplinary majors	215.81	11.02	193.82	237.81
One	Psychology	207.44	19.09	169.34	245.54
	Nursing	211.60	7.83	195.98	227.22
	Traditional majors	213.91	15.24	183.50	244.32
	Interdisciplinary majors	198.78	12.21	174.42	223.14
Two	Psychology	195.77	7.79	180.22	211.32
	Nursing	195.69	11.16	173.43	217.95
	Traditional majors	194.81	24.44	146.04	243.58
	Interdisciplinary majors	187.91	14.45	159.08	216.75

Table 26.

Table of Correlations between time 1 and time 2 CT measures.

	Time 2																	
Time1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. CT	.65***																	
2. CTF	.59**	.56***																
3. CTR	.56**	.41**	.53***															
4. VR	.56**	.42**	.53**	.48***														
5. VRF	.26*	.18	.27*	.32**	.36**													
6. VRR	.54**	.41**	.51**	.41**	.27*	.38***												
7. AA	.50**	.39**	.47**	.28*	.23*	.24*	.43***											
8. AAF	.57**	.52**	.46**	.32**	.34**	.24*	.44**	.46***										
9. AAR	.26*	.13	.30**	.14	.05	.15	.27*	.21	.23**									
10. HT	.51**	.48**	.40**	.17	.14	.15	.44**	.45**	.27*	.48***								
11. HTF	.38**	.40**	.27*	.10	.16	.05	.31**	.30**	.19	.40**	.43***							
12. HTR	.42**	.35**	.37**	.18	.06	.19	.39**	.41**	.23*	.34**	.18	.42***						
13. LU	.58**	.38**	.59**	.29**	.28**	.24*	.41**	.34**	.31**	.44**	.24*	.53**	.52***					
14. LUF	.49**	.39**	.45**	.26*	.39**	.16	.22*	.21	.14	.41**	.23*	.47**	.46**	.45***				
15. LUR	.48**	.27*	.53**	.24*	.14	.23*	.42**	.34**	.34**	.35**	.18	.44**	.43**	.26*	.42***			
16. PS	.44**	.45**	.33**	.17	.14	.15	.33**	.28*	.25*	.32**	.27*	.28*	.13	.04	.14	.49***		
17. PSF	.36**	.37**	.26*	.19	.18	.15	.20	.16	.17	.25*	.21	.22*	.08	.09	.06	.45**	.41***	
18. PSR	.38**	.37**	.30**	.07	.00	.08	.37**	.34**	.27*	.29**	.25*	.24*	.14	-.05	.20	.34**	.31**	.19

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents include forced-choice (F) and free-response (R) items.
* – $p < .05$. ** – $p < .01$. *** – $p < .001$.

Table 27.

Correlation Summary Table between Student Engagement Index and CT measures.

	Time 1		Time 2		Time 1/Time 2		*r*-difference	
Item	*r*	*p*	*r*	*p*	*r*	*p*	*t*	*p*
CT	-.17	.128	.02	.894	.65	< .001	-2.03	.052
CTF	-.19	.081	.05	.620	.56	< .001	-2.44	.022
CTR	-.10	.340	-.03	.794	.53	< .001	-.72	.306
VR	-.18	.105	-.07	.506	.48	< .001	-.93	.257
VRF	-.09	.401	-.09	.423	.36	.001	-.03	.398
VRR	-.18	.105	-.04	.705	.38	< .001	-1.12	.211
AA	.00	.984	.02	.876	.43	< .001	-.16	.393
AAF	-.08	.469	.05	.677	.46	< .001	-1.10	.216
AAR	.08	.485	-.02	.883	.23	.038	.68	.316
HT	-.19	.084	-.01	.922	.48	< .001	-1.62	.108
HTF	-.19	.082	-.02	.881	.43	< .001	-1.49	.131
HTR	-.13	.232	.00	.986	.42	< .001	-1.13	.210
LU	-.22	.040	.11	.313	.52	< .001	-3.29	.002
LUF	-.04	.746	.05	.645	.45	< .001	-.74	.302
LUR	-.26	.015	.12	.275	.42	< .001	-3.44	.001
PS	-.04	.748	.01	.907	.49	< .001	-.43	.362
PSF	-.15	.184	.10	.353	.41	< .001	-2.11	.044
PSR	.12	.281	-.13	.232	.19	.076	1.81	.078

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents include forced-choice (F) and free-response (R) items.

Table 28.

Correlation Summary Table between Discussion Posting and CT measures.

	Time 1		Time 2		Time 1/Time 2		*r*-difference	
Item	*r*	*p*	*r*	*p*	*r*	*p*	*t*	*p*
CT	-.22	.038	-.02	.858	.65	< .001	-2.32	.029
CTF	-.14	.194	.08	.493	.56	< .001	-2.16	.040
CTR	-.23	.030	-.11	.318	.53	< .001	-1.21	.191
VR	-.32	.003	-.09	.392	.48	< .001	-2.16	.040
VRF	-.07	.539	-.02	.877	.36	.001	-.40	.366
VRR	-.36	.001	-.11	.335	.38	< .001	-2.28	.031
AA	-.02	.837	-.02	.833	.43	< .001	.00	.398
AAF	-.06	.562	-.01	.940	.46	< .001	-.48	.354
AAR	.03	.802	-.03	.791	.23	.038	.41	.365
HT	-.26	.017	-.09	.433	.48	< .001	-1.58	.114
HTF	-.15	.158	-.02	.851	.43	< .001	-1.15	.204
HTR	-.29	.006	-.13	.242	.42	< .001	-1.47	.135
LU	-.23	.032	-.05	.660	.52	< .001	-1.76	.086
LUF	-.08	.491	.04	.742	.45	< .001	-.97	.249
LUR	-.26	.018	-.09	.419	.42	< .001	-1.46	.138
PS	-.01	.898	.09	.410	.49	< .001	-.94	.254
PSF	-.08	.481	.16	.133	.41	< .001	-2.06	.049
PSR	.07	.520	-.06	.563	.19	.076	.96	.251

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents include forced-choice (F) and free-response (R) items.

Table 29.

Moderated regression models between time 1 and time 2 CT scores.

Outcome Model	Predictor	*B*	*SE*	*t*	*p*	*LLCI*	*ULCI*
t2 CT (n = 80)	Constant	-.24	.35	-.67	.502	-.94	.47
	College Major	-.04	.13	-.32	.750	-.30	.22
	t1 CT	.94	.35	2.65	.010	.23	1.64
	t1 CT X College Major	-.06	.13	-.48	.632	-.32	.19
	Discussion Posts	.08	.35	.24	.809	-.61	.78
	t1 CT X Discussion Posts	-.26	.38	-.70	.488	-1.02	.49
	College Major X Discussion Posts	.05	.13	.41	.686	-.20	.31
	t1 CT X College Major X Discussion Posts	.07	.13	.53	.595	-.19	.33
Model Summary	$F(7,72) = 8.77$, $p < .001$, $R^2 = .46$.						
t2 CTF (n = 80)	Constant	-.13	.32	-.41	.682	-.77	.51
	College Major	.02	.12	.20	.843	-.21	.26
	t1 CTF	.83	.36	2.29	.025	.11	1.55
	t1 CTF X College Major	-.07	.13	-.52	.603	-.33	.19
	Discussion Posts	.10	.34	.28	.777	-.57	.76
	t1 CTF X Discussion Posts	-.21	.43	-.49	.629	-1.05	.64
	College Major X Discussion Posts	.05	.13	.37	.714	-.21	.30
	t1 CTF X College Major X Discussion Posts	.05	.15	.34	.733	-.24	.35
Model Summary	$F(7,72) = 5.43$, $p < .001$, $R^2 = .35$.						
t2 CTR (n = 80)	Constant	.19	.43	.44	.664	-.68	1.06
	College Major	-.19	.16	-1.14	.257	-.51	.14
	t1 CTR	.44	.39	1.14	.258	-.33	1.21
	t1 CTR X College Major	.05	.15	.31	.758	-.25	.35
	Discussion Posts	-.14	.43	-.32	.749	-.99	.71
	t1 CTR X Discussion Posts	-.05	.42	-.12	.905	-.89	.79
	College Major X Discussion Posts	.07	.16	.45	.654	-.24	.39
	t1 CTR X College Major X Discussion Posts	.04	.15	.28	.780	-.26	.34
Model Summary	$F(7,72) = 4.62$, $p < .001$, $R^2 = .31$.						
t2 VR (n = 80)	Constant	-.54	.40	-1.36	.178	-1.33	.25
	College Major	.12	.15	.77	.445	-.19	.43
	t1 VR	.59	.40	1.47	.146	-.21	1.39
	t1 VR X College Major	-.06	.15	-.41	.682	-.36	.24
	Discussion Posts	.38	.37	1.02	.309	-.36	1.12
	t1 VR X Discussion Posts	-.08	.54	-.14	.886	-1.15	.99
	College Major X Discussion Posts	-.13	.15	-.86	.393	-.42	.17
	t1 VR X College Major X Discussion Posts	.05	.20	.22	.826	-.36	.45
Model Summary	$F(7,72) = 3.03$, $p = .008$, $R^2 = .23$.						

Note. Total critical thinking (CT), verbal response (VR), forced-choice (F), and constructed-response (R).

Table 29 (Cont.).

Outcome Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 VRF (n = 80)	Constant	-.36	.40	-.89	.380	-1.15	.44
	College Major	.08	.15	.50	.620	-.23	.38
	t1 VRF	.62	.42	1.48	.140	-.21	1.44
	t1 VRF X College Major	-.08	.15	-.51	.610	-.38	.22
	Discussion Posts	.30	.40	.75	.460	-.50	1.10
	t1 VRF X Discussion Posts	-.53	.59	-.90	.370	-1.70	.64
	College Major X Discussion Posts	-.12	.16	-.75	.450	-.43	.19
	t1 VRF X College Major X Discussion Posts	.16	.22	.74	.460	-.27	.59
Model Summary	*F*(7,72) = 1.63, *p* = .141, R^2 = .14.						
t2 VRR (n = 80)	Constant	-.51	.39	-1.32	.190	-1.29	.26
	College Major	.15	.15	1.03	.310	-.14	.45
	t1 VRR	.53	.39	1.38	.170	-.24	1.31
	t1 VRR X College Major	-.11	.15	-.73	.470	-.40	.19
	Discussion Posts	.39	.38	1.04	.300	-.36	1.14
	t1 VRR X Discussion Posts	.08	.53	.15	.880	-.98	1.15
	College Major X Discussion Posts	-.14	.15	-.91	.360	-.45	.17
	t1 VRR X College Major X Discussion Posts	.03	.21	.17	.870	-.38	.44
Model Summary	*F*(7,72) = 1.94, *p* = .075, R^2 = .16.						
t2 AA (n = 80)	Constant	.24	.38	.61	.541	-.53	1.00
	College Major	-.12	.14	-.89	.376	-.39	.15
	t1 AA	.67	.40	1.70	.094	-.12	1.46
	t1 AA X College Major	-.13	.15	-.87	.385	-.43	.17
	Discussion Posts	-.12	.40	-.29	.772	-.91	.68
	t1 AA X Discussion Posts	-.04	.43	-.10	.922	-.90	.81
	College Major X Discussion Posts	.01	.14	.05	.957	-.28	.29
	t1 AA X College Major X Discussion Posts	.07	.14	.46	.645	-.22	.35
Model Summary	*F*(7,72) = 3.38, *p* = .004, R^2 = .25.						
t2 AAF (n = 80)	Constant	.12	.33	.37	.716	-.53	.77
	College Major	-.03	.12	-.25	.802	-.27	.21
	t1 AAF	.60	.40	1.50	.139	-.20	1.41
	t1 AAF X College Major	-.07	.16	-.45	.656	-.38	.24
	Discussion Posts	.07	.34	.21	.833	-.60	.75
	t1 AAF X Discussion Posts	.01	.42	.03	.975	-.82	.84
	College Major X Discussion Posts	-.04	.13	-.32	.751	-.30	.22
	t1 AAF X College Major X Discussion Posts	.00	.14	.00	.997	-.29	.29
Model Summary	*F*(7,72) = 3.17, *p* = .006, R^2 = .24.						

Note. Verbal response (VR), argument analysis (AA), forced-choice (F), and constructed-response (R).

Table 29 (Cont.).

Outcome Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 AAR (n = 80)	Constant	.55	.45	1.21	.230	-.35	1.45
	College Major	-.22	.17	-1.33	.190	-.55	.11
	t1 AAR	.34	.43	.79	.430	-.52	1.20
	t1 AAR X College Major	-.07	.17	-.43	.670	-.41	.27
	Discussion Posts	.03	.52	.05	.960	-1.01	1.06
	t1 AAR X Discussion Posts	-.32	.49	-.66	.510	-1.30	.66
	College Major X Discussion Posts	-.03	.18	-.18	.850	-.39	.32
	t1 AAR X College Major X Discussion Posts	.15	.17	.86	.390	-.19	.48
Model Summary	F(7,72) = 1.48, p = .187, R^2 = .13.						
t2 HT (n = 80)	Constant	.30	.36	.85	.396	-.40	1.01
	College Major	-.09	.13	-.74	.461	-.35	.16
	t1 HT	.46	.32	1.43	.158	-.18	1.09
	t1 HT X College Major	.00	.12	-.01	.991	-.25	.24
	Discussion Posts	-.16	.35	-.45	.656	-.86	.54
	t1 HT X Discussion Posts	.00	.35	.01	.993	-.69	.69
	College Major X Discussion Posts	.10	.14	.74	.462	-.17	.37
	t1 HT X College Major X Discussion Posts	.03	.14	.21	.834	-.26	.32
Model Summary	F(7,72) = 4.10, p = .001, R^2 = .28.						
t2 HTF (n = 80)	Constant	.12	.36	.33	.745	-.60	.83
	College Major	.01	.13	.09	.925	-.25	.28
	t1 HTF	.33	.33	1.02	.311	-.32	.98
	t1 HTF X College Major	.05	.12	.42	.674	-.19	.30
	Discussion Posts	-.10	.38	-.27	.786	-.86	.66
	t1 HTF X Discussion Posts	.30	.48	.63	.532	-.66	1.26
	College Major X Discussion Posts	.09	.14	.64	.524	-.19	.38
	t1 HTF X College Major X Discussion Posts	-.10	.20	-.47	.639	-.50	.31
Model Summary	F(7,72) = 3.12, p = .006, R^2 = .23.						
t2 HTR (n = 80)	Constant	.48	.40	1.19	.237	-.32	1.28
	College Major	-.18	.14	-1.26	.212	-.46	.10
	t1 HTR	.52	.35	1.49	.141	-.18	1.23
	t1 HTR X College Major	-.13	.14	-.89	.376	-.41	.16
	Discussion Posts	-.19	.39	-.49	.622	-.96	.58
	t1 HTR X Discussion Posts	-.29	.33	-.88	.383	-.96	.37
	College Major X Discussion Posts	.07	.15	.49	.626	-.23	.38
	t1 HTR X College Major X Discussion Posts	.19	.13	1.47	.147	-.07	.45
Model Summary	F(7,72) = 3.51, p = .003, R^2 = .25.						

Note. Argument analysis (AA), hypothesis testing (HT), forced-choice (F), and constructed-response (R).

Table 29 (Cont.).

Outcome Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 LU (n = 80)	Constant	.13	.39	.33	.745	-.64	.89
	College Major	-.12	.14	-.84	.404	-.40	.16
	t1 LU	.45	.35	1.28	.205	-.25	1.15
	t1 LU X College Major	.06	.12	.47	.641	-.18	.30
	Discussion Posts	-.13	.39	-.33	.745	-.91	.65
	t1 LU X Discussion Posts	.00	.52	-.01	.994	-1.05	1.04
	College Major X Discussion Posts	.11	.15	.73	.465	-.19	.41
	t1 LU X College Major X Discussion Posts	-.03	.19	-.16	.874	-.41	.35
Model Summary	$F(7,72) = 4.62$, $p < .001$, $R^2 = .31$.						
t2 LUF (n = 80)	Constant	-.22	.35	-.64	.527	-.93	.48
	College Major	.06	.13	.46	.643	-.20	.32
	t1 LUF	.75	.45	1.67	.098	-.14	1.63
	t1 LUF X College Major	-.04	.14	-.29	.775	-.33	.25
	Discussion Posts	.42	.40	1.07	.290	-.37	1.21
	t1 LUF X Discussion Posts	-.49	.42	-1.16	.250	-1.33	.35
	College Major X Discussion Posts	-.12	.15	-.82	.416	-.42	.18
	t1 LUF X College Major X Discussion Posts	.13	.15	.85	.401	-.17	.42
Model Summary	$F(7,72) = 3.45$, $p = .003$, $R^2 = .25$.						
t2 LUR (n = 80)	Constant	.43	.43	1.01	.316	-.42	1.29
	College Major	-.21	.16	-1.31	.194	-.53	.11
	t1 LUR	.23	.35	.65	.517	-.48	.94
	t1 LUR X College Major	.09	.13	.69	.490	-.16	.34
	Discussion Posts	-.57	.43	-1.34	.183	-1.42	.28
	t1 LUR X Discussion Posts	-.12	.54	-.22	.826	-1.20	.96
	College Major X Discussion Posts	.25	.17	1.50	.138	-.08	.58
	t1 LUR X College Major X Discussion Posts	.03	.19	.16	.873	-.35	.41
Model Summary	$F(7,72) = 2.71$, $p = .015$, $R^2 = .21$.						
t2 PS (n = 80)	Constant	-.15	.35	-.42	.675	-.85	.55
	College Major	.00	.13	.01	.993	-.26	.26
	t1 PS	.96	.48	2.02	.047	.01	1.92
	t1 PS X College Major	-.13	.17	-.76	.449	-.46	.21
	Discussion Posts	-.03	.48	-.06	.950	-.98	.93
	t1 PS X Discussion Posts	-.19	.47	-.40	.689	-1.12	.74
	College Major X Discussion Posts	.07	.17	.42	.677	-.26	.40
	t1 PS X College Major X Discussion Posts	.07	.16	.44	.664	-.25	.39
Model Summary	$F(7,72) = 3.74$, $p = .002$, $R^2 = .27$.						

Note. Likelihood and uncertainty (LU), problem solving (PS), forced-choice (F), and constructed-response (R).

Table 29 (Cont.).

Outcome Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 PSF (n = 80)	Constant	.11	.36	.31	.754	-.61	.84
	College Major	-.08	.13	-.58	.565	-.34	.19
	t1 PSF	.01	.44	.02	.984	-.88	.89
	t1 PSF X College Major	.17	.16	1.06	.293	-.15	.49
	Discussion Posts	-.35	.45	-.78	.440	-1.25	.55
	t1 PSF X Discussion Posts	.54	.46	1.16	.248	-.38	1.46
	College Major X Discussion Posts	.23	.16	1.43	.156	-.09	.55
	t1 PSF X College Major X Discussion Posts	-.18	.16	-1.17	.246	-.50	.13
Model Summary	*F*(7,72) = 3.11, *p* = .006, R^2 = .23.						
t2 PSR (n = 80)	Constant	-.08	.37	-.21	.830	-.81	.65
	College Major	.04	.14	.31	.760	-.23	.32
	t1 PSR	.50	.40	1.25	.220	-.29	1.29
	t1 PSR X College Major	-.09	.15	-.59	.560	-.39	.21
	Discussion Posts	.54	.51	1.06	.290	-.47	1.54
	t1 PSR X Discussion Posts	-.38	.52	-.73	.470	-1.43	.66
	College Major X Discussion Posts	-.23	.18	-1.25	.220	-.59	.14
	t1 PSR X College Major X Discussion Posts	.10	.19	.53	.600	-.28	.49
Model Summary	*F*(7,72) = .95, *p* = .475, R^2 = .08.						
t2 CT (n = 80)	Constant	-.31	.38	-.82	.417	-1.07	.45
	Department Major	-.01	.13	-.08	.935	-.27	.25
	t1 CT	1.07	.36	3.01	.004	.36	1.78
	t1 CT X Department Major	-.11	.13	-.91	.366	-.36	.14
	Discussion Posts	.20	.35	.56	.576	-.50	.90
	t1 CT X Discussion Posts	-.23	.39	-.60	.548	-1.00	.54
	Department Major X Discussion Posts	.00	.12	.01	.990	-.24	.24
	t1 CT X Department Major X Discussion Posts	.06	.13	.45	.653	-.19	.31
Model Summary	*F*(7,72) = 8.85, *p* < .001, R^2 = .46.						
t2 CTF (n = 80)	Constant	-.05	.37	-.14	.887	-.78	.68
	Department Major	-.01	.13	-.07	.946	-.26	.24
	t1 CTF	1.03	.46	2.26	.027	.12	1.94
	t1 CTF X Department Major	-.14	.17	-.87	.388	-.47	.19
	Discussion Posts	.27	.35	.78	.440	-.43	.98
	t1 CTF X Discussion Posts	-.61	.43	-1.42	.161	-1.47	.25
	Department Major X Discussion Posts	-.02	.12	-.15	.881	-.27	.23
	t1 CTF X Department Major X Discussion Posts	.19	.14	1.29	.201	-.10	.47
Model Summary	*F*(7,72) = 5.70, *p* < .001, R^2 = .36.						

Note. Problem solving (PS), total critical thinking (CT), forced-choice (F), and constructed-response (R).

Table 29 (Cont.).

Outcome Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 CTR (n = 80)	Constant	-.11	.44	-.25	.803	-1.00	.77
	Department Major	-.06	.15	-.40	.694	-.36	.24
	t1 CTR	.77	.36	2.13	.036	.05	1.50
	t1 CTR X Department Major	-.09	.13	-.71	.481	-.35	.17
	Discussion Posts	-.25	.42	-.59	.554	-1.08	.58
	t1 CTR X Discussion Posts	.46	.44	1.04	.302	-.42	1.35
	Department Major X Discussion Posts	.08	.14	.58	.564	-.20	.37
	t1 CTR X Department Major X Discussion Posts	-.13	.15	-.85	.400	-.43	.17
Model Summary	$F(7,72) = 4.93$, $p < .001$, $R^2 = .32$.						
t2 VR (n = 80)	Constant	-.49	.39	-1.23	.222	-1.27	.30
	Department Major	.09	.14	.65	.517	-.19	.37
	t1 VR	.64	.40	1.58	.118	-.17	1.45
	t1 VR X Department Major	-.08	.14	-.53	.594	-.36	.21
	Discussion Posts	.53	.37	1.43	.158	-.21	1.27
	t1 VR X Discussion Posts	-.16	.47	-.33	.742	-1.09	.78
	Department Major X Discussion Posts	-.17	.13	-1.30	.199	-.44	.09
	t1 VR X Department Major X Discussion Posts	.07	.16	.46	.649	-.25	.40
Model Summary	$F(7,72) = 3.21$, $p = .005$, $R^2 = .24$.						
t2 VRF (n = 80)	Constant	-.03	.42	-.06	.950	-.87	.82
	Department Major	-.05	.15	-.31	.760	-.35	.25
	t1 VRF	.53	.50	1.06	.290	-.47	1.53
	t1 VRF X Department Major	-.05	.18	-.26	.800	-.41	.32
	Discussion Posts	.40	.44	.91	.360	-.47	1.28
	t1 VRF X Discussion Posts	-.78	.51	-1.52	.130	-1.81	.24
	Department Major X Discussion Posts	-.15	.16	-.92	.360	-.47	.17
	t1 VRF X Department Major X Discussion Posts	.23	.17	1.32	.190	-.12	.58
Model Summary	$F(7,72) = 2.03$, $p = .063$, $R^2 = .16$.						
t2 VRR (n = 80)	Constant	-.50	.39	-1.28	.203	-1.27	.27
	Department Major	.13	.14	.97	.335	-.14	.41
	t1 VRR	.38	.38	.99	.326	-.38	1.14
	t1 VRR X Department Major	-.04	.14	-.29	.771	-.31	.23
	Discussion Posts	.67	.38	1.77	.082	-.09	1.42
	t1 VRR X Discussion Posts	.84	.50	1.70	.093	-.14	1.83
	Department Major X Discussion Posts	-.23	.14	-1.71	.092	-.51	.04
	t1 VRR X Department Major X Discussion Posts	-.24	.17	-1.41	.164	-.58	.10
Model Summary	$F(7,72) = 2.59$, $p = .019$, $R^2 = .20$.						

Note. Total critical thinking (CT), verbal reasoning (VR), forced-choice (F), and constructed-response (R).

Table 29 (Cont.).

Outcome Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 AA (n = 80)	Constant	.05	.43	.13	.900	-.80	.90
	Department Major	-.06	.14	-.41	.681	-.34	.22
	t1 AA	1.05	.38	2.79	.007	.30	1.80
	t1 AA X Department Major	-.26	.13	-2.05	.044	-.52	-.01
	Discussion Posts	-.07	.44	-.17	.868	-.94	.80
	t1 AA X Discussion Posts	-.42	.44	-.94	.349	-1.30	.47
	Department Major X Discussion Posts	.00	.15	-.01	.991	-.30	.30
	t1 AA X Department Major X Discussion Posts	.20	.15	1.37	.176	-.09	.50
Model Summary	$F(7,72) = 4.00$, $p = .001$, $R^2 = .28$.						
t2 AAF (n = 80)	Constant	.35	.36	.96	.340	-.37	1.07
	Department Major	-.12	.13	-.99	.323	-.37	.12
	t1 AAF	1.02	.38	2.70	.009	.27	1.77
	t1 AAF X Department Major	-.22	.13	-1.69	.096	-.48	.04
	Discussion Posts	-.29	.35	-.83	.412	-1.00	.41
	t1 AAF X Discussion Posts	-.46	.41	-1.11	.270	-1.28	.36
	Department Major X Discussion Posts	.11	.12	.87	.389	-.14	.36
	t1 AAF X Department Major X Discussion Posts	.17	.13	1.28	.205	-.09	.42
Model Summary	$F(7,72) = 3.97$, $p = .001$, $R^2 = .28$.						
t2 AAR (n = 80)	Constant	.08	.53	.16	.880	-.97	1.14
	Department Major	-.04	.18	-.22	.830	-.39	.31
	t1 AAR	.75	.48	1.58	.120	-.20	1.71
	t1 AAR X Department Major	-.22	.17	-1.32	.190	-.56	.11
	Discussion Posts	.13	.60	.21	.830	-1.06	1.31
	t1 AAR X Discussion Posts	-.46	.56	-.82	.420	-1.56	.65
	Department Major X Discussion Posts	-.09	.21	-.41	.680	-.51	.33
	t1 AAR X Department Major X Discussion Posts	.21	.19	1.10	.280	-.17	.58
Model Summary	$F(7,72) = 1.19$, $p = .318$, $R^2 = .10$.						
t2 HT (n = 80)	Constant	.46	.41	1.14	.259	-.35	1.28
	Department Major	-.15	.14	-1.05	.296	-.42	.13
	t1 HT	.46	.35	1.30	.197	-.24	1.16
	t1 HT X Department Major	-.01	.13	-.07	.947	-.26	.25
	Discussion Posts	-.03	.38	-.09	.932	-.79	.73
	t1 HT X Discussion Posts	-.04	.32	-.13	.899	-.68	.60
	Department Major X Discussion Posts	.05	.14	.34	.735	-.23	.32
	t1 HT X Department Major X Discussion Posts	.04	.12	.37	.716	-.20	.29
Model Summary	$F(7,72) = 4.29$, $p = .001$, $R^2 = .29$.						

Note. Argument analysis (AA), hypothesis testing (HT), forced-choice (F), and constructed-response (R).

Table 29 (Cont.).

Outcome Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 HTF (n = 80)	Constant	.34	.41	.85	.400	-.46	1.15
	Department Major	-.07	.14	-.49	.626	-.35	.21
	t1 HTF	.43	.36	1.20	.234	-.28	1.14
	t1 HTF X Department Major	.01	.13	.06	.954	-.25	.26
	Discussion Posts	.18	.42	.42	.676	-.66	1.01
	t1 HTF X Discussion Posts	.24	.41	.60	.548	-.56	1.05
	Department Major X Discussion Posts	-.02	.15	-.14	.891	-.33	.29
	t1 HTF X Department Major X Discussion Posts	-.06	.16	-.41	.685	-.37	.25
Model Summary	*F*(7,72) = 3.03, *p* = .007, R^2 = .23.						
t2 HTR (n = 80)	Constant	.46	.45	1.03	.309	-.44	1.36
	Department Major	-.16	.15	-1.05	.298	-.47	.14
	t1 HTR	.52	.36	1.43	.156	-.20	1.24
	t1 HTR X Department Major	-.12	.14	-.83	.408	-.39	.16
	Discussion Posts	-.14	.41	-.34	.738	-.95	.68
	t1 HTR X Discussion Posts	-.34	.34	-.99	.325	-1.02	.34
	Department Major X Discussion Posts	.05	.14	.32	.747	-.24	.34
	t1 HTR X Department Major X Discussion Posts	.21	.13	1.57	.120	-.05	.47
Model Summary	*F*(7,72) = 3.45, *p* = .003, R^2 = .25.						
t2 LU (n = 80)	Constant	.19	.43	.44	.658	-.67	1.05
	Department Major	-.14	.15	-.91	.367	-.43	.16
	t1 LU	.69	.40	1.72	.089	-.11	1.49
	t1 LU X Department Major	-.03	.14	-.24	.810	-.30	.24
	Discussion Posts	-.09	.42	-.22	.826	-.92	.74
	t1 LU X Discussion Posts	-.29	.48	-.60	.550	-1.25	.67
	Department Major X Discussion Posts	.09	.15	.59	.559	-.21	.38
	t1 LU X Department Major X Discussion Posts	.06	.15	.44	.661	-.23	.36
Model Summary	*F*(7,72) = 4.74, *p* < .001, R^2 = .32.						
t2 LUF (n = 80)	Constant	-.26	.40	-.65	.516	-1.05	.53
	Department Major	.07	.14	.49	.624	-.21	.34
	t1 LUF	.75	.56	1.34	.186	-.37	1.87
	t1 LUF X Department Major	-.04	.19	-.21	.831	-.42	.34
	Discussion Posts	.60	.42	1.44	.154	-.23	1.43
	t1 LUF X Discussion Posts	-.50	.45	-1.10	.276	-1.40	.41
	Department Major X Discussion Posts	-.17	.15	-1.18	.240	-.46	.12
	t1 LUF X Department Major X Discussion Posts	.12	.16	.77	.443	-.19	.43
Model Summary	*F*(7,72) = 3.75, *p* = .002, R^2 = .27.						

Note. Hypothesis testing (HT), likelihood and uncertainty (LU), forced-choice (F), and constructed-response (R).

Table 29 (Cont.).

Outcome Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 LUR (n = 80)	Constant	.43	.47	.93	.358	-.50	1.37
	Department Major	-.20	.16	-1.21	.228	-.52	.13
	t1 LUR	.79	.41	1.92	.058	-.03	1.60
	t1 LUR X Department Major	-.12	.14	-.86	.395	-.39	.16
	Discussion Posts	-.57	.44	-1.30	.199	-1.44	.31
	t1 LUR X Discussion Posts	-.53	.52	-1.02	.309	-1.56	.50
	Department Major X Discussion Posts	.22	.16	1.43	.156	-.09	.53
	t1 LUR X Department Major X Discussion Posts	.15	.16	.97	.335	-.16	.47
Model Summary	$F(7,72) = 3.11$, $p = .006$, $R^2 = .23$.						
t2 PS (n = 80)	Constant	-.08	.37	-.22	.825	-.83	.66
	Department Major	-.03	.13	-.19	.847	-.29	.24
	t1 PS	.66	.51	1.28	.204	-.37	1.69
	t1 PS X Department Major	-.01	.19	-.07	.948	-.39	.37
	Discussion Posts	.27	.50	.54	.588	-.72	1.27
	t1 PS X Discussion Posts	-.51	.63	-.81	.419	-1.77	.75
	Department Major X Discussion Posts	-.02	.16	-.10	.919	-.33	.30
	t1 PS X Department Major X Discussion Posts	.15	.20	.74	.461	-.25	.54
Model Summary	$F(7,72) = 3.72$, $p = .002$, $R^2 = .27$.						
t2 PSF (n = 80)	Constant	-.03	.39	-.07	.946	-.80	.75
	Department Major	-.03	.14	-.21	.832	-.31	.25
	t1 PSF	.23	.52	.44	.660	-.81	1.27
	t1 PSF X Department Major	.10	.19	.50	.617	-.29	.48
	Discussion Posts	.47	.45	1.05	.298	-.42	1.37
	t1 PSF X Discussion Posts	-.70	.55	-1.27	.207	-1.80	.40
	Department Major X Discussion Posts	-.04	.15	-.23	.817	-.34	.27
	t1 PSF X Department Major X Discussion Posts	.20	.18	1.13	.261	-.15	.55
Model Summary	$F(7,72) = 3.32$, $p = .004$, $R^2 = .24$.						
t2 PSR (n = 80)	Constant	.11	.41	.27	.790	-.70	.92
	Department Major	-.04	.14	-.27	.790	-.32	.24
	t1 PSR	.33	.53	.61	.540	-.73	1.39
	t1 PSR X Department Major	-.02	.20	-.10	.920	-.41	.37
	Discussion Posts	.10	.50	.19	.850	-.90	1.09
	t1 PSR X Discussion Posts	-.08	.68	-.12	.900	-1.43	1.26
	Department Major X Discussion Posts	-.05	.16	-.33	.740	-.37	.27
	t1 PSR X Department Major X Discussion Posts	.00	.23	-.01	.990	-.45	.45
Model Summary	$F(7,72) = .67$, $p = .697$, $R^2 = .06$.						

Note. Likelihood and uncertainty (LU), problem solving (PS), forced-choice (F), and constructed-response (R).

Table 30.

Moderated regression models between time 1 and time 2 CT scores, controlling for age and gender.

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 CT (n = 80)	Constant	-.52	.61	-.85	.396	-1.75	.70
	Department Major	-.02	.14	-.14	.888	-.29	.25
	t1 CT	1.01	.38	2.70	.009	.27	1.76
	t1 CT X Department Major	-.09	.14	-.65	.516	-.36	.18
	Discussion Posts	.17	.37	.46	.647	-.56	.90
	t1 CT X Discussion Posts	-.20	.39	-.52	.604	-.99	.58
	Department Major X Discussion Posts	.01	.13	.10	.920	-.24	.27
	t1 CT X Department Major X Discussion Posts	.05	.13	.35	.727	-.21	.30
	Age	.00	.01	.04	.972	-.03	.03
	Gender	.12	.23	.54	.593	-.33	.57
Model Summary	$F(9,70) = 6.75$, $p < .001$, $R^2 = .46$.						
t2 CTF (n = 80)	Constant	-.55	.68	-.82	.416	-1.90	.80
	Department Major	-.03	.13	-.22	.824	-.29	.24
	t1 CTF	.97	.47	2.06	.043	.03	1.91
	t1 CTF X Department Major	-.12	.18	-.66	.512	-.46	.23
	Discussion Posts	.21	.37	.57	.574	-.52	.94
	t1 CTF X Discussion Posts	-.59	.44	-1.35	.180	-1.46	.28
	Department Major X Discussion Posts	.01	.13	.05	.957	-.25	.26
	t1 CTF X Department Major X Discussion Posts	.18	.15	1.20	.233	-.12	.47
	Age	.01	.02	.62	.537	-.02	.04
	Gender	.17	.25	.67	.508	-.33	.67
Model Summary	$F(9,70) = 4.45$, $p < .001$, $R^2 = .36$.						

Note. Time 2 Critical thinking (CT) measures and total critical thinking forced-choice (CTF) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 CTR (n = 80)	Constant	-.21	.71	-.30	.769	-1.62	1.20
	Department Major	-.07	.16	-.43	.665	-.39	.25
	t1 CTR	.76	.39	1.98	.051	.00	1.53
	t1 CTR X Department Major	-.09	.14	-.65	.515	-.37	.19
	Discussion Posts	-.27	.44	-.62	.537	-1.14	.60
	t1 CTR X Discussion Posts	.47	.46	1.02	.309	-.44	1.37
	Department Major X Discussion Posts	.09	.15	.60	.548	-.21	.39
	t1 CTR X Department Major X Discussion Posts	-.13	.16	-.83	.410	-.44	.18
	Age	.00	.02	.22	.824	-.03	.04
	Gender	.02	.26	.06	.953	-.50	.53
Model Summary	$F(9,70) = 3.74$, $p = .001$, $R^2 = .32$.						
t2 VR (n = 80)	Constant	-.11	.70	-.16	.877	-1.51	1.29
	Department Major	.07	.14	.51	.614	-.21	.36
	t1 VR	.75	.41	1.83	.072	-.07	1.56
	t1 VR X Department Major	-.13	.15	-.88	.382	-.42	.16
	Discussion Posts	.52	.38	1.38	.171	-.23	1.28
	t1 VR X Discussion Posts	-.22	.47	-.47	.637	-1.16	.71
	Department Major X Discussion Posts	-.18	.14	-1.29	.201	-.45	.10
	t1 VR X Department Major X Discussion Posts	.10	.16	.64	.524	-.22	.43
	Age	.01	.02	.73	.467	-.02	.05
	Gender	-.35	.25	-1.39	.168	-.84	.15
Model Summary	$F(9,70) = 2.81$, $p = .007$, $R^2 = .27$.						

Note. Time 2 Critical thinking constructed-response (CTR) measures and total verbal reasoning (VR) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 VRF (n = 80)	Constant	.58	.81	.72	.470	-1.03	2.19
	Department Major	-.03	.16	-.19	.850	-.34	.28
	t1 VRF	.52	.51	1.04	.300	-.49	1.54
	t1 VRF X Department Major	-.05	.18	-.26	.790	-.42	.32
	Discussion Posts	.47	.45	1.04	.300	-.44	1.38
	t1 VRF X Discussion Posts	-.80	.52	-1.54	.130	-1.84	.23
	Department Major X Discussion Posts	-.17	.17	-1.04	.300	-.51	.16
	t1 VRF X Department Major X Discussion Posts	.23	.18	1.33	.190	-.12	.58
	Age	-.01	.02	-.62	.540	-.05	.03
	Gender	-.19	.28	-.69	.490	-.75	.37
Model Summary	F(9,70) = 1.64, p = .121, R^2 = .17.						
t2 VRR (n = 80)	Constant	-.35	.69	-.50	.616	-1.73	1.03
	Department Major	.09	.14	.67	.506	-.19	.37
	t1 VRR	.49	.39	1.28	.206	-.28	1.27
	t1 VRR X Department Major	-.09	.14	-.68	.499	-.37	.18
	Discussion Posts	.60	.38	1.59	.117	-.16	1.36
	t1 VRR X Discussion Posts	.76	.49	1.53	.130	-.23	1.74
	Department Major X Discussion Posts	-.21	.14	-1.55	.127	-.49	.06
	t1 VRR X Department Major X Discussion Posts	-.20	.17	-1.17	.245	-.54	.14
	Age	.02	.02	1.30	.199	-.01	.06
	Gender	-.32	.25	-1.30	.197	-.81	.17
Model Summary	F(9,70) = 2.47, p = .017, R^2 = .24.						

Note. Time 2 verbal response forced-choice (VRF) measures and verbal response constructed-response (VRR) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 AA (n = 80)	Constant	-.39	.69	-.56	.577	-1.77	.99
	Department Major	-.09	.15	-.58	.564	-.38	.21
	t1 AA	.97	.40	2.46	.016	.19	1.76
	t1 AA X Department Major	-.24	.14	-1.74	.086	-.51	.03
	Discussion Posts	-.13	.45	-.29	.771	-1.02	.76
	t1 AA X Discussion Posts	-.41	.45	-.92	.361	-1.31	.48
	Department Major X Discussion Posts	.02	.16	.12	.902	-.29	.33
	t1 AA X Department Major X Discussion Posts	.20	.15	1.33	.189	-.10	.50
	Age	.01	.02	.55	.585	-.02	.04
	Gender	.16	.25	.65	.516	-.33	.66
Model Summary	$F(9,70) = 3.12$, $p = .003$, $R^2 = .29$.						
t2 AAF (n = 80)	Constant	.00	.70	.00	.998	-1.40	1.40
	Department Major	-.13	.13	-.99	.324	-.40	.13
	t1 AAF	.98	.39	2.51	.015	.20	1.75
	t1 AAF X Department Major	-.20	.14	-1.48	.142	-.47	.07
	Discussion Posts	-.33	.37	-.89	.377	-1.06	.41
	t1 AAF X Discussion Posts	-.46	.42	-1.11	.271	-1.29	.37
	Department Major X Discussion Posts	.12	.13	.93	.356	-.14	.38
	t1 AAF X Department Major X Discussion Posts	.17	.13	1.27	.210	-.10	.43
	Age	.00	.02	.29	.769	-.03	.04
	Gender	.13	.25	.53	.595	-.37	.63
Model Summary	$F(9,70) = 3.05$, $p = .004$, $R^2 = .28$.						

Note. Time 2 total argument analysis (AA) measures and argument analysis forced-choice (AAF) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 AAR (n = 80)	Constant	-.63	.79	-.80	.430	-2.22	.95
	Department Major	-.09	.18	-.52	.610	-.46	.27
	t1 AAR	.61	.51	1.21	.230	-.40	1.62
	t1 AAR X Department Major	-.18	.18	-1.01	.310	-.54	.18
	Discussion Posts	.00	.61	-.01	.990	-1.22	1.21
	t1 AAR X Discussion Posts	-.41	.57	-.73	.470	-1.55	.72
	Department Major X Discussion Posts	-.04	.22	-.17	.870	-.47	.39
	t1 AAR X Department Major X Discussion Posts	.19	.19	.96	.340	-.20	.57
	Age	.02	.02	.88	.380	-.02	.05
	Gender	.26	.28	.92	.360	-.31	.82
Model Summary	$F(9,70) = 1.08$, $p = .385$, $R^2 = .12$.						
t2 HT (n = 80)	Constant	.17	.73	.23	.821	-1.30	1.63
	Department Major	-.17	.15	-1.13	.264	-.46	.13
	t1 HT	.45	.36	1.24	.217	-.27	1.16
	t1 HT X Department Major	-.01	.13	-.04	.969	-.27	.26
	Discussion Posts	-.08	.40	-.20	.838	-.87	.71
	t1 HT X Discussion Posts	-.02	.33	-.07	.941	-.68	.63
	Department Major X Discussion Posts	.06	.14	.45	.654	-.22	.35
	t1 HT X Department Major X Discussion Posts	.04	.12	.31	.755	-.21	.29
	Age	.01	.02	.51	.610	-.03	.04
	Gender	.07	.26	.26	.798	-.45	.59
Model Summary	$F(9,70) = 3.30$, $p = .002$, $R^2 = .30$.						

Note. Time 2 argument analysis constructed-response (AAR) measures and total hypothesis testing (HT) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 HTF (n = 80)	Constant	.36	.81	.44	.661	-1.26	1.98
	Department Major	-.07	.15	-.46	.650	-.37	.24
	t1 HTF	.43	.36	1.18	.242	-.29	1.15
	t1 HTF X Department Major	.01	.13	.06	.956	-.25	.27
	Discussion Posts	.18	.44	.41	.686	-.69	1.05
	t1 HTF X Discussion Posts	.24	.41	.60	.553	-.58	1.07
	Department Major X Discussion Posts	-.02	.16	-.14	.893	-.34	.30
	t1 HTF X Department Major X Discussion Posts	-.06	.16	-.40	.689	-.38	.25
	Age	.00	.02	.00	.996	-.04	.04
	Gender	-.01	.30	-.02	.983	-.61	.59
Model Summary	$F(9,70) = 2.29$, $p = .025$, $R^2 = .23$.						
t2 HTR (n = 80)	Constant	-.01	.76	-.01	.992	-1.51	1.50
	Department Major	-.19	.16	-1.21	.232	-.52	.13
	t1 HTR	.46	.38	1.24	.220	-.28	1.21
	t1 HTR X Department Major	-.10	.14	-.67	.507	-.38	.19
	Discussion Posts	-.23	.43	-.54	.591	-1.08	.62
	t1 HTR X Discussion Posts	-.28	.35	-.79	.433	-.98	.43
	Department Major X Discussion Posts	.08	.15	.53	.598	-.22	.38
	t1 HTR X Department Major X Discussion Posts	.19	.13	1.38	.172	-.08	.45
	Age	.01	.02	.70	.487	-.02	.05
	Gender	.13	.27	.50	.616	-.40	.66
Model Summary	$F(9,70) = 2.71$, $p = .009$, $R^2 = .26$.						

Note. Time 2 hypothesis testing forced-choice (HTF) measures and hypothesis testing constructed-response (HTR) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 LU (n = 80)	Constant	.47	.78	.60	.551	-1.09	2.03
	Department Major	-.10	.16	-.65	.515	-.42	.21
	t1 LU	.72	.41	1.77	.082	-.09	1.54
	t1 LU X Department Major	-.04	.14	-.27	.787	-.31	.24
	Discussion Posts	-.02	.43	-.06	.955	-.89	.84
	t1 LU X Discussion Posts	-.31	.49	-.64	.523	-1.29	.66
	Department Major X Discussion Posts	.06	.15	.41	.685	-.24	.37
	t1 LU X Department Major X Discussion Posts	.07	.15	.47	.642	-.23	.37
	Age	-.01	.02	-.69	.492	-.05	.03
	Gender	-.02	.28	-.07	.947	-.58	.54
Model Summary	$F(9,70) = 3.66$, $p = .001$, $R^2 = .32$.						
t2 LUF (n = 80)	Constant	-.71	.79	-.90	.370	-2.28	.86
	Department Major	.09	.15	.60	.552	-.21	.38
	t1 LUF	.79	.58	1.37	.174	-.36	1.95
	t1 LUF X Department Major	-.04	.19	-.23	.819	-.43	.34
	Discussion Posts	.59	.43	1.38	.172	-.26	1.45
	t1 LUF X Discussion Posts	-.54	.47	-1.16	.252	-1.47	.39
	Department Major X Discussion Posts	-.17	.15	-1.13	.263	-.47	.13
	t1 LUF X Department Major X Discussion Posts	.13	.16	.83	.410	-.19	.45
	Age	.00	.02	-.10	.924	-.04	.04
	Gender	.25	.28	.89	.377	-.30	.80
Model Summary	$F(9,70) = 2.96$, $p = .005$, $R^2 = .28$.						

Note. Time 2 total likelihood and uncertainty (LU) measures and likelihood and uncertainty forced-choice (LUF) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 LUR (n = 80)	Constant	1.08	.84	1.28	.204	-.60	2.75
	Department Major	-.19	.17	-1.09	.279	-.53	.15
	t1 LUR	.84	.42	2.02	.047	.01	1.67
	t1 LUR X Department Major	-.14	.14	-1.00	.323	-.42	.14
	Discussion Posts	-.50	.46	-1.10	.277	-1.41	.41
	t1 LUR X Discussion Posts	-.51	.52	-.97	.334	-1.55	.53
	Department Major X Discussion Posts	.20	.16	1.21	.229	-.13	.52
	t1 LUR X Department Major X Discussion Posts	.14	.16	.90	.371	-.17	.46
	Age	-.01	.02	-.30	.763	-.05	.04
	Gender	-.28	.30	-.94	.351	-.88	.32
Model Summary	F(9,70) = 2.49, p = .016, R^2 = .24.						
t2 PS (n = 80)	Constant	-.42	.70	-.60	.552	-1.82	.98
	Department Major	-.05	.14	-.37	.714	-.32	.22
	t1 PS	.65	.54	1.20	.233	-.43	1.73
	t1 PS X Department Major	-.02	.20	-.09	.929	-.42	.38
	Discussion Posts	.21	.51	.42	.675	-.80	1.23
	t1 PS X Discussion Posts	-.52	.64	-.81	.421	-1.80	.76
	Department Major X Discussion Posts	.00	.16	.03	.978	-.32	.33
	t1 PS X Department Major X Discussion Posts	.15	.20	.75	.456	-.25	.56
	Age	.01	.02	.74	.464	-.02	.05
	Gender	.05	.26	.19	.853	-.46	.56
Model Summary	F(9,70) = 2.89, p = .006, R^2 = .27.						

Note. Time 2 likelihood and uncertainty constructed-response (LUR) measures and total problem solving (PS) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 PSF (n = 80)	Constant	-.54	.74	-.73	.469	-2.02	.94
	Department Major	-.07	.14	-.52	.608	-.36	.21
	t1 PSF	.29	.53	.55	.583	-.77	1.36
	t1 PSF X Department Major	.07	.20	.33	.742	-.33	.46
	Discussion Posts	.36	.46	.78	.440	-.56	1.27
	t1 PSF X Discussion Posts	-.71	.55	-1.28	.205	-1.81	.40
	Department Major X Discussion Posts	.00	.16	.03	.979	-.31	.32
	t1 PSF X Department Major X Discussion Posts	.21	.18	1.17	.246	-.15	.56
	Age	.02	.02	1.30	.196	-.01	.06
	Gender	.02	.26	.08	.940	-.51	.55
Model Summary	F(9,70) = 2.76, p = .008, R^2 = .26.						
t2 PSR (n = 80)	Constant	-.27	.78	-.34	.730	-1.84	1.30
	Department Major	-.04	.15	-.28	.780	-.34	.26
	t1 PSR	.25	.55	.44	.660	-.86	1.35
	t1 PSR X Department Major	.01	.20	.05	.960	-.40	.42
	Discussion Posts	.07	.51	.14	.890	-.95	1.09
	t1 PSR X Discussion Posts	-.04	.69	-.06	.950	-1.42	1.33
	Department Major X Discussion Posts	-.04	.17	-.26	.790	-.37	.29
	t1 PSR X Department Major X Discussion Posts	-.02	.23	-.08	.940	-.48	.44
	Age	.00	.02	.21	.840	-.03	.04
	Gender	.16	.28	.58	.560	-.40	.72
Model Summary	F(9,70) = .55, p = .833, R^2 = .07.						

Note. Time 2 problem solving forced-choice (PSF) measures and problem solving constructed-response (PSR) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 CT (n = 80)	Constant	-.56	.63	-.89	.377	-1.83	.70
	College Major	-.05	.13	-.37	.715	-.31	.22
	t1 CT	.85	.38	2.25	.028	.10	1.60
	t1 CT X College Major	-.02	.14	-.15	.882	-.30	.26
	Discussion Posts	.01	.37	.02	.981	-.73	.74
	t1 CT X Discussion Posts	-.18	.40	-.45	.653	-.98	.62
	College Major X Discussion Posts	.08	.14	.60	.550	-.19	.35
	t1 CT X College Major X Discussion Posts	.04	.14	.28	.779	-.24	.31
	Age	.00	.01	.02	.988	-.03	.03
	Gender	.18	.24	.76	.451	-.30	.66
Model Summary	$F(9,70) = 6.75$, $p < .001$, $R^2 = .46$.						
t2 CTF (n = 80)	Constant	-.81	.71	-1.14	.259	-2.23	.61
	College Major	.02	.12	.18	.858	-.22	.27
	t1 CTF	.74	.38	1.98	.052	-.01	1.49
	t1 CTF X College Major	-.02	.14	-.15	.880	-.30	.26
	Discussion Posts	.01	.35	.03	.979	-.68	.70
	t1 CTF X Discussion Posts	-.13	.44	-.31	.759	-1.01	.74
	College Major X Discussion Posts	.08	.13	.62	.537	-.18	.34
	t1 CTF X College Major X Discussion Posts	.02	.15	.14	.890	-.28	.33
	Age	.01	.02	.49	.626	-.02	.04
	Gender	.26	.27	.97	.334	-.28	.80
Model Summary	$F(9,70) = 4.30$, $p < .001$, $R^2 = .36$.						

Note. Time 2 Critical thinking (CT) measures and total critical thinking forced-choice (CTF) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 CTR (n = 80)	Constant	.08	.76	.11	.916	-1.43	1.59
	College Major	-.19	.17	-1.14	.259	-.52	.14
	t1 CTR	.43	.41	1.05	.298	-.39	1.24
	t1 CTR X College Major	.05	.16	.32	.754	-.27	.37
	Discussion Posts	-.16	.45	-.35	.725	-1.06	.74
	t1 CTR X Discussion Posts	-.04	.44	-.08	.935	-.92	.85
	College Major X Discussion Posts	.08	.17	.47	.637	-.25	.41
	t1 CTR X College Major X Discussion Posts	.04	.16	.24	.811	-.28	.35
	Age	.00	.02	.11	.913	-.03	.04
	Gender	.04	.27	.14	.885	-.50	.58
Model Summary	$F(9,70) = 3.50$, $p = .001$, $R^2 = .31$.						
t2 VR (n = 80)	Constant	-.11	.74	-.15	.884	-1.59	1.37
	College Major	.09	.16	.58	.563	-.22	.40
	t1 VR	.67	.41	1.64	.105	-.14	1.48
	t1 VR X College Major	-.10	.15	-.68	.500	-.41	.20
	Discussion Posts	.41	.38	1.08	.282	-.35	1.18
	t1 VR X Discussion Posts	-.17	.54	-.32	.750	-1.26	.91
	College Major X Discussion Posts	-.15	.15	-.95	.343	-.45	.16
	t1 VR X College Major X Discussion Posts	.08	.21	.40	.689	-.33	.50
	Age	.01	.02	.66	.510	-.02	.05
	Gender	-.35	.26	-1.32	.191	-.87	.18
Model Summary	$F(9,70) = 2.63$, $p = .011$, $R^2 = .25$.						

Note. Time 2 Critical thinking constructed-response (CTR) measures and total verbal reasoning (VR) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 VRF (n = 80)	Constant	.39	.84	.46	.640	-1.29	2.06
	College Major	.10	.16	.61	.540	-.22	.42
	t1 VRF	.68	.42	1.62	.110	-.16	1.53
	t1 VRF X College Major	-.11	.15	-.70	.490	-.42	.20
	Discussion Posts	.41	.42	.98	.330	-.43	1.25
	t1 VRF X Discussion Posts	-.56	.59	-.95	.340	-1.74	.62
	College Major X Discussion Posts	-.16	.16	-.99	.320	-.48	.16
	t1 VRF X College Major X Discussion Posts	.17	.22	.77	.440	-.27	.60
	Age	-.01	.02	-.77	.440	-.05	.02
	Gender	-.23	.30	-.76	.450	-.83	.37
Model Summary	$F(9,70) = 1.37$, $p = .218$, $R^2 = .15$.						
t2 VRR (n = 80)	Constant	-.33	.76	-.43	.670	-1.84	1.18
	College Major	.10	.15	.69	.500	-.20	.40
	t1 VRR	.62	.39	1.61	.110	-.15	1.40
	t1 VRR X College Major	-.16	.15	-1.05	.300	-.45	.14
	Discussion Posts	.37	.38	.97	.330	-.39	1.13
	t1 VRR X Discussion Posts	-.02	.54	-.04	.970	-1.10	1.05
	College Major X Discussion Posts	-.14	.15	-.88	.380	-.44	.17
	t1 VRR X College Major X Discussion Posts	.08	.21	.39	.700	-.33	.49
	Age	.02	.02	1.36	.180	-.01	.06
	Gender	-.35	.26	-1.33	.190	-.88	.18
Model Summary	$F(9,70) = 1.99$, $p = .054$, $R^2 = .20$.						

Note. Time 2 verbal response forced-choice (VRF) measures and verbal response constructed-response (VRR) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 AA (n = 80)	Constant	-.20	.73	-.27	.784	-1.66	1.26
	College Major	-.13	.14	-.94	.350	-.41	.15
	t1 AA	.60	.43	1.41	.164	-.25	1.45
	t1 AA X College Major	-.10	.16	-.63	.533	-.43	.22
	Discussion Posts	-.19	.42	-.46	.644	-1.03	.64
	t1 AA X Discussion Posts	.03	.47	.05	.957	-.91	.96
	College Major X Discussion Posts	.04	.15	.25	.805	-.26	.34
	t1 AA X College Major X Discussion Posts	.04	.16	.26	.794	-.27	.36
	Age	.01	.02	.41	.683	-.03	.04
	Gender	.16	.28	.58	.567	-.39	.71
Model Summary	$F(9,70) = 2.63$, $p = .011$, $R^2 = .25$.						
t2 AAF (n = 80)	Constant	-.20	.76	-.26	.792	-1.72	1.31
	College Major	-.01	.13	-.10	.920	-.27	.24
	t1 AAF	.52	.43	1.20	.232	-.34	1.38
	t1 AAF X College Major	-.03	.17	-.18	.861	-.37	.31
	Discussion Posts	.05	.35	.15	.882	-.65	.75
	t1 AAF X Discussion Posts	.09	.44	.20	.846	-.79	.96
	College Major X Discussion Posts	-.03	.13	-.25	.801	-.30	.23
	t1 AAF X College Major X Discussion Posts	-.03	.15	-.18	.856	-.34	.28
	Age	.00	.02	-.06	.955	-.03	.03
	Gender	.17	.28	.60	.551	-.39	.73
Model Summary	$F(9,70) = 2.45$, $p = .017$, $R^2 = .24$.						

Note. Time 2 total argument analysis (AA) measures and argument analysis forced-choice (AAF) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 AAR (n = 80)	Constant	-.14	.81	-.17	.860	-1.76	1.48
	College Major	-.24	.17	-1.42	.160	-.57	.10
	t1 AAR	.32	.45	.71	.480	-.58	1.22
	t1 AAR X College Major	-.08	.18	-.42	.680	-.44	.29
	Discussion Posts	-.07	.54	-.13	.900	-1.15	1.01
	t1 AAR X Discussion Posts	-.31	.53	-.59	.560	-1.37	.74
	College Major X Discussion Posts	.00	.19	.02	.980	-.37	.38
	t1 AAR X College Major X Discussion Posts	.14	.19	.78	.440	-.23	.51
	Age	.02	.02	.97	.340	-.02	.06
	Gender	.16	.30	.55	.590	-.43	.75
Model Summary	$F(9,70) = 1.28$, $p = .265$, $R^2 = .14$.						
t2 HT (n = 80)	Constant	-.09	.77	-.12	.908	-1.62	1.44
	College Major	-.10	.14	-.72	.476	-.37	.17
	t1 HT	.45	.33	1.40	.167	-.19	1.10
	t1 HT X College Major	.00	.13	.02	.985	-.25	.26
	Discussion Posts	-.20	.36	-.55	.584	-.93	.53
	t1 HT X Discussion Posts	.01	.35	.02	.983	-.69	.71
	College Major X Discussion Posts	.12	.14	.84	.402	-.16	.40
	t1 HT X College Major X Discussion Posts	.03	.15	.20	.841	-.26	.32
	Age	.01	.02	.39	.695	-.03	.04
	Gender	.12	.28	.43	.665	-.43	.67
Model Summary	$F(9,70) = 3.15$, $p = .003$, $R^2 = .29$.						

Note. Time 2 argument analysis constructed-response (AAR) measures and total hypothesis testing (HT) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 HTF (n = 80)	Constant	-.07	.84	-.09	.929	-1.75	1.60
	College Major	.03	.14	.23	.820	-.25	.32
	t1 HTF	.33	.33	1.01	.314	-.32	.99
	t1 HTF X College Major	.06	.13	.49	.628	-.19	.32
	Discussion Posts	-.09	.40	-.24	.814	-.88	.70
	t1 HTF X Discussion Posts	.28	.49	.58	.567	-.70	1.26
	College Major X Discussion Posts	.09	.15	.60	.550	-.21	.39
	t1 HTF X College Major X Discussion Posts	-.09	.21	-.42	.674	-.50	.32
	Age	.00	.02	-.19	.852	-.04	.04
	Gender	.13	.32	.41	.685	-.51	.77
Model Summary	$F(9,70) = 2.38$, $p = .020$, $R^2 = .23$.						
t2 HTR (n = 80)	Constant	.07	.79	.08	.934	-1.51	1.65
	College Major	-.20	.15	-1.36	.179	-.49	.09
	t1 HTR	.54	.36	1.49	.142	-.18	1.26
	t1 HTR X College Major	-.14	.15	-.92	.361	-.43	.16
	Discussion Posts	-.26	.40	-.64	.527	-1.06	.55
	t1 HTR X Discussion Posts	-.27	.34	-.80	.424	-.95	.40
	College Major X Discussion Posts	.10	.16	.63	.531	-.21	.41
	t1 HTR X College Major X Discussion Posts	.19	.13	1.42	.161	-.08	.45
	Age	.01	.02	.81	.420	-.02	.05
	Gender	.05	.28	.19	.849	-.50	.60
Model Summary	$F(9,70) = 2.75$, $p = .008$, $R^2 = .26$.						

Note. Time 2 hypothesis testing forced-choice (HTF) measures and hypothesis testing constructed-response (HTR) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 LU (n = 80)	Constant	.38	.82	.47	.641	-1.25	2.02
	College Major	-.09	.15	-.56	.574	-.39	.22
	t1 LU	.50	.36	1.39	.170	-.22	1.23
	t1 LU X College Major	.04	.12	.36	.723	-.20	.29
	Discussion Posts	-.05	.41	-.13	.895	-.87	.77
	t1 LU X Discussion Posts	-.01	.53	-.01	.991	-1.07	1.05
	College Major X Discussion Posts	.08	.16	.52	.605	-.23	.40
	t1 LU X College Major X Discussion Posts	-.03	.19	-.17	.862	-.42	.35
	Age	-.01	.02	-.73	.467	-.05	.02
	Gender	.00	.29	.02	.988	-.58	.59
Model Summary	$F(9,70) = 3.58$, $p = .001$, $R^2 = .32$.						
t2 LUF (n = 80)	Constant	-.81	.83	-.98	.330	-2.46	.84
	College Major	.08	.14	.60	.553	-.20	.36
	t1 LUF	.75	.46	1.65	.104	-.16	1.66
	t1 LUF X College Major	-.03	.15	-.22	.830	-.33	.26
	Discussion Posts	.38	.41	.92	.361	-.44	1.19
	t1 LUF X Discussion Posts	-.52	.43	-1.20	.233	-1.37	.34
	College Major X Discussion Posts	-.11	.16	-.68	.500	-.42	.21
	t1 LUF X College Major X Discussion Posts	.13	.15	.87	.389	-.17	.43
	Age	.00	.02	.10	.919	-.04	.04
	Gender	.27	.29	.91	.364	-.31	.85
Model Summary	$F(9,70) = 2.73$, $p = .009$, $R^2 = .26$.						

Note. Time 2 total likelihood and uncertainty (LU) measures and likelihood and uncertainty forced-choice (LUF) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 LUR (n = 80)	Constant	1.09	.89	1.23	.224	-.68	2.85
	College Major	-.20	.17	-1.21	.231	-.54	.13
	t1 LUR	.26	.36	.73	.470	-.46	.99
	t1 LUR X College Major	.08	.13	.60	.551	-.18	.33
	Discussion Posts	-.48	.44	-1.08	.283	-1.37	.41
	t1 LUR X Discussion Posts	-.11	.55	-.21	.838	-1.20	.98
	College Major X Discussion Posts	.21	.18	1.21	.229	-.14	.56
	t1 LUR X College Major X Discussion Posts	.02	.19	.11	.913	-.37	.41
	Age	-.01	.02	-.50	.618	-.05	.03
	Gender	-.22	.32	-.70	.486	-.85	.41
Model Summary	$F(9,70) = 2.15$, $p = .036$, $R^2 = .22$.						
t2 PS (n = 80)	Constant	-.39	.73	-.54	.593	-1.85	1.06
	College Major	-.02	.14	-.15	.884	-.29	.25
	t1 PS	.99	.52	1.91	.060	-.04	2.03
	t1 PS X College Major	-.15	.18	-.80	.429	-.51	.22
	Discussion Posts	-.06	.49	-.12	.901	-1.05	.92
	t1 PS X Discussion Posts	-.22	.49	-.45	.654	-1.19	.75
	College Major X Discussion Posts	.08	.17	.48	.636	-.26	.43
	t1 PS X College Major X Discussion Posts	.09	.17	.51	.614	-.25	.42
	Age	.01	.02	.80	.428	-.02	.05
	Gender	-.02	.28	-.09	.931	-.57	.53
Model Summary	$F(9,70) = 2.92$, $p = .005$, $R^2 = .27$.						

Note. Time 2 likelihood and uncertainty constructed-response (LUR) measures and total problem solving (PS) measures.

Table 30 (Cont.).

Model	Predictor	B	SE	t	p	LLCI	ULCI
t2 PSF (n = 80)	Constant	-.75	.78	-.96	.339	-2.30	.80
	College Major	-.12	.14	-.86	.392	-.39	.16
	t1 PSF	-.06	.47	-.12	.904	-.99	.88
	t1 PSF X College Major	.19	.17	1.10	.277	-.15	.53
	Discussion Posts	-.51	.47	-1.09	.278	-1.44	.42
	t1 PSF X Discussion Posts	.60	.48	1.25	.215	-.35	1.55
	College Major X Discussion Posts	.29	.16	1.75	.085	-.04	.62
	t1 PSF X College Major X Discussion Posts	-.20	.16	-1.22	.227	-.52	.13
	Age	.03	.02	1.49	.140	-.01	.06
	Gender	.16	.29	.55	.586	-.42	.74
Model Summary	$F(9,70) = 2.70$, $p = .009$, $R^2 = .26$.						
t2 PSR (n = 80)	Constant	-.29	.81	-.35	.730	-1.91	1.33
	College Major	.05	.15	.32	.750	-.24	.34
	t1 PSR	.48	.41	1.16	.250	-.34	1.29
	t1 PSR X College Major	-.08	.15	-.53	.600	-.39	.23
	Discussion Posts	.52	.51	1.02	.310	-.50	1.55
	t1 PSR X Discussion Posts	-.38	.53	-.72	.480	-1.45	.68
	College Major X Discussion Posts	-.22	.19	-1.19	.240	-.60	.15
	t1 PSR X College Major X Discussion Posts	.10	.20	.52	.610	-.29	.50
	Age	.00	.02	.10	.920	-.04	.04
	Gender	.08	.29	.30	.770	-.49	.65
Model Summary	$F(9,70) = .73$, $p = .681$, $R^2 = .09$.						

Note. Time 2 problem solving forced-choice (PSF) measures and problem solving constructed-response (PSR) measures.

Table 31.

ANCOVA summary table for models using standardized difference scores on CT measures.

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
CT	Age	.17	1	.17	.28	.601	.00
	Gender	1.27	1	1.27	2.09	.153	.03
	Discussion Posts	.91	2	.45	.75	.478	.02
	Department Major	.25	3	.08	.14	.939	.01
	Discussion Posts X Department Major	1.36	5	.27	.45	.813	.03
	Error	40.68	67	.61			
	Total	46.61	79				
CTF	Age	.04	1	.04	.05	.820	.00
	Gender	3.42	1	3.42	4.42	.039	.06
	Discussion Posts	1.45	2	.72	.94	.398	.03
	Department Major	2.23	3	.74	.96	.417	.04
	Discussion Posts X Department Major	1.20	5	.24	.31	.905	.02
	Error	51.87	67	.77			
	Total	60.71	79				
CTR	Age	.56	1	.56	.63	.431	.01
	Gender	.07	1	.07	.08	.777	.00
	Discussion Posts	.15	2	.08	.08	.920	.00
	Department Major	1.12	3	.37	.42	.741	.02
	Discussion Posts X Department Major	2.04	5	.41	.45	.809	.03
	Error	60.10	67	.90			
	Total	64.72	79				
VR	Age	.02	1	.02	.02	.885	.00
	Gender	.12	1	.12	.12	.733	.00
	Discussion Posts	2.93	2	1.47	1.40	.253	.04
	Department Major	.88	3	.29	.28	.839	.01
	Discussion Posts X Department Major	1.00	5	.20	.19	.965	.01
	Error	69.97	67	1.04			
	Total	76.12	79				
VRF	Age	.39	1	.39	.30	.589	.00
	Gender	.73	1	.73	.55	.460	.01
	Discussion Posts	.03	2	.02	.01	.987	.00
	Department Major	5.13	3	1.71	1.29	.285	.06
	Discussion Posts X Department Major	4.74	5	.95	.72	.614	.05
	Error	88.80	67	1.33			
	Total	97.52	79				

Note. Critical thinking (CT) and verbal reasoning (VR) measures with forced-choice (F) and constructed-response (R) items.

Table 31 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
VRR	Age	.21	1	.21	.18	.675	.00
	Gender	.60	1	.60	.51	.480	.01
	Discussion Posts	4.81	2	2.41	2.04	.137	.06
	Department Major	.23	3	.08	.06	.979	.00
	Discussion Posts X Department Major	2.61	5	.52	.44	.817	.03
	Error	78.84	67	1.18			
	Total	88.79	79				
AA	Age	.05	1	.05	.05	.817	.00
	Gender	1.19	1	1.19	1.22	.273	.02
	Discussion Posts	.66	2	.33	.34	.715	.01
	Department Major	.74	3	.25	.26	.858	.01
	Discussion Posts X Department Major	5.85	5	1.17	1.20	.319	.08
	Error	65.27	67	.97			
	Total	73.55	79				
AAF	Age	.07	1	.07	.07	.791	.00
	Gender	1.20	1	1.20	1.20	.278	.02
	Discussion Posts	.19	2	.09	.09	.911	.00
	Department Major	1.58	3	.53	.52	.668	.02
	Discussion Posts X Department Major	6.76	5	1.35	1.34	.257	.09
	Error	67.46	67	1.01			
	Total	76.61	79				
AAR	Age	.27	1	.27	.20	.655	.00
	Gender	.69	1	.69	.52	.472	.01
	Discussion Posts	.81	2	.40	.31	.737	.01
	Department Major	.39	3	.13	.10	.960	.00
	Discussion Posts X Department Major	3.66	5	.73	.56	.734	.04
	Error	88.23	67	1.32			
	Total	95.13	79				
HT	Age	.01	1	.01	.01	.911	.00
	Gender	2.04	1	2.04	2.06	.156	.03
	Discussion Posts	.96	2	.48	.49	.618	.01
	Department Major	2.68	3	.89	.90	.445	.04
	Discussion Posts X Department Major	3.45	5	.69	.70	.628	.05
	Error	66.30	67	.99			
	Total	77.24	79				

Note. Verbal reasoning (VR), argument analysis (AA), and hypothesis testing (HT) measures with forced-choice (F) and constructed-response (R) items.

Table 31 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
HTF	Age	.76	1	.76	.71	.402	.01
	Gender	4.86	1	4.86	4.54	.037	.06
	Discussion Posts	2.60	2	1.30	1.21	.305	.04
	Department Major	2.73	3	.91	.85	.472	.04
	Discussion Posts X Department Major	2.18	5	.44	.41	.842	.03
	Error	71.85	67	1.07			
	Total	87.00	79				
HTR	Age	.55	1	.55	.45	.505	.01
	Gender	.01	1	.01	.00	.949	.00
	Discussion Posts	.15	2	.08	.06	.940	.00
	Department Major	6.45	3	2.15	1.76	.163	.07
	Discussion Posts X Department Major	4.61	5	.92	.76	.584	.05
	Error	81.75	67	1.22			
	Total	93.35	79				
LU	Age	1.98	1	1.98	1.80	.185	.03
	Gender	.60	1	.60	.55	.463	.01
	Discussion Posts	3.74	2	1.87	1.70	.191	.05
	Department Major	.48	3	.16	.14	.933	.01
	Discussion Posts X Department Major	2.50	5	.50	.45	.810	.03
	Error	73.94	67	1.10			
	Total	84.13	79				
LUF	Age	.01	1	.01	.01	.907	.00
	Gender	2.63	1	2.63	2.52	.117	.04
	Discussion Posts	6.27	2	3.13	3.00	.057	.08
	Department Major	5.25	3	1.75	1.68	.181	.07
	Discussion Posts X Department Major	7.54	5	1.51	1.44	.221	.10
	Error	70.02	67	1.05			
	Total	83.23	79				
LUR	Age	3.14	1	3.14	2.22	.141	.03
	Gender	.00	1	.00	.00	.980	.00
	Discussion Posts	.90	2	.45	.32	.727	.01
	Department Major	.68	3	.23	.16	.923	.01
	Discussion Posts X Department Major	6.43	5	1.29	.91	.480	.06
	Error	94.65	67	1.41			
	Total	109.23	79				

Note. Hypothesis testing (HT) and likelihood and uncertainty (LU) measures with forced-choice (F) and constructed-response (R) items.

Table 31 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
PS	Age	.01	1	.01	.01	.920	.00
	Gender	.29	1	.29	.34	.564	.01
	Discussion Posts	.30	2	.15	.18	.840	.01
	Department Major	1.75	3	.58	.69	.563	.03
	Discussion Posts X Department Major	1.06	5	.21	.25	.939	.02
	Error	56.92	67	.85			
	Total	61.77	79				
PSF	Age	1.18	1	1.18	1.10	.297	.02
	Gender	.20	1	.20	.19	.666	.00
	Discussion Posts	3.05	2	1.53	1.42	.248	.04
	Department Major	4.08	3	1.36	1.27	.292	.05
	Discussion Posts X Department Major	3.22	5	.65	.60	.699	.04
	Error	71.87	67	1.07			
	Total	85.35	79				
PSR	Age	1.33	1	1.33	.99	.322	.02
	Gender	.20	1	.20	.15	.704	.00
	Discussion Posts	1.59	2	.80	.60	.554	.02
	Department Major	2.47	3	.83	.62	.607	.03
	Discussion Posts X Department Major	3.28	5	.66	.49	.783	.04
	Error	89.76	67	1.34			
	Total	98.02	79				
CT	Age	.10	1	.10	.18	.676	.00
	Gender	1.63	1	1.63	2.75	.102	.04
	Discussion Posts	1.74	2	.87	1.47	.238	.04
	College Major	1.33	3	.44	.75	.528	.03
	Discussion Posts X College Major	2.95	6	.49	.83	.551	.07
	Error	39.06	66	.59			
	Total	46.61	79				
CTF	Age	.02	1	.02	.02	.885	.00
	Gender	4.32	1	4.32	5.73	.020	.08
	Discussion Posts	2.74	2	1.37	1.82	.170	.05
	College Major	3.86	3	1.29	1.71	.174	.07
	Discussion Posts X College Major	2.72	6	.45	.60	.728	.05
	Error	49.77	66	.75			
	Total	60.71	79				

Note. Problem solving (PS) and total critical thinking (CT) measures with forced-choice (F) and constructed-response (R) items.

Table 31 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
CTR	Age	.30	1	.30	.33	.567	.01
	Gender	.09	1	.09	.10	.753	.00
	Discussion Posts	.29	2	.14	.16	.852	.01
	College Major	.86	3	.29	.32	.810	.01
	Discussion Posts X College Major	3.45	6	.58	.65	.692	.06
	Error	58.69	66	.89			
	Total	64.72	79				
VR	Age	.02	1	.02	.02	.898	.00
	Gender	.03	1	.03	.03	.862	.00
	Discussion Posts	3.21	2	1.60	1.55	.219	.05
	College Major	1.29	3	.43	.42	.743	.02
	Discussion Posts X College Major	2.94	6	.49	.47	.825	.04
	Error	68.15	66	1.03			
	Total	76.12	79				
VRF	Age	.44	1	.44	.32	.571	.01
	Gender	.65	1	.65	.48	.491	.01
	Discussion Posts	.11	2	.05	.04	.961	.00
	College Major	4.24	3	1.41	1.04	.382	.05
	Discussion Posts X College Major	4.01	6	.67	.49	.813	.04
	Error	89.86	66	1.36			
	Total	97.52	79				
VRR	Age	.21	1	.21	.18	.671	.00
	Gender	.29	1	.29	.25	.616	.00
	Discussion Posts	4.38	2	2.19	1.91	.157	.06
	College Major	1.37	3	.46	.40	.755	.02
	Discussion Posts X College Major	5.66	6	.94	.82	.557	.07
	Error	75.81	66	1.15			
	Total	88.79	79				
AA	Age	.04	1	.04	.04	.836	.00
	Gender	1.13	1	1.13	1.14	.289	.02
	Discussion Posts	.25	2	.13	.13	.881	.00
	College Major	.96	3	.32	.32	.808	.02
	Discussion Posts X College Major	6.31	6	1.05	1.07	.392	.09
	Error	65.16	66	.99			
	Total	73.55	79				

Note. Critical thinking (CT) verbal reasoning (VR), and argument analysis (AA) measures with forced-choice (F) and constructed-response (R) items.

Table 31 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
AAF	Age	.00	1	.00	.00	.996	.00
	Gender	1.62	1	1.62	1.64	.205	.02
	Discussion Posts	.72	2	.36	.37	.696	.01
	College Major	3.78	3	1.26	1.28	.289	.06
	Discussion Posts X College Major	8.73	6	1.46	1.48	.200	.12
	Error	65.02	66	.99			
	Total	76.61	79				
AAR	Age	.06	1	.06	.04	.837	.00
	Gender	.38	1	.38	.29	.592	.00
	Discussion Posts	.64	2	.32	.25	.782	.01
	College Major	.38	3	.13	.10	.961	.00
	Discussion Posts X College Major	5.67	6	.95	.73	.629	.06
	Error	85.75	66	1.30			
	Total	95.13	79				
HT	Age	.00	1	.00	.00	.971	.00
	Gender	2.91	1	2.91	2.96	.090	.04
	Discussion Posts	1.58	2	.79	.81	.451	.02
	College Major	2.88	3	.96	.98	.410	.04
	Discussion Posts X College Major	4.98	6	.83	.84	.540	.07
	Error	64.88	66	.98			
	Total	77.24	79				
HTF	Age	.68	1	.68	.64	.428	.01
	Gender	6.41	1	6.41	5.99	.017	.08
	Discussion Posts	2.75	2	1.38	1.29	.283	.04
	College Major	4.45	3	1.48	1.39	.254	.06
	Discussion Posts X College Major	3.06	6	.51	.48	.822	.04
	Error	70.53	66	1.07			
	Total	87.00	79				
HTR	Age	.89	1	.89	.73	.395	.01
	Gender	.03	1	.03	.03	.868	.00
	Discussion Posts	1.17	2	.58	.48	.620	.01
	College Major	3.64	3	1.21	1.00	.398	.04
	Discussion Posts X College Major	6.74	6	1.12	.93	.480	.08
	Error	79.89	66	1.21			
	Total	93.35	79				

Note. Argument analysis (AA) and hypothesis testing (HT) measures with forced-choice (F) and constructed-response (R) items.

Table 31 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
LU	Age	1.82	1	1.82	1.64	.205	.02
	Gender	.90	1	.90	.81	.371	.01
	Discussion Posts	3.11	2	1.56	1.40	.254	.04
	College Major	.59	3	.20	.18	.913	.01
	Discussion Posts X College Major	3.00	6	.50	.45	.843	.04
	Error	73.41	66	1.11			
	Total	84.13	79				
LUF	Age	.01	1	.01	.01	.929	.00
	Gender	2.74	1	2.74	2.70	.105	.04
	Discussion Posts	3.83	2	1.92	1.89	.159	.05
	College Major	.25	3	.08	.08	.970	.00
	Discussion Posts X College Major	10.72	6	1.79	1.76	.121	.14
	Error	66.98	66	1.02			
	Total	83.23	79				
LUR	Age	2.44	1	2.44	1.74	.192	.03
	Gender	.03	1	.03	.02	.892	.00
	Discussion Posts	1.35	2	.68	.48	.619	.01
	College Major	1.30	3	.43	.31	.819	.01
	Discussion Posts X College Major	8.50	6	1.42	1.01	.426	.08
	Error	92.47	66	1.40			
	Total	109.23	79				
PS	Age	.03	1	.03	.04	.850	.00
	Gender	.29	1	.29	.34	.564	.01
	Discussion Posts	.88	2	.44	.51	.602	.02
	College Major	2.09	3	.70	.81	.491	.04
	Discussion Posts X College Major	1.93	6	.32	.38	.892	.03
	Error	56.62	66	.86			
	Total	61.77	79				
PSF	Age	1.35	1	1.35	1.27	.265	.02
	Gender	.32	1	.32	.30	.585	.01
	Discussion Posts	4.73	2	2.36	2.22	.117	.06
	College Major	5.66	3	1.89	1.77	.161	.07
	Discussion Posts X College Major	5.29	6	.88	.83	.553	.07
	Error	70.35	66	1.07			
	Total	85.35	79				

Note. Likelihood and uncertainty (LU) and problem solving (PS) measures with forced-choice (F) and constructed-response (R) items.

Table 31 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
PSR	Age	1.24	1	1.24	.91	.343	.01
	Gender	.10	1	.10	.07	.789	.00
	Discussion Posts	1.33	2	.67	.49	.616	.02
	College Major	2.40	3	.80	.59	.625	.03
	Discussion Posts X College Major	3.23	6	.54	.40	.880	.04
	Error	89.98	66	1.36			
	Total	98.02	79				

Note. Problem solving constructed-response (PSR) measures.

Table 32.

ANCOVA summary table for time 2 CT scores with time 1 CT scores as covariate.

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
CT	Age	.00	1.00	.00	.00	.947	.00
	Gender	.55	1.00	.55	.99	.322	.02
	t1 CT	28.16	1.00	28.16	50.84	.000	.44
	Discussion Posts	.43	2.00	.22	.39	.680	.01
	Department Major	.07	3.00	.02	.04	.989	.00
	Discussion Posts X Department Major	1.45	5.00	.29	.52	.757	.04
	Error	36.55	66.00	.55			
	Total	70.46	79.00				
CTF	Age	.31	1.00	.31	.48	.493	.01
	Gender	1.04	1.00	1.04	1.59	.212	.02
	t1 CTF	21.57	1.00	21.57	32.90	.000	.33
	Discussion Posts	.98	2.00	.49	.75	.478	.02
	Department Major	2.00	3.00	.67	1.02	.390	.04
	Discussion Posts X Department Major	1.10	5.00	.22	.33	.890	.03
	Error	43.28	66.00	.66			
	Total	71.28	79.00				
CTR	Age	.01	1.00	.01	.01	.912	.00
	Gender	.00	1.00	.00	.00	.947	.00
	t1 CTR	15.26	1.00	15.26	20.31	.000	.24
	Discussion Posts	.04	2.00	.02	.03	.973	.00
	Department Major	1.86	3.00	.62	.82	.485	.04
	Discussion Posts X Department Major	2.91	5.00	.58	.78	.571	.06
	Error	49.60	66.00	.75			
	Total	75.40	79.00				
VR	Age	.47	1.00	.47	.67	.417	.01
	Gender	.89	1.00	.89	1.27	.264	.02
	t1 VR	8.35	1.00	8.35	11.89	.001	.15
	Discussion Posts	.31	2.00	.15	.22	.804	.01
	Department Major	1.72	3.00	.57	.82	.489	.04
	Discussion Posts X Department Major	3.79	5.00	.76	1.08	.380	.08
	Error	46.35	66.00	.70			
	Total	68.56	79.00				

Note. Critical thinking (CT) and verbal reasoning (VR) measures with forced-choice (F) and constructed-response (R) items.

Table 32 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
VRF	Age	.08	1.00	.08	.09	.767	.00
	Gender	.19	1.00	.19	.20	.657	.00
	t1 VRF	6.57	1.00	6.57	6.91	.011	.10
	Discussion Posts	.31	2.00	.15	.16	.852	.01
	Department Major	3.81	3.00	1.27	1.34	.270	.06
	Discussion Posts X Department Major	2.06	5.00	.41	.43	.823	.03
	Error	62.76	66.00	.95			
	Total	77.94	79.00				
VRR	Age	1.10	1.00	1.10	1.49	.226	.02
	Gender	.96	1.00	.96	1.31	.256	.02
	t1 VRR	4.69	1.00	4.69	6.38	.014	.09
	Discussion Posts	.30	2.00	.15	.20	.816	.01
	Department Major	.94	3.00	.31	.42	.736	.02
	Discussion Posts X Department Major	5.40	5.00	1.08	1.47	.212	.10
	Error	48.52	66.00	.74			
	Total	66.02	79.00				
AA	Age	.10	1.00	.10	.14	.709	.00
	Gender	.64	1.00	.64	.94	.335	.01
	t1 AA	10.64	1.00	10.64	15.61	.000	.19
	Discussion Posts	.99	2.00	.49	.72	.489	.02
	Department Major	2.18	3.00	.73	1.07	.370	.05
	Discussion Posts X Department Major	5.14	5.00	1.03	1.51	.199	.10
	Error	44.99	66.00	.68			
	Total	67.37	79.00				
AAF	Age	.09	1.00	.09	.13	.719	.00
	Gender	.10	1.00	.10	.15	.701	.00
	t1 AAF	14.72	1.00	14.72	21.58	.000	.25
	Discussion Posts	.51	2.00	.26	.38	.688	.01
	Department Major	2.52	3.00	.84	1.23	.306	.05
	Discussion Posts X Department Major	5.47	5.00	1.09	1.60	.171	.11
	Error	45.02	66.00	.68			
	Total	68.07	79.00				

Note. Verbal reasoning (VR) and argument analysis (AA) measures with forced-choice (F) and constructed-response (R) items.

Table 32 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
AAR	Age	.34	1.00	.34	.39	.533	.01
	Gender	1.40	1.00	1.40	1.61	.209	.02
	t1 AAR	1.54	1.00	1.54	1.77	.189	.03
	Discussion Posts	.98	2.00	.49	.56	.573	.02
	Department Major	2.08	3.00	.70	.80	.500	.04
	Discussion Posts X Department Major	2.73	5.00	.55	.63	.680	.05
	Error	57.51	66.00	.87			
	Total	69.59	79.00				
HT	Age	.23	1.00	.23	.31	.583	.01
	Gender	.15	1.00	.15	.19	.661	.00
	t1 HT	16.72	1.00	16.72	21.84	.000	.25
	Discussion Posts	.38	2.00	.19	.25	.780	.01
	Department Major	1.10	3.00	.37	.48	.698	.02
	Discussion Posts X Department Major	1.78	5.00	.36	.47	.801	.03
	Error	50.53	66.00	.77			
	Total	75.17	79.00				
HTF	Age	.01	1.00	.01	.01	.933	.00
	Gender	.48	1.00	.48	.54	.463	.01
	t1 HTF	13.53	1.00	13.53	15.23	.000	.19
	Discussion Posts	1.72	2.00	.86	.97	.386	.03
	Department Major	3.32	3.00	1.11	1.25	.300	.05
	Discussion Posts X Department Major	.59	5.00	.12	.13	.984	.01
	Error	58.63	66.00	.89			
	Total	84.54	79.00				
HTR	Age	.53	1.00	.53	.66	.421	.01
	Gender	.03	1.00	.03	.04	.840	.00
	t1 HTR	8.32	1.00	8.32	10.33	.002	.14
	Discussion Posts	.66	2.00	.33	.41	.666	.01
	Department Major	6.95	3.00	2.32	2.87	.043	.12
	Discussion Posts X Department Major	4.03	5.00	.81	1.00	.425	.07
	Error	53.19	66.00	.81			
	Total	77.39	79.00				

Note. Argument analysis (AA) and hypothesis testing (HT) measures with forced-choice (F) and constructed-response (R) items.

Table 32 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
LU	Age	.34	1.00	.34	.36	.549	.01
	Gender	.02	1.00	.02	.02	.879	.00
	t1 LU	23.52	1.00	23.52	25.44	.000	.28
	Discussion Posts	.94	2.00	.47	.51	.605	.02
	Department Major	.39	3.00	.13	.14	.936	.01
	Discussion Posts X Department Major	1.10	5.00	.22	.24	.944	.02
	Error	61.03	66.00	.93			
	Total	90.41	79.00				
LUF	Age	.00	1.00	.00	.00	.953	.00
	Gender	.63	1.00	.63	.69	.410	.01
	t1 LUF	18.23	1.00	18.23	20.02	.000	.23
	Discussion Posts	4.19	2.00	2.09	2.30	.108	.07
	Department Major	3.20	3.00	1.07	1.17	.327	.05
	Discussion Posts X Department Major	4.61	5.00	.92	1.01	.417	.07
	Error	60.11	66.00	.91			
	Total	84.76	79.00				
LUR	Age	.08	1.00	.08	.07	.786	.00
	Gender	1.10	1.00	1.10	1.06	.307	.02
	t1 LUR	12.20	1.00	12.20	11.72	.001	.15
	Discussion Posts	.24	2.00	.12	.12	.891	.00
	Department Major	.98	3.00	.33	.31	.816	.01
	Discussion Posts X Department Major	5.77	5.00	1.15	1.11	.365	.08
	Error	68.68	66.00	1.04			
	Total	93.69	79.00				
PS	Age	.33	1.00	.33	.44	.510	.01
	Gender	.31	1.00	.31	.40	.527	.01
	t1 PS	15.80	1.00	15.80	20.81	.000	.24
	Discussion Posts	.47	2.00	.23	.31	.735	.01
	Department Major	1.06	3.00	.35	.47	.708	.02
	Discussion Posts X Department Major	.72	5.00	.14	.19	.965	.01
	Error	50.10	66.00	.76			
	Total	70.99	79.00				

Note. Likelihood and uncertainty (LU) and problem solving (PS) measures with forced-choice (F) and constructed-response (R) items.

Table 32 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
PSF	Age	1.75	1.00	1.75	2.09	.153	.03
	Gender	.27	1.00	.27	.33	.569	.01
	t1 PSF	11.99	1.00	11.99	14.33	.000	.18
	Discussion Posts	2.00	2.00	1.00	1.19	.310	.04
	Department Major	3.81	3.00	1.27	1.52	.218	.07
	Discussion Posts X Department Major	2.29	5.00	.46	.55	.741	.04
	Error	55.26	66.00	.84			
	Total	78.33	79.00				
PSR	Age	.03	1.00	.03	.03	.872	.00
	Gender	.15	1.00	.15	.16	.694	.00
	t1 PSR	2.72	1.00	2.72	2.87	.095	.04
	Discussion Posts	.41	2.00	.21	.22	.806	.01
	Department Major	.96	3.00	.32	.34	.799	.02
	Discussion Posts X Department Major	.99	5.00	.20	.21	.958	.02
	Error	62.57	66.00	.95			
	Total	68.64	79.00				
CT	Age	.01	1.00	.01	.01	.924	.00
	Gender	.71	1.00	.71	1.29	.260	.02
	t1 CT	28.86	1.00	28.86	52.51	.000	.45
	Discussion Posts	.95	2.00	.48	.87	.425	.03
	College Major	.54	3.00	.18	.33	.804	.02
	Discussion Posts X College Major	2.37	6.00	.39	.72	.637	.06
	Error	35.73	65.00	.55			
	Total	70.46	79.00				
CTF	Age	.21	1.00	.21	.33	.569	.01
	Gender	1.40	1.00	1.40	2.15	.148	.03
	t1 CTF	22.81	1.00	22.81	34.87	.000	.35
	Discussion Posts	2.22	2.00	1.11	1.70	.191	.05
	College Major	2.48	3.00	.83	1.26	.295	.06
	Discussion Posts X College Major	1.71	6.00	.29	.44	.852	.04
	Error	42.52	65.00	.65			
	Total	71.28	79.00				

Note. Problem solving (PS) and critical thinking (CT) measures with forced-choice (F) and constructed-response (R) items.

Table 32 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
CTR	Age	.04	1.00	.04	.05	.816	.00
	Gender	.00	1.00	.00	.00	.998	.00
	t1 CTR	15.23	1.00	15.23	20.15	.000	.24
	Discussion Posts	.07	2.00	.03	.04	.957	.00
	College Major	1.56	3.00	.52	.69	.562	.03
	Discussion Posts X College Major	3.24	6.00	.54	.71	.640	.06
	Error	49.14	65.00	.76			
	Total	75.40	79.00				
VR	Age	.40	1.00	.40	.56	.455	.01
	Gender	.68	1.00	.68	.95	.335	.01
	t1 VR	9.10	1.00	9.10	12.75	.001	.16
	Discussion Posts	.74	2.00	.37	.52	.600	.02
	College Major	1.53	3.00	.51	.71	.547	.03
	Discussion Posts X College Major	4.16	6.00	.69	.97	.452	.08
	Error	46.40	65.00	.71			
	Total	68.56	79.00				
VRF	Age	.15	1.00	.15	.15	.696	.00
	Gender	.20	1.00	.20	.20	.657	.00
	t1 VRF	6.34	1.00	6.34	6.48	.013	.09
	Discussion Posts	.25	2.00	.12	.13	.881	.00
	College Major	2.88	3.00	.96	.98	.408	.04
	Discussion Posts X College Major	1.53	6.00	.26	.26	.953	.02
	Error	63.61	65.00	.98			
	Total	77.94	79.00				
VRR	Age	1.06	1.00	1.06	1.41	.239	.02
	Gender	.74	1.00	.74	.99	.324	.02
	t1 VRR	5.58	1.00	5.58	7.43	.008	.10
	Discussion Posts	.60	2.00	.30	.40	.673	.01
	College Major	1.00	3.00	.33	.44	.723	.02
	Discussion Posts X College Major	5.40	6.00	.90	1.20	.319	.10
	Error	48.81	65.00	.75			
	Total	66.02	79.00				

Note. Critical thinking (CT) and verbal reasoning (VR) measures with forced-choice (F) and constructed-response (R) items.

Table 32 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
AA	Age	.10	1.00	.10	.15	.700	.00
	Gender	.37	1.00	.37	.53	.467	.01
	t1 AA	10.53	1.00	10.53	15.09	.000	.19
	Discussion Posts	.58	2.00	.29	.42	.662	.01
	College Major	2.14	3.00	.72	1.02	.388	.05
	Discussion Posts X College Major	5.28	6.00	.88	1.26	.288	.10
	Error	45.36	65.00	.70			
	Total	67.37	79.00				
AAF	Age	.01	1.00	.01	.02	.897	.00
	Gender	.12	1.00	.12	.18	.676	.00
	t1 AAF	15.24	1.00	15.24	22.08	.000	.25
	Discussion Posts	.37	2.00	.19	.27	.766	.01
	College Major	2.98	3.00	.99	1.44	.239	.06
	Discussion Posts X College Major	5.86	6.00	.98	1.41	.223	.12
	Error	44.87	65.00	.69			
	Total	68.07	79.00				
AAR	Age	.53	1.00	.53	.61	.439	.01
	Gender	.70	1.00	.70	.81	.373	.01
	t1 AAR	1.66	1.00	1.66	1.90	.172	.03
	Discussion Posts	.85	2.00	.42	.49	.617	.02
	College Major	2.23	3.00	.74	.86	.469	.04
	Discussion Posts X College Major	3.15	6.00	.53	.60	.727	.05
	Error	56.54	65.00	.87			
	Total	69.59	79.00				
HT	Age	.40	1.00	.40	.53	.471	.01
	Gender	.26	1.00	.26	.34	.564	.01
	t1 HT	17.56	1.00	17.56	23.18	.000	.26
	Discussion Posts	.27	2.00	.14	.18	.837	.01
	College Major	1.48	3.00	.49	.65	.587	.03
	Discussion Posts X College Major	3.06	6.00	.51	.67	.671	.06
	Error	49.24	65.00	.76			
	Total	75.17	79.00				

Note. Argument analysis (AA) and hypothesis testing (HT) measures with forced-choice (F) and constructed-response (R) items.

Table 32 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
HTF	Age	.02	1.00	.02	.03	.875	.00
	Gender	.83	1.00	.83	.94	.335	.01
	t1 HTF	13.98	1.00	13.98	15.88	.000	.20
	Discussion Posts	1.66	2.00	.83	.94	.394	.03
	College Major	4.58	3.00	1.53	1.74	.168	.07
	Discussion Posts X College Major	1.62	6.00	.27	.31	.932	.03
	Error	57.23	65.00	.88			
	Total	84.54	79.00				
HTR	Age	.84	1.00	.84	1.05	.309	.02
	Gender	.10	1.00	.10	.12	.730	.00
	t1 HTR	8.58	1.00	8.58	10.77	.002	.14
	Discussion Posts	.71	2.00	.35	.44	.644	.01
	College Major	5.91	3.00	1.97	2.47	.070	.10
	Discussion Posts X College Major	4.96	6.00	.83	1.04	.409	.09
	Error	51.82	65.00	.80			
	Total	77.39	79.00				
LU	Age	.34	1.00	.34	.37	.545	.01
	Gender	.00	1.00	.00	.00	.983	.00
	t1 LU	23.18	1.00	23.18	25.11	.000	.28
	Discussion Posts	1.21	2.00	.61	.66	.522	.02
	College Major	.65	3.00	.22	.24	.872	.01
	Discussion Posts X College Major	2.40	6.00	.40	.43	.854	.04
	Error	59.99	65.00	.92			
	Total	90.41	79.00				
LUF	Age	.04	1.00	.04	.04	.842	.00
	Gender	.76	1.00	.76	.88	.353	.01
	t1 LUF	17.65	1.00	17.65	20.41	.000	.24
	Discussion Posts	4.50	2.00	2.25	2.61	.082	.07
	College Major	.26	3.00	.09	.10	.959	.01
	Discussion Posts X College Major	8.80	6.00	1.47	1.70	.136	.14
	Error	56.19	65.00	.86			
	Total	84.76	79.00				

Note. Hypothesis testing (HT) and Likelihood and uncertainty (LU) measures with forced-choice (F) and constructed-response (R) items.

Table 32 (Cont.).

Outcome	Factor	*SS*	*df*	*MS*	*F*	*p*	η^2_p
LUR	Age	.04	1.00	.04	.04	.842	.00
	Gender	.88	1.00	.88	.84	.363	.01
	t1 LUR	12.64	1.00	12.64	12.11	.001	.16
	Discussion Posts	.10	2.00	.05	.05	.955	.00
	College Major	1.13	3.00	.38	.36	.782	.02
	Discussion Posts X College Major	6.76	6.00	1.13	1.08	.384	.09
	Error	67.89	65.00	1.04			
	Total	93.69	79.00				
PS	Age	.33	1.00	.33	.43	.514	.01
	Gender	.26	1.00	.26	.33	.568	.01
	t1 PS	15.79	1.00	15.79	20.38	.000	.24
	Discussion Posts	1.13	2.00	.57	.73	.486	.02
	College Major	1.09	3.00	.36	.47	.705	.02
	Discussion Posts X College Major	.71	6.00	.12	.15	.988	.01
	Error	50.38	65.00	.78			
	Total	70.99	79.00				
PSF	Age	1.80	1.00	1.80	2.11	.152	.03
	Gender	.25	1.00	.25	.29	.593	.00
	t1 PSF	12.53	1.00	12.53	14.68	.000	.18
	Discussion Posts	4.59	2.00	2.30	2.69	.075	.08
	College Major	3.84	3.00	1.28	1.50	.223	.07
	Discussion Posts X College Major	2.14	6.00	.36	.42	.865	.04
	Error	55.49	65.00	.85			
	Total	78.33	79.00				
PSR	Age	.00	1.00	.00	.00	.952	.00
	Gender	.10	1.00	.10	.11	.744	.00
	t1 PSR	2.26	1.00	2.26	2.37	.129	.04
	Discussion Posts	.91	2.00	.46	.48	.622	.02
	College Major	.96	3.00	.32	.34	.800	.02
	Discussion Posts X College Major	1.71	6.00	.29	.30	.935	.03
	Error	62.11	65.00	.96			
	Total	68.64	79.00				

Note. Likelihood and uncertainty (LU) and problem solving (PS) measures with forced-choice (F) and constructed-response (R) items.

Table 33.

Correlations between Time 1 CT measures and course outcomes.

	Quiz (n = 302)		Discussion (n = 148)		Final Exam (n = 286)		Total Points (n = 302)	
Measure	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
CT	.11	.058	.14	.082	.13	.024	.08	.178
CTF	.11	.053	.15	.061	.13	.032	.08	.177
CTR	.08	.148	.10	.217	.11	.068	.06	.295
VR	.06	.331	.09	.262	.13	.026	.03	.554
VRF	.05	.369	.05	.551	.14	.017	.03	.561
VRR	.05	.434	.10	.253	.10	.102	.03	.645
AA	.12	.041	.10	.231	.19	.001	.09	.109
AAF	.17	.004	.20	.017	.19	.001	.14	.014
AAR	.04	.534	-.02	.798	.13	.034	.02	.728
HT	.19	.001	.19	.022	.13	.034	.17	.004
HTF	.18	.002	.16	.049	.12	.039	.16	.005
HTR	.14	.017	.15	.064	.09	.143	.12	.039
LU	.12	.036	.15	.062	.12	.037	.10	.075
LUF	.12	.047	.14	.081	.08	.162	.09	.135
LUR	.09	.107	.12	.157	.11	.055	.09	.141
PS	-.05	.366	.02	.801	-.06	.347	-.08	.176
PSF	-.08	.145	-.01	.920	-.05	.377	-.11	.058
PSR	.00	.939	.05	.545	-.04	.517	-.01	.828

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 34.

Correlations between Time 2 CT measures and course outcomes.

	Quiz (n = 129)		Discussion (n = 71)		Final Exam (n = 126)		Total Points (n = 129)	
Measure	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
CT	.31	< .001	.29	.015	.29	.001	.31	< .001
CTF	.29	.001	.30	.010	.28	.001	.29	.001
CTR	.26	.003	.20	.093	.24	.007	.27	.002
VR	.28	.001	.25	.035	.27	.002	.28	.001
VRF	.20	.021	.31	.008	.15	.094	.18	.046
VRR	.24	.006	.15	.198	.26	.003	.26	.003
AA	.28	.001	.23	.051	.18	.043	.25	.004
AAF	.23	.009	.26	.031	.22	.015	.21	.018
AAR	.24	.007	.14	.249	.09	.318	.22	.015
HT	.23	.009	.17	.148	.24	.008	.26	.003
HTF	.17	.049	.13	.266	.21	.018	.20	.024
HTR	.20	.024	.14	.249	.17	.059	.23	.009
LU	.26	.003	.25	.038	.27	.002	.26	.003
LUF	.35	< .001	.33	.006	.26	.003	.31	< .001
LUR	.13	.140	.08	.488	.20	.022	.15	.084
PS	.21	.015	.23	.051	.23	.011	.22	.012
PSF	.20	.020	.19	.118	.20	.026	.22	.014
PSR	.15	.093	.18	.131	.18	.041	.15	.097

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 35.

Correlation Summary Table between Quiz Points and CT measures.

	Time 1		Time 2		Time 1/Time 2		*r*-difference	
Item	*r*	*p*	*r*	*p*	*r*	*p*	*t*	*p*
CT	.45	< .001	.45	< .001	.70	< .001	.00	.398
CTF	.32	.006	.45	< .001	.63	< .001	-1.37	.155
CTR	.45	< .001	.35	.002	.57	< .001	1.01	.238
VR	.34	.003	.40	< .001	.50	< .001	-.54	.343
VRF	.26	.026	.24	.042	.40	< .001	.18	.391
VRR	.31	.007	.36	.002	.42	< .001	-.42	.364
AA	.31	.008	.35	.002	.46	< .001	-.38	.370
AAF	.27	.020	.32	.005	.51	< .001	-.48	.355
AAR	.23	.047	.25	.031	.25	.036	-.14	.393
HT	.36	.002	.31	.008	.55	< .001	.55	.340
HTF	.27	.023	.28	.018	.48	< .001	-.09	.396
HTR	.37	.001	.20	.097	.48	< .001	1.49	.131
LU	.34	.003	.51	< .001	.55	< .001	-1.80	.080
LUF	.26	.024	.56	< .001	.46	< .001	-2.91	.007
LUR	.31	.007	.36	.002	.47	< .001	-.40	.367
PS	.23	.048	.30	.011	.54	< .001	-.57	.338
PSF	.07	.575	.29	.011	.43	< .001	-1.86	.072
PSR	.32	.007	.17	.156	.25	.031	1.07	.223

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 36.

Correlation Summary Table between Discussion Points and CT measures.

	Time 1		Time 2		Time 1/Time 2		*r*-difference	
Item	*r*	*p*	*r*	*p*	*r*	*p*	*t*	*p*
CT	-.16	.359	.05	.792	.76	< .001	-1.77	.084
CTF	-.01	.975	.19	.250	.74	< .001	-1.67	.099
CTR	-.26	.115	-.07	.666	.60	< .001	-1.29	.171
VR	-.24	.157	-.10	.553	.54	.001	-.86	.272
VRF	-.06	.733	.09	.599	.35	.034	-.76	.295
VRR	-.27	.106	-.15	.373	.45	.006	-.68	.312
AA	-.16	.340	-.10	.575	.51	.001	-.39	.366
AAF	-.01	.951	-.14	.426	.54	< .001	.77	.292
AAR	-.27	.110	-.04	.819	.19	.251	-1.09	.218
HT	-.09	.603	.06	.740	.56	< .001	-.91	.259
HTF	-.09	.589	.13	.428	.56	< .001	-1.45	.138
HTR	-.07	.698	-.04	.798	.46	.005	-.12	.393
LU	-.10	.573	.21	.217	.53	.001	-1.92	.065
LUF	.02	.890	.29	.086	.39	.017	-1.46	.138
LUR	-.14	.415	.07	.677	.35	.035	-1.09	.218
PS	-.01	.948	.13	.442	.72	< .001	-1.12	.211
PSF	.06	.725	.22	.196	.62	< .001	-1.08	.220
PSR	-.11	.513	-.08	.635	.18	.279	-.14	.392

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 37.

Correlation Summary Table between Final Exam Points and CT measures.

	Time 1		Time 2		Time 1/Time 2		*r*-difference	
Item	*r*	*p*	*r*	*p*	*r*	*p*	*t*	*p*
CT	.43	< .001	.36	.002	.69	< .001	.89	.267
CTF	.25	.036	.33	.004	.63	< .001	-.87	.271
CTR	.48	< .001	.29	.013	.56	< .001	1.89	.068
VR	.47	< .001	.39	.001	.50	< .001	.77	.295
VRF	.32	.007	.31	.009	.40	.001	.09	.396
VRR	.44	< .001	.31	.007	.42	< .001	1.14	.207
AA	.35	.003	.22	.066	.46	< .001	1.13	.209
AAF	.27	.021	.28	.018	.51	< .001	-.06	.397
AAR	.30	.011	.08	.492	.24	.039	1.53	.124
HT	.24	.043	.30	.010	.54	< .001	-.59	.334
HTF	.21	.071	.25	.038	.47	< .001	-.26	.384
HTR	.20	.096	.23	.055	.48	< .001	-.24	.386
LU	.38	.001	.37	.001	.53	< .001	.08	.396
LUF	.26	.026	.31	.009	.47	< .001	-.37	.370
LUR	.36	.002	.32	.006	.44	< .001	.38	.370
PS	.13	.261	.21	.080	.55	< .001	-.66	.319
PSF	-.07	.579	.17	.155	.43	< .001	-1.88	.069
PSR	.32	.007	.18	.140	.25	.033	1.02	.235

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 38.

Correlation Summary Table between Total Points and CT measures.

	Time 1		Time 2		Time 1/Time 2		*r*-difference	
Item	*r*	*p*	*r*	*P*	*r*	*p*	*t*	*p*
CT	.43	< .001	.42	< .001	.70	< .001	.18	.391
CTF	.30	.009	.42	< .001	.63	< .001	-1.21	.190
CTR	.43	< .001	.32	.006	.57	< .001	1.14	.207
VR	.35	.002	.40	< .001	.50	< .001	-.47	.356
VRF	.27	.020	.25	.033	.40	< .001	.18	.391
VRR	.31	.007	.35	.002	.42	< .001	-.32	.377
AA	.32	.006	.32	.006	.46	< .001	-.03	.397
AAF	.27	.020	.30	.010	.51	< .001	-.26	.384
AAR	.24	.038	.22	.060	.25	.036	.15	.393
HT	.32	.005	.29	.012	.55	< .001	.30	.380
HTF	.24	.040	.26	.026	.48	< .001	-.16	.392
HTR	.32	.006	.19	.109	.48	< .001	1.11	.214
LU	.31	.007	.48	< .001	.55	< .001	-1.64	.105
LUF	.25	.031	.54	< .001	.46	< .001	-2.75	.010
LUR	.28	.015	.32	.006	.47	< .001	-.30	.379
PS	.23	.056	.26	.027	.54	< .001	-.31	.379
PSF	.05	.656	.27	.024	.43	< .001	-1.72	.092
PSR	.32	.006	.14	.243	.25	.031	1.31	.168

Note. Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS). Subcomponents of totals for forced-choice are designated with “F” and free-response are designated with “R”.

Table 39.

Moderated effects for increasing time 2 CT measures on course outcomes, with age and gender.

Major Classification	CT component	Outcome	Major	Discussion posting
Department	t2 CT	Quiz Points	!INTS	0,1
		Discussion Points		
		Final Exam		0
		Total Course Points	NURS,TRAD	
	t2 CTF	Quiz Points	!INTS	0
		Discussion Points		
		Final Exam	PSYC	0
		Total Course Points	!INTS	0
	t2 CTR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 VR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2VRF	Quiz Points	PSYC	0,1
		Discussion Points		
		Final Exam		0
		Total Course Points	PSYC, NURS	0,1
	t2 VRR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 AA	Quiz Points	!INTS	0,1
		Discussion Points		
		Final Exam	PSYC	0
		Total Course Points	!INTS	0,1
	t2 AAF	Quiz Points	!INTS	0,1
		Discussion Points		
		Final Exam	PSYC	0,1
		Total Course Points	!INTS	0,1
	t2 AAR	Quiz Points	TRAD	
		Discussion Points		
		Final Exam		
		Total Course Points	TRAD	

Note. Critical thinking (CT), verbal reasoning (VR), and Argument analysis (AA) measures with forced-choice (F) and constructed-response (R) items. Psychology (PSYC), nursing (NURS), traditional (TRAD), and interdisciplinary (INTS) majors, where a bang (!) designation before a specific group indicates all categories except the specified group.

Table 39 (Cont.).

Major Classification	CT component	Outcome	Major	Discussion posting
Department	t2 HT	Quiz Points	!INTS	0,1
		Discussion Points		
		Final Exam		
		Total Course Points	PSYC, TRAD	0,1
	t2 HTF	Quiz Points		0
		Discussion Points		1
		Final Exam		
		Total Course Points		
	t2 HTR	Quiz Points	PSYC, TRAD	0
		Discussion Points		
		Final Exam		
		Total Course Points	PSYC, TRAD	0
	t2 LU	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 LUF	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 LUR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 PS	Quiz Points	NURS	0
		Discussion Points		
		Final Exam	PSYC	
		Total Course Points	NURS	
	t2 PSF	Quiz Points	!INTS	0
		Discussion Points		
		Final Exam	PSYC	0
		Total Course Points	NURS	0
	t2 PSR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		

Note. Hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS) measures with forced-choice (F) and constructed-response (R) items. Psychology (PSYC), nursing (NURS), traditional (TRAD), and interdisciplinary (INTS) majors, where bang (!) designation before a group indicates all categories except the indicated group.

Table 39 (Cont.).

Major Classification	CT component	Outcome	Major	Discussion posting
College	t2 CT	Quiz Points		0,1
		Discussion Points		
		Final Exam		
		Total Course Points	!INTS	0,1
	t2 CTF	Quiz Points	!INTS	0,1
		Discussion Points		
		Final Exam		
		Total Course Points	!INTS	0,1
	t2 CTR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 VR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2VRF	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 VRR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 AA	Quiz Points	!INTS	0,1
		Discussion Points		
		Final Exam	SCIE	
		Total Course Points	!INTS	0,1
	t2 AAF	Quiz Points	!INTS	0,1
		Discussion Points		
		Final Exam	SCIE	
		Total Course Points	!INTS	0,1
	t2 AAR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		

Note. Critical thinking (CT), verbal reasoning (VR), and Argument analysis (AA) measures with forced-choice (F) and constructed-response (R) items. Psychology (PSYC), nursing (NURS), traditional (TRAD), and interdisciplinary (INTS) majors, where a bang (!) designation before a specific group indicates all categories except the specified group.

Table 39 (Cont.).

Major Classification	CT component	Outcome	Major	Discussion posting
College	t2 HT	Quiz Points	SCIE, TRAD	0
		Discussion Points		
		Final Exam		
		Total Course Points	TRAD	0
	t2 HTF	Quiz Points		0
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 HTR	Quiz Points	SCIE, TRAD	0
		Discussion Points		
		Final Exam		
		Total Course Points	SCIE, TRAD	0
	t2 LU	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 LUF	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		0,1
	t2 LUR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 PS	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		
	t2 PSF	Quiz Points	SCIE, NURS	0
		Discussion Points		
		Final Exam		
		Total Course Points	SCIE, NURS	
	t2 PSR	Quiz Points		
		Discussion Points		
		Final Exam		
		Total Course Points		

Note. Hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS) measures with forced-choice (F) and constructed-response (R) items. Psychology (PSYC), nursing (NURS), traditional (TRAD), and interdisciplinary (INTS) majors, where bang (!) designation before a group indicates all categories except the indicated group.

Table 40.

Mediated regression models across course outcomes through respective CT measures.

Model		Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
t1 CT on Final Exam, through t2 CT (n = 72)	A-path: $F(1,70) = 62.73$, $p < .001$	Constant	-.17	.09	-1.99	.050	-.34	.00
		t1 CT	.71	.09	7.92	< .001	.53	.88
	B-path: $F(2,69) = 8.27$, $p = .001$	Constant	31.17	.37	83.97	< .001	30.43	31.91
		t2 CT	.38	.50	.75	.455	-.62	1.37
		t1 CT	1.23	.51	2.39	.020	.20	2.25
	C-path: $F(1,70) = 16.08$, $p < .001$	Constant	31.10	.36	86.40	< .001	30.38	31.82
		t1 CT	1.49	.37	4.01	< .001	.75	2.23
	Mediation Summary	Total	1.49	.37	4.01	< .001	.75	2.23
		Direct	1.23	.51	2.39	.020	.20	2.25
		Indirect	.27	.36	.74	.301	-.46	.99
t1 CTF on Final Exam, through t2 CTF (n = 72)	A-path: $F(1,70) = 46.36$, $p < .001$	Constant	.09	.09	1.04	.303	-.08	.26
		t1 CTF	.64	.09	6.81	< .001	.45	.82
	B-path: $F(2,69) = 4.37$, $p = .016$	Constant	31.50	.35	89.16	< .001	30.79	32.20
		t2 CTF	.97	.49	2.00	.050	.00	1.94
		t1 CTF	.21	.49	.43	.669	-.77	1.19
	C-path: $F(1,70) = 4.56$, $p = .036$	Constant	31.58	.36	88.22	< .001	30.87	32.30
		t1 CTF	.83	.39	2.13	.036	.05	1.60
	Mediation Summary	Total	.83	.39	2.13	.036	.05	1.60
		Direct	.21	.49	.43	.669	-.77	1.19
		Indirect	.62	.38	1.64	.104	-.06	1.43
t1 CTR on Final Exam, through t2 CTR (n = 72)	A-path: $F(1,70) = 31.51$, $p < .001$	Constant	-.30	.11	-2.66	.010	-.52	-.07
		t1 CTR	.60	.11	5.61	< .001	.39	.82
	B-path: $F(2,69) = 10.30$, $p < .001$	Constant	30.84	.39	78.18	< .001	30.05	31.63
		t2 CTR	.11	.40	.28	.778	-.69	.92
		t1 CTR	1.58	.44	3.60	.001	.71	2.46

Note. Total critical thinking (CT), total CT forced-choice (CTF), and total CT constructed-response (CTR).

Table 40 (Cont.).

Model		Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
	C-path: $F(1,70) = 20.80$, $p < .001$	Constant	30.81	.37	82.48	< .001	30.06	31.55
		t1 CTR	1.65	.36	4.56	< .001	.93	2.37
	Mediation Summary	Total	1.65	.36	4.56	< .001	.93	2.37
		Direct	1.58	.44	3.60	.001	.71	2.46
		Indirect	.07	.23	.31	.379	-.37	.52
t1 VR on Final Exam, through t2 VR (n = 72)	A-path: $F(1,70) = 23.36$, $p < .001$	Constant	-.20	.10	-2.05	.044	-.40	-.01
		t1 VR	.48	.10	4.83	< .001	.28	.68
	B-path: $F(2,69) = 11.62$, $p < .001$	Constant	31.40	.34	91.73	< .001	30.72	32.08
		t2 VR	.68	.40	1.71	.091	-.11	1.48
		t1 VR	1.16	.38	3.04	.003	.40	1.93
	C-path: $F(1,70) = 19.75$, $p < .001$	Constant	31.26	.34	92.75	< .001	30.59	31.93
		t1 VR	1.49	.34	4.44	< .001	.82	2.16
	Mediation Summary	Total	1.49	.34	4.44	< .001	.82	2.16
		Direct	1.16	.38	3.04	.003	.40	1.93
		Indirect	.33	.24	1.35	.160	-.08	.86
t1 VRF on Final Exam, through t2 VRF (n = 72)	A-path: $F(1,70) = 13.26$, $p = .001$	Constant	-.19	.11	-1.81	.074	-.41	.02
		t1 VRF	.40	.11	3.64	.001	.18	.62
	B-path: $F(2,69) = 5.51$, $p = .006$	Constant	31.57	.36	87.30	< .001	30.84	32.29
		t2 VRF	.69	.39	1.74	.086	-.10	1.47
		t1 VRF	.75	.40	1.90	.062	-.04	1.54
	C-path: $F(1,70) = 7.76$, $p = .007$	Constant	31.43	.36	87.69	< .001	30.72	32.15
		t1 VRF	1.03	.37	2.79	.007	.29	1.76
	Mediation Summary	Total	1.03	.37	2.79	.007	.29	1.76
		Direct	.75	.40	1.90	.062	-.04	1.54
		Indirect	.28	.17	1.59	.113	.00	.70

Note. Total verbal reasoning (VR) and verbal reasoning forced-choice (VRF).

Table 40 (Cont.).

Model		Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
t1 VRR on Final Exam, through t2 VRR (n = 72)	A-path: $F(1,70) = 14.76$, $p < .001$	Constant	-.14	.11	-1.29	.201	-.35	.08
		t1 VRR	.42	.11	3.84	< .001	.20	.64
	B-path: $F(2,69) = 9.57$, $p < .001$	Constant	31.40	.34	92.11	< .001	30.72	32.08
		t2 VRR	.50	.38	1.32	.190	-.25	1.25
		t1 VRR	1.23	.38	3.24	.002	.47	1.99
	C-path: $F(1,70) = 17.21$, $p < .001$	Constant	31.33	.34	92.50	< .001	30.66	32.01
		t1 VRR	1.44	.35	4.15	< .001	.75	2.13
	Mediation Summary	Total	1.44	.35	4.15	< .001	.75	2.13
		Direct	1.23	.38	3.24	.002	.47	1.99
		Indirect	.21	.19	1.12	.212	-.10	.66
t1 AA on Final Exam, through t2 AA (n = 72)	A-path: $F(1,70) = 19.07$, $p < .001$	Constant	-.19	.11	-1.70	.094	-.41	.03
		t1 AA	.46	.11	4.37	< .001	.25	.67
	B-path: $F(2,69) = 5.00$, $p = .009$	Constant	31.10	.41	76.74	< .001	30.29	31.91
		t2 AA	.24	.43	.56	.575	-.62	1.10
		t1 AA	1.08	.43	2.50	.015	.22	1.94
	C-path: $F(1,70) = 9.77$, $p = .003$	Constant	31.06	.40	78.57	< .001	30.27	31.85
		t1 AA	1.19	.38	3.13	.003	.43	1.95
	Mediation Summary	Total	1.19	.38	3.13	.003	.43	1.95
t1 AAF on Final Exam, through t2 AAF (n = 72)	A-path: $F(1,70) = 24.88$, $p < .001$	Constant	.02	.09	.19	.851	-.17	.21
		t1 AAF	.47	.09	4.99	< .001	.28	.66
	B-path: $F(2,69) = 3.82$, $p = .027$	Constant	31.63	.35	90.01	< .001	30.92	32.33
		t2 AAF	.62	.44	1.41	.162	-.26	1.51
		t1 AAF	.54	.41	1.32	.192	-.28	1.35
	C-path: $F(1,70) = 5.57$, $p = .021$	Constant	31.64	.35	89.43	< .001	30.93	32.34
		t1 AAF	.83	.35	2.36	.021	.13	1.53
	Mediation Summary	Total	.83	.35	2.36	.021	.13	1.53
		Direct	.54	.41	1.32	.192	-.28	1.35

Note. Verbal reasoning forced-choice (VRR), total argument analysis (AA), argument analysis forced-choice (AAF).

Table 40 (Cont.).

Model		Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
		Indirect	.29	.23	1.28	.175	-.10	.83
t1 AAR on Final Exam, through t2 AAR (n = 72)	A-path: $F(1,70) = 4.41$, $p = .039$	Constant	-.16	.15	-1.07	.290	-.45	.13
		t1 AAR	.28	.13	2.10	.039	.01	.54
	B-path: $F(2,69) = 3.37$, $p = .040$	Constant	30.85	.48	64.63	< .001	29.90	31.81
		t2 AAR	.03	.39	.09	.931	-.74	.81
		t1 AAR	1.10	.44	2.50	.015	.22	1.98
	C-path: $F(1,70) = 6.83$, $p = .011$	Constant	30.85	.47	65.61	< .001	29.91	31.79
		t1 AAR	1.11	.42	2.61	.011	.26	1.95
	Mediation Summary	Total	1.11	.42	2.61	.011	.26	1.95
		Direct	1.10	.44	2.50	.015	.22	1.98
t1 HT on Final Exam, through t2 HT (n = 72)	A-path: $F(1,70) = 29.14$, $p < .001$	Constant	.16	.10	1.63	.107	-.04	.35
		t1 HT	.51	.09	5.40	< .001	.32	.69
	B-path: $F(2,69) = 3.83$, $p = .027$	Constant	31.56	.36	88.23	< .001	30.85	32.27
		t2 HT	.78	.43	1.81	.075	-.08	1.64
		t1 HT	.31	.40	.78	.437	-.49	1.12
	C-path: $F(1,70) = 4.25$, $p = .043$	Constant	31.68	.36	88.82	< .001	30.97	32.39
		t1 HT	.71	.34	2.06	.043	.02	1.39
	Mediation Summary	Total	.71	.34	2.06	.043	.02	1.39
		Direct	.31	.40	.78	.437	-.49	1.12
		Indirect	.39	.19	2.05	.050	.10	.87
t1 HTF on Final Exam, through t2 HTF (n = 72)	A-path: $F(1,70) = 20.08$, $p < .001$	Constant	.24	.11	2.26	.027	.03	.46
		t1 HTF	.50	.11	4.48	< .001	.28	.72
	B-path: $F(2,69) = 2.70$, $p = .074$	Constant	31.64	.37	84.62	< .001	30.89	32.38
		t2 HTF	.56	.40	1.41	.163	-.23	1.36
		t1 HTF	.41	.42	.96	.338	-.43	1.25
	C-path: $F(1,70) = 3.37$, $p = .070$	Constant	31.77	.36	87.41	< .001	31.05	32.50
		t1 HTF	.69	.37	1.84	.070	-.06	1.43

Note. Argument analysis constructed-response (AAR), total hypothesis testing (HT), and hypothesis testing forced-choice (HTF).

Table 40 (Cont.).

Model		Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
	Mediation Summary	Total	.69	.37	1.84	.070	-.06	1.43
		Direct	.41	.42	.96	.338	-.43	1.25
		Indirect	.28	.20	1.40	.149	-.02	.79
t1 HTR on Final Exam, through t2 HTR (n = 72)	A-path: $F(1,70) = 20.88$, $p < .001$	Constant	.00	.11	.01	.988	-.21	.21
		t1 HTR	.46	.10	4.57	< .001	.26	.66
	B-path: $F(2,69) = 2.27$, $p = .111$	Constant	31.59	.36	87.42	< .001	30.87	32.31
		t2 HTR	.53	.41	1.29	.201	-.29	1.34
		t1 HTR	.34	.39	.87	.387	-.44	1.12
	C-path: $F(1,70) = 2.85$, $p = .096$	Constant	31.59	.36	87.00	< .001	30.86	32.31
		t1 HTR	.58	.35	1.69	.096	-.11	1.27
	Mediation Summary	Total	.58	.35	1.69	.096	-.11	1.27
		Direct	.34	.39	.87	.387	-.44	1.12
		Indirect	.24	.16	1.52	.126	-.04	.59
t1 LU on Final Exam, through t2 LU (n = 72)	A-path: $F(1,70) = 27.57$, $p < .001$	Constant	-.03	.11	-.31	.761	-.25	.18
		t1 LU	.55	.11	5.25	< .001	.34	.76
	B-path: $F(2,69) = 7.78$, $p = .001$	Constant	31.54	.34	93.61	< .001	30.87	32.22
		t2 LU	.69	.37	1.84	.070	-.06	1.43
		t1 LU	.77	.39	1.97	.052	-.01	1.54
	C-path: $F(1,70) = 11.76$, $p = .001$	Constant	31.52	.34	92.04	< .001	30.84	32.21
		t1 LU	1.15	.33	3.43	.001	.48	1.81
	Mediation Summary	Total	1.15	.33	3.43	.001	.48	1.81
		Direct	.77	.39	1.97	.052	-.01	1.54
		Indirect	.38	.22	1.77	.084	-.02	.84
t1 LUF on Final Exam, through t2 LUF (n = 72)	A-path: $F(1,70) = 19.33$, $p < .001$	Constant	-.03	.11	-.32	.752	-.25	.18
		t1 LUF	.51	.12	4.40	< .001	.28	.74
	B-path: $F(2,69) = 4.35$, $p = .017$	Constant	31.67	.35	90.77	< .001	30.98	32.37
		t2 LUF	.71	.39	1.83	.072	-.06	1.49

Note. Hypothesis testing constructed-response (HTR), total likelihood and uncertainty (LU), and likelihood and uncertainty forced-choice (LUF).

Table 40 (Cont.).

Model		Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
		t1 LUF	.51	.42	1.20	.235	-.34	1.35
	C-path: *F*(1,70) = 5.18, *p* = .026	Constant	31.65	.35	89.28	< .001	30.94	32.36
		t1 LUF	.87	.38	2.28	.026	.11	1.63
	Mediation Summary	Total	.87	.38	2.28	.026	.11	1.63
		Direct	.51	.42	1.20	.235	-.34	1.35
		Indirect	.36	.23	1.60	.111	-.04	.86
t1 LUR on Final Exam, through t2 LUR (n = 72)	A-path: *F*(1,70) = 16.52, *p* < .001	Constant	.00	.12	-.03	.978	-.24	.23
		t1 LUR	.47	.12	4.06	< .001	.24	.71
	B-path: *F*(2,69) = 6.81, *p* = .002	Constant	31.50	.34	92.11	< .001	30.82	32.18
		t2 LUR	.57	.35	1.63	.108	-.13	1.27
		t1 LUR	.86	.38	2.27	.027	.10	1.62
	C-path: *F*(1,70) = 10.70, *p* = .002	Constant	31.50	.35	91.03	< .001	30.81	32.19
		t1 LUR	1.13	.35	3.27	.002	.44	1.83
	Mediation Summary	Total	1.13	.35	3.27	.002	.44	1.83
		Direct	.86	.38	2.27	.027	.10	1.62
		Indirect	.27	.16	1.66	.101	.01	.67
t1 PS on Final Exam, through t2 PS (n = 72)	A-path: *F*(1,70) = 29.79, *p* < .001	Constant	-.08	.10	-.85	.399	-.27	.11
		t1 PS	.61	.11	5.46	< .001	.39	.83
	B-path: *F*(2,69) = 1.58, *p* = .213	Constant	31.54	.40	79.41	< .001	30.75	32.33
		t2 PS	.67	.49	1.36	.177	-.31	1.64
		t1 PS	.11	.54	.21	.834	-.97	1.20
	C-path: *F*(1,70) = 1.28, *p* = .261	Constant	31.49	.40	79.20	< .001	30.69	32.28
		t1 PS	.52	.46	1.13	.261	-.39	1.43
	Mediation Summary	Total	.52	.46	1.13	.261	-.39	1.43
		Direct	.11	.54	.21	.834	-.97	1.20
		Indirect	.41	.27	1.51	.127	-.06	.99

Note. Likelihood and uncertainty constructed-response (LUR) and total problem solving (PS).

Table 40 (Cont.).

Model		Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
t1 PSF on Final Exam, through t2 PSF (n = 72)	A-path: $F(1,70) = 15.97$, $p < .001$	Constant	.12	.10	1.16	.248	-.09	.33
		t1 PSF	.45	.11	4.00	< .001	.22	.67
	B-path: $F(2,69) = 1.92$, $p = .155$	Constant	31.62	.37	84.51	< .001	30.87	32.37
		t2 PSF	.79	.42	1.87	.065	-.05	1.63
		t1 PSF	-.58	.44	-1.32	.191	-1.45	.30
	C-path: $F(1,70) = 0.31$, $p = .579$	Constant	31.72	.38	84.09	< .001	30.96	32.47
		t1 PSF	-.22	.40	-.56	.579	-1.03	.58
	Mediation Summary	Total	-.22	.40	-.56	.579	-1.03	.58
		Direct	-.58	.44	-1.32	.191	-1.45	.30
		Indirect	.35	.23	1.52	.126	-.01	.90
t1 PSR on Final Exam, through t2 PSR (n = 72)	A-path: $F(1,70) = 4.71$, $p = .033$	Constant	-.15	.11	-1.34	.184	-.37	.07
		t1 PSR	.26	.12	2.17	.033	.02	.50
	B-path: $F(2,69) = 4.28$, $p = .018$	Constant	31.29	.39	80.85	< .001	30.51	32.06
		t2 PSR	.36	.42	.87	.386	-.47	1.19
		t1 PSR	1.08	.43	2.48	.015	.21	1.94
	C-path: $F(1,70) = 7.82$, $p = .007$	Constant	31.23	.38	81.88	< .001	30.47	31.99
		t1 PSR	1.17	.42	2.80	.007	.34	2.01
	Mediation Summary	Total	1.17	.42	2.80	.007	.34	2.01
		Direct	1.08	.43	2.48	.015	.21	1.94
		Indirect	.10	.11	.90	.264	-.05	.39

Note. Problem solving forced-choice (PSF) and problem solving constructed-response (PSR).

Table 41.

Mediated regression models across course outcomes through respective CT measures with age and gender controlled.

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
t2 CT	A-path: $F(3,68) = 20.62$, $p < .001$, $R^2 = .48$	Constant	-.53	.53	-.99	.324	-1.58	.53
		t1 CT	.71	.09	7.73	< .001	.53	.89
		Age	.00	.01	.33	.745	-.02	.03
		Gender	.14	.21	.64	.523	-.28	.55
Final Exam	B-path: $F(4,67) = 4.74$, $p = .002$, $R^2 = .22$	Constant	27.85	2.21	12.63	< .001	23.45	32.25
		t2 CT	.31	.50	.63	.533	-.69	1.31
		t1 CT	1.26	.52	2.43	.018	.22	2.29
		Age	.06	.05	1.06	.294	-.05	.17
		Gender	1.02	.87	1.17	.245	-.72	2.76
	C-path: $F(3,68) = 6.24$, $p = .001$, $R^2 = .22$	Constant	27.69	2.18	12.70	< .001	23.34	32.04
		t1 CT	1.48	.38	3.93	< .001	.73	2.23
		Age	.06	.05	1.09	.280	-.05	.17
		Gender	1.06	.86	1.23	.223	-.66	2.79
	Mediation Summary	Total	1.48	.38	3.93	< .001	.73	2.23
		Direct	1.26	.52	2.43	.018	.22	2.29
		Indirect	.22	.36	.62	.537	-.53	.91
t2 CTF	A-path: $F(3,68) = 15.56$, $p < .001$, $R^2 = .41$	Constant	-.43	.58	-.75	.457	-1.58	.72
		t1 CTF	.66	.10	6.76	< .001	.46	.85
		Age	.00	.01	.33	.743	-.02	.03
		Gender	.22	.23	.96	.343	-.24	.68
Final Exam	B-path: $F(4,67) = 2.97$, $p = .025$, $R^2 = .15$	Constant	27.58	2.32	11.87	< .001	22.94	32.21
		t2 CTF	.89	.49	1.83	.072	-.08	1.86
		t1 CTF	.34	.50	.67	.505	-.67	1.34
		Age	.08	.06	1.39	.170	-.03	.19
		Gender	1.07	.94	1.15	.256	-.80	2.94

Note. Total critical thinking (CT) and total CT forced-choice (CTF).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
	C-path: $F(3,68) = 2.76$, $p = .049$, $R^2 = .11$	Constant	27.19	2.35	11.56	< .001	22.50	31.89
		t1 CTF	.92	.40	2.32	.023	.13	1.71
		Age	.08	.06	1.44	.155	-.03	.20
		Gender	1.27	.95	1.34	.184	-.62	3.15
	Mediation Summary	Total	.92	.40	2.32	.023	.13	1.71
		Direct	.34	.50	.67	.505	-.67	1.34
		Indirect	.58	.40	1.48	.143	-.12	1.41
t2 CTR	A-path: $F(3,68) = 10.36$, $p < .001$, $R^2 = .31$	Constant	-.60	.64	-.94	.350	-1.88	.68
		t1 CTR	.59	.11	5.34	< .001	.37	.81
		Age	.01	.02	.55	.583	-.02	.04
		Gender	.05	.25	.20	.843	-.46	.56
Final Exam	B-path: $F(4,67) = 5.34$, $p = .001$, $R^2 = .24$	Constant	28.70	2.18	13.19	< .001	24.36	33.05
		t2 CTR	.09	.41	.21	.832	-.73	.90
		t1 CTR	1.53	.45	3.44	.001	.64	2.42
		Age	.05	.05	.86	.395	-.06	.16
		Gender	.55	.85	.64	.524	-1.16	2.25
	C-path: $F(3,68) = 7.21$, $p < .001$, $R^2 = .24$	Constant	28.65	2.15	13.35	< .001	24.37	32.93
		t1 CTR	1.58	.37	4.27	< .001	.84	2.33
		Age	.05	.05	.88	.383	-.06	.16
		Gender	.55	.85	.65	.518	-1.14	2.24
	Mediation Summary	Total	1.58	.37	4.27	< .001	.84	2.33
		Direct	1.53	.45	3.44	.001	.64	2.42
		Indirect	.05	.23	.23	.819	-.42	.49
t2 VR	A-path: $F(3,68) = 8.00$, $p < .001$, $R^2 = .26$	Constant	-.28	.64	-.43	.667	-1.56	1.00
		t1 VR	.47	.10	4.67	< .001	.27	.67
		Age	.01	.02	.80	.425	-.02	.04
		Gender	-.13	.25	-.53	.601	-.64	.37

Note. Total critical thinking constructed-response (CTR) and total verbal reasoning (VR).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
Final Exam	B-path: $F(4,67) = 6.93$, $p < .001$, $R^2 = .29$	Constant	27.34	2.10	13.04	< .001	23.16	31.53
		t2 VR	.67	.40	1.69	.095	-.12	1.46
		t1 VR	1.20	.38	3.18	.002	.45	1.96
		Age	.07	.05	1.37	.176	-.03	.17
		Gender	1.25	.83	1.50	.139	-.41	2.90
	C-path: $F(3,68) = 8.06$, $p < .001$, $R^2 = .26$	Constant	27.16	2.12	12.80	< .001	22.92	31.39
		t1 VR	1.52	.33	4.55	< .001	.85	2.18
		Age	.08	.05	1.52	.133	-.03	.18
		Gender	1.16	.84	1.38	.173	-.52	2.83
	Mediation Summary	Total	1.52	.33	4.55	< .001	.85	2.18
		Direct	1.20	.38	3.18	.002	.45	1.96
		Indirect	.32	.24	1.32	.191	-.11	.82
t2 VRF	A-path: $F(3,68) = 5.46$, $p = .002$, $R^2 = .19$	Constant	.39	.70	.55	.582	-1.01	1.79
		t1 VRF	.41	.11	3.65	.001	.19	.64
		Age	-.03	.02	-1.67	.099	-.06	.01
		Gender	.07	.28	.24	.808	-.49	.63
	B-path: $F(4,67) = 4.46$, $p = .003$, $R^2 = .21$	Constant	26.14	2.26	11.54	< .001	21.62	30.66
		t2 VRF	.82	.39	2.09	.040	.04	1.60
		t1 VRF	.83	.40	2.09	.041	.04	1.63
		Age	.11	.06	2.00	.050	.00	.22
		Gender	1.45	.90	1.61	.113	-.35	3.25
Final Exam	C-path: $F(3,68) = 4.28$, $p = .008$, $R^2 = .16$	Constant	26.45	2.31	11.43	< .001	21.83	31.07
		t1 VRF	1.17	.37	3.13	.003	.42	1.92
		Age	.09	.06	1.58	.120	-.02	.20
		Gender	1.50	.92	1.63	.108	-.34	3.35
	Mediation Summary	Total	1.17	.37	3.13	.003	.42	1.92
		Direct	.83	.40	2.09	.041	.04	1.63

Note. Verbal reasoning forced-choice (VRF).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
		Indirect	.34	.19	1.74	.086	.04	.82
t2 VRR	A-path: $F(3,68) = 6.34$, $p = .001$, $R^2 = .22$	Constant	-.50	.68	-.73	.465	-1.85	.86
		t1 VRR	.41	.11	3.79	< .001	.19	.63
		Age	.03	.02	1.74	.086	.00	.06
		Gender	-.21	.27	-.76	.448	-.74	.33
Final Exam	B-path: $F(4,67) = 5.41$, $p = .001$, $R^2 = .24$	Constant	28.12	2.16	13.00	< .001	23.81	32.44
		t2 VRR	.44	.38	1.14	.257	-.33	1.21
		t1 VRR	1.24	.38	3.27	.002	.48	2.00
		Age	.07	.05	1.21	.232	-.04	.18
		Gender	.89	.86	1.04	.301	-.81	2.60
	C-path: $F(3,68) = 6.75$, $p = .001$, $R^2 = .23$	Constant	27.90	2.16	12.92	< .001	23.60	32.21
		t1 VRR	1.42	.35	4.11	< .001	.73	2.11
		Age	.08	.05	1.47	.146	-.03	.19
		Gender	.80	.85	.94	.351	-.90	2.51
	Mediation Summary	Total	1.42	.35	4.11	< .001	.73	2.11
		Direct	1.24	.38	3.27	.002	.48	2.00
		Indirect	.18	.18	1.01	.316	-.10	.63
t2 AA	A-path: $F(3,68) = 6.41$, $p = .001$, $R^2 = .22$	Constant	-.61	.64	-.96	.341	-1.89	.66
		t1 AA	.46	.11	4.25	< .001	.24	.67
		Age	.00	.02	.24	.815	-.03	.04
		Gender	.18	.25	.73	.468	-.32	.69
Final Exam	B-path: $F(4,67) = 3.01$, $p = .024$, $R^2 = .15$	Constant	28.23	2.30	12.29	< .001	23.65	32.82
		t2 AA	.21	.43	.48	.631	-.66	1.07
		t1 AA	1.05	.43	2.42	.018	.18	1.91
		Age	.08	.06	1.35	.181	-.04	.19
		Gender	.53	.91	.59	.560	-1.28	2.34
	C-path: $F(3,68) = 3.98$, $p = .011$, $R^2 = .15$	Constant	28.10	2.27	12.39	< .001	23.58	32.63

Note. Verbal reasoning constructed-response (VRR) and total argument analysis (AA).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
		t1 AA	1.14	.38	2.99	.004	.38	1.90
		Age	.08	.06	1.37	.174	-.04	.19
		Gender	.57	.90	.63	.528	-1.22	2.36
	Mediation Summary	Total	1.14	.38	2.99	.004	.38	1.90
		Direct	1.05	.43	2.42	.018	.18	1.91
		Indirect	.10	.20	.47	.640	-.29	.52
t2 AAF	A-path: $F(3,68) = 8.52$, $p < .001$, $R^2 = .27$	Constant	-.12	.64	-.19	.847	-1.39	1.14
		t1 AAF	.48	.10	4.99	< .001	.29	.67
		Age	-.01	.02	-.56	.578	-.04	.02
		Gender	.20	.25	.79	.433	-.30	.70
Final Exam	B-path: $F(4,67) = 2.94$, $p = .026$, $R^2 = .15$	Constant	27.44	2.30	11.92	< .001	22.84	32.04
		t2 AAF	.64	.44	1.46	.149	-.24	1.52
		t1 AAF	.59	.41	1.46	.150	-.22	1.40
		Age	.10	.06	1.79	.078	-.01	.22
		Gender	.90	.91	.98	.330	-.93	2.72
	C-path: $F(3,68) = 3.16$, $p = .030$, $R^2 = .12$	Constant	27.36	2.32	11.79	< .001	22.73	31.99
		t1 AAF	.90	.35	2.56	.013	.20	1.60
		Age	.10	.06	1.68	.097	-.02	.21
		Gender	1.02	.92	1.12	.268	-.81	2.85
	Mediation Summary	Total	.90	.35	2.56	.013	.20	1.60
		Direct	.59	.41	1.46	.150	-.22	1.40
		Indirect	.31	.24	1.28	.205	-.08	.89
t2 AAR	A-path: $F(3,68) = 2.10$, $p = .109$, $R^2 = .08$	Constant	-1.11	.72	-1.53	.131	-2.55	.34
		t1 AAR	.23	.14	1.67	.100	-.04	.50
		Age	.02	.02	1.15	.255	-.02	.06
		Gender	.26	.29	.88	.380	-.32	.84
Final Exam	B-path: $F(4,67) = 2.00$, $p = .105$, $R^2 = .11$	Constant	28.76	2.40	11.97	< .001	23.96	33.55

Note. Argument analysis forced-choice (AAF) and argument analysis constructed-response (AAR).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
		t2 AAR	-.03	.40	-.08	.935	-.82	.76
		t1 AAR	1.02	.45	2.24	.028	.11	1.92
		Age	.07	.06	1.14	.259	-.05	.19
		Gender	.25	.96	.27	.791	-1.66	2.16
	C-path: $F(3,68) = 2.70$, $p = .052$, $R^2 = .11$	Constant	28.79	2.35	12.27	< .001	24.11	33.47
		t1 AAR	1.01	.44	2.29	.025	.13	1.89
		Age	.07	.06	1.15	.256	-.05	.18
		Gender	.25	.94	.26	.795	-1.64	2.13
	Mediation Summary	Total	1.01	.44	2.29	.025	.13	1.89
		Direct	1.02	.45	2.24	.028	.11	1.92
		Indirect	-.01	.10	-.07	.944	-.27	.17
t2 HT	A-path: $F(3,68) = 10.49$, $p < .001$, $R^2 = .32$	Constant	-.80	.65	-1.23	.223	-2.09	.50
		t1 HT	.53	.10	5.47	< .001	.33	.72
		Age	.02	.02	1.11	.269	-.01	.05
		Gender	.28	.26	1.08	.283	-.24	.80
Final Exam	B-path: $F(4,67) = 2.60$, $p = .043$, $R^2 = .13$	Constant	27.79	2.36	11.79	< .001	23.09	32.50
		t2 HT	.65	.44	1.49	.140	-.22	1.52
		t1 HT	.45	.41	1.09	.281	-.38	1.28
		Age	.08	.06	1.31	.196	-.04	.19
		Gender	1.04	.94	1.11	.273	-.84	2.93
	C-path: $F(3,68) = 2.68$, $p = .054$, $R^2 = .11$	Constant	27.28	2.35	11.60	< .001	22.58	31.97
		t1 HT	.79	.35	2.28	.026	.10	1.49
		Age	.09	.06	1.51	.136	-.03	.20
		Gender	1.23	.94	1.30	.198	-.66	3.11
	Mediation Summary	Total	.79	.35	2.28	.026	.10	1.49
		Direct	.45	.41	1.09	.281	-.38	1.28
		Indirect	.34	.20	1.75	.084	.04	.85

Note. Total hypothesis testing (HT).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
t2 HTF	A-path: $F(3,68) = 6.73$, $p = .001$, $R^2 = .23$	Constant	-.28	.72	-.38	.704	-1.72	1.16
		t1 HTF	.51	.12	4.27	< .001	.27	.75
		Age	.01	.02	.52	.607	-.03	.04
		Gender	.16	.30	.54	.593	-.44	.76
Final Exam	B-path: $F(4,67) = 2.17$, $p = .082$, $R^2 = .11$	Constant	27.48	2.36	11.64	< .001	22.77	32.19
		t2 HTF	.50	.40	1.26	.212	-.29	1.29
		t1 HTF	.55	.44	1.25	.215	-.33	1.44
		Age	.07	.06	1.22	.226	-.05	.19
		Gender	1.32	.98	1.35	.180	-.63	3.27
	C-path: $F(3,68) = 2.35$, $p = .080$, $R^2 = .09$	Constant	27.34	2.37	11.54	< .001	22.62	32.07
		t1 HTF	.81	.39	2.05	.044	.02	1.60
		Age	.08	.06	1.30	.199	-.04	.19
		Gender	1.40	.98	1.43	.157	-.55	3.36
	Mediation Summary	Total	.81	.39	2.05	.044	.02	1.60
		Direct	.55	.44	1.25	.215	-.33	1.44
		Indirect	.26	.21	1.25	.182	-.06	.79
t2 HTR	A-path: $F(3,68) = 7.80$, $p < .001$, $R^2 = .26$	Constant	-1.06	.70	-1.53	.132	-2.45	.33
		t1 HTR	.48	.10	4.71	< .001	.27	.68
		Age	.02	.02	1.14	.257	-.01	.05
		Gender	.31	.27	1.14	.257	-.23	.86
Final Exam	B-path: $F(4,67) = 1.82$, $p = .135$, $R^2 = .10$	Constant	28.02	2.41	11.64	< .001	23.22	32.83
		t2 HTR	.41	.41	.99	.325	-.41	1.23
		t1 HTR	.45	.40	1.13	.262	-.34	1.24
		Age	.09	.06	1.52	.133	-.03	.21
		Gender	.72	.94	.76	.449	-1.16	2.59
	C-path: $F(3,68) = 2.10$, $p = .109$, $R^2 = .08$	Constant	27.59	2.37	11.65	< .001	22.87	32.31
		t1 HTR	.64	.34	1.87	.066	-.04	1.33

Note. Hypothesis testing forced-choice (HTF) and hypothesis testing constructed-response (HTR).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
		Age	.10	.06	1.67	.099	-.02	.21
		Gender	.84	.93	.91	.368	-1.01	2.70
	Mediation Summary	Total	.64	.34	1.87	.066	-.04	1.33
		Direct	.45	.40	1.13	.262	-.34	1.24
		Indirect	.19	.17	1.18	.242	-.11	.56
t2 LU	A-path: $F(3,68) = 8.98$, $p < .001$, $R^2 = .28$	Constant	.18	.72	.25	.803	-1.25	1.61
		t1 LU	.55	.11	4.98	< .001	.33	.77
		Age	.00	.02	-.12	.904	-.04	.03
		Gender	-.09	.29	-.30	.765	-.66	.49
Final Exam	B-path: $F(4,67) = 4.81$, $p = .002$, $R^2 = .22$	Constant	27.61	2.19	12.62	< .001	23.24	31.97
		t2 LU	.71	.37	1.93	.058	-.03	1.45
		t1 LU	.79	.39	2.00	.049	.00	1.57
		Age	.06	.06	1.07	.290	-.05	.17
		Gender	1.36	.88	1.54	.127	-.40	3.11
	C-path: $F(3,68) = 4.97$, $p = .004$, $R^2 = .18$	Constant	27.73	2.23	12.44	< .001	23.29	32.18
		t1 LU	1.18	.34	3.43	.001	.49	1.86
		Age	.06	.06	1.02	.312	-.05	.17
		Gender	1.29	.90	1.45	.153	-.49	3.08
	Mediation Summary	Total	1.18	.34	3.43	.001	.49	1.86
		Direct	.79	.39	2.00	.049	.00	1.57
		Indirect	.39	.21	1.83	.071	.00	.84
t2 LUF	A-path: $F(3,68) = 6.63$, $p = .001$, $R^2 = .23$	Constant	-.64	.72	-.88	.380	-2.07	.80
		t1 LUF	.53	.12	4.46	< .001	.29	.76
		Age	.01	.02	.29	.773	-.03	.04
		Gender	.26	.29	.91	.366	-.31	.83
Final Exam	B-path: $F(4,67) = 3.09$, $p = .021$, $R^2 = .16$	Constant	27.53	2.32	11.87	< .001	22.90	32.16
		t2 LUF	.65	.39	1.68	.099	-.12	1.43

Note. Total likelihood and uncertainty (LU) and likelihood and uncertainty forced-choice (LUF).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
		t1 LUF	.63	.43	1.46	.149	-.23	1.49
		Age	.09	.06	1.58	.119	-.02	.20
		Gender	1.05	.92	1.13	.261	-.80	2.89
	C-path: $F(3,68) = 3.11$, $p = .032$, $R^2 = .12$	Constant	27.12	2.34	11.60	< .001	22.45	31.78
		t1 LUF	.97	.38	2.53	.014	.21	1.74
		Age	.09	.06	1.62	.111	-.02	.21
		Gender	1.22	.93	1.31	.195	-.64	3.08
	Mediation Summary	Total	.97	.38	2.53	.014	.21	1.74
		Direct	.63	.43	1.46	.149	-.23	1.49
		Indirect	.34	.24	1.43	.157	-.09	.90
t2 LUR	A-path: $F(3,68) = 5.83$, $p = .001$, $R^2 = .20$	Constant	.62	.77	.81	.419	-.90	2.15
		t1 LUR	.46	.12	3.74	< .001	.21	.70
		Age	.00	.02	-.04	.964	-.04	.04
		Gender	-.33	.31	-1.08	.283	-.94	.28
Final Exam	B-path: $F(4,67) = 4.16$, $p = .004$, $R^2 = .20$	Constant	27.85	2.23	12.50	< .001	23.40	32.30
		t2 LUR	.64	.35	1.82	.073	-.06	1.34
		t1 LUR	.84	.39	2.15	.035	.06	1.61
		Age	.05	.06	.86	.390	-.06	.16
		Gender	1.33	.89	1.49	.140	-.45	3.11
	C-path: $F(3,68) = 4.30$, $p = .008$, $R^2 = .16$	Constant	28.25	2.26	12.52	< .001	23.75	32.75
		t1 LUR	1.13	.36	3.14	.003	.41	1.85
		Age	.05	.06	.84	.404	-.07	.16
		Gender	1.12	.90	1.25	.217	-.67	2.92
	Mediation Summary	Total	1.13	.36	3.14	.003	.41	1.85
		Direct	.84	.39	2.15	.035	.06	1.61
		Indirect	.29	.17	1.74	.086	.03	.71

Note. Likelihood and uncertainty constructed-response (LUR) and total problem solving (PS).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
t2 PS	A-path: $F(3,68) = 9.66$, $p < .001$, $R^2 = .30$	Constant	-.08	.60	-.13	.898	-1.26	1.11
		t1 PS	.61	.12	5.26	< .001	.38	.84
		Age	.00	.01	.12	.902	-.03	.03
		Gender	-.03	.23	-.12	.905	-.50	.44
Final Exam	B-path: $F(4,67) = 1.31$, $p = .274$, $R^2 = .07$	Constant	28.33	2.40	11.81	< .001	23.54	33.11
		t2 PS	.66	.49	1.35	.180	-.31	1.64
		t1 PS	-.01	.55	-.02	.982	-1.11	1.09
		Age	.08	.06	1.30	.199	-.04	.20
		Gender	.71	.94	.76	.453	-1.17	2.60
	C-path: $F(3,68) = 1.13$, $p = .345$, $R^2 = .05$	Constant	28.27	2.41	11.72	< .001	23.46	33.09
		t1 PS	.39	.47	.83	.409	-.54	1.32
		Age	.08	.06	1.31	.194	-.04	.20
		Gender	.70	.95	.73	.467	-1.20	2.59
	Mediation Summary	Total	.39	.47	.83	.409	-.54	1.32
		Direct	-.01	.55	-.02	.982	-1.11	1.09
		Indirect	.40	.29	1.40	.166	-.09	1.06
t2 PSF	A-path: $F(3,68) = 5.74$, $p = .002$, $R^2 = .20$	Constant	-.07	.68	-.10	.923	-1.41	1.28
		t1 PSF	.44	.11	3.90	< .001	.21	.66
		Age	.02	.02	1.02	.310	-.02	.05
		Gender	-.13	.27	-.50	.622	-.66	.40
Final Exam	B-path: $F(4,67) = 1.57$, $p = .193$, $R^2 = .09$	Constant	28.12	2.37	11.87	< .001	23.39	32.85
		t2 PSF	.75	.43	1.75	.084	-.10	1.59
		t1 PSF	-.59	.44	-1.35	.181	-1.46	.28
		Age	.08	.06	1.33	.187	-.04	.20
		Gender	.84	.94	.90	.373	-1.03	2.71
	C-path: $F(3,68) = 1.04$, $p = .382$, $R^2 = .04$	Constant	28.07	2.41	11.67	< .001	23.27	32.87
		t1 PSF	-.26	.40	-.66	.514	-1.06	.54

Note. Problem solving forced-choice (CTF).

Table 41 (Cont.).

Outcome	Model	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
		Age	.09	.06	1.54	.129	-.03	.21
		Gender	.74	.95	.78	.437	-1.15	2.64
	Mediation Summary	Total	-.26	.40	-.66	.514	-1.06	.54
		Direct	-.59	.44	-1.35	.181	-1.46	.28
		Indirect	.33	.23	1.42	.160	-.04	.85
t2 PSR	A-path: $F(3,68) = 1.85$, $p = .146$, $R^2 = .08$	Constant	-.47	.68	-.69	.490	-1.82	.88
		t1 PSR	.26	.13	2.06	.043	.01	.51
		Age	.00	.02	-.25	.803	-.04	.03
		Gender	.24	.27	.89	.377	-.29	.77
Final Exam	B-path: $F(4,67) = 2.35$, $p = .063$, $R^2 = .12$	Constant	29.19	2.36	12.36	< .001	24.48	33.91
		t2 PSR	.36	.42	.85	.400	-.48	1.20
		t1 PSR	.96	.45	2.13	.037	.06	1.87
		Age	.05	.06	.92	.359	-.06	.17
		Gender	.42	.93	.45	.654	-1.44	2.27
	C-path: $F(3,68) = 2.91$, $p = .041$, $R^2 = .11$	Constant	29.03	2.35	12.36	< .001	24.34	33.71
		t1 PSR	1.06	.44	2.42	.018	.18	1.93
		Age	.05	.06	.90	.372	-.07	.17
		Gender	.50	.92	.54	.588	-1.34	2.34
	Mediation Summary	Total	1.06	.44	2.42	.018	.18	1.93
		Direct	.96	.45	2.13	.037	.06	1.87
		Indirect	.09	.11	.88	.382	-.05	.40

Note. Problem solving constructed-response (PSR).

Figures

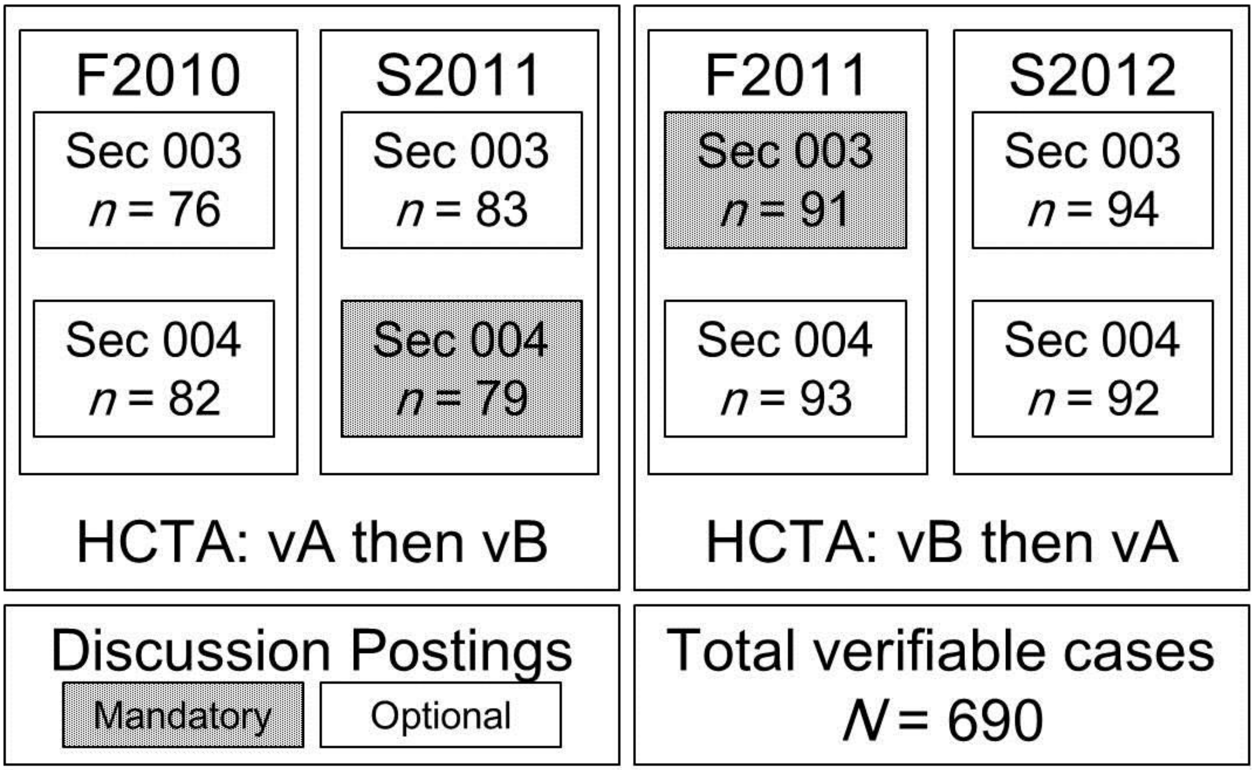

Figure 1. Infographic describing the original QEP study.

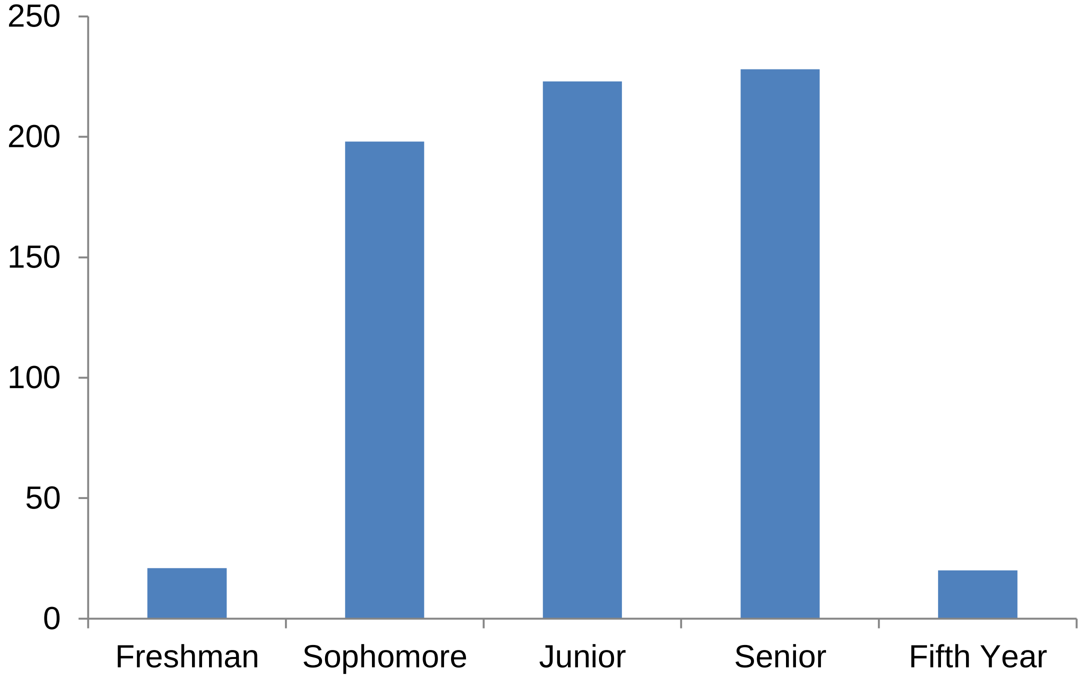

Figure 2. Academic ranking for the current sample (*N* = 690).

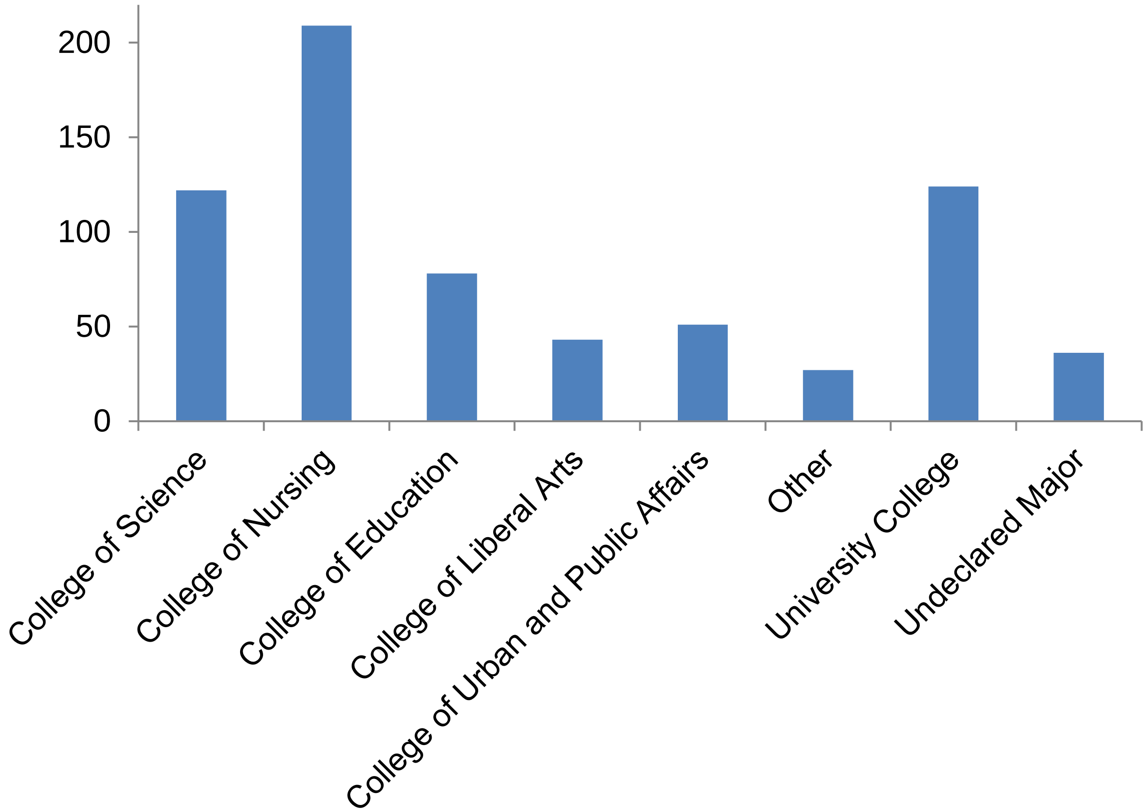

*Figure 3***.** Classification of Student Major for the current sample (*N* = 690).

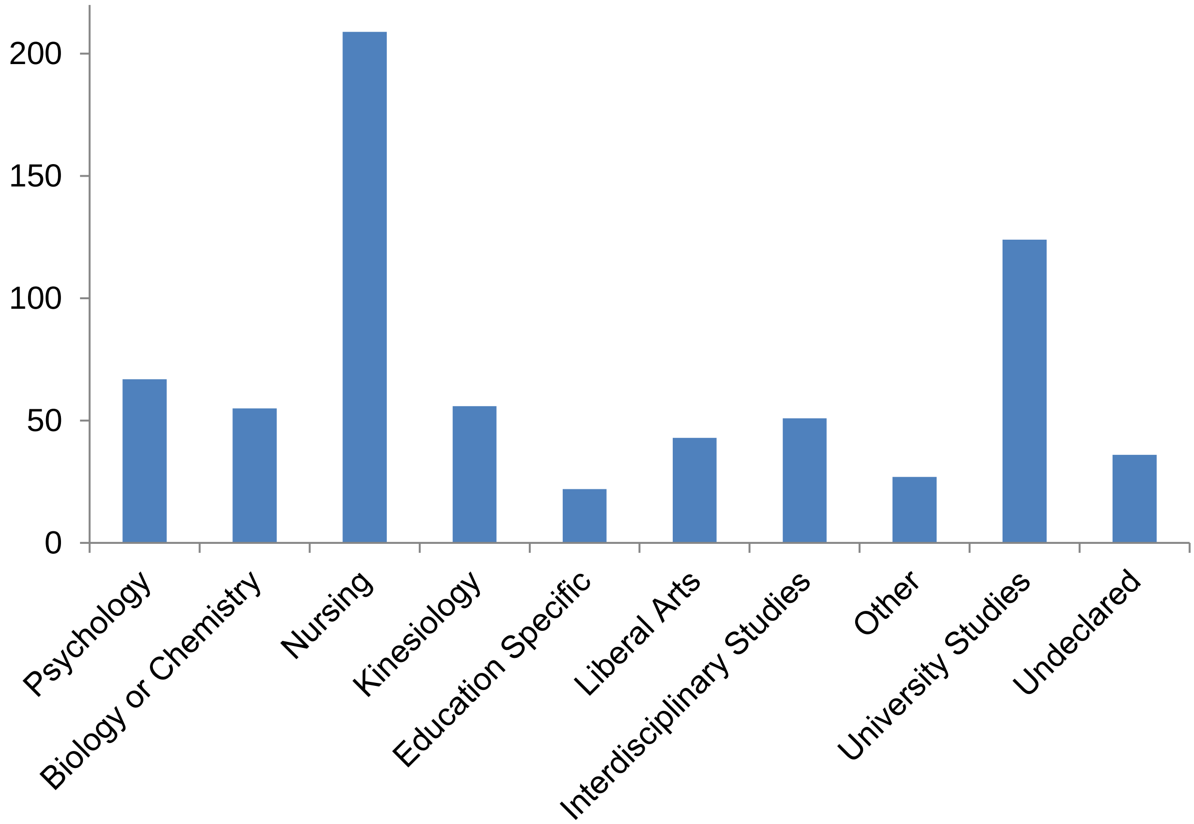

Figure 4. Classification of Student Major for the current sample (*N* = 690).

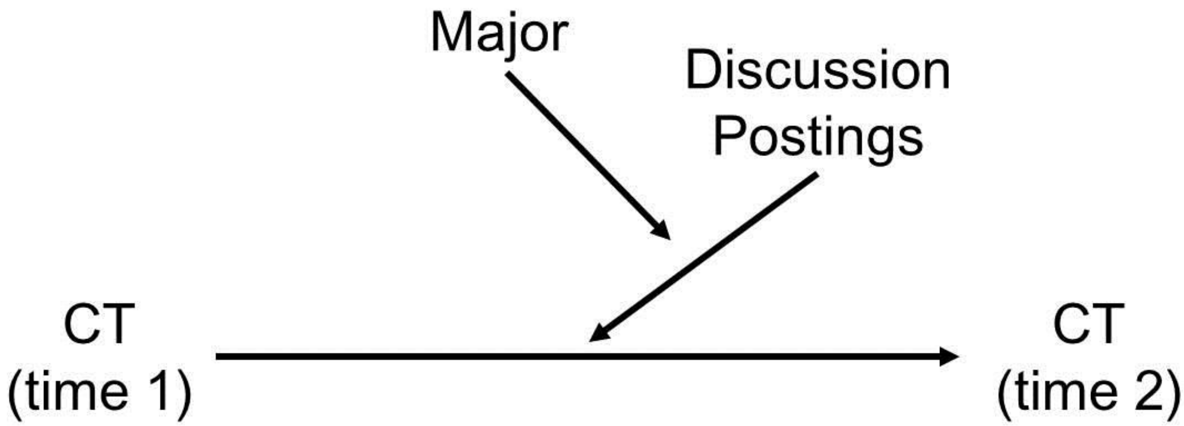

Figure 5. Schematic for moderation analyses (Process Model 3) on CT measures. Moderation model for time 1 CT measures predicting time 2 CT measures by major and discussion postings.

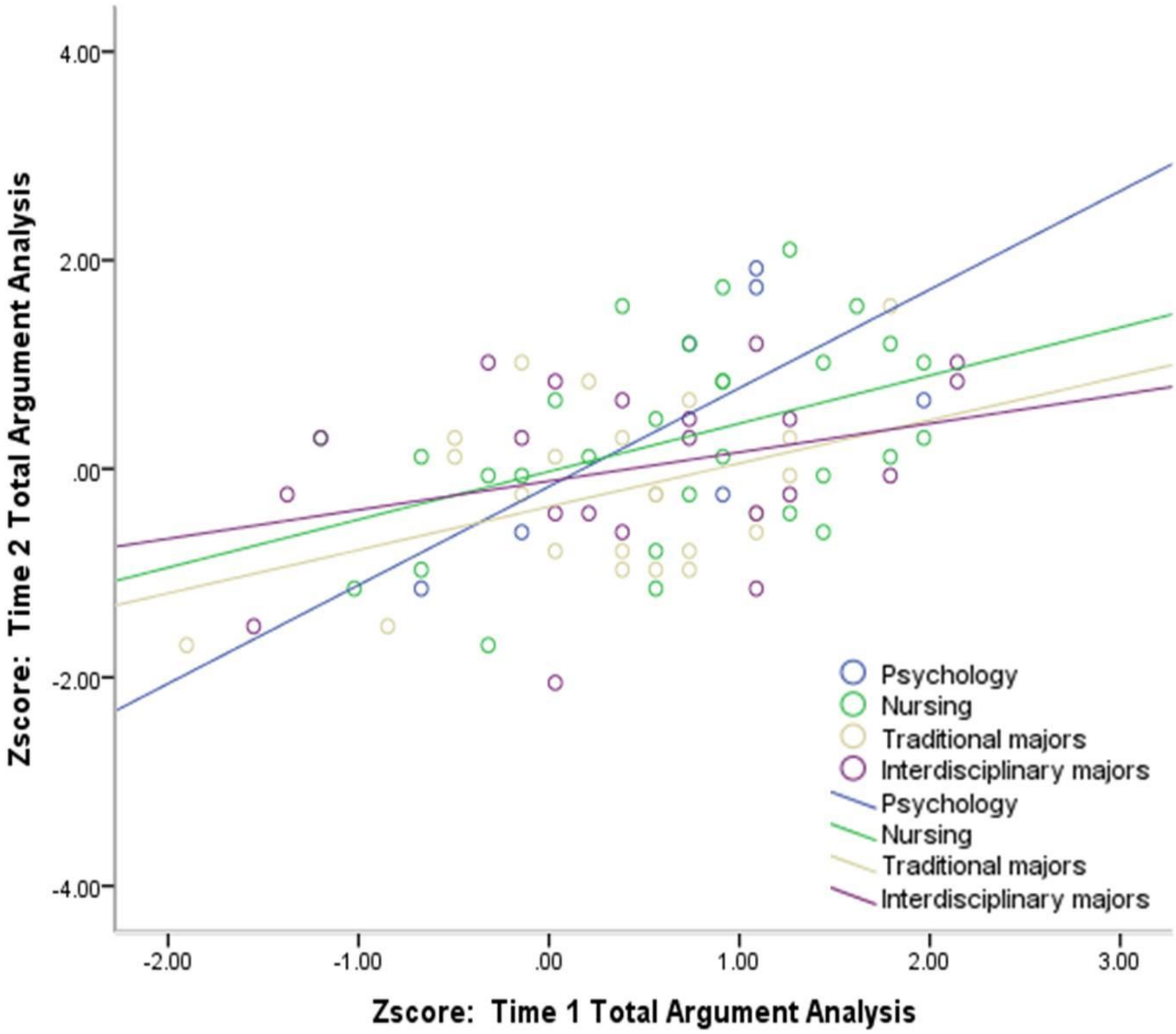

Figure 6. Scatterplot of t1 AA on t2 AA by department major.

To visualize the potential moderation, a scatterplot of t1AA scores on t2 AA scores was produced with group designations by department major. Fit lines represent psychology, $R^2 = .47$; nursing, $R^2 = .19$; traditional, $R^2 = .17$; and interdisciplinary, $R^2 = .11$.

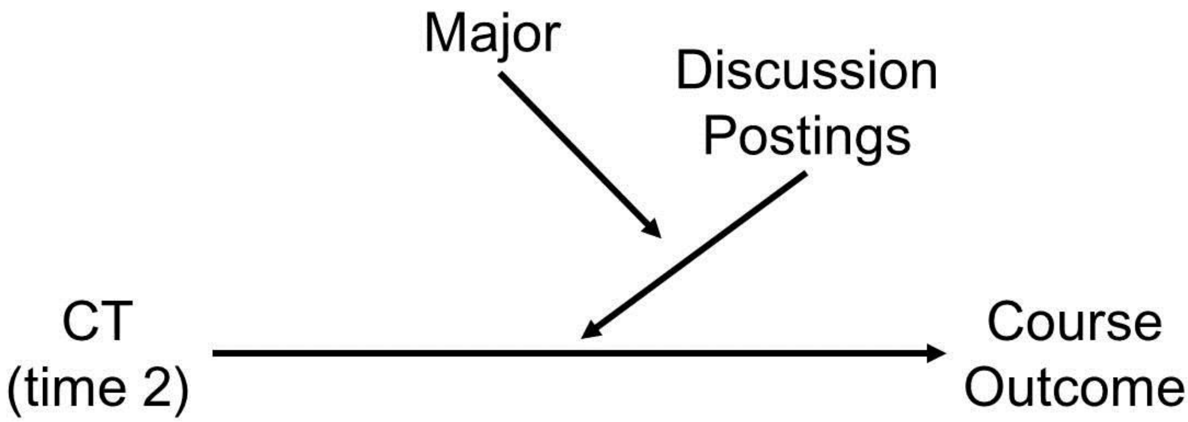

Figure 7. Schematic for moderation analyses (Process Model 3) on CT measures. Moderation model for time 2 CT measures predicting course outcome measures by major and discussion postings.

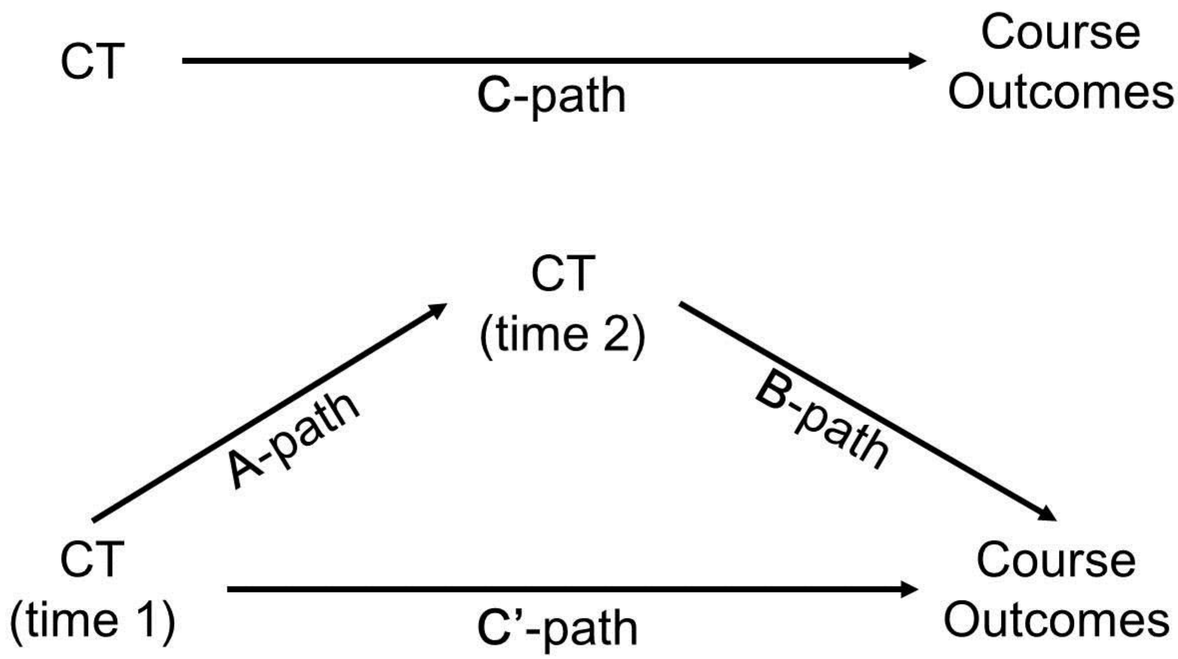

Figure 8. Schematic for mediation on CT and course outcomes (Process Model 4).

Course outcome measures represent quiz points, discussion points, final exam points, and total points as separate mediation models.

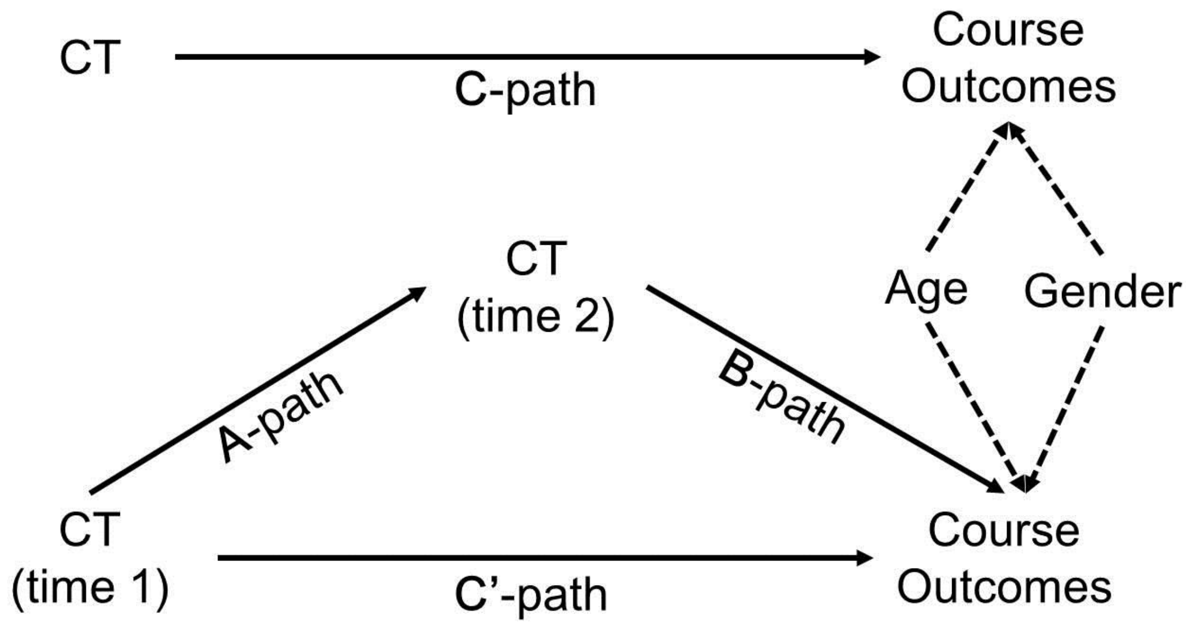

Figure 9. Schematic of mediation (Process Model 4), with age and gender.

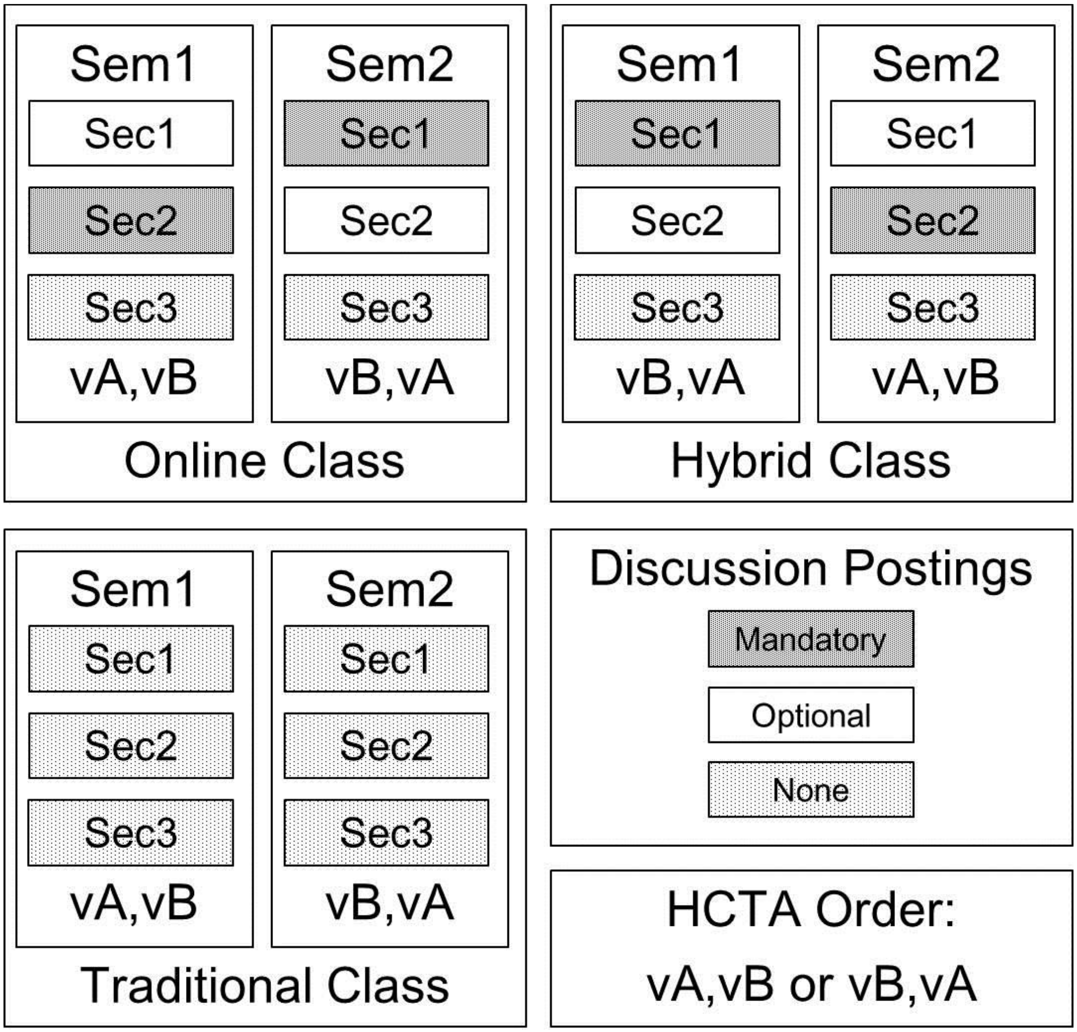

Figure 10. Schematic of hypothetical future replication and extension study.

This study design would simultaneously provide comparisons of critical thinking skills and course performance across categories of both discussion postings and online learning environments with a traditional-course environment control condition. Ideally, this design would be most effective using an introductory course with nine sections across two semesters, allowing for both similar course content and an ability to test changes in CT skills within subsequent courses.

Appendix A.

Short Survey Items with Responses Coded from (1) to (5)

First Short Survey Items.

1. I am confident that I will do well in this course, Developmental Psychology.

strongly disagree	disagree	neither agree nor	agree	strongly agree
(1)		disagree		(5)

2. I am confident that I have the technical skills (or will acquire those skills) to perform well in this class.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

3. I find that computers and technology _____ my studying and learning.

greatly restrain	restrain	neither restrain nor enhance	enhance	greatly enhance

4. This course in Developmental Psychology is _____ to the completion of my degree plan.

unimportant	of little importance	moderately important	important	very important

5. At this time, I estimate that my knowledge of Developmental Psychology is ______.

very weak	weak	unknown to me; neither weak nor strong	moderately strong	very strong

6. I often choose assignment topics that I will learn something from even if they require more work.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

7. When studying, I try to connect the things I am learning about with what I already know.

not at all true of	slightly true of	about halfway true	mostly true of	true of myself

myself	myself	of myself	myself	

8. I am very comfortable with my ability to learn the material in an online class.

not at all true of myself	slightly true of myself	about halfway true of myself	mostly true of myself	true of myself

9. I consider myself to be a flexible and imaginative thinker.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

10. During the last full semester, when I needed additional information or help with a course assignment, I visited the library or contacted a librarian _____.

zero times	once	twice	3-5 times	6 or more times

Second Short Survey Items.

1. I am confident that I am spending adequate amounts of time reading and studying to do well in this course.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

2. My technical skills are allowing me to perform well in this class.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

3. I find that computers and technology _____ my creativity.

greatly restrain	restrain	neither restrain nor enhance	enhance	greatly enhance

4. The topic of Developmental Psychology is _____ to my career plans.

unimportant	of little importance	moderately important	important	very important

5. The prerequisite course I took in Introductory Psychology prepared me well for Developmental Psychology.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

6. I ask myself questions to make sure I know the material I have been studying.

not at all true of myself	slightly true of myself	about halfway true of myself	mostly true of myself	true of myself

7. When I study for a test, I try to put together the information from the lectures and from the text.

not at all true of myself	slightly true of myself	about halfway true of myself	mostly true of myself	true of myself

8. I am very comfortable with my writing abilities.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

9. I consider myself to be quite open to continuous learning.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

10. During the last full semester, I contacted the Help Desk at UTA _____.

zero times	once	twice	3-5 times	6 or more times

Third Short Survey Items.

1. I am confident that this course in Developmental Psychology will have a positive impact on the other courses I am currently taking.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

2. I am confident that the technical skills I am acquiring in this class will have positive payoffs for me in other classes in which I am currently enrolled.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

3. I find that computers and technology _____ my productivity.

greatly restrain	restrain	neither restrain nor enhance	enhance	greatly enhance

4. The topic of Developmental Psychology is _____ to the understanding of families.

unimportant	of little importance	moderately important	important	very important

5. At this time, I find myself learning new material as I re-learn older material, so I estimate that my knowledge of Developmental Psychology is now_____.

very weak	weak	unknown to me	moderately good	very good

6. I often find myself translating ideas from the text and lectures into my own words so that I may study better.

not at all true of myself	slightly true of myself	about halfway true of myself	mostly true of myself	true of myself

7. When studying, I try to find some people to study with and to test my knowledge of the material.

not at all true of myself	slightly true of myself	about halfway true of myself	mostly true of myself	true of myself

8. I consider myself to be a skillful critical thinker.

strongly disagree	disagree	neither agree nor	agree	strongly agree

disagree

9. I often pause to think about my own thinking skills and/or thinking style.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

10. During the last full semester, when I needed additional information or help with a course assignment, I visited the Writing Center or contacted someone in the Online Writing Laboratory _____.

zero times	once	twice	3-5 times	6 or more times

Fourth Short Survey Items.

1. I am confident that this course in Developmental Psychology will have a positive impact on my making course selections in the future.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

2. I am confident that the technical skills I am acquiring in this class will have positive payoffs for me in other classes in classes that I plan to take in the future.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

3. I find that computers and technology _____ my knowledge in general.

greatly restrain	restrain	neither restrain nor enhance	enhance	greatly enhance

4. The topic of Developmental Psychology is _____ to the understanding of societies.

unimportant	of little importance	moderately important	important	very important

5. As I find myself learning some new and surprising material in this course, I now estimate that my knowledge of Developmental Psychology is _____.

very weak	weak	unknown to me	moderately good	very good

6. I often find myself sufficiently challenged by the material in this class.

not at all true of myself	slightly true of myself	about halfway true of myself	mostly true of myself	true of myself

7. After studying, I find myself eager to share my knowledge and skills with others.

not at all true of myself	slightly true of myself	about halfway true of myself	mostly true of myself	true of myself

8. I consider myself to be a very creative thinker.

strongly disagree	disagree	neither agree nor	agree	strongly agree

disagree

9. I pride myself on communicating with clarity.

strongly disagree	disagree	neither agree nor disagree	agree	strongly agree

10. In considering my responses to the questions in these 4 short surveys, I thought carefully about my answers:

none of the time (or hardly ever)	a little of the time	some of the time	most of the time	all of the time

Appendix B.

Discussion Posting Rubric.

Performance categories based on total scores:	Expert (16-22) Points Earned
Timeliness	The post was made on time. (1)
Word Count (excluding references)	Minimum and/or maximum word limits were followed exactly. (2)
Spelling and Grammar	The post was free of mistakes in spelling and grammar. (2)
Use of Sources	The content of the post is based on 3 or more reliable scholarly resources. (>4-5)
APA Style / Referencing	The post was formatted in APA style, and data were appropriately referenced. (>4-5)
Content	The post answered or explained the discussion question in a way that was “thoughtful” and/or innovative (>3-7)

Appendix C.

Discussion Posting Assignments.

The explicit text for each of these discussion posting assignments has been modified from a presentation given by Martha Mann at the UT Arlington Engaging Students Conference during the Fall 2013 academic term (Mann et al., 2013).

Text for argumentative discussion posting:

> "Judith Harris, author of The Nurture Assumption, presented a shocking and controversial theory stating that parents have little to no influence on the development of their children. She believes that genes and one's peer group determine the path our lives will take. This theory contrasts directly with numerous existing notions about human development and the irreplaceable role that parents play; however, much data exist illustrating the profound influence of peers over parents, particularly during the adolescent years. What type of research designs could you use to examine the validity of her contention? What control groups would you include and why? (slide 24)."

Text for reflective discussion posting:

> "Increasingly, information about psychology is freely available on the internet. People often write blogs about their concerns and questions. For this assignment, excerpt a person's blog on an issue in developmental psychology and provide the link… The excerpt and link will not count against your word limit. Next, reflect upon the needs of the blogger, reflect upon your abilities to respond to the blogger, and report in this assignment what you reflected upon. Then respond to the topic in the blog as though you were answering the blogger, providing reliable sources of information, pdf files, or links that will help that person to understand better the problem(s) they have posed…(slide 25)."

Text for creative discussion posting:

> Suppose you are the instructor of a college-level course called "Understanding Developmental Psychology through Film." Which 3 films will you include to give your students a better understanding of developmental theory, processes, and practices? Be sure to justify the inclusion of each film. Describe how any one of these films could be used in cinematherapy. (See for example www.cinematherapy.com) And please do NOT (1) use the film Rain Man since this film was already described in your text and do NOT (2) simply excerpt the plot synopsis; just assume that your readers are already familiar with the films. (slide 26)."

Appendix D.

Data parsing Perl script, “parse_data.pl”.

```
#!/usr/bin/perl -w

use strict;
use POSIX;

## Immediate output for progress indicators ##
$| = 1;

#### Global variables ####
my $INV_out_file = "Inventory.txt";
#my $use_ID_file = 1;
#my $Id_file = "Identity.txt";
## ^M is actually "Ctrl-V Ctrl-M" from a Unix shell ##
my $stripper1 = '^M|(\")?<[a-z]+.*\">|(<\/[A-Za-z]+.*\>)+(\")?|\"|(<[A-Za-z0-9]+>)';
my $stripper2 = '(\240)+|(\177)+';
## Coding for sem_code ##
my %sem_code = (
	'1' => 'F2010_003',
	'2' => 'F2010_004',
	'3' => 'S2011_003',
	'4' => 'S2011_004',
	'5' => 'F2011_003',
	'6' => 'F2011_004',
	'7' => 'S2012_003',
	'8' => 'S2012_004'
);

### BBGC Specific ###
my $grade_suffix = "grades\.txt";
my $valid_grades = "[ABCDF]";
## Position of inventory relevant items in the BBGC ##
my $BBGCLN = "0";
my $BBGCFN = "1";
my $BBGCUNI = "2";
my $disc1 = "5";
my $disc2 = "6";
my $disc3 = "7";
my $disc_exception = "Needs Grading";
my $BBGCtotpts = "22";
my $BBGCletgrd = "25";
## Remember, must be column_num - 1! ##
## Perl arrays always start with "0" ##

### HCTA specific ###
my @HCTA_files = ("HCTAvA.dat", "HCTAvB.dat");
my $HCTAA_FILE = "HCTAvA.dat";
my $HCTAB_FILE = "HCTAvB.dat";
my $HCTA_suffix = "\.dat";

### SS specific ###
my @SS_suffix = ("SS1data.txt", "SS2data.txt", "SS3data.txt", "SS4data.txt");
my @SS_data_suffix = ("_SS1_data", "_SS2_data", "_SS3_data", "_SS4_data");
my $valuesfile = "values";
my @null_resp = ("not applicable", "unanswered");
my $null_resp_val = "0";
my $special_exception = "<Unanswered>";
my $special_fix = "Unanswered";
```

```
### SOD specific ###
## Specify file names ##
my @SOD_files = ("SOD_F2010.txt", "SOD_S2011.txt", "SOD_F2011.txt", "SOD_S2012.txt");
my $SOD_out_suff = "_SOD.txt";
## Specify headers to be used in "Inventory" file ##
my @INV_hdrs = ("CaseID", "ID number", "UTANetID", "Name", "Semester", "Section", "Sem_code",
    "Total credit hours", "Major College", "Major Dept", "Major code", "Major Text", "Ethnicity",
    "Total transfer hours", "Hours Taken", "DOB", "Gender", "Enrollment", "Academic rank",
    "SODGrade", "ACT Comp", "ACT Math", "ACT Engl", "SAT Verbal", "SAT Math",
    "ENGL 1301", "ENGL 1302", "Age at enroll", "BBGC", "DPosts", "HCTAvA", "multHCTAvA", "HCTAvB",
"multHCTAvB", "SSs");
## Specify SOD columns for bulk import into Inventory ##
my @SOD_cols = ("14", "15", "16", "17", "18", "19", "20", "22", "23", "24", "25", "26");
## CaseID and Semester are generated at the beginning of each entry - DO NOT INCLUDE ##
## Indicate where "Course Grade", "Enroll Date", and "DOB" should be found ##
## Indicate specific columns which will require additional processing ##
my $SOD_ID = "0";
my $SOD_NetID = "1";
my $SOD_nm = "2";
my $SOD_section = "3";
my $SOD_CG = "4";
my $SOD_ED = "5";
my $SOD_CurGPA = "6";
my $SOD_CumGPA = "8";
my $SOD_ACT1 = "9";
my $SOD_ACT2 = "10";
my $SOD_ACT3 = "11";
my $SOD_SAT1 = "12";
my $SOD_SAT2 = "13";
my $SOD_ENGL1 = "27";
my $SOD_ENGL2 = "28";
my $SOD_DOB = "23";

#### Body of script ####
open INVOUT, ">$INV_out_file";
my $INV_hdr = join("\t",@INV_hdrs);
print INVOUT "$INV_hdr\n";
my $caseID_ct = 0;
my @sem_code_keys = (sort keys %sem_code);
foreach my $sem_code_key (@sem_code_keys) {
### NEED TO ADJUST TO HANDLE SOD FIRST ###
    my $prefix = $sem_code{$sem_code_key};
    print STDOUT "\nProcessing data for $prefix:\n\n";
    print STDOUT "Parsing SS data for:\n";
    my @sem_section = split("_", $prefix);
    my $Semester = $sem_section[0];
    my $Section = $sem_section[1];
    my $HCTAvA_data_file = "$prefix" . "_" . "HCTAvA";
    my $HCTAvB_data_file = "$prefix" . "_" . "HCTAvB";
    open HCTDAFILE, ">$HCTAvA_data_file";
    open HCTDBFILE, ">$HCTAvB_data_file";
### Process SS ###
    foreach my $SS_suffix (@SS_suffix) {
        my $SS_read_file = "$prefix" . "$SS_suffix";
        print STDOUT "\t$SS_read_file...";
        open SSREAD, "$SS_read_file";
        my @SS_read_lines = <SSREAD>;
        shift(@SS_read_lines);
        my $SS_file_length = scalar(@SS_read_lines);
        if ($SS_file_length !~ /\d+[0]/ ) {
            print STDOUT "Warning: $SS_read_file does not have 10 responses per case.";
```

```
}
my $QID_suffix = $SS_suffix;
$QID_suffix =~ s/\D+//g;
my $SSoutfile = "$prefix" . "_SS" . "$QID_suffix" . "_data";
open SSOUT, ">$SSoutfile";
my $SS_name;
my @SS_names;
my $SS_name_prev;
my $SS_netid;
my @SS_data_out;
foreach my $SSreadline (@SS_read_lines) {
    chomp($SSreadline);
    if (length($special_exception) > 0) {
        $SSreadline =~ s/$special_exception/$special_fix/;
    }
    $SSreadline =~ s/${stripper1}//g;
    $SSreadline =~ s/${stripper2}/\ /g;
    $SSreadline =~ tr/A-Z/a-z/;
    my @SS_data = split("\t", $SSreadline);
    $SS_name = "$SS_data[1]" . ", " . "$SS_data[2]";
    $SS_netid = "$SS_data[0]";
    my $SS_QID = "$SS_data[3]";
    $SS_QID =~ s/\D+//g;
    my $QID_value = "Q" . "$SS_QID" . "_" . "$QID_suffix";
    my $SS_datum = "$SS_data[5]";
    $SS_datum =~ s/^(\s)+//;
    $SS_datum =~ s/(\s)+$//;
    $SS_datum =~ s/\(//;
    $SS_datum =~ s/\)//;
    my $SS_data_resp_val;
    my $null_val_test = 0;
    if (defined($null_resp_val) && length($null_resp_val) > 0) {
        foreach my $null_resp (@null_resp) {
            if ($SS_datum eq "$null_resp") {
                $SS_data_resp_val = $null_resp_val;
                $null_val_test++;
                last;
            } else {
                next;
            }
        }
    }
    if ($null_val_test == 0) {
        open VFILE, "$valuesfile";
        my @values = <VFILE>;
        shift(@values);
        foreach my $value_line (@values) {
            chomp($value_line);
            my @values_line = split("\t", $value_line);
            my $value_ct = 0;
            my $test_val = $values_line[$value_ct];
            $test_val =~ s/\(//;
            $test_val =~ s/\)//;
            $test_val =~ s/^(\s)+//;
            $test_val =~ s/(\s)+$//;
            if ($values_line[0] =~ $QID_value) {
                until ($SS_datum =~ /$values_line[$value_ct]/i) {
                    $value_ct++;
                    next;
                }
                $SS_data_resp_val = $value_ct;
                last;
```

```
                } else {
                    next;
                }
            }
        }
        if (defined($SS_name_prev) && length($SS_name_prev) < 1) {
            #do first case of file
            push(@SS_data_out, $SS_name);
            push(@SS_names, $SS_name);
            push(@SS_data_out, $SS_netid);
            push(@SS_data_out, $SS_data_resp_val);
        } else {
            if (defined($SS_name_prev) && $SS_name_prev =~ /$SS_name/) {
                push(@SS_data_out, $SS_data_resp_val);
            } else {
                my $SS_outline = join("\t", @SS_data_out);
                print SSOUT "$SS_outline\n";
                undef(@SS_data_out);
                push(@SS_data_out, $SS_name);
                push(@SS_data_out, $SS_netid);
                push(@SS_data_out, $SS_data_resp_val);
            }
        }
        $SS_name_prev = $SS_name;
    }
    close SSREAD;
    close SSOUT;
    print STDOUT ".Done!\n";
  }
## END OF SS AND HCTA PARSING ##
  foreach my $SOD_file (@SOD_files) {
    my $SOD_file_name = $SOD_file;
    $SOD_file_name =~ s/SOD_//;
    $SOD_file_name =~ s/\.txt//;
    if ("$Semester" =~ /$SOD_file_name/ ) {
        open SODFILE, "$SOD_file";
        my $proc_SOD = $prefix . $SOD_out_suff;
        open SODOUT, ">$proc_SOD";
### process SOD data here ###
### first parse into the intended SOD data file ###
## KEEP SOD PROCESSING INSIDE first (%sem_code) loop!!! ##
        print STDOUT "Parsing SOD information for $prefix...";
        my @SODlines = <SODFILE>;
        #shift(@SODlines);
        foreach my $SODline (@SODlines) {
            next if (($SODline =~ /^#/) || ($SODline =~ /^(\s+)?$/));
            my @INVout;
            my @SODout;
            chomp($SODline);
            $SODline =~ s/^M|\'|\"//g;
            my @SODdata = split("\t", $SODline);
            if ($SODdata[$SOD_section] eq "$Section") {
                print STDOUT ".";
                print SODOUT "$SODline\n";
                $caseID_ct++;
                my $caseID_val = sprintf('%#.3u',$caseID_ct);
                push(@INVout,$caseID_val);
                my $SOD_ID_num = $SODdata[$SOD_ID];
                my $last4ID = substr($SOD_ID_num, -4, 4);
                push(@INVout,$SOD_ID_num);
## Need to match these names and netIDs ##
                my $NetID = $SODdata[$SOD_NetID];
```

```
		$NetID =~ tr/A-Z/a-z/;
		my $SOD_name = $SODdata[$SOD_nm];
########################################
		push(@INVout,$NetID);
		push(@INVout,$SOD_name);
		push(@INVout,$Semester);
		push(@INVout,$Section);
## Generate Sem_code ##
		my @sem_keys = (sort keys %sem_code);
		foreach my $sem_key (@sem_keys) {
		   if ($prefix eq "$sem_code{$sem_key}") {
		      push(@INVout,$sem_key);
		   }
		}
## Bulk import ##
		foreach my $SOD_col (@SOD_cols) {
		   push(@INVout,$SODdata[$SOD_col]);
		}
## Determine valid course grade in SOD ##
		if ($SODdata[$SOD_CG] =~ /$valid_grades/) {
		   push(@INVout,"1");
		} elsif ($SODdata[$SOD_CG] eq "") {
		   push(@INVout,"");
		} else {
		   push(@INVout,"0");
		}
## Account for ACT and SAT ##
		if ($SODdata[$SOD_ACT1] > 0 ) {
		   push(@INVout,"1");
		} elsif ($SODdata[$SOD_ACT1] == 0 ) {
		   push(@INVout,"0");
		} else {
		   push(@INVout,"");
		}
		if ($SODdata[$SOD_ACT2] > 0 ) {
		   push(@INVout,"1");
		} elsif ($SODdata[$SOD_ACT2] == 0 ) {
		   push(@INVout,"0");
		} else {
		   push(@INVout,"");
		}
		if ($SODdata[$SOD_ACT3] > 0 ) {
		   push(@INVout,"1");
		} elsif ($SODdata[$SOD_ACT3] == 0 ) {
		   push(@INVout,"0");
		} else {
		   push(@INVout,"");
		}
		if ($SODdata[$SOD_SAT1] > 0 ) {
		   push(@INVout,"1");
		} elsif ($SODdata[$SOD_SAT1] == 0 ) {
		   push(@INVout,"0");
		} else {
		   push(@INVout,"");
		}
		if ($SODdata[$SOD_SAT2] > 0 ) {
		   push(@INVout,"1");
		} elsif ($SODdata[$SOD_SAT2] == 0 ) {
		   push(@INVout,"0");
		} else {
		   push(@INVout,"");
		}
```

```
## Determine valid course grades for prereqs ##
        if ($SODdata[$SOD_ENGL1] =~ /$valid_grades/) {
            push(@INVout,"1");
        } elsif ($SODdata[$SOD_ENGL1] eq "") {
            push(@INVout,"");
        } else {
            push(@INVout,"0");
        }
        if ($SODdata[$SOD_ENGL2] =~ /$valid_grades/) {
            push(@INVout,"1");
        } elsif ($SODdata[$SOD_ENGL2] eq "") {
            push(@INVout,"");
        } else {
            push(@INVout,"0");
        }
## Age calculated here ##
        my $age_enroll;
        if ($SODdata[$SOD_ED] ne "" && $SODdata[$SOD_DOB] ne "") {
            my @en_date = split("/", $SODdata[$SOD_ED]);
            my @DOB = split("/", $SODdata[$SOD_DOB]);
            my $en_date_ctime = "$en_date[2]$en_date[0]$en_date[1]";
            my $en_date_year = $en_date[2] - 1900;
            my $en_date_mon = $en_date[0] - 1;
            my $en_date_day = $en_date[1];
            my $DOB_ctime = "$DOB[2]$DOB[0]$DOB[1]";
            my $DOB_year = $DOB[2] - 1900;
            my $DOB_mon = $DOB[0] - 1;
            my $DOB_day = $DOB[1];
            my $en_date_ctime_out = POSIX::mktime(0, 0, 0, $en_date_day, $en_date_mon, $en_date_year);
            my $DOB_ctime_out = POSIX::mktime(0, 0, 0, $DOB_day, $DOB_mon, $DOB_year);
            my $diff_date;
            if ($DOB_ctime_out > 0) {
                $diff_date = $en_date_ctime_out - $DOB_ctime_out;
            } else {
                $diff_date = $en_date_ctime_out + $DOB_ctime_out;
            }
            my $adjusted_age = (((($diff_date/60)/60)/24)/365);
            $age_enroll = sprintf("%.2f", $adjusted_age);
        } else {
            #do neither
            $age_enroll = "";
        }
        push(@INVout,"$age_enroll");
        my $SOD_grade_ct = 0;
        my $SOD_dpost_ct = 0;
        my $grade_file = "$prefix" . "$grade_suffix";
        open GRDFILE, "$grade_file";
        GRDC: while (my $grdline = <GRDFILE>) {
            my @grd_data = split("\t", $grdline);
            my $grd_test_name = "$grd_data[$BBGCLN]" . ", " . "$grd_data[$BBGCFN]";
            my $grd_netID = $grd_data[$BBGCUNI];
            $grd_test_name =~ tr/A-Z/a-z/;
            $grd_netID =~ tr/A-Z/a-z/;
            if (($grd_test_name =~ /^$SOD_name/i) || ($grd_netID =~ $NetID) || ($grd_netID =~ /$last4ID$/)) {
                #extract DATA - ADD structure for DPosts?
                if (($grd_data[$disc1] ne "") && ($grd_data[$disc1] ne "$disc_exception") && ($grd_data[$disc1] gt "0")) {
                    $SOD_dpost_ct++;
                }
                if (($grd_data[$disc2] ne "") && ($grd_data[$disc2] ne "$disc_exception") && ($grd_data[$disc2] gt "0")) {
                    $SOD_dpost_ct++;
                }
                if (($grd_data[$disc3] ne "") && ($grd_data[$disc3] ne "$disc_exception") && ($grd_data[$disc3] gt "0")) {
```

```
            $SOD_dpost_ct++;
          }
          $SOD_grade_ct++;
          last GRDC;
        } else {
          next GRDC;
        }
      }
      close GRDFILE;
      if ($SOD_grade_ct > 0) {
        push(@INVout, "1");
      } else {
        push(@INVout, "0");
      }
      if ($SOD_dpost_ct > 0) {
        push(@INVout, "$SOD_dpost_ct");
      } else {
        push(@INVout, "0");
      }
      open HCTAREAD, "$HCTAA_FILE";
      open HCTBREAD, "$HCTAB_FILE";
      my $SOD_HCTAvA_ct = 0;
      my @HCTAvA_cases;
      my @HCTDA_lines = <HCTAREAD>;
      shift(@HCTDA_lines);
      foreach my $HCTDA_line (@HCTDA_lines) {
        chomp($HCTDA_line);
        my @HCTDA_data = split("\t",$HCTDA_line);
        if ($SOD_name =~ /^$HCTDA_data[0]/i) {
          push(@HCTAvA_cases,$HCTDA_data[15]);
          $SOD_HCTAvA_ct++;
          print HCTDAFILE "$HCTDA_line\n";
        } else {
          next;
        }
      }
      if ($SOD_HCTAvA_ct > 1) {
        my $multi_vA = join("\&",@HCTAvA_cases);
        push(@INVout,"1");
        push(@INVout,$multi_vA);
      } elsif ($SOD_HCTAvA_ct == 1) {
        push(@INVout,"1");
        push(@INVout,"");
      } else {
        push(@INVout,"0");
        push(@INVout,"");
      }
      close HCTAREAD;
      my $SOD_HCTAvB_ct = 0;
      my @HCTAvB_cases;
      my @HCTDB_lines = <HCTBREAD>;
      shift(@HCTDB_lines);
      foreach my $HCTDB_line (@HCTDB_lines) {
        chomp($HCTDB_line);
        my @HCTDB_data = split("\t",$HCTDB_line);
        if ($SOD_name =~ /^$HCTDB_data[0]/i) {
          push(@HCTAvB_cases,$HCTDB_data[15]);
          $SOD_HCTAvB_ct++;
          print HCTDBFILE "$HCTDB_line\n";
        } else {
          next;
        }
```

```
          }
          if ($SOD_HCTAvB_ct > 1) {
            my $multi_vB = join("\&",@HCTAvB_cases);
            push(@INVout,"1");
            push(@INVout,$multi_vB);
          } elsif ($SOD_HCTAvB_ct == 1) {
            push(@INVout,"1");
            push(@INVout,"");
          } else {
            push(@INVout,"0");
            push(@INVout,"");
          }
          close HCTBREAD;
## SS counting ##
          my $SOD_SS_ct = 0;
          foreach my $SS_data_suffix (@SS_data_suffix) {
            my $SS_file = "$prefix" . "$SS_data_suffix";
            open SSFILE, "$SS_file";
            SSDATA: while (my $SSline = <SSFILE>) {
              my @SSdata = split("\t",$SSline);
              if (scalar(@SSdata) > 1) {
                my $SS_name = "$SSdata[1]" . "," . "$SSdata[2]";
                my $SS_NetID = $SSdata[0];
                if (($SS_name =~ /^$SOD_name/i) || ($SS_NetID =~ $NetID) || ($SS_NetID =~ /$last4ID$/)) {
                  $SOD_SS_ct++;
                  last SSDATA;
                } else {
                  next SSDATA;
                }
              } else {
                next SSDATA;
              }
            }
            close SSFILE;
          }
          push(@INVout,$SOD_SS_ct);
          my $INV_output = join("\t",@INVout);
          print INVOUT "$INV_output\n";
        } else {
          next;
        }
      }
      close SODFILE;
      close SODOUT;
    } else {
      next;
    }
    print STDOUT ".Done!\n";
  }
  close HCTDAFILE;
  close HCTDBFILE;
}
close INVOUT;
print STDOUT <<"EOT";

Manually inspect "$INV_out_file" for any coding considerations and to verify cases.
When finished, make any appropriate modifications to "make_db.pl" and execute it.

EOT
```

Appendix E.

Dataset processing Perl script “make_db.pl”.

```
#!/usr/bin/perl -w

use strict;
use diagnostics;

## Immediate output for progress indicators ##
$| = 1;
##############################
### Variable declarations ###
##############################
## File names ##
my $readfile = "Inventory.txt";
my $outfile = "dataset.csv";
my $SPSS_dataset_name = "CT_DATA";
my $syn_out = "dataset.sps";
my @SS_suffix = ("SS1data.txt", "SS2data.txt", "SS3data.txt", "SS4data.txt");
my @SS_data_suffix = ("_SS1_data", "_SS2_data", "_SS3_data", "_SS4_data");
my $SS_vals_file = "values";
my $HCTA_vA_suffix = "HCTAvA";
my $HCTA_vB_suffix = "HCTAvB";
my $SOD_suffix = "_SOD.txt";
my $grade_suffix = "grades.txt";
## SPSS variables ##
my $v_str_length = "A13";
my $v_num_length = "F8.2";
my $SYSMIS = "";
my $SSMISVAL = "0";
## Add any additional SPSS syntax between variable declaration below and BLOCK ##
my $SPSS_block = <<"BLOCK";

COMPUTE TotDpts=SUM(Disc1,Disc2,Disc3).
COMPUTE TotQpts=SUM(Quiz1,Quiz2,Quiz3,Quiz4,Quiz5,Quiz6,Quiz7,Quiz8,Quiz9).
VARIABLE LABELS TotDpts 'Total Discussion Points'.
VARIABLE LABELS TotQpts 'Total Quiz Points'.
COMPUTE SSQ1=Median(Q1_1,Q1_2,Q1_3,Q1_4).
COMPUTE SSQ2=Median(Q2_1,Q2_2,Q2_3,Q2_4).
COMPUTE SSQ3=Median(Q3_1,Q3_2,Q3_3,Q3_4).
COMPUTE SSQ4=Median(Q4_1,Q4_2,Q4_3,Q4_4).
COMPUTE SSQ5=Median(Q5_1,Q5_2,Q5_3,Q5_4).
COMPUTE SSQ6=Median(Q6_1,Q6_2,Q6_3,Q6_4).
COMPUTE SSQ7=Median(Q7_1,Q7_2,Q7_3,Q7_4).
COMPUTE SSQ8=Median(Q8_1,Q8_2,Q8_3,Q8_4).
COMPUTE SSQ9=Median(Q9_1,Q9_2,Q9_3,Q9_4).
COMPUTE SSQ10=Median(Q10_1,Q10_2,Q10_3,Q10_4).
VARIABLE LABELS SSQ1 'Academic Confidence'.
VARIABLE LABELS SSQ2 'Technology Confidence'.
VARIABLE LABELS SSQ3 'Technology Attitudes'.
VARIABLE LABELS SSQ4 'Topic Importance'.
VARIABLE LABELS SSQ5 'Topic Knowledge'.
VARIABLE LABELS SSQ6 'Learning Motivation'.
VARIABLE LABELS SSQ7 'Studying/Testing Habits'.
VARIABLE LABELS SSQ8 'Confidence in Skills'.
VARIABLE LABELS SSQ9 'CT Characteristics'.
VARIABLE LABELS SSQ10 'Resource Use'.
EXECUTE.

BLOCK
```

```
## Script variables - change with caution ##
my $stripper1 = '^M|(\")?<[a-z]+.*\">|(<\/[A-Za-z]+.*\>)+(\")?|\"|(<[A-Za-z0-9]+>)';
my $stripper2 = '(\240)+|(\177)+';
my @VAR_ACCT;
#############################################
## Variable names for the dataset - SYNOUT           ##
#############################################
my $case_str = "CaseID";
my $case_str_val = "Case identifier via inventory file";
my @variable_names = ("Sem_code", "Dcond", "HCTAcnd", "Age", "Gender", "Ethnic", "Enrl_hrs", "TransHrs",
   "CHtotal", "Stype", "ARank", "Col_maj", "Dept_maj", "Code_maj", "SODGrad", "BBGC", "SSs_N",
   "Disc_N", "HCTAvA", "HCTAvB", "HCTAboth", "HCTAs");
my %variable_vals = (
   'Sem_code' => 'Semester and section code',
   'Dcond' => 'Discussion posting condition',
   'HCTAcnd' => 'HCTA order condition',
   'Age' => 'Age at enrollment in years',
   'Gender' => 'Gender from SOD',
   'Ethnic' => 'Ethnicity from SOD',
   'Enrl_hrs' => 'Number of hours attempted during Sem_code',
   'TransHrs' => 'Total transfer hours completed during Sem_code',
   'CHtotal' => 'Number of hours completed during Sem_code',
   'Stype' => 'Student Enrollment Type',
   'ARank' => 'Academic rank during Sem_code',
   'Col_maj' => 'Major by college designation',
   'Dept_maj' => 'Specific departmental majors of interest',
   'Code_maj' => 'Major or Intended',
   'SODGrad' => 'Valid grade in SOD',
   'BBGC' => 'Grade center information available',
   'SSs_N'    => 'Number of completed SSs',
   'Disc_N' => 'Number of completed discussion postings',
   'HCTAvA' => 'HCTAvA completion',
   'HCTAvB' => 'HCTAvB completion',
   'HCTAboth' => 'Both HCTA completion',
   'HCTAs' => 'HCTA completion categories',
   'ACT1' => 'ACT Composition',
   'ACT2' => 'ACT Math',
   'ACT3' => 'ACT English',
   'SAT1' => 'SAT Verbal',
   'SAT2' => 'SAT Math',
   'ENGL1' => 'ENGL Comp 1',
   'ENGL2' => 'ENGL Comp 2',
);
############################################
## Inventory file READ variable positions            ##
############################################
my $CaseID_pos = 0;
my $ID_num_pos = 1;
my $name_pos = 3;
my $semcode_pos = 6;
my $enrlhrs_pos = 7;
my $majcol_pos = 8;
my $majdept_pos = 9;
my $majtype_pos = 10;
my $majtext_pos = 11;
my $ethnic_pos = 12;
my $tottrans_pos = 13;
my $totcred_pos = 14;
my $gender_pos = 16;
my $Stype_pos = 17;
my $Arank_pos = 18;
```

```
my $SOD_grd_pos = 19;
my $ACT1_pos = 20;
my $ACT2_pos = 21;
my $ACT3_pos = 22;
my $SAT1_pos = 23;
my $SAT2_pos = 24;
my $age_pos = 27;
my $BBGC_pos = 28;
my $Dposts_pos = 29;
my $HCTAvA_pos = 30;
my $multivA_pos = 31;
my $HCTAvB_pos = 32;
my $multivB_pos = 33;
my $SSs_pos = 34;
######################################
## Categorical coding for variables              ##
######################################
## Code for sem_code ##
my %sem_code = (
   '1' => 'F2010_003',
   '2' => 'F2010_004',
   '3' => 'S2011_003',
   '4' => 'S2011_004',
   '5' => 'F2011_003',
   '6' => 'F2011_004',
   '7' => 'S2012_003',
   '8' => 'S2012_004'
);
## Sections for second groupings in Dcond and HCTAcnd ##
## Coding for gender ##
my %gend_vals = (
   '1' => 'Male',
   '2' => 'Female'
);
## Coding for Major code type ##
my %code_maj_vals = (
   '1' => 'Major',
   '2' => 'Intended'
);
## Coding for majors by college ##
my $maj_search1 = 'SCIE';
my $Cmajval1 = "1";
my $maj_search2 = 'NURS';
my $Cmajval2 = "2";
my $maj_search3 = 'EDUC';
my $Cmajval3 = "3";
my $maj_search4 = 'LART';
my $Cmajval4 = "4";
my $maj_search5 = 'URPA';
my $Cmajval5 = "5";
## Special cases using COLLEGE column ##
my $maj_search6 = 'ARCH|BUSA|ENGR|SOCW';
my $Cmajval6 = "6";
## These special cases must use DEPARTMENT and TEXT columns ##
my $maj_search7 = 'UAC';
my $maj_search8 = 'University\ Studies';
my $Cmajval7 = "7";
my $maj_search9 = 'Undeclared\ Intended|UND';
my $Cmajval8 = "8";
## Coding for majors by department ##
my $Dmaj_search1 = 'PSYC';
my $Dmajval1 = "1";
```

```
my $Dmaj_search2 = 'BIOL|CHEM';
my $Dmajval2 = "2";
my $Dmajval3 = "3";
my $Dmaj_search3 = 'KINE';
my $Dmajval4 = "4";
my $Dmaj_search4 = 'EDCI';
my $Dmajval5 = "5";
my $Dmajval6 = "6";
my $Dmajval7 = "7";
my $Dmajval8 = "8";
my $Dmajval9 = "9";
my $Dmajval10 = "10";
## Values for "Maj_col" ##
## This hash is only used for SYNOUT ##
my %maj_col_vals = (
   '1' => 'College of Science',
   '2' => 'College of Nursing',
   '3' => 'College of Education',
   '4' => 'College of Liberal Arts',
   '5' => 'College of Urban and Public Affairs',
   '6' => 'Other',
   '7' => 'University College',
   '8' => 'Undeclared Major'
);
## Values for "Maj_dept" ##
## This hash is only used for SYNOUT ##
my %maj_dept_vals = (
   '1' => 'Psychology',
   '2' => 'Biology or Chemistry',
   '3' => 'Nursing',
   '4' => 'Kinesiology',
   '5' => 'Education Specific',
   '6' => 'ANTH COMM CRCJ ENGL HIST LING MODL PHIL POLS THEA',
   '7' => 'Interdisciplinary Studies',
   '8' => 'Other',
   '9' => 'University Studies',
   '10' => 'Undeclared'
);
## Values for "Stype" ##
my %Stype_vals = (
   '1' => 'Less 1/2',
   '2' => 'Half-Time',
   '3' => 'Full-Time'
);
## Values for "Standing" ##
my %standing_vals = (
   '1' => 'Freshman',
   '2' => 'Sophomore',
   '3' => 'Junior',
   '4' => 'Senior',
   '5' => 'Fifth Year'
);
## Coding for Ethnicity - note use of except vars in hash ##
my $ethn_except = "M";
my $ethn_except_val = "9";
my %ethnic_vals = (
   '1' => 'White',
   '2' => 'Black/African American',
   '3' => 'Hispanic/Latino',
   '4' => 'Asian',
   '5' => 'American Indian/Alaska Native',
   '6' => 'Foreign National',
```

```
   '7' => 'Not Specificied',
   '8' => 'Native Hawaiian/Other Pacific Islander',
   '9' => 'Multiple Ethnicities',
);
## Coding for "Conditions" ##
## Values for "Dcond" (a.k.a. Condition 1) ##
my $cond1_2 = "4|5";
my $Dcond;
my $cond1_true = "2";
my $cond1_false = "1";
my %condition1vals = (
   '1' => 'Optional Posting',
   '2' => 'Mandatory Posting'
);
## Values for "HCTAcnd" (a.k.a. Condition 2) ##
## value ge below; first semester key number ##
my $cond2_2 = "5";
my $HCTAcnd;
my $cond2_true = "2";
my $cond2_false = "1";
my %condition2vals = (
   '1' => 'Version A, then Version B',
   '2' => 'Version B, then Version A'
);
my %HCTAs_vals = (
   '0' => 'No HCTAs completed',
   '1' => 'Only HCTA Version A completed',
   '2' => 'Only HCTA Version B completed',
   '3' => 'Both HCTAs completed'
);
### Note: All remaining demographic variables do not need coding ###
###################################
### Selection of imported data            ###
###################################
# NOTE: SOD vars are already labeled from INV file #
##############################
## SOD file read positions          ##
##############################
my @SOD_cols = ("6", "8", "9", "10", "11", "12", "13");
my @SOD_vars = ("curGPA", "cumGPA", "ACT1", "ACT2", "ACT3", "SAT1", "SAT2", "ENGL1", "ENGL2");
my %SOD_var_labels = (
   'curGPA' => 'Semester GPA',
   'cumGPA' => 'Cumulative GPA',
   'ACT1' => 'ACT Comp',
   'ACT2' => 'ACT Math',
   'ACT3' => 'ACT English',
   'SAT1' => 'SAT Verbal',
   'SAT2' => 'SAT Math',
   'ENGL1' => 'ENGL Comp 1',
   'ENGL2' => 'ENGL Comp 2'
);
# Use the later declared, %letter_grade_vals, to code the following two variables #
my $SOD_ENGL1_pos = 27;
my $SOD_ENGL2_pos = 28;
###############################
## BBGC file read positions         ##
###############################
## 5,7 = discs, 12,20 = quizzes, 21 = final, 22,25 = course grade ##
my @grade_cols = ("5", "6", "7", "12", "13", "14", "15", "16", "17",
   "18", "19", "20", "21", "22", "23", "24");
my $LetterG_col = 25;
my @grade_vars = ("Disc1", "Disc2", "Disc3", "Quiz1", "Quiz2", "Quiz3",
```

```
    "Quiz4", "Quiz5", "Quiz6", "Quiz7", "Quiz8", "Quiz9", "FinExam",
    "Cumm_pts", "TotPts", "PctGrd", "LetGrd");
my %grade_var_labels = (
    'Disc1' => 'Discussion Post 1',
    'Disc2' => 'Discussion Post 2',
    'Disc3' => 'Discussion Post 3',
    'Quiz1' => 'Quiz 1 - Chapter 1',
    'Quiz2' => 'Quiz 2 - Chapters 2 and 3',
    'Quiz3' => 'Quiz 3 - Chapters 4 and 5',
    'Quiz4' => 'Quiz 4 - Chapters 6 and 5',
    'Quiz5' => 'Quiz 5 - Chapters 8 and 9',
    'Quiz6' => 'Quiz 6 - Chapters 10 and 11',
    'Quiz7' => 'Quiz 7 - Chapters 12 and 13',
    'Quiz8' => 'Quiz 8 - Chapters 14 and 15',
    'Quiz9' => 'Quiz 9 - Chapters 16 and 17',
    'FinExam' => 'Cummulative final exam',
    'Cumm_pts' => 'Total Points before dropped grades',
    'TotPts' => 'Total Points after dropped grades',
    'PctGrd' => 'Percent of Total Points out of 240',
    'LetGrd' => 'Points after dropped grades'
);
### Use the following hash for all letter grade coding ###
my %letter_grade_vals = (
    '0' => 'F',
    '1' => 'D',
    '2' => 'C',
    '3' => 'B',
    '4' => 'A'
);
## HCTA data ##
my @HCTA_vA_cols = ("25", "26", "27", "28", "29", "30", "31", "32",
    "33", "34", "35", "36", "37", "38", "39", "40", "41", "42");
my $HCTA_vA_case = "0";
my @HCTAvA_vars = ("vACT", "vACTR", "vACTF", "vAVR", "vAVRR",
    "vAVRF", "vAAA", "vAAAR", "vAAAF", "vAHT", "vAHTR",
    "vAHTF", "vALU", "vALUR", "vALUF", "vAPS", "vAPSR", "vAPSF");
my %HCTAvA_var_labels = (
    'vACT' => 'Version A Total Critical Thinking',
    'vACTR' => 'Version A Critical Thinking - Forced Choice',
    'vACTF' => 'Version A Critical Thinking - Constructed Response',
    'vAVR' => 'Version A Total Verbal Reasoning',
    'vAVRR' => 'Version A Verbal Reasoning - Forced Choice',
    'vAVRF' => 'Version A Verbal Reasoning - Constructed Response',
    'vAAA' => 'Version A Total Argument Analysis',
    'vAAAR' => 'Version A Argument Analysis - Forced Choice',
    'vAAAF' => 'Version A Argument Analysis - Constructed Response',
    'vAHT' => 'Version A Total Hypothesis Testing',
    'vAHTR' => 'Version A Hypothesis Testing - Forced Choice',
    'vAHTF' => 'Version A Hypothesis Testing - Constructed Response',
    'vALU' => 'Version A Total Likelihood and Uncertainty',
    'vALUR' => 'Version A Likelihood and Uncertainty - Forced Choice',
    'vALUF' => 'Version A Likelihood and Uncertainty - Constructed Response',
    'vAPS' => 'Version A Total Problem Solving',
    'vAPSR' => 'Version A Problem Solving - Forced Choice',
    'vAPSF' => 'Version A Problem Solving - Constructed Response'
);
my @HCTA_vB_cols = ("24", "25", "26", "27", "28", "29", "30", "31",
    "32", "33", "34", "35", "36", "37", "38", "39", "40", "41");
my $HCTA_vB_case = "0";
my @HCTAvB_vars = ("vBCT", "vBCTR", "vBCTF", "vBVR", "vBVRR", "vBVRF",
    "vBAA", "vBAAR", "vBAAF", "vBHT", "vBHTR", "vBHTF", "vBLU",
    "vBLUR", "vBLUF", "vBPS", "vBPSR", "vBPSF");
```

```
my %HCTAvB_var_labels = (
    'vBCT' => 'Version B Total Critical Thinking',
    'vBCTR' => 'Version B Critical Thinking - Forced Choice',
    'vBCTF' => 'Version B Critical Thinking - Constructed Response',
    'vBVR' => 'Version B Total Verbal Reasoning',
    'vBVRR' => 'Version B Verbal Reasoning - Forced Choice',
    'vBVRF' => 'Version B Verbal Reasoning - Constructed Response',
    'vBAA' => 'Version B Total Argument Analysis',
    'vBAAR' => 'Version B Argument Analysis - Forced Choice',
    'vBAAF' => 'Version B Argument Analysis - Constructed Response',
    'vBHT' => 'Version B Total Hypothesis Testing',
    'vBHTR' => 'Version B Hypothesis Testing - Forced Choice',
    'vBHTF' => 'Version B Hypothesis Testing - Constructed Response',
    'vBLU' => 'Version B Total Likelihood and Uncertainty',
    'vBLUR' => 'Version B Likelihood and Uncertainty - Forced Choice',
    'vBLUF' => 'Version B Likelihood and Uncertainty - Constructed Response',
    'vBPS' => 'Version B Total Problem Solving',
    'vBPSR' => 'Version B Problem Solving - Forced Choice',
    'vBPSF' => 'Version B Problem Solving - Constructed Response'
);
## for the following array, only include variables with more than one group ##
my @categorical = ("Sem_code", "Dcond", "HCTAcnd", "Gender", "Ethnic", "Stype",
    "ARank", "Col_maj", "Dept_maj", "Code_maj", "HCTAs", "ENGL1", "ENGL2", "LetGrd");
######################
### Body of script       ###
######################
### WARNING! DO NOT CHANGE ANY VALUES BELOW THIS LINE! ###
## First pull variables and labels from SS files ##
open SSVALUES, "$SS_vals_file";
my @SS_vals_vars = <SSVALUES>;
shift(@SS_vals_vars);
my $SS_total_ct = @SS_vals_vars;
my $SS_ct = @SS_suffix;
my $SS_item_ct = ($SS_total_ct/$SS_ct);
my @SS_vars;
foreach my $SS_vals_vars (@SS_vals_vars) {
    chomp($SS_vals_vars);
    my @SS_var_name = split("\t", $SS_vals_vars);
    my $SS_var = $SS_var_name[0];
    push(@SS_vars, $SS_var);
}
close SSVALUES;
my $QID_tot_ct = scalar(@SS_vars);
my @Sem_prefix = (sort keys %sem_code);
my %Questions;
my $prefix_1 = $sem_code{$Sem_prefix[0]};
foreach my $SS_suffix (@SS_suffix) {
    my $SS_filename = "$prefix_1" . "$SS_suffix";
    my $Q_num_suffix = $SS_suffix;
    $Q_num_suffix =~ s/\D+//g;
    open SSRAWFILE, "$SS_filename";
    my @SS_raw_lines = <SSRAWFILE>;
    shift(@SS_raw_lines);
    my $ct_grep = "_" . "$Q_num_suffix";
    my @QID_matches = grep(/$ct_grep/, @SS_vars);
    my $QID_cur_ct = @QID_matches;
    $QID_cur_ct++;
    my $QID_ct = 0;
    while ($QID_ct < $QID_cur_ct) {
        foreach my $QID_match (@QID_matches) {
            foreach my $SS_raw_line (@SS_raw_lines) {
                my @SS_raw_data = split("\t", $SS_raw_line);
```

```
        my $Question_num = $SS_raw_data[3];
        $Question_num =~ s/\D+//g;
        my $Q_ID = "Q" . "$Question_num" . "$ct_grep";
        if ($Q_ID =~ /$QID_match/) {
          my $Question = $SS_raw_data[4];
          $Question =~ s/${stripper1}//g;
          $Question =~ s/${stripper2}/\ /g;
          $Questions{$Q_ID} = $Question;
          $QID_ct++;
          last;
        } else {
          next;
        }
      }
      next;
    }
  }
  close SSRAWFILE;
}
push(@VAR_ACCT, $case_str);
push(@VAR_ACCT, @variable_names);
push(@VAR_ACCT, @SOD_vars);
push(@VAR_ACCT, @grade_vars);
push(@VAR_ACCT, @HCTAvA_vars);
push(@VAR_ACCT, @HCTAvB_vars);
push(@VAR_ACCT, @SS_vars);
## First generate Syntax file ##
print STDOUT "Generating syntax file...";
open SYNOUT, ">$syn_out";
## Add the top ##
## Beginning of Syntax file and declaration of variables for SPSS ##
print SYNOUT <<"EOT";
GET DATA
  /TYPE=TXT
  /FILE="$outfile"
  /DELCASE=LINE
  /DELIMITERS=","
  /ARRANGEMENT=DELIMITED
  /FIRSTCASE=1
  /IMPORTCASE=ALL
  /VARIABLES=
EOT
## Start with the string variable ##
print SYNOUT "\t$case_str\t$v_str_length\n";
## Pull variables from datasets for syntax "GET DATA" declaration. ##
## Add READ variables ##
foreach my $variable_name (@variable_names) {
  $| = 1; print STDOUT ".";
  print SYNOUT "\t$variable_name\t$v_num_length\n";
}
## Add SOD variables ##
foreach my $SOD_var (@SOD_vars) {
  $| = 1; print STDOUT ".";
  print SYNOUT "\t$SOD_var\t$v_num_length\n";
}
## Add grade variables ##
foreach my $grade_var (@grade_vars) {
  $| = 1; print STDOUT ".";
  print SYNOUT "\t$grade_var\t$v_num_length\n";
}
## Add SS variables ##
foreach my $SS_var_Q (@SS_vars) {
```

```
    $| = 1; print STDOUT ".";
    print SYNOUT "\t$SS_var_Q\t$v_num_length\n";
}
## Add HCTA variables ##
foreach my $HCTAvA_var (@HCTAvA_vars) {
    $| = 1; print STDOUT ".";
    print SYNOUT "\t$HCTAvA_var\t$v_num_length\n";
}
## since HCTAvB is last, use count ##
my $HCTAvB_vars_ct = scalar(@HCTAvB_vars);
my $HCTAvB_test_ct = $HCTAvB_vars_ct - 1;
my $HCTAvB_item_ct = 0;
until ($HCTAvB_item_ct == $HCTAvB_test_ct) {
    $| = 1; print STDOUT ".";
    print SYNOUT "\t$HCTAvB_vars[$HCTAvB_item_ct]\t$v_num_length\n";
    $HCTAvB_item_ct++;
}
print SYNOUT "\t$HCTAvB_vars[$HCTAvB_item_ct]\t$v_num_length.\n";
print SYNOUT <<"EOT";
CACHE.
EXECUTE.
DATASET NAME $SPSS_dataset_name WINDOW=FRONT.
VARIABLE LABELS
EOT
## variable labels for variable names ##
print SYNOUT "$case_str\t\'$case_str_val\'\n";
foreach my $variable_name (@variable_names) {
    print SYNOUT "$variable_name\t\'$variable_vals{$variable_name}\'\n";
}
foreach my $SOD_var (@SOD_vars) {
    print SYNOUT "$SOD_var\t\'$SOD_var_labels{$SOD_var}\'\n";
}
foreach my $grade_var (@grade_vars) {
    print SYNOUT "$grade_var\t\'$grade_var_labels{$grade_var}\'\n";
}
## Add SS variables ##
foreach my $SS_var_Q (@SS_vars) {
    print SYNOUT "$SS_var_Q\t\'$SS_var_Q: $Questions{$SS_var_Q}\'\n";
}
foreach my $HCTAvA_var (@HCTAvA_vars) {
#    $| = 1; print STDOUT ".";
    print SYNOUT "$HCTAvA_var\t\'$HCTAvA_var_labels{$HCTAvA_var}\'\n";
}
## since HCTAvB is last, use count ##
$HCTAvB_item_ct = 0;
until ($HCTAvB_item_ct == $HCTAvB_test_ct) {
    my $HCTAvB_item = $HCTAvB_vars[$HCTAvB_item_ct];
    print SYNOUT "$HCTAvB_item\t\'$HCTAvB_var_labels{$HCTAvB_item}\'\n";
    $HCTAvB_item_ct++;
}
my $HCTAvB_item = $HCTAvB_vars[$HCTAvB_item_ct];
print SYNOUT "$HCTAvB_item\t\'$HCTAvB_var_labels{$HCTAvB_item}\'.\n";
## Value labels for specific variables ##
my $val_label_ct = 0;
## Add SS variable values first ##
foreach my $SS_var_Q (@SS_vars) {
    print SYNOUT "VALUE LABELS $SS_var_Q\n";
    open SSVALUES, "$SS_vals_file";
    VALUELNS: while (my $SS_value_list = <SSVALUES>) {
        chomp($SS_value_list);
        my @SS_values_list = split("\t", $SS_value_list);
        if ($SS_var_Q =~ /$SS_values_list[0]/) {
```

```
            my $tot_SS_val_elem = scalar(@SS_values_list);
## start with [1], since [0] is nominal ##
            my $SS_val_elem_ct = 1;
            until ($SS_val_elem_ct == $tot_SS_val_elem) {
               $| = 1; print STDOUT ".";
               print SYNOUT "\t\t$SS_val_elem_ct\t\'$SS_values_list[$SS_val_elem_ct]\'\n";
               $SS_val_elem_ct++;
            }
            if (defined($SSMISVAL) || length($SSMISVAL) > 0) {
               print SYNOUT "\t\t$SSMISVAL\t\'Missing\'.\n";
            }
            last VALUELNS;
         } else {
            next VALUELNS;
         }
   }
   close SSVALUES;
}
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @sem_code_vals = (sort keys %sem_code);
my $sem_code_total = @sem_code_vals;
my $sem_code_ct = 1;
foreach my $sem_code_vals (@sem_code_vals) {
   if ($sem_code_ct == $sem_code_total) {
      print SYNOUT "\t\t$sem_code_vals\t\'$sem_code{$sem_code_vals}\'.\n";
   } else {
      print SYNOUT "\t\t$sem_code_vals\t\'$sem_code{$sem_code_vals}\'\n";
      $sem_code_ct++;
   }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @cond1_keys = (sort keys %condition1vals);
my $cond1_total = @cond1_keys;
my $cond1_ct = 1;
foreach my $cond1_keys (@cond1_keys) {
   if ($cond1_ct == $cond1_total) {
      print SYNOUT "\t\t$cond1_keys\t\'$condition1vals{$cond1_keys}\'.\n";
   } else {
      print SYNOUT "\t\t$cond1_keys\t\'$condition1vals{$cond1_keys}\'\n";
      $cond1_ct++;
   }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @cond2_keys = (sort keys %condition2vals);
my $cond2_total = @cond2_keys;
my $cond2_ct = 1;
foreach my $cond2_keys (@cond2_keys) {
   if ($cond2_ct == $cond2_total) {
      print SYNOUT "\t\t$cond2_keys\t\'$condition2vals{$cond2_keys}\'.\n";
   } else {
      print SYNOUT "\t\t$cond2_keys\t\'$condition2vals{$cond2_keys}\'\n";
      $cond2_ct++;
   }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @gend_keys = (sort keys %gend_vals);
my $gend_total = @cond2_keys;
my $gend_ct = 1;
foreach my $gend_keys (@gend_keys) {
```

```
    if ($gend_ct == $gend_total) {
        print SYNOUT "\t\t$gend_keys\t\'$gend_vals{$gend_keys}\'.\n";
    } else {
        print SYNOUT "\t\t$gend_keys\t\'$gend_vals{$gend_keys}\'\n";
        $gend_ct++;
    }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @ethnic_val_key = (sort keys %ethnic_vals);
my $ethnic_total = @ethnic_val_key;
my $ethnic_ct = 1;
foreach my $ethnic_val_key (@ethnic_val_key) {
    if ($ethnic_ct == $ethnic_total) {
        print SYNOUT "\t\t$ethnic_val_key\t\'$ethnic_vals{$ethnic_val_key}\'.\n";
    } else {
        print SYNOUT "\t\t$ethnic_val_key\t\'$ethnic_vals{$ethnic_val_key}\'\n";
        $ethnic_ct++;
    }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @Stype_val_key = (sort keys %Stype_vals);
my $Stype_total = @Stype_val_key;
my $Stype_ct = 1;
foreach my $Stype_val_key (@Stype_val_key) {
    if ($Stype_ct == $Stype_total) {
        print SYNOUT "\t\t$Stype_val_key\t\'$Stype_vals{$Stype_val_key}\'.\n";
    } else {
        print SYNOUT "\t\t$Stype_val_key\t\'$Stype_vals{$Stype_val_key}\'\n";
        $Stype_ct++;
    }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @stand_val_key = (sort keys %standing_vals);
my $stand_total = @stand_val_key;
my $stand_ct = 1;
foreach my $stand_val_key (@stand_val_key) {
    if ($stand_ct == $stand_total) {
        print SYNOUT "\t\t$stand_val_key\t\'$standing_vals{$stand_val_key}\'.\n";
    } else {
        print SYNOUT "\t\t$stand_val_key\t\'$standing_vals{$stand_val_key}\'\n";
        $stand_ct++;
    }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @maj_col_val_keys = (sort keys %maj_col_vals);
my $maj_col_total = @maj_col_val_keys;
my $maj_col_ct = 1;
foreach my $maj_col_val_keys (@maj_col_val_keys) {
    if ($maj_col_ct == $maj_col_total) {
        print SYNOUT "\t\t$maj_col_val_keys\t\'$maj_col_vals{$maj_col_val_keys}\'.\n";
    } else {
        print SYNOUT "\t\t$maj_col_val_keys\t\'$maj_col_vals{$maj_col_val_keys}\'\n";
        $maj_col_ct++;
    }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @maj_dept_val_keys = (sort keys %maj_dept_vals);
```

```
my $maj_dept_total = @maj_dept_val_keys;
my $maj_dept_ct = 1;
foreach my $maj_dept_val_keys (@maj_dept_val_keys) {
   if ($maj_dept_ct == $maj_dept_total) {
      print SYNOUT "\t\t$maj_dept_val_keys\t\'$maj_dept_vals{$maj_dept_val_keys}\'.\n";
   } else {
      print SYNOUT "\t\t$maj_dept_val_keys\t\'$maj_dept_vals{$maj_dept_val_keys}\'\n";
      $maj_dept_ct++;
   }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @code_maj_keys = (sort keys %code_maj_vals);
my $code_maj_total = @cond2_keys;
my $code_maj_ct = 1;
foreach my $code_maj_keys (@code_maj_keys) {
   if ($code_maj_ct == $code_maj_total) {
      print SYNOUT "\t\t$code_maj_keys\t\'$code_maj_vals{$code_maj_keys}\'.\n";
   } else {
      print SYNOUT "\t\t$code_maj_keys\t\'$code_maj_vals{$code_maj_keys}\'\n";
      $code_maj_ct++;
   }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @HCTAs_keys = (sort keys %HCTAs_vals);
my $HCTAs_total = @HCTAs_keys;
my $HCTAs_ct = 1;
foreach my $HCTAs_key (@HCTAs_keys) {
   if ($HCTAs_ct == $HCTAs_total) {
      print SYNOUT "\t\t$HCTAs_key\t\'$HCTAs_vals{$HCTAs_key}\'.\n";
   } else {
      print SYNOUT "\t\t$HCTAs_key\t\'$HCTAs_vals{$HCTAs_key}\'\n";
      $HCTAs_ct++;
   }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
my @let_grd_keys = (sort keys %letter_grade_vals);
my $letter_total = @let_grd_keys;
my $letter_ct = 1;
foreach my $let_grd_key (@let_grd_keys) {
   if ($letter_ct == $letter_total) {
      print SYNOUT "\t\t$let_grd_key\t\'$letter_grade_vals{$let_grd_key}\'.\n";
   } else {
      print SYNOUT "\t\t$let_grd_key\t\'$letter_grade_vals{$let_grd_key}\'\n";
      $letter_ct++;
   }
}
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
@let_grd_keys = (sort keys %letter_grade_vals);
$letter_total = @let_grd_keys;
$letter_ct = 1;
foreach my $let_grd_key (@let_grd_keys) {
   if ($letter_ct == $letter_total) {
      print SYNOUT "\t\t$let_grd_key\t\'$letter_grade_vals{$let_grd_key}\'.\n";
   } else {
      print SYNOUT "\t\t$let_grd_key\t\'$letter_grade_vals{$let_grd_key}\'\n";
      $letter_ct++;
   }
}
```

```
$val_label_ct++;
print SYNOUT "VALUE LABELS $categorical[$val_label_ct]\n";
@let_grd_keys = (sort keys %letter_grade_vals);
$letter_total = @let_grd_keys;
$letter_ct = 1;
foreach my $let_grd_key (@let_grd_keys) {
   if ($letter_ct == $letter_total) {
      print SYNOUT "\t\t$let_grd_key\t\'$letter_grade_vals{$let_grd_key}\'.\n";
   } else {
      print SYNOUT "\t\t$let_grd_key\t\'$letter_grade_vals{$let_grd_key}\'\n";
      $letter_ct++;
   }
}
print SYNOUT "$SPSS_block";
print STDOUT ".Done!\nFile \"$syn_out\" has been created.\n";
close SYNOUT;
## Now, generate database file ##
print STDOUT "\nBuilding \"$SPSS_dataset_name\" dataset...";
open OUT, ">$outfile";
open READ, "$readfile";
my @read_lines = <READ>;
shift(@read_lines);
## pull data according to the cases in READ ##
my $mult_vA_ct = 0;
my $mult_vB_ct = 0;
my $mult_both_ct = 0;
my $useable_ct = 0;
## stupid parser would not read "" from first line? ##
foreach my $read_line (@read_lines) {
   chomp($read_line);
   print STDOUT ".";
   my @read_data = split("\t", $read_line);
   my @data_out;
## Exclude cases with $multi_vA or $multi_vB ##
## Also generate count totals for STDOUT ##
   my $exclusion = 0;
   my $name = "$read_data[$name_pos]";
   $name =~ tr/A-Z/a-z/;
   if (defined($read_data[$multivA_pos]) && length($read_data[$multivA_pos]) >= 1) {
      $exclusion++;
      $mult_vA_ct++;
   } elsif (defined($read_data[$multivB_pos]) && length($read_data[$multivB_pos]) >= 1) {
      $exclusion++;
      $mult_vB_ct++;
   } elsif ((defined($read_data[$multivA_pos]) && length($read_data[$multivA_pos]) >= 1) &&
(defined($read_data[$multivB_pos]) && length($read_data[$multivB_pos]) >= 1)) {
      $exclusion++;
      $mult_both_ct++;
   } else {
   }
   if ($exclusion > 0) {
      next;
   } else {
## Declare the remaining variables ##
      my $caseID = "$read_data[$CaseID_pos]";
      my $ID_num = "$read_data[$ID_num_pos]";
      my $sem_code_val = "$read_data[$semcode_pos]";
      my $age = "$read_data[$age_pos]";
      my $gender = "$read_data[$gender_pos]";
      my $ethnic = "$read_data[$ethnic_pos]";
      my $enrlhrs = "$read_data[$enrlhrs_pos]";
      my $Stype = "$read_data[$Stype_pos]";
```

```
    my $majortext = "$read_data[$majtext_pos]";
    my $majorcode = "$read_data[$majtype_pos]";
    my $majcol = "$read_data[$majcol_pos]";
    my $majdept = "$read_data[$majdept_pos]";
    my $transHrs = "$read_data[$tottrans_pos]";
    my $totcred = "$read_data[$totcred_pos]";
    my $standing = "$read_data[$Arank_pos]";
    my $SODgrd = "$read_data[$SOD_grd_pos]";
    my $BBGC = "$read_data[$BBGC_pos]";
    my $num_disc = "$read_data[$Dposts_pos]";
    my $num_SS = "$read_data[$SSs_pos]";
    my $HCTAvA = "$read_data[$HCTAvA_pos]";
    my $HCTAvB = "$read_data[$HCTAvB_pos]";
## $name $netID and $last4ID used to pull data from files ##
    push(@data_out, $caseID);
    my $sem_code_raw;
    my @sem_keys = (sort keys %sem_code);
    foreach my $sem_keys (@sem_keys) {
      if ($sem_keys =~ /$sem_code_val/) {
        $sem_code_raw = $sem_code{$sem_keys};
        last;
      } else {
        next;
      }
    }
    push(@data_out, $sem_code_val);
    if ($sem_code_val =~ /$cond1_2/) {
      $Dcond = $cond1_true;
    } else {
      $Dcond = $cond1_false;
    }
    push(@data_out, $Dcond);
    if ($sem_code_val ge $cond2_2) {
      $HCTAcnd = $cond2_true;
    } else {
      $HCTAcnd = $cond2_false;
    }
    push(@data_out, $HCTAcnd);
    push(@data_out, $age);
    my $gend_out;
    my @gend_key = (keys %gend_vals);
    foreach my $gend_key (@gend_key) {
      my $gend_test_val = $gend_vals{$gend_key};
      my $gend_test = substr($gend_test_val, 0, 1);
      if ($gender =~ /$gend_test/) {
        $gend_out = $gend_key;
        last;
      } else {
        next;
      }
    }
    push(@data_out, $gend_out);
    if ($ethnic eq "$ethn_except") {
      $ethnic = $ethn_except_val;
    }
    push(@data_out, $ethnic);
    push(@data_out, $enrlhrs);
    push(@data_out, $transHrs);
    push(@data_out, $totcred);
    my $Stype_out;
    my @Stype_keys = (sort keys %Stype_vals);
    foreach my $Stype_key (@Stype_keys) {
```

```
        if ($Stype_vals{$Stype_key} =~ /$Stype/) {
            $Stype_out = $Stype_key;
            last;
        } else {
            next;
        }
    }
    push(@data_out, $Stype_out);
    my $stand_out;
    my @stand_keys = (sort keys %standing_vals);
    foreach my $stand_key (@stand_keys) {
        if ($standing_vals{$stand_key} =~ /$standing/) {
            $stand_out = $stand_key;
            last;
        } else {
            next;
        }
    }
    push(@data_out, $stand_out);
#### Coding for major variables ####
    my $maj_col_out;
    my $maj_dept_out;
    if ($majcol =~ /$maj_search1/) {
        $maj_col_out = $Cmajval1;
        if ($majdept =~ /$Dmaj_search1/) {
            $maj_dept_out = $Dmajval1;
        } elsif ($majdept =~ /$Dmaj_search2/) {
            $maj_dept_out = $Dmajval2;
        } else {
            $maj_dept_out = $SYSMIS;
        }
    } elsif ($majcol =~ /$maj_search2/) {
        $maj_col_out = $Cmajval2;
        $maj_dept_out = $Dmajval3;
    } elsif ($majcol =~ /$maj_search3/) {
        $maj_col_out = $Cmajval3;
        if ($majdept =~ /$Dmaj_search3/) {
            $maj_dept_out = $Dmajval4;
        } elsif ($majdept =~ /$Dmaj_search4/) {
            $maj_dept_out = $Dmajval5;
        } else {
            $maj_dept_out = $SYSMIS;
        }
    } elsif ($majcol =~ /$maj_search4/) {
        $maj_col_out = $Cmajval4;
        $maj_dept_out = $Dmajval6;
    } elsif ($majcol =~ /$maj_search5/) {
        $maj_col_out = $Cmajval5;
        $maj_dept_out = $Dmajval7;
    } elsif ($majcol =~ /$maj_search6/) {
        $maj_col_out = $Cmajval6;
        $maj_dept_out = $Dmajval8;
    } elsif ($majdept =~ /$maj_search7/) {
        if ($majortext =~ /$maj_search8/) {
            $maj_col_out = $Cmajval7;
            $maj_dept_out = $Dmajval9;
        } elsif ($majortext =~ /$maj_search9/) {
            $maj_col_out = $Cmajval8;
            $maj_dept_out = $Dmajval10;
        } else {
            $maj_col_out = $SYSMIS;
            $maj_dept_out = $SYSMIS;
```

```
        }
    } else {
        $maj_col_out = $SYSMIS;
        $maj_dept_out = $SYSMIS;
    }
    push(@data_out, $maj_col_out);
    push(@data_out, $maj_dept_out);
    foreach my $majcode_test (sort keys %code_maj_vals) {
        my $test_maj_code = substr($code_maj_vals{$majcode_test},0,3);
        if ($majorcode =~ /$test_maj_code/i) {
            push(@data_out, $majcode_test);
            last;
        } else {
            next;
        }
    }
    push(@data_out, $SODgrd);
    push(@data_out, $BBGC);
    push(@data_out, $num_SS);
    push(@data_out, $num_disc);
    push(@data_out, $HCTAvA);
    push(@data_out, $HCTAvB);
    my $HCTAboth;
    my $HCTAs;
    if (($HCTAvA > 0) && ($HCTAvB > 0)) {
        $HCTAboth = 1;
        $HCTAs = 3;
    } elsif (($HCTAvA > 0) && ($HCTAvB == 0)) {
        $HCTAboth = 0;
        $HCTAs = 1;
    } elsif (($HCTAvA == 0) && ($HCTAvB > 0)) {
        $HCTAboth = 0;
        $HCTAs = 2;
    } else {
        $HCTAboth = 0;
        $HCTAs = 0;
    }
    push(@data_out, $HCTAboth);
    push(@data_out, $HCTAs);
## first SOD ##
    my $SOD_file = "$sem_code_raw$SOD_suffix";
    open SODFILE, "$SOD_file";
    SODDATA: while (my $SODline = <SODFILE>) {
        $SODline =~ s/^M|%//;
        my @SOD_data = split("\t", $SODline);
        my $SOD_name = "$SOD_data[2]";
        $SOD_name =~ tr/A-Z/a-z/;
        if ($name =~ /^$SOD_name/) {
            foreach my $SOD_cols (@SOD_cols) {
                if ($SOD_data[$SOD_cols] == 0) {
                    push(@data_out, "$SYSMIS");
                } else {
                    push(@data_out, "$SOD_data[$SOD_cols]");
                }
            }
            my $letter1_out = $SOD_data[$SOD_ENGL1_pos];
            my @letter1_keys = sort(keys %letter_grade_vals);
            my $SODENGL1_ct = 0;
            foreach my $letter_key (@letter1_keys) {
                my $letter_test = $letter_grade_vals{$letter_key};
                if ($letter1_out =~ /$letter_test/) {
                    push(@data_out, "$letter_key");
```

```
                $SODENGL1_ct++;
                last;
            } else {
                next;
            }
        }
        if ($SODENGL1_ct == 0) {
            push(@data_out, "$SYSMIS");
        }
        my $letter2_out = $SOD_data[$SOD_ENGL2_pos];
        my @letter2_keys = sort(keys %letter_grade_vals);
        my $SODENGL2_ct = 0;
        foreach my $letter_key (@letter2_keys) {
            my $letter_test = $letter_grade_vals{$letter_key};
            if ($letter2_out =~ /$letter_test/) {
                push(@data_out, "$letter_key");
                $SODENGL2_ct++;
                last;
            } else {
                next;
            }
        }
        if ($SODENGL2_ct == 0) {
            push(@data_out, "$SYSMIS");
        }
        last SODDATA;
    } else {
        next SODDATA;
    }
}
close SODFILE;
## then BBGC ##
if ($BBGC eq "1") {
    #push grade data
    my $BBGC_ct = 0;
    my $grd_file = "$sem_code_raw$grade_suffix";
    open GRDFILE, "$grd_file";
    GRDDATA: while (my $grdline = <GRDFILE>) {
        $grdline =~ s/^M|%//;
        my @grade_data = split("\t", $grdline);
        my $grade_name = "$grade_data[0], $grade_data[1]";
        $grade_name =~ tr/A-Z/a-z/;
        if ($name =~ /^$grade_name/) {
            foreach my $grade_cols (@grade_cols) {
                push(@data_out, "$grade_data[$grade_cols]");
            }
            my $letter_out = $grade_data[$LetterG_col];
            my @letter_keys = (keys %letter_grade_vals);
            foreach my $letter_key (@letter_keys) {
                my $letter_test = $letter_grade_vals{$letter_key};
                if ($letter_out =~ /$letter_test/) {
                    push(@data_out, "$letter_key");
                    $BBGC_ct++;
                    last;
                } else {
                    next;
                }
            }
            last GRDDATA;
        } else {
            next GRDDATA;
        }
```

```
                #do stuff
            }
            if ($BBGC_ct == 0) {
                #push dummy grade data
                foreach my $grade_cols (@grade_cols) {
                    push(@data_out, $SYSMIS);
                }
                ## Account for letter grade field ##
                push(@data_out, $SYSMIS);
            }
            close GRDFILE;
        } else {
            #push dummy grade data
            foreach my $grade_cols (@grade_cols) {
                push(@data_out, $SYSMIS);
            }
            ## Account for letter grade field ##
            push(@data_out, $SYSMIS);
        }
## then SS ##
        if ($num_SS gt "0") {
            foreach my $SS_data_suffix (@SS_data_suffix) {
                my $SS_file_name = "$sem_code_raw$SS_data_suffix";
                my $SS_found_ct = 0;
                my $SS_data_suffix_num = $SS_data_suffix;
                $SS_data_suffix_num =~ s/\D+//g;
                my $SS_grep = "_" . "$SS_data_suffix_num";
                my @SS_var_track = grep(/$SS_grep/, @SS_vars);
                my $SS_var_ct = @SS_var_track;
                if ((-s $SS_file_name) > 1) {
                    open SSFILE, "$SS_file_name";
                    SSDATA: while (my $SSline = <SSFILE>) {
                        next if ($SSline =~ /^$/);
                        #do stuff
                        chomp($SSline);
                        my @SS_data_out = split("\t", $SSline);
                        my $SS_name = shift(@SS_data_out);
                        my $SS_netID = shift(@SS_data_out);
                        if ($name =~ $SS_name) {
                            until ($SS_found_ct == $SS_var_ct) {
                                my $SS_data_val = $SS_data_out[$SS_found_ct];
                                push(@data_out, $SS_data_val);
                                $SS_found_ct++;
                            }
                            last SSDATA;
                        } else {
                            next SSDATA;
                        }
                    }
                    close SSFILE;
                }
## The following if statement accounts for cases missing a SS ##
                if ($SS_found_ct == 0) {
                    #push dummy data to @data_out
                    my $SS_miss_ct = 0;
                    until ($SS_miss_ct == $SS_item_ct) {
                        push(@data_out, $SYSMIS);
                        $SS_miss_ct++;
                    }
                }
            }
        } else {
```

```
            #push dummy data
            my $SS_miss_ct = 0;
            until ($SS_miss_ct == $SS_total_ct) {
                push(@data_out, $SYSMIS);
                $SS_miss_ct++;
            }
        }
### last HCTA ###
        my @HCTAvA_data;
        my @HCTAvB_data;
## Version A ##
        my $HCTAvA_found_ct = 0;
        if ((defined($HCTAvA)) && ($HCTAvA ge "1")) {
            my $HCTA_vA_file_name = "$sem_code_raw" . "_" . "$HCTA_vA_suffix";
            open HCTAAFILE, "$HCTA_vA_file_name";
            HCTAADATA: while (my $HCTAAline = <HCTAAFILE>) {
                chomp($HCTAAline);
                $HCTAAline =~ s/^M//;
                my @HCTAAdata = split("\t", $HCTAAline);
                my $HCTAA_name = "$HCTAAdata[$HCTA_vA_case]";
                $HCTAA_name =~ tr/A-Z/a-z/;
                if ($name =~ /^$HCTAA_name/) {
                    foreach my $HCTA_vA_cols (@HCTA_vA_cols) {
                        my $temp_HCTAA_datum = $HCTAAdata[$HCTA_vA_cols];
                        push(@HCTAvA_data, "$temp_HCTAA_datum");
                    }
                    $HCTAvA_found_ct++;
                    last HCTAADATA;
                } else {
                    next HCTAADATA;
                }
            }
            if ($HCTAvA_found_ct == 0) {
                foreach my $HCTA_vA_cols (@HCTA_vA_cols) {
                    push(@HCTAvA_data,$SYSMIS);
                }
            }
            close HCTAAFILE;
        } else {
            foreach my $HCTA_vA_cols (@HCTA_vA_cols) {
                push(@HCTAvA_data,$SYSMIS);
            }
        }
        push(@data_out, @HCTAvA_data);
## Version B ##
        my $HCTAvB_found_ct = 0;
        if ((defined($HCTAvB)) && ($HCTAvB ge "1")) {
            my $HCTA_vB_file_name = "$sem_code_raw" . "_" . "$HCTA_vB_suffix";
            open HCTABFILE, "$HCTA_vB_file_name";
            HCTABDATA: while (my $HCTABline = <HCTABFILE>) {
                chomp($HCTABline);
                $HCTABline =~ s/^M//;
                my @HCTABdata = split("\t", $HCTABline);
                my $HCTAB_name = "$HCTABdata[$HCTA_vB_case]";
                $HCTAB_name =~ tr/A-Z/a-z/;
                if ($name =~ /^$HCTAB_name/) {
                    foreach my $HCTA_vB_cols (@HCTA_vB_cols) {
                        my $temp_HCTAB_datum = $HCTABdata[$HCTA_vB_cols];
                        push(@HCTAvB_data, "$temp_HCTAB_datum");
                    }
                    $HCTAvB_found_ct++;
                    last HCTABDATA;
```

```
                } else {
                    next HCTABDATA;
                }
            }
            if ($HCTAvB_found_ct == 0) {
                foreach my $HCTA_vB_cols (@HCTA_vB_cols) {
                    push(@HCTAvB_data,$SYSMIS);
                }
            }
            close HCTABFILE;
        } else {
            foreach my $HCTA_vB_cols (@HCTA_vB_cols) {
                push(@HCTAvB_data,$SYSMIS);
            }
        }
        push(@data_out, @HCTAvB_data);
## Write data to output file ##
        my $data_line_out = join(",", @data_out);
        print OUT "$data_line_out\n";
        $useable_ct++;
    }
}
print STDOUT ".Done!\nFile \"$outfile\" has been created.\n";
close READ;
close OUT;
## Finally, provide summary and closing instructions ##
my $total_variables = scalar(@VAR_ACCT);
my $total_data_pts = $useable_ct * $total_variables;
my $total_drop_cases = $mult_vA_ct + $mult_vB_ct + $mult_both_ct;
my $case_percent = ($useable_ct/($useable_ct + $total_drop_cases));
my $case_percent_out = sprintf("%2d%%", $case_percent*100);
print STDOUT <<EOT;

Data Summary:

Multiple HCTA version A attempts = $mult_vA_ct
Multiple HCTA version B attempts = $mult_vB_ct
Multiple HCTA both version attempts = $mult_both_ct
Total multiple cases dropped = $total_drop_cases

Useable cases imported into the dataset ($case_percent_out of total available cases) = $useable_ct
Variables per case = $total_variables
Active dataset should contain $total_data_pts total data points.

Additional Instructions:

First run the syntax file \"$syn_out\" in SPSS. Check for any syntax errors.
This may require editing the path (i.e. the "/FILE=" line) for \"$outfile\" in \"$syn_out\":
GET DATA
        /TYPE=TXT
        /FILE="PUT_FULL_PATH_TO_.csv_FILE_HERE\\$outfile"

EOT
```

Appendix F.

SPSS Syntax.

```
DATASET ACTIVATE CT_DATA.
*Recoding and labeling of essential variables.
RECODE Col_maj (1=1) (2=2) (5=3) (7=3) (3=4) (4=4) (6=4) (8=SYSMIS) INTO R_colmaj.
VARIABLE LABELS  R_colmaj 'Recoded College Major'.
RECODE Dept_maj (1=1) (3=2) (2=3) (4=3) (5=3) (6=3) (7=4) (8=3) (9=4) (10=SYSMIS) INTO R_depmaj.
VARIABLE LABELS  R_depmaj 'Recoded Department Major'.
VALUE LABELS R_colmaj
                    1          'College of Science'
                    2          'College of Nursing'
                    3          'Interdisciplinary Majors'
                    4          'Other majors'.
VALUE LABELS R_depmaj
                    1          'Psychology'
                    2          'Nursing'
                    3          'Traditional majors'
                    4          'Interdisciplinary majors'.
EXECUTE.
*Compute Discussion posts 0/1 for H3a.
RECODE Disc_N (1=1) (0=0) (2=1) INTO DNDiscs.
VARIABLE LABELS  DNDiscs 'Number of Discussion Postings 0/1'.
EXECUTE.
*Recode for StudEng.
RECODE Quiz1 (0=0) (SYSMIS=SYSMIS) (1 thru Highest=1) INTO DQ1.
VARIABLE LABELS  DQ1 'Quiz 1 0/1'.
RECODE Quiz2 (0=0) (SYSMIS=SYSMIS) (1 thru Highest=1) INTO DQ2.
VARIABLE LABELS  DQ2 'Quiz 2 0/1'.
RECODE Quiz3 (0=0) (SYSMIS=SYSMIS) (1 thru Highest=1) INTO DQ3.
VARIABLE LABELS  DQ3 'Quiz 3 0/1'.
RECODE Quiz4 (0=0) (SYSMIS=SYSMIS) (1 thru Highest=1) INTO DQ4.
VARIABLE LABELS  DQ4 'Quiz 4 0/1'.
RECODE Quiz5 (0=0) (SYSMIS=SYSMIS) (1 thru Highest=1) INTO DQ5.
VARIABLE LABELS  DQ5 'Quiz 5 0/1'.
RECODE Quiz6 (0=0) (SYSMIS=SYSMIS) (1 thru Highest=1) INTO DQ6.
VARIABLE LABELS  DQ6 'Quiz 6 0/1'.
RECODE Quiz7 (0=0) (SYSMIS=SYSMIS) (1 thru Highest=1) INTO DQ7.
VARIABLE LABELS  DQ7 'Quiz 7 0/1'.
RECODE Quiz8 (0=0) (SYSMIS=SYSMIS) (1 thru Highest=1) INTO DQ8.
VARIABLE LABELS  DQ8 'Quiz 8 0/1'.
RECODE Quiz9 (0=0) (SYSMIS=SYSMIS) (1 thru Highest=1) INTO DQ9.
VARIABLE LABELS  DQ9 'Quiz 9 0/1'.
COMPUTE TotQC=SUM(DQ1,DQ2,DQ3,DQ4,DQ5,DQ6,DQ7,DQ8,DQ9).
VARIABLE LABELS TotQC 'Number of Completed Quizzes'.
RECODE HCTAs (0=0) (1 thru 2=1) (3=2) INTO R2HCTAs.
VARIABLE LABELS  R2HCTAs '2nd Recoded HCTA completion'.
VALUE LABELS R2HCTAs
          0          'Non completion'
          1          'One HCTA'
          2          'Full HCTA completion'.
COMPUTE StudEng=SUM(SSs_N,R2HCTAs,Disc_N,TotQC).
VARIABLE LABELS StudEng 'Student Engagement Index'.
EXECUTE.
IF (HCTAcnd = 1) v1CT=vACT.
IF (HCTAcnd = 1) v1CTR=vACTR.
```

```
IF (HCTAcnd = 1) v1CTF=vACTF.
IF (HCTAcnd = 1) v1VR=vAVR.
IF (HCTAcnd = 1) v1VRR=vAVRR.
IF (HCTAcnd = 1) v1VRF=vAVRF.
IF (HCTAcnd = 1) v1AA=vAAA.
IF (HCTAcnd = 1) v1AAR=vAAAR.
IF (HCTAcnd = 1) v1AAF=vAAAF.
IF (HCTAcnd = 1) v1HT=vAHT.
IF (HCTAcnd = 1) v1HTR=vAHTR.
IF (HCTAcnd = 1) v1HTF=vAHTF.
IF (HCTAcnd = 1) v1LU=vALU.
IF (HCTAcnd = 1) v1LUR=vALUR.
IF (HCTAcnd = 1) v1LUF=vALUF.
IF (HCTAcnd = 1) v1PS=vAPS.
IF (HCTAcnd = 1) v1PSR=vAPSR.
IF (HCTAcnd = 1) v1PSF=vAPSF.
IF (HCTAcnd = 1) v2CT=vBCT.
IF (HCTAcnd = 1) v2CTR=vBCTR.
IF (HCTAcnd = 1) v2CTF=vBCTF.
IF (HCTAcnd = 1) v2VR=vBVR.
IF (HCTAcnd = 1) v2VRR=vBVRR.
IF (HCTAcnd = 1) v2VRF=vBVRF.
IF (HCTAcnd = 1) v2AA=vBAA.
IF (HCTAcnd = 1) v2AAR=vBAAR.
IF (HCTAcnd = 1) v2AAF=vBAAF.
IF (HCTAcnd = 1) v2HT=vBHT.
IF (HCTAcnd = 1) v2HTR=vBHTR.
IF (HCTAcnd = 1) v2HTF=vBHTF.
IF (HCTAcnd = 1) v2LU=vBLU.
IF (HCTAcnd = 1) v2LUR=vBLUR.
IF (HCTAcnd = 1) v2LUF=vBLUF.
IF (HCTAcnd = 1) v2PS=vBPS.
IF (HCTAcnd = 1) v2PSR=vBPSR.
IF (HCTAcnd = 1) v2PSF=vBPSF.
IF (HCTAcnd = 2) v1CT=vBCT.
IF (HCTAcnd = 2) v1CTR=vBCTR.
IF (HCTAcnd = 2) v1CTF=vBCTF.
IF (HCTAcnd = 2) v1VR=vBVR.
IF (HCTAcnd = 2) v1VRR=vBVRR.
IF (HCTAcnd = 2) v1VRF=vBVRF.
IF (HCTAcnd = 2) v1AA=vBAA.
IF (HCTAcnd = 2) v1AAR=vBAAR.
IF (HCTAcnd = 2) v1AAF=vBAAF.
IF (HCTAcnd = 2) v1HT=vBHT.
IF (HCTAcnd = 2) v1HTR=vBHTR.
IF (HCTAcnd = 2) v1HTF=vBHTF.
IF (HCTAcnd = 2) v1LU=vBLU.
IF (HCTAcnd = 2) v1LUR=vBLUR.
IF (HCTAcnd = 2) v1LUF=vBLUF.
IF (HCTAcnd = 2) v1PS=vBPS.
IF (HCTAcnd = 2) v1PSR=vBPSR.
IF (HCTAcnd = 2) v1PSF=vBPSF.
IF (HCTAcnd = 2) v2CT=vACT.
IF (HCTAcnd = 2) v2CTR=vACTR.
IF (HCTAcnd = 2) v2CTF=vACTF.
IF (HCTAcnd = 2) v2VR=vAVR.
IF (HCTAcnd = 2) v2VRR=vAVRR.
IF (HCTAcnd = 2) v2VRF=vAVRF.
IF (HCTAcnd = 2) v2AA=vAAA.
IF (HCTAcnd = 2) v2AAR=vAAAR.
IF (HCTAcnd = 2) v2AAF=vAAAF.
IF (HCTAcnd = 2) v2HT=vAHT.
```

```
IF (HCTAcnd = 2) v2HTR=vAHTR.
IF (HCTAcnd = 2) v2HTF=vAHTF.
IF (HCTAcnd = 2) v2LU=vALU.
IF (HCTAcnd = 2) v2LUR=vALUR.
IF (HCTAcnd = 2) v2LUF=vALUF.
IF (HCTAcnd = 2) v2PS=vAPS.
IF (HCTAcnd = 2) v2PSR=vAPSR.
IF (HCTAcnd = 2) v2PSF=vAPSF.
EXECUTE.
VARIABLE LABELS
v1CT   'Time 1 Total Critical Thinking'
v1CTR   'Time 1 Critical Thinking - Forced Choice'
v1CTF   'Time 1 Critical Thinking - Constructed Response'
v1VR   'Time 1 Total Verbal Reasoning'
v1VRR   'Time 1 Verbal Reasoning - Forced Choice'
v1VRF   'Time 1 Verbal Reasoning - Constructed Response'
v1AA   'Time 1 Total Argument Analysis'
v1AAR   'Time 1 Argument Analysis - Forced Choice'
v1AAF   'Time 1 Argument Analysis - Constructed Response'
v1HT   'Time 1 Total Hypothesis Testing'
v1HTR   'Time 1 Hypothesis Testing - Forced Choice'
v1HTF   'Time 1 Hypothesis Testing - Constructed Response'
v1LU   'Time 1 Total Likelihood and Uncertainty'
v1LUR   'Time 1 Likelihood and Uncertainty - Forced Choice'
v1LUF   'Time 1 Likelihood and Uncertainty - Constructed Response'
v1PS   'Time 1 Total Problem Solving'
v1PSR   'Time 1 Problem Solving - Forced Choice'
v1PSF   'Time 1 Problem Solving - Constructed Response'
v2CT   'Time 2 Total Critical Thinking'
v2CTR   'Time 2 Critical Thinking - Forced Choice'
v2CTF   'Time 2 Critical Thinking - Constructed Response'
v2VR   'Time 2 Total Verbal Reasoning'
v2VRR   'Time 2 Verbal Reasoning - Forced Choice'
v2VRF   'Time 2 Verbal Reasoning - Constructed Response'
v2AA   'Time 2 Total Argument Analysis'
v2AAR   'Time 2 Argument Analysis - Forced Choice'
v2AAF   'Time 2 Argument Analysis - Constructed Response'
v2HT   'Time 2 Total Hypothesis Testing'
v2HTR   'Time 2 Hypothesis Testing - Forced Choice'
v2HTF   'Time 2 Hypothesis Testing - Constructed Response'
v2LU   'Time 2 Total Likelihood and Uncertainty'
v2LUR   'Time 2 Likelihood and Uncertainty - Forced Choice'
v2LUF   'Time 2 Likelihood and Uncertainty - Constructed Response'
v2PS   'Time 2 Total Problem Solving'
v2PSR   'Time 2 Problem Solving - Forced Choice'
v2PSF   'Time 2 Problem Solving - Constructed Response'.
EXECUTE.
*Compute z scores for Time 1 and Time 2 CT measures.
DESCRIPTIVES VAR=v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU v1LUR
  v1LUF v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU
  v2LUR v2LUF v2PS v2PSR v2PSF
/SAVE.
*Compute difference scores for Hypothesis 3c.
IF  (HCTAboth = 1)  dCT=Zv2CT - Zv1CT.
IF  (HCTAboth = 1)  dCTR=Zv2CTR - Zv1CTR.
IF  (HCTAboth = 1)  dCTF=Zv2CTF - Zv1CTF.
IF  (HCTAboth = 1)  dVR=Zv2VR - Zv1VR.
IF  (HCTAboth = 1)  dVRR=Zv2VRR - Zv1VRR.
IF  (HCTAboth = 1)  dVRF=Zv2VRF - Zv1VRF.
IF  (HCTAboth = 1)  dAA=Zv2AA - Zv1AA.
IF  (HCTAboth = 1)  dAAR=Zv2AAR - Zv1AAR.
IF  (HCTAboth = 1)  dAAF=Zv2AAF - Zv1AAF.
```

```
IF  (HCTAboth = 1)  dHT=Zv2HT - Zv1HT.
IF  (HCTAboth = 1)  dHTR=Zv2HTR - Zv1HTR.
IF  (HCTAboth = 1)  dHTF=Zv2HTF - Zv1HTF.
IF  (HCTAboth = 1)  dLU=Zv2LU - Zv1LU.
IF  (HCTAboth = 1)  dLUR=Zv2LUR - Zv1LUR.
IF  (HCTAboth = 1)  dLUF=Zv2LUF - Zv1LUF.
IF  (HCTAboth = 1)  dPS=Zv2PS - Zv1PS.
IF  (HCTAboth = 1)  dPSR=Zv2PSR - Zv1PSR.
IF  (HCTAboth = 1)  dPSF=Zv2PSF - Zv1PSF.
VARIABLE LABELS
dCT    'T2 - T1 Total Critical Thinking'
dCTR   'T2 - T1 Critical Thinking - Forced Choice'
dCTF   'T2 - T1 Critical Thinking - Constructed Response'
dVR    'T2 - T1 Total Verbal Reasoning'
dVRR   'T2 - T1 Verbal Reasoning - Forced Choice'
dVRF   'T2 - T1 Verbal Reasoning - Constructed Response'
dAA    'T2 - T1 Total Argument Analysis'
dAAR   'T2 - T1 Argument Analysis - Forced Choice'
dAAF   'T2 - T1 Argument Analysis - Constructed Response'
dHT    'T2 - T1 Total Hypothesis Testing'
dHTR   'T2 - T1 Hypothesis Testing - Forced Choice'
dHTF   'T2 - T1 Hypothesis Testing - Constructed Response'
dLU    'T2 - T1 Total Likelihood and Uncertainty'
dLUR   'T2 - T1 Likelihood and Uncertainty - Forced Choice'
dLUF   'T2 - T1 Likelihood and Uncertainty - Constructed Response'
dPS    'T2 - T1 Total Problem Solving'
dPSR   'T2 - T1 Problem Solving - Forced Choice'
dPSF   'T2 - T1 Problem Solving - Constructed Response'.
VALUE LABELS Disc_N
                    0        'None'
                    1        'One'
                    2        'Two'.
EXECUTE.
**************.
*** Begin analyses.
**************.
*Demographic, Frequency, and Descriptive Data.
CROSSTABS
  /TABLES=Gender Col_maj Dept_maj ARank Stype Code_maj Ethnic ENGL1 ENGL2 SSs_N Disc_N HCTAs DQ1 DQ2 DQ3
DQ4
    DQ5 DQ6 DQ7 DQ8 DQ9 BY Sem_code
  /FORMAT=AVALUE TABLES
  /CELLS=COUNT
  /COUNT ROUND CELL.
USE ALL.
COMPUTE filter_$=(FinExam >= 1).
VARIABLE LABELS filter_$ 'FinExam >= 1 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
FREQUENCIES VARIABLES=Sem_code
  /ORDER=ANALYSIS.
FILTER OFF.
USE ALL.
EXECUTE.
MEANS TABLES=Age curGPA cumGPA ACT1 ACT2 ACT3 SAT1 SAT2 Disc1 Disc2 Disc3 Quiz1 Quiz2 Quiz3 Quiz4
Quiz5 Quiz6 Quiz7 Quiz8 Quiz9 FinExam
    Cumm_pts PctGrd BY Sem_code
  /CELLS MEAN SEMEAN.
SORT CASES  BY Sem_code.
SPLIT FILE LAYERED BY Sem_code.
```

```
FREQUENCIES VARIABLES=Enrl_hrs TransHrs CHtotal SSQ1 SSQ2 SSQ3 SSQ4 SSQ5 SSQ6 SSQ7 SSQ8 SSQ9 SSQ10
  /FORMAT=NOTABLE
  /NTILES=4
  /STATISTICS=MEDIAN
  /ORDER=ANALYSIS.
SPLIT FILE OFF.
RELIABILITY
  /VARIABLES=Q1_1 Q1_2 Q1_3 Q1_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
RELIABILITY
  /VARIABLES=Q2_1 Q2_2 Q2_3 Q2_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
RELIABILITY
  /VARIABLES=Q3_1 Q3_2 Q3_3 Q3_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
RELIABILITY
  /VARIABLES=Q4_1 Q4_2 Q4_3 Q4_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
RELIABILITY
  /VARIABLES=Q5_1 Q5_2 Q5_3 Q5_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
RELIABILITY
  /VARIABLES=Q6_1 Q6_2 Q6_3 Q6_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
RELIABILITY
  /VARIABLES=Q7_1 Q7_2 Q7_3 Q7_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
RELIABILITY
  /VARIABLES=Q8_1 Q8_2 Q8_3 Q8_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
RELIABILITY
  /VARIABLES=Q9_1 Q9_2 Q9_3 Q9_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
RELIABILITY
  /VARIABLES=Q10_1 Q10_2 Q10_3 Q10_4
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
FREQUENCIES VARIABLES=Age
  /FORMAT=NOTABLE
  /STATISTICS=SEMEAN MEAN MEDIAN
  /ORDER=ANALYSIS.
FREQUENCIES VARIABLES=TotQC
  /ORDER=ANALYSIS.
*** Distributions.
FREQUENCIES VARIABLES=Zv1CT Zv1CTR Zv1CTF Zv1VR Zv1VRR Zv1VRF Zv1AA Zv1AAR Zv1AAF Zv1HT
Zv1HTR Zv1HTF Zv1LU Zv1LUR
    Zv1LUF Zv1PS Zv1PSR Zv1PSF Zv2CT Zv2CTR Zv2CTF Zv2VR Zv2VRR Zv2VRF Zv2AA Zv2AAR Zv2AAF Zv2HT
Zv2HTR Zv2HTF Zv2LU
    Zv2LUR Zv2LUF Zv2PS Zv2PSR Zv2PSF
  /FORMAT=NOTABLE
  /HISTOGRAM NORMAL
  /ORDER=ANALYSIS.
```

```
FREQUENCIES VARIABLES=dCT dCTR dCTF dVR dVRR dVRF dAA dAAR dAAF dHT dHTR dHTF dLU dLUR dLUF
dPS
    dPSR dPSF
  /FORMAT=NOTABLE
  /HISTOGRAM NORMAL
  /ORDER=ANALYSIS.
** Assumption testing for regressions.
*pull from other syntax file; t1CT on t2CT, t1CT on course outcomes, then t2CT on course outcomes.
INCLUDE FILE='C:\Users\mcn4817\Desktop\data20161022\regression-assump.sps'.
****.
*** Preliminary Analyses.
****.
UNIANOVA Age BY Gender Sem_code
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(Gender) COMPARE ADJ(BONFERRONI)
  /EMMEANS=TABLES(Sem_code) COMPARE ADJ(BONFERRONI)
  /EMMEANS=TABLES(Gender*Sem_code) COMPARE (Gender) ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=Gender Sem_code Gender*Sem_code.
CORRELATIONS
  /VARIABLES=Age v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU v1LUR
    v1LUF v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU
    v2LUR v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
CORRELATIONS
  /VARIABLES=Age TotQpts TotDpts FinExam Cumm_pts
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
USE ALL.
COMPUTE filter_$=(HCTAs = 3).
VARIABLE LABELS filter_$ 'HCTAs = 3 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
CORRELATIONS
  /VARIABLES=Age Zv1CT Zv1CTR Zv1CTF Zv1VR Zv1VRR Zv1VRF Zv1AA Zv1AAR Zv1AAF Zv1HT Zv1HTR
Zv1HTF Zv1LU Zv1LUR
    Zv1LUF Zv1PS Zv1PSR Zv1PSF Zv2CT Zv2CTR Zv2CTF Zv2VR Zv2VRR Zv2VRF Zv2AA Zv2AAR Zv2AAF Zv2HT
Zv2HTR Zv2HTF Zv2LU
    Zv2LUR Zv2LUF Zv2PS Zv2PSR Zv2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
CORRELATIONS
  /VARIABLES=Age TotQpts TotDpts FinExam Cumm_pts
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
FILTER OFF.
USE ALL.
EXECUTE.
T-TEST GROUPS=Gender(1 2)
  /MISSING=ANALYSIS
  /VARIABLES=v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU v1LUR v1LUF
    v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU v2LUR
    v2LUF v2PS v2PSR v2PSF
  /CRITERIA=CI(.95).
T-TEST GROUPS=Gender(1 2)
  /MISSING=ANALYSIS
```

```
  /VARIABLES=Zv1CT Zv1CTR Zv1CTF Zv1VR Zv1VRR Zv1VRF Zv1AA Zv1AAR Zv1AAF Zv1HT Zv1HTR Zv1HTF
Zv1LU Zv1LUR Zv1LUF
    Zv1PS Zv1PSR Zv1PSF Zv2CT Zv2CTR Zv2CTF Zv2VR Zv2VRR Zv2VRF Zv2AA Zv2AAR Zv2AAF Zv2HT Zv2HTR
Zv2HTF Zv2LU Zv2LUR
    Zv2LUF Zv2PS Zv2PSR Zv2PSF
  /CRITERIA=CI(.95).
T-TEST GROUPS=Gender(1 2)
  /MISSING=ANALYSIS
  /VARIABLES=TotQpts TotDpts FinExam Cumm_pts
  /CRITERIA=CI(.95).
*Exploring age by participation and age by discussion/major.
CORRELATIONS
  /VARIABLES=StudEng Age
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
USE ALL.
COMPUTE filter_$=(HCTAs = 3).
VARIABLE LABELS filter_$ 'HCTAs = 3 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
CORRELATIONS
  /VARIABLES=StudEng Age
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
FILTER OFF.
USE ALL.
EXECUTE.
UNIANOVA Age BY Disc_N R_depmaj
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(R_depmaj) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=Disc_N R_depmaj Disc_N*R_depmaj.
USE ALL.
COMPUTE filter_$=(HCTAs = 3).
VARIABLE LABELS filter_$ 'HCTAs = 3 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
UNIANOVA Age BY Disc_N R_depmaj
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(R_depmaj) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=Disc_N R_depmaj Disc_N*R_depmaj.
FILTER OFF.
USE ALL.
EXECUTE.
*Correlations with Course Outcomes: SS and SM.
CORRELATIONS
  /VARIABLES=DNDiscs StudEng TotQpts TotDpts FinExam Cumm_pts SSQ1 SSQ2 SSQ3 SSQ4 SSQ5 SSQ6 SSQ7
    SSQ8 SSQ9 SSQ10
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
CORRELATIONS
  /VARIABLES=DNDiscs StudEng TotQpts TotDpts FinExam Cumm_pts curGPA cumGPA ACT1 ACT2 ACT3 SAT1 SAT2
  /PRINT=TWOTAIL SIG
```

```
  /MISSING=PAIRWISE.
*Correlations with CT measures: SS and SM.
CORRELATIONS
  /VARIABLES=curGPA cumGPA ACT1 ACT2 ACT3 SAT1 SAT2 v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR
    v2AAF v2HT v2HTR v2HTF v2LU v2LUR v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
CORRELATIONS
  /VARIABLES=SSQ1 SSQ2 SSQ3 SSQ4 SSQ5 SSQ6 SSQ7 SSQ8 SSQ9 SSQ10 v2CT v2CTR v2CTF v2VR v2VRR v2VRF
v2AA v2AAR
    v2AAF v2HT v2HTR v2HTF v2LU v2LUR v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
*Compare ENGL comp grades on course outcomes.
UNIANOVA TotQpts BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA TotDpts BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA FinExam BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Cumm_pts BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
*Compare ENGL comp grades on CT measures.
UNIANOVA Zv2CT BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2CTR BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2CTF BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
```

```
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2VR BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2VRR BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2VRF BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2AA BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2AAR BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2AAF BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2HT BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2HTR BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2HTF BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
```

```
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2LU BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2LUR BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2LUF BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2PS BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2PSR BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2PSF BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
*Post hoc testing for ENGL grades.
UNIANOVA Zv2AA BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(ENGL1) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2AAR BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(ENGL1) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.
UNIANOVA Zv2LU BY ENGL1 ENGL2
  /METHOD=SSTYPE(3)
```

```
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(ENGL2) COMPARE ADJ(BONFERRONI)
  /EMMEANS=TABLES(ENGL1*ENGL2) COMPARE (ENGL1) ADJ(BONFERRONI)
  /EMMEANS=TABLES(ENGL1*ENGL2) COMPARE (ENGL2) ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=ENGL1 ENGL2 ENGL1*ENGL2.

USE ALL.
COMPUTE filter_$=(HCTAs = 3).
VARIABLE LABELS filter_$ 'HCTAs = 3 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
CORRELATIONS
  /VARIABLES=StudEng DNDiscs TotQpts TotDpts FinExam Cumm_pts
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.
FILTER OFF.
USE ALL.
EXECUTE.
****Hypothesis 1.
***Using standardized scores for CT.
GLM Zv1CT Zv2CT BY R_depmaj Disc_N WITH Age Gender
  /WSFACTOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1CTR Zv2CTR BY R_depmaj Disc_N WITH Age Gender
  /WSFACTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1CTF Zv2CTF BY R_depmaj Disc_N WITH Age Gender
  /WSFACTFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1VR Zv2VR BY R_depmaj Disc_N WITH Age Gender
  /WSFAVROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1VRR Zv2VRR BY R_depmaj Disc_N WITH Age Gender
  /WSFAVRROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
```

```
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1VRF Zv2VRF BY R_depmaj Disc_N WITH Age Gender
  /WSFAVRFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1AA Zv2AA BY R_depmaj Disc_N WITH Age Gender
  /WSFAAAOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1AAR Zv2AAR BY R_depmaj Disc_N WITH Age Gender
  /WSFAAAROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1AAF Zv2AAF BY R_depmaj Disc_N WITH Age Gender
  /WSFAAAFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1HT Zv2HT BY R_depmaj Disc_N WITH Age Gender
  /WSFAHTOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1HTR Zv2HTR BY R_depmaj Disc_N WITH Age Gender
  /WSFAHTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1HTF Zv2HTF BY R_depmaj Disc_N WITH Age Gender
  /WSFAHTFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1LU Zv2LU BY R_depmaj Disc_N WITH Age Gender
  /WSFALUOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
```

```
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1LUR Zv2LUR BY R_depmaj Disc_N WITH Age Gender
  /WSFALUROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1LUF Zv2LUF BY R_depmaj Disc_N WITH Age Gender
  /WSFALUFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1PS Zv2PS BY R_depmaj Disc_N WITH Age Gender
  /WSFAPSOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1PSR Zv2PSR BY R_depmaj Disc_N WITH Age Gender
  /WSFAPSROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
GLM Zv1PSF Zv2PSF BY R_depmaj Disc_N WITH Age Gender
  /WSFAPSFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
*college major.
GLM Zv1CT Zv2CT BY R_colmaj Disc_N WITH Age Gender
  /WSFACTOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1CTR Zv2CTR BY R_colmaj Disc_N WITH Age Gender
  /WSFACTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1CTF Zv2CTF BY R_colmaj Disc_N WITH Age Gender
```

```
  /WSFACTFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1VR Zv2VR BY R_colmaj Disc_N WITH Age Gender
  /WSFAVROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1VRR Zv2VRR BY R_colmaj Disc_N WITH Age Gender
  /WSFAVRROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1VRF Zv2VRF BY R_colmaj Disc_N WITH Age Gender
  /WSFAVRFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1AA Zv2AA BY R_colmaj Disc_N WITH Age Gender
  /WSFAAAOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1AAR Zv2AAR BY R_colmaj Disc_N WITH Age Gender
  /WSFAAAROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1AAF Zv2AAF BY R_colmaj Disc_N WITH Age Gender
  /WSFAAAFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1HT Zv2HT BY R_colmaj Disc_N WITH Age Gender
  /WSFAHTOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
```

```
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1HTR Zv2HTR BY R_colmaj Disc_N WITH Age Gender
  /WSFAHTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1HTF Zv2HTF BY R_colmaj Disc_N WITH Age Gender
  /WSFAHTFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1LU Zv2LU BY R_colmaj Disc_N WITH Age Gender
  /WSFALUOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1LUR Zv2LUR BY R_colmaj Disc_N WITH Age Gender
  /WSFALUROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1LUF Zv2LUF BY R_colmaj Disc_N WITH Age Gender
  /WSFALUFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1PS Zv2PS BY R_colmaj Disc_N WITH Age Gender
  /WSFAPSOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1PSR Zv2PSR BY R_colmaj Disc_N WITH Age Gender
  /WSFAPSROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
GLM Zv1PSF Zv2PSF BY R_colmaj Disc_N WITH Age Gender
  /WSFAPSFOR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
```

```
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
*******
**Post hoc tests for H1.
*******.
*main effect for within.
GLM Zv1CTR Zv2CTR BY R_depmaj Disc_N WITH Age Gender
  /WSFACTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /EMMEANS=TABLES(factor1) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
*main effect for within and for between.
GLM Zv1HTR Zv2HTR BY R_depmaj Disc_N WITH Age Gender
  /WSFACTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /EMMEANS=TABLES(factor1) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
*main effect for between.
GLM Zv1HTF Zv2HTF BY R_depmaj Disc_N WITH Age Gender
  /WSFACTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /EMMEANS=TABLES(R_depmaj) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_depmaj Disc_N R_depmaj*Disc_N.
*main effect for within.
GLM Zv1CTR Zv2CTR BY R_colmaj Disc_N WITH Age Gender
  /WSFACTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /EMMEANS=TABLES(factor1) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
*main effect for within.
GLM Zv1HTR Zv2HTR BY R_colmaj Disc_N WITH Age Gender
  /WSFACTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /EMMEANS=TABLES(factor1) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
*main effect for between.
GLM Zv1HTF Zv2HTF BY R_colmaj Disc_N WITH Age Gender
  /WSFACTROR=factor1 2 Polynomial
  /METHOD=SSTYPE(3)
  /EMMEANS=TABLES(R_colmaj) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ TEST(MMATRIX) HOMOGENEITY
```

```
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=factor1
  /DESIGN=Age Gender R_colmaj Disc_N R_colmaj*Disc_N.
** END post hocs for H1.
****.
****Hypothesis 2.
**Department Major.
*Quiz points.
UNIANOVA TotQpts BY Disc_N R_depmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Dcond Disc_N*R_depmaj Disc_N*Dcond R_depmaj*Dcond
Disc_N*R_depmaj*Dcond.
*Final Exam points.
UNIANOVA FinExam BY Disc_N R_depmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Dcond Disc_N*R_depmaj Disc_N*Dcond R_depmaj*Dcond
Disc_N*R_depmaj*Dcond.
**Total course points.
UNIANOVA Cumm_pts BY Disc_N R_depmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Dcond Disc_N*R_depmaj Disc_N*Dcond R_depmaj*Dcond
Disc_N*R_depmaj*Dcond.
** separate model for Dpoints.
UNIANOVA TotDpts BY R_depmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender R_depmaj Dcond R_depmaj*Dcond.
**College Major.
*Quiz points.
UNIANOVA TotQpts BY Disc_N R_colmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Dcond Disc_N*R_colmaj Disc_N*Dcond R_colmaj*Dcond
Disc_N*R_colmaj*Dcond.
*Final Exam points.
UNIANOVA FinExam BY Disc_N R_colmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Dcond Disc_N*R_colmaj Disc_N*Dcond R_colmaj*Dcond
Disc_N*R_colmaj*Dcond.
```

```
**Total course points.
UNIANOVA Cumm_pts BY Disc_N R_colmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Dcond Disc_N*R_colmaj Disc_N*Dcond R_colmaj*Dcond
Disc_N*R_colmaj*Dcond.
** separate model for Dpoints.
UNIANOVA TotDpts BY R_colmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender R_colmaj Dcond R_colmaj*Dcond.
** H2 Posthoc testing.
CROSSTABS
  /TABLES=Disc_N BY Dcond
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ PHI
  /CELLS=COUNT SRESID BPROP
  /COUNT ROUND CELL.
**Department Major.
*Quiz points.
UNIANOVA TotQpts BY Disc_N R_depmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(Dcond) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Dcond Disc_N*R_depmaj Disc_N*Dcond R_depmaj*Dcond
Disc_N*R_depmaj*Dcond.
** separate model for Dpoints.
UNIANOVA TotDpts BY R_depmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(Dcond) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender R_depmaj Dcond R_depmaj*Dcond.
**College Major.
*Quiz points.
UNIANOVA TotQpts BY Disc_N R_colmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(Dcond) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Dcond Disc_N*R_colmaj Disc_N*Dcond R_colmaj*Dcond
Disc_N*R_colmaj*Dcond.
** separate model for Dpoints.
UNIANOVA TotDpts BY R_colmaj Dcond WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(Dcond) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
```

```
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender R_colmaj Dcond R_colmaj*Dcond.
**Models including SOD measures.
*Department Major.
UNIANOVA TotQpts BY Disc_N R_depmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA Disc_N R_depmaj Dcond Disc_N*R_depmaj Disc_N*Dcond
    R_depmaj*Dcond Disc_N*R_depmaj*Dcond.
UNIANOVA FinExam BY Disc_N R_depmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA Disc_N R_depmaj Dcond Disc_N*R_depmaj Disc_N*Dcond
    R_depmaj*Dcond Disc_N*R_depmaj*Dcond.
UNIANOVA Cumm_pts BY Disc_N R_depmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA Disc_N R_depmaj Dcond Disc_N*R_depmaj Disc_N*Dcond
    R_depmaj*Dcond Disc_N*R_depmaj*Dcond.
UNIANOVA TotDpts BY R_depmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA R_depmaj Dcond R_depmaj*Dcond.
*College Major.
UNIANOVA TotQpts BY Disc_N R_colmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA Disc_N R_colmaj Dcond Disc_N*R_colmaj Disc_N*Dcond
    R_colmaj*Dcond Disc_N*R_colmaj*Dcond.
UNIANOVA FinExam BY Disc_N R_colmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA Disc_N R_colmaj Dcond Disc_N*R_colmaj Disc_N*Dcond
    R_colmaj*Dcond Disc_N*R_colmaj*Dcond.
UNIANOVA Cumm_pts BY Disc_N R_colmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA Disc_N R_colmaj Dcond Disc_N*R_colmaj Disc_N*Dcond
    R_colmaj*Dcond Disc_N*R_colmaj*Dcond.
UNIANOVA TotDpts BY R_colmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
```

```
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA R_colmaj Dcond R_colmaj*Dcond.
*H2SOD post-hoc.
UNIANOVA Cumm_pts BY Disc_N R_depmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /EMMEANS=TABLES(Disc_N*R_depmaj) COMPARE (Disc_N) ADJ(BONFERRONI)
  /EMMEANS=TABLES(Disc_N*R_depmaj) COMPARE (R_depmaj) ADJ(BONFERRONI)
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA Disc_N R_depmaj Dcond Disc_N*R_depmaj Disc_N*Dcond
    R_depmaj*Dcond Disc_N*R_depmaj*Dcond.
UNIANOVA TotDpts BY R_depmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /EMMEANS=TABLES(Dcond*R_depmaj) COMPARE (Dcond) ADJ(BONFERRONI)
  /EMMEANS=TABLES(Dcond*R_depmaj) COMPARE (R_depmaj) ADJ(BONFERRONI)
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA R_depmaj Dcond R_depmaj*Dcond.
UNIANOVA Cumm_pts BY Disc_N R_colmaj Dcond WITH Age Gender ENGL1 ENGL2 curGPA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /EMMEANS=TABLES(Dcond) COMPARE ADJ(BONFERRONI)
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender ENGL1 ENGL2 curGPA Disc_N R_colmaj Dcond Disc_N*R_colmaj Disc_N*Dcond
    R_colmaj*Dcond Disc_N*R_colmaj*Dcond.
****Hypothesis 3.
***Turn on filter for BOTH HCTA.
USE ALL.
COMPUTE filter_$=(HCTAs = 3).
VARIABLE LABELS filter_$ 'HCTAs = 3 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
*Main - compare T1 to T2 CTs.
CORRELATIONS
  /VARIABLES=v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU v1LUR v1LUF
    v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU v2LUR
    v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
*3a.
*****CANNOT USE Pearson's R for Disc_N
****Using Discussion posting 0/1 (zero or at least one discussion posting).
CORRELATIONS
  /VARIABLES=DNDiscs v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU
v1LUR
    v1LUF v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU
    v2LUR v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
****Using measure of student engagement.
CORRELATIONS
```

```
 /VARIABLES=StudEng v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU
v1LUR
    v1LUF v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU
    v2LUR v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
*Follow-up Regressions for significant Hotelling's t-test differences.
*Student Engagement.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Zv1LU
  /METHOD=ENTER StudEng.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Zv2LU
  /METHOD=ENTER StudEng Zv1LU.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Zv1LUF
  /METHOD=ENTER StudEng.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Zv2LUF
  /METHOD=ENTER StudEng Zv1LUF.
*Discussion posting.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Zv1CT
  /METHOD=ENTER DNDiscs.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Zv2CT
  /METHOD=ENTER DNDiscs Zv1CT.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Zv1VR
  /METHOD=ENTER DNDiscs.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
```

```
  /NOORIGIN
  /DEPENDENT Zv2VR
  /METHOD=ENTER DNDiscs Zv1VR.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Zv1VRF
  /METHOD=ENTER DNDiscs.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Zv2VRF
  /METHOD=ENTER DNDiscs Zv1VRF.
*3b.
*Moderation stuff. Run process.sps first.
INCLUDE FILE='C:\Users\mcn4817\Desktop\process.sps'.
*** Model 3 R_depmaj Disc_N.
process vars = Zv1CT Zv2CT R_depmaj Disc_N Age Gender/y = Zv2CT/x = Zv1CT/m = R_depmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1CTR Zv2CTR R_depmaj Disc_N Age Gender/y = Zv2CTR/x = Zv1CTR/m = R_depmaj/w =
Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1CTF Zv2CTF R_depmaj Disc_N Age Gender/y = Zv2CTF/x = Zv1CTF/m = R_depmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VR Zv2VR R_depmaj Disc_N Age Gender/y = Zv2VR/x = Zv1VR/m = R_depmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VRR Zv2VRR R_depmaj Disc_N Age Gender/y = Zv2VRR/x = Zv1VRR/m = R_depmaj/w =
Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VRF Zv2VRF R_depmaj Disc_N Age Gender/y = Zv2VRF/x = Zv1VRF/m = R_depmaj/w =
Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AA Zv2AA R_depmaj Disc_N Age Gender/y = Zv2AA/x = Zv1AA/m = R_depmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AAR Zv2AAR R_depmaj Disc_N Age Gender/y = Zv2AAR/x = Zv1AAR/m = R_depmaj/w =
Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AAF Zv2AAF R_depmaj Disc_N Age Gender/y = Zv2AAF/x = Zv1AAF/m = R_depmaj/w =
Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HT Zv2HT R_depmaj Disc_N Age Gender/y = Zv2HT/x = Zv1HT/m = R_depmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HTR Zv2HTR R_depmaj Disc_N Age Gender/y = Zv2HTR/x = Zv1HTR/m = R_depmaj/w =
Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HTF Zv2HTF R_depmaj Disc_N Age Gender/y = Zv2HTF/x = Zv1HTF/m = R_depmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LU Zv2LU R_depmaj Disc_N Age Gender/y = Zv2LU/x = Zv1LU/m = R_depmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LUR Zv2LUR R_depmaj Disc_N Age Gender/y = Zv2LUR/x = Zv1LUR/m = R_depmaj/w =
Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LUF Zv2LUF R_depmaj Disc_N Age Gender/y = Zv2LUF/x = Zv1LUF/m = R_depmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PS Zv2PS R_depmaj Disc_N Age Gender/y = Zv2PS/x = Zv1PS/m = R_depmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PSR Zv2PSR R_depmaj Disc_N Age Gender/y = Zv2PSR/x = Zv1PSR/m = R_depmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PSF Zv2PSF R_depmaj Disc_N Age Gender/y = Zv2PSF/x = Zv1PSF/m = R_depmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
*** Model 3 R_colmaj Disc_N.
process vars = Zv1CT Zv2CT R_colmaj Disc_N Age Gender/y = Zv2CT/x = Zv1CT/m = R_colmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1CTR Zv2CTR R_colmaj Disc_N Age Gender/y = Zv2CTR/x = Zv1CTR/m = R_colmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
```

```
process vars = Zv1CTF Zv2CTF R_colmaj Disc_N Age Gender/y = Zv2CTF/x = Zv1CTF/m = R_colmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VR Zv2VR R_colmaj Disc_N Age Gender/y = Zv2VR/x = Zv1VR/m = R_colmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VRR Zv2VRR R_colmaj Disc_N Age Gender/y = Zv2VRR/x = Zv1VRR/m = R_colmaj/w =
Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VRF Zv2VRF R_colmaj Disc_N Age Gender/y = Zv2VRF/x = Zv1VRF/m = R_colmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AA Zv2AA R_colmaj Disc_N Age Gender/y = Zv2AA/x = Zv1AA/m = R_colmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AAR Zv2AAR R_colmaj Disc_N Age Gender/y = Zv2AAR/x = Zv1AAR/m = R_colmaj/w =
Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AAF Zv2AAF R_colmaj Disc_N Age Gender/y = Zv2AAF/x = Zv1AAF/m = R_colmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HT Zv2HT R_colmaj Disc_N Age Gender/y = Zv2HT/x = Zv1HT/m = R_colmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HTR Zv2HTR R_colmaj Disc_N Age Gender/y = Zv2HTR/x = Zv1HTR/m = R_colmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HTF Zv2HTF R_colmaj Disc_N Age Gender/y = Zv2HTF/x = Zv1HTF/m = R_colmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LU Zv2LU R_colmaj Disc_N Age Gender/y = Zv2LU/x = Zv1LU/m = R_colmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LUR Zv2LUR R_colmaj Disc_N Age Gender/y = Zv2LUR/x = Zv1LUR/m = R_colmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LUF Zv2LUF R_colmaj Disc_N Age Gender/y = Zv2LUF/x = Zv1LUF/m = R_colmaj/w = Disc_N/MODEL
= 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PS Zv2PS R_colmaj Disc_N Age Gender/y = Zv2PS/x = Zv1PS/m = R_colmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PSR Zv2PSR R_colmaj Disc_N Age Gender/y = Zv2PSR/x = Zv1PSR/m = R_colmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PSF Zv2PSF R_colmaj Disc_N Age Gender/y = Zv2PSF/x = Zv1PSF/m = R_colmaj/w = Disc_N/MODEL =
3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
*** scatterplot to probe conditional effect.
GRAPH
  /SCATTERPLOT(BIVAR)=Zv1AA WITH Zv2AA BY R_depmaj (IDENTIFY)
  /MISSING=LISTWISE.
****3c.
***Difference scores ANOVAs for R_depmaj.
UNIANOVA dCT BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dCTR BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dCTF BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dVR BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
```

```
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dVRR BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dVRF BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dAA BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dAAR BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dAAF BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dHT BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dHTR BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dHTF BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dLU BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
```

```
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dLUR BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dLUF BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dPS BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dPSR BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA dPSF BY Disc_N R_depmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_depmaj Disc_N*R_depmaj.
***Difference scores ANOVAs for R_colmaj.
UNIANOVA dCT BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dCTR BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dCTF BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
```

```
UNIANOVA dVR BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dVRR BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dVRF BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dAA BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dAAR BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dAAF BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dHT BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dHTR BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dHTF BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
```

```
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dLU BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dLUR BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dLUF BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dPS BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dPSR BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA dPSF BY Disc_N R_colmaj WITH Age Gender
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Disc_N R_colmaj Disc_N*R_colmaj.
*** Post Hoc testing.
UNIANOVA dAAF BY R_colmaj Disc_N
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(R_colmaj) COMPARE ADJ(BONFERRONI)
  /EMMEANS=TABLES(Disc_N) COMPARE ADJ(BONFERRONI)
  /EMMEANS=TABLES(R_colmaj*Disc_N) COMPARE (R_colmaj) ADJ(BONFERRONI)
  /EMMEANS=TABLES(R_colmaj*Disc_N) COMPARE (Disc_N) ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=R_colmaj Disc_N R_colmaj*Disc_N.
UNIANOVA dLUR BY R_colmaj Disc_N
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(R_colmaj) COMPARE ADJ(BONFERRONI)
  /EMMEANS=TABLES(Disc_N) COMPARE ADJ(BONFERRONI)
  /EMMEANS=TABLES(R_colmaj*Disc_N) COMPARE (R_colmaj) ADJ(BONFERRONI)
  /EMMEANS=TABLES(R_colmaj*Disc_N) COMPARE (Disc_N) ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
```

```
  /CRITERIA=ALPHA(.05)
  /DESIGN=R_colmaj Disc_N R_colmaj*Disc_N.
UNIANOVA dLUR BY R_depmaj Disc_N
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(R_depmaj) COMPARE ADJ(BONFERRONI)
  /EMMEANS=TABLES(Disc_N) COMPARE ADJ(BONFERRONI)
  /EMMEANS=TABLES(R_depmaj*Disc_N) COMPARE (R_depmaj) ADJ(BONFERRONI)
  /EMMEANS=TABLES(R_depmaj*Disc_N) COMPARE (Disc_N) ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=R_depmaj Disc_N R_depmaj*Disc_N.
****Alternate approach to H3c using ANCOVA with time 1 as covariate: R_depmaj.
UNIANOVA Zv2CT BY Disc_N R_depmaj WITH Age Gender Zv1CT
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1CT Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2CTR BY Disc_N R_depmaj WITH Age Gender Zv1CTR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1CTR Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2CTF BY Disc_N R_depmaj WITH Age Gender Zv1CTF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1CTF Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2VR BY Disc_N R_depmaj WITH Age Gender Zv1VR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1VR Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2VRR BY Disc_N R_depmaj WITH Age Gender Zv1VRR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1VRR Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2VRF BY Disc_N R_depmaj WITH Age Gender Zv1VRF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1VRF Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2AA BY Disc_N R_depmaj WITH Age Gender Zv1AA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1AA Disc_N R_depmaj Disc_N*R_depmaj.
```

```
UNIANOVA Zv2AAR BY Disc_N R_depmaj WITH Age Gender Zv1AAR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1AAR Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2AAF BY Disc_N R_depmaj WITH Age Gender Zv1AAF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1AAF Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2HT BY Disc_N R_depmaj WITH Age Gender Zv1HT
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1HT Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2HTR BY Disc_N R_depmaj WITH Age Gender Zv1HTR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1HTR Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2HTF BY Disc_N R_depmaj WITH Age Gender Zv1HTF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1HTF Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2LU BY Disc_N R_depmaj WITH Age Gender Zv1LU
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1LU Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2LUR BY Disc_N R_depmaj WITH Age Gender Zv1LUR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1LUR Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2LUF BY Disc_N R_depmaj WITH Age Gender Zv1LUF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1LUF Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2PS BY Disc_N R_depmaj WITH Age Gender Zv1PS
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
```

```
  /DESIGN=Age Gender Zv1PS Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2PSR BY Disc_N R_depmaj WITH Age Gender Zv1PSR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1PSR Disc_N R_depmaj Disc_N*R_depmaj.
UNIANOVA Zv2PSF BY Disc_N R_depmaj WITH Age Gender Zv1PSF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1PSF Disc_N R_depmaj Disc_N*R_depmaj.
****Alternate approach to H3c using ANCOVA with time 1 as covariate: R_colmaj.
UNIANOVA Zv2CT BY Disc_N R_colmaj WITH Age Gender Zv1CT
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1CT Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2CTR BY Disc_N R_colmaj WITH Age Gender Zv1CTR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1CTR Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2CTF BY Disc_N R_colmaj WITH Age Gender Zv1CTF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1CTF Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2VR BY Disc_N R_colmaj WITH Age Gender Zv1VR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1VR Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2VRR BY Disc_N R_colmaj WITH Age Gender Zv1VRR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1VRR Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2VRF BY Disc_N R_colmaj WITH Age Gender Zv1VRF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1VRF Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2AA BY Disc_N R_colmaj WITH Age Gender Zv1AA
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
```

```
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1AA Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2AAR BY Disc_N R_colmaj WITH Age Gender Zv1AAR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1AAR Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2AAF BY Disc_N R_colmaj WITH Age Gender Zv1AAF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1AAF Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2HT BY Disc_N R_colmaj WITH Age Gender Zv1HT
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1HT Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2HTR BY Disc_N R_colmaj WITH Age Gender Zv1HTR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1HTR Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2HTF BY Disc_N R_colmaj WITH Age Gender Zv1HTF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1HTF Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2LU BY Disc_N R_colmaj WITH Age Gender Zv1LU
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1LU Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2LUR BY Disc_N R_colmaj WITH Age Gender Zv1LUR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1LUR Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2LUF BY Disc_N R_colmaj WITH Age Gender Zv1LUF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1LUF Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2PS BY Disc_N R_colmaj WITH Age Gender Zv1PS
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
```

```
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1PS Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2PSR BY Disc_N R_colmaj WITH Age Gender Zv1PSR
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1PSR Disc_N R_colmaj Disc_N*R_colmaj.
UNIANOVA Zv2PSF BY Disc_N R_colmaj WITH Age Gender Zv1PSF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ HOMOGENEITY
  /PLOT=SPREADLEVEL
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age Gender Zv1PSF Disc_N R_colmaj Disc_N*R_colmaj.
*** H3cANCOVA posthoc.
UNIANOVA Zv2HTF BY Disc_N R_depmaj WITH Zv1HTF
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(R_depmaj) COMPARE ADJ(BONFERRONI)
  /PRINT=ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /DESIGN=Zv1HTF Disc_N R_depmaj Disc_N*R_depmaj.
***Turn off filter.
FILTER OFF.
USE ALL.
EXECUTE.
**Hypothesis 4.
*Main hypothesis.
CORRELATIONS
  /VARIABLES=TotQpts TotDpts FinExam Cumm_pts v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF
    v1HT v1HTR v1HTF v1LU v1LUR v1LUF v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR
    v2AAF v2HT v2HTR v2HTF v2LU v2LUR v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
*Follow-up correlation with those with both HCTA for coefficient testing.
***Turn on filter for BOTH HCTA.
USE ALL.
COMPUTE filter_$=(HCTAs = 3).
VARIABLE LABELS filter_$ 'HCTAs = 3 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
CORRELATIONS
  /VARIABLES=TotQpts TotDpts FinExam Cumm_pts v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF
    v1HT v1HTR v1HTF v1LU v1LUR v1LUF v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR
    v2AAF v2HT v2HTR v2HTF v2LU v2LUR v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
**To do coefficient testing, need T1/T2 coefficients for each inclusive sample.
* For Quiz.
USE ALL.
COMPUTE filter_$=(((HCTAs = 3) AND (TotQC >= 1))).
VARIABLE LABELS filter_$ '((HCTAs = 3) AND (TotQC >= 1)) (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
```

```
CORRELATIONS
  /VARIABLES=v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU v1LUR v1LUF
    v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU v2LUR
    v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
* For Disc.
USE ALL.
COMPUTE filter_$=(((HCTAs = 3) AND (Disc_N >=1))).
VARIABLE LABELS filter_$ '((HCTAs = 3) AND (Disc_N >= 1)) (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
CORRELATIONS
  /VARIABLES=v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU v1LUR v1LUF
    v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU v2LUR
    v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
*For some bizarre reason, SPSS is processing TotDpts as "LISTWISE" in previous CORRELATION.
*Repeating correlation for only TotDpts to get correct values for coefficient testing.
CORRELATIONS
  /VARIABLES=TotDpts v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF
    v1HT v1HTR v1HTF v1LU v1LUR v1LUF v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR
    v2AAF v2HT v2HTR v2HTF v2LU v2LUR v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
*For Final.
USE ALL.
COMPUTE filter_$=(((HCTAs = 3) AND (FinExam >= 1))).
VARIABLE LABELS filter_$ '((HCTAs = 3) AND (FinExam >= 1)) (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
CORRELATIONS
  /VARIABLES=v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU v1LUR v1LUF
    v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU v2LUR
    v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
*For Total.
USE ALL.
COMPUTE filter_$=(((HCTAs = 3) AND (Cumm_pts >= 1))).
VARIABLE LABELS filter_$ '((HCTAs = 3) AND (Cumm_pts >= 1)) (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
CORRELATIONS
  /VARIABLES=v1CT v1CTR v1CTF v1VR v1VRR v1VRF v1AA v1AAR v1AAF v1HT v1HTR v1HTF v1LU v1LUR v1LUF
    v1PS v1PSR v1PSF v2CT v2CTR v2CTF v2VR v2VRR v2VRF v2AA v2AAR v2AAF v2HT v2HTR v2HTF v2LU v2LUR
    v2LUF v2PS v2PSR v2PSF
  /PRINT=TWOTAIL SIG
  /MISSING=PAIRWISE.
******* NOTE: t-diffs in "Dissertation_workbook.xlsx" under "H4-main-compare".
***Turn off filter.
FILTER OFF.
USE ALL.
EXECUTE.
*4a Moderations.
```

*Testing Model 3, multiple moderators in moderation only, Major Disc_N with Age and Gender.
*Testing Model 3 R_depmaj.
process vars = Zv2CT TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2CT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2CT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2CT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2CT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2CTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2CTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2CTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2CTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2CTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2CTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2CTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2CTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2VR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2VR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2VR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2VR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2VRR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2VRR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2VRR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2VRR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2VRF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2VRF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2VRF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2VRF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2AA/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2AA/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2AA/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2AA/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2AAR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2AAR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.

process vars = Zv2AAR FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2AAR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2AAR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2AAF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2AAF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2AAF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2AAF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2HT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2HT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2HT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2HT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2HTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2HTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2HTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2HTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2HTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2HTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2HTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2HTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2LU/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2LU/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2LU/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2LU/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2LUR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2LUR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2LUR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2LUR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2LUF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2LUF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2LUF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2LUF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2PS/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.

process vars = Zv2PS TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2PS/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2PS/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2PS/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2PSR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2PSR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2PSR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2PSR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF TotQpts R_depmaj Disc_N Age Gender/y = TotQpts/x = Zv2PSF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2PSF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF FinExam R_depmaj Disc_N Age Gender/y = FinExam/x = Zv2PSF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF Cumm_pts R_depmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2PSF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
*Testing Model 3 with R_colmaj.
process vars = Zv2CT TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2CT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2CT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2CT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2CT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2CTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2CTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2CTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2CTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2CTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2CTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2CTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2CTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2VR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2VR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2VR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2VR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2VRR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2VRR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2VRR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.

process vars = Zv2VRR Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2VRR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2VRF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2VRF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2VRF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2VRF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2AA/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2AA/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2AA/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2AA/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2AAR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2AAR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2AAR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2AAR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2AAF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2AAF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2AAF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2AAF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2HT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2HT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2HT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2HT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2HTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2HTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2HTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2HTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2HTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2HTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2HTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2HTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2LU/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2LU/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.

process vars = Zv2LU FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2LU/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2LU/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2LUR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2LUR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2LUR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2LUR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2LUF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2LUF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2LUF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2LUF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2PS/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2PS/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2PS/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2PS/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2PSR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2PSR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2PSR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2PSR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF TotQpts R_colmaj Disc_N Age Gender/y = TotQpts/x = Zv2PSF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2PSF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF FinExam R_colmaj Disc_N Age Gender/y = FinExam/x = Zv2PSF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF Cumm_pts R_colmaj Disc_N Age Gender/y = Cumm_pts/x = Zv2PSF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
**Moderations for 4a with SOD..
*Testing Model 3, multiple moderators in moderation only, Major Disc_N with Age and Gender, ENGL and GPA.
*Testing Model 3 R_depmaj.
process vars = Zv2CT TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2CT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2CT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2CT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2CT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2CTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2CTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2CTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.

process vars = Zv2CTR Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2CTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2CTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2CTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2CTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2CTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2VR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2VR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2VR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2VR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2VRR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2VRR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2VRR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2VRR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2VRF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2VRF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2VRF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2VRF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2AA/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2AA/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2AA/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2AA/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2AAR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2AAR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2AAR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAR Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2AAR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2AAF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2AAF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2AAF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AAF Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2AAF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2HT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2HT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.

process vars = Zv2HT FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2HT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2HT/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2HTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2HTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2HTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2HTR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2HTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2HTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2HTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2HTF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2LU/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2LU/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2LU/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LU Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2LU/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2LUR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2LUR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2LUR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2LUR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2LUF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2LUF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2LUF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUF Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2LUF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2PS/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2PS/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2PS/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PS Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2PS/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2PSR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2PSR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2PSR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSR Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2PSR/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF TotQpts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2PSF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.

process vars = Zv2PSF TotDpts R_depmaj Disc_N Age Gender/y = TotDpts/x = Zv2PSF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF FinExam R_depmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2PSF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2PSF Cumm_pts R_depmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2PSF/m = R_depmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
*Testing Model 3 R_colmaj.
process vars = Zv2CT TotQpts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2CT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2CT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2CT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CT Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2CT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR TotQpts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2CTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2CTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2CTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTR Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2CTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF TotQpts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2CTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2CTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2CTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2CTF Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2CTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR TotQpts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2VR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2VR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VR FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2VR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
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process vars = Zv2VRR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2VRR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2VRR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRR Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2VRR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2VRF TotQpts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2VRF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
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process vars = Zv2AA TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2AA/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2AA FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2AA/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.

process vars = Zv2AA Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2AA/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
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process vars = Zv2AAF Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2AAF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
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process vars = Zv2HT TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2HT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2HT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HT Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2HT/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR TotQpts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2HTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2HTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2HTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTR Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2HTR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2HTF TotQpts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2HTF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
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process vars = Zv2LU Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2LU/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR TotQpts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = TotQpts/x = Zv2LUR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2LUR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv2LUR FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2LUR/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
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process vars = Zv2LUF TotDpts R_colmaj Disc_N Age Gender/y = TotDpts/x = Zv2LUF/m = R_colmaj/w = Disc_N/MODEL = 3/BOOT = 5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.

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process vars = Zv2LUF FinExam R_colmaj Disc_N Age Gender ENGL1 ENGL2 curGPA/y = FinExam/x = Zv2LUF/m =
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process vars = Zv2PS Cumm_pts R_colmaj Disc_N Age Gender ENGL1 curGPA/y = Cumm_pts/x = Zv2PS/m = R_colmaj/w =
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**Supplemental regression appendix.
*Hypothesis 3.
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  /NOORIGIN
  /DEPENDENT Cumm_pts
  /METHOD=ENTER Zv2CTR R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TotQpts
  /METHOD=ENTER Zv2AA R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT FinExam
  /METHOD=ENTER Zv2AA R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Cumm_pts
  /METHOD=ENTER Zv2AA R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TotQpts
  /METHOD=ENTER Zv2AAR R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT FinExam
  /METHOD=ENTER Zv2AAR R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Cumm_pts
```

```
  /METHOD=ENTER Zv2AAR R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TotQpts
  /METHOD=ENTER Zv2HT R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Cumm_pts
  /METHOD=ENTER Zv2HT R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TotQpts
  /METHOD=ENTER Zv2HTR R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TotQpts
  /METHOD=ENTER Zv2HTF R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Cumm_pts
  /METHOD=ENTER Zv2HTF R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TotQpts
  /METHOD=ENTER Zv2LU R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Cumm_pts
  /METHOD=ENTER Zv2LUR R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TotQpts
  /METHOD=ENTER Zv2PSR R_colmaj Disc_N Age Gender.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
```

```
  /DEPENDENT Cumm_pts
  /METHOD=ENTER Zv2PSR R_colmaj Disc_N Age Gender.
***Turn off filter - just in case.
FILTER OFF.
USE ALL.
EXECUTE.
**************************** v1CT v2CT TotQpts TotDpts FinExam Cumm_pts.
*H5.
*Tests using model 4.
process vars = Zv1CT Zv2CT FinExam/y = FinExam/x = Zv1CT/m = Zv2CT/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1CTR Zv2CTR FinExam/y = FinExam/x = Zv1CTR/m = Zv2CTR/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1CTF Zv2CTF FinExam/y = FinExam/x = Zv1CTF/m = Zv2CTF/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VR Zv2VR FinExam/y = FinExam/x = Zv1VR/m = Zv2VR/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VRR Zv2VRR FinExam/y = FinExam/x = Zv1VRR/m = Zv2VRR/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VRF Zv2VRF FinExam/y = FinExam/x = Zv1VRF/m = Zv2VRF/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AA Zv2AA FinExam/y = FinExam/x = Zv1AA/m = Zv2AA/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AAR Zv2AAR FinExam/y = FinExam/x = Zv1AAR/m = Zv2AAR/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AAF Zv2AAF FinExam/y = FinExam/x = Zv1AAF/m = Zv2AAF/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HT Zv2HT FinExam/y = FinExam/x = Zv1HT/m = Zv2HT/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HTR Zv2HTR FinExam/y = FinExam/x = Zv1HTR/m = Zv2HTR/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HTF Zv2HTF FinExam/y = FinExam/x = Zv1HTF/m = Zv2HTF/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LU Zv2LU FinExam/y = FinExam/x = Zv1LU/m = Zv2LU/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LUR Zv2LUR FinExam/y = FinExam/x = Zv1LUR/m = Zv2LUR/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LUF Zv2LUF FinExam/y = FinExam/x = Zv1LUF/m = Zv2LUF/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PS Zv2PS FinExam/y = FinExam/x = Zv1PS/m = Zv2PS/MODEL = 4/BOOT = 5000/CONF = 95/COEFFCI
= 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PSR Zv2PSR FinExam/y = FinExam/x = Zv1PSR/m = Zv2PSR/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PSF Zv2PSF FinExam/y = FinExam/x = Zv1PSF/m = Zv2PSF/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
*Tests using Model 4, with covariates of age and gender .
process vars = Zv1CT Zv2CT FinExam Age Gender/y = FinExam/x = Zv1CT/m = Zv2CT/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1CTR Zv2CTR FinExam Age Gender/y = FinExam/x = Zv1CTR/m = Zv2CTR/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1CTF Zv2CTF FinExam Age Gender/y = FinExam/x = Zv1CTF/m = Zv2CTF/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VR Zv2VR FinExam Age Gender/y = FinExam/x = Zv1VR/m = Zv2VR/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VRR Zv2VRR FinExam Age Gender/y = FinExam/x = Zv1VRR/m = Zv2VRR/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1VRF Zv2VRF FinExam Age Gender/y = FinExam/x = Zv1VRF/m = Zv2VRF/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AA Zv2AA FinExam Age Gender/y = FinExam/x = Zv1AA/m = Zv2AA/MODEL = 4/BOOT = 5000/CONF
= 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1AAR Zv2AAR FinExam Age Gender/y = FinExam/x = Zv1AAR/m = Zv2AAR/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
```

```
process vars = Zv1AAF Zv2AAF FinExam Age Gender/y = FinExam/x = Zv1AAF/m = Zv2AAF/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HT Zv2HT FinExam Age Gender/y = FinExam/x = Zv1HT/m = Zv2HT/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HTR Zv2HTR FinExam Age Gender/y = FinExam/x = Zv1HTR/m = Zv2HTR/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1HTF Zv2HTF FinExam Age Gender/y = FinExam/x = Zv1HTF/m = Zv2HTF/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LU Zv2LU FinExam Age Gender/y = FinExam/x = Zv1LU/m = Zv2LU/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LUR Zv2LUR FinExam Age Gender/y = FinExam/x = Zv1LUR/m = Zv2LUR/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1LUF Zv2LUF FinExam Age Gender/y = FinExam/x = Zv1LUF/m = Zv2LUF/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PS Zv2PS FinExam Age Gender/y = FinExam/x = Zv1PS/m = Zv2PS/MODEL = 4/BOOT = 5000/CONF =
95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PSR Zv2PSR FinExam Age Gender/y = FinExam/x = Zv1PSR/m = Zv2PSR/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
process vars = Zv1PSF Zv2PSF FinExam Age Gender/y = FinExam/x = Zv1PSF/m = Zv2PSF/MODEL = 4/BOOT =
5000/CONF = 95/COEFFCI = 1/TOTAL = 1/DETAIL = 1.
*****.
*** Mediation with SOD parameters.
RECODE TotQC (0=0) (SYSMIS=SYSMIS) (ELSE=1) INTO DTotQC.
VARIABLE LABELS  DTotQC 'Quiz count 0/1'.
RECODE FinExam (0=0) (SYSMIS=SYSMIS) (ELSE=1) INTO DFExam.
VARIABLE LABELS  DFExam 'final Exam 0/1'.
RECODE Cumm_pts (0=0) (SYSMIS=SYSMIS) (ELSE=1) INTO D_TotPts.
VARIABLE LABELS  D_TotPts 'Total Points 0/1'.
EXECUTE.
****Total number for SOD mediation.
USE ALL.
COMPUTE filter_$=(ENGL1 >= 1 AND ENGL2 >= 1 AND DNDiscs = 1 AND DTotQC = 1AND DFExam = 1 AND
    D_TotPts = 1).
VARIABLE LABELS filter_$ 'ENGL1 >= 1 AND ENGL2 >= 1 AND DNDiscs = 1 AND DTotQC = 1AND DFExam = 1 '+
    'AND D_TotPts = 1 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
FREQUENCIES VARIABLES=Gender
  /ORDER=ANALYSIS.
FILTER OFF.
USE ALL.
EXECUTE.
***cannot produce mediation or moderated-mediation models with these predictors (n = 40).
**END OF ANALYSES.
```

Appendix G.

Regression summary table for direct effects of predictors in significant moderation models.

Outcome	Predictor	*B*	*SE*	β	*t*	*p*
Time 2 Argument Analysis	Constant	.25	.30			
	Department Major	-.13	.10	-.14	-1.34	.184
	Discussion Postings	-.04	.12	-.04	-.36	.718
	Time 1 Total Argument Analysis	.43	.10	.43	4.17	.000
Model summary	$F(3 ,76) = 7.03$, $p < .001$, $R^2 = 0.22$					
Quiz Points	Constant	143.92	16.48			
	Time 2 Total Critical Thinking	11.09	2.46	.48	4.52	.000
	Department Major	3.16	2.57	.13	1.23	.222
	Discussion Postings	-7.83	2.86	-.29	-2.74	.008
	Age	.05	.39	.01	.13	.896
	Gender	10.25	5.89	.18	1.74	.086
Model summary	$F(5 ,62) = 6.14$, $p < .001$, $R^2 = 0.33$					
Final Exam	Constant	29.24	2.63			
	Time 2 Total Critical Thinking	1.13	.40	.34	2.85	.006
	Department Major	-.15	.42	-.04	-.37	.712
	Discussion Postings	-.57	.46	-.15	-1.25	.216
	Age	.08	.06	.15	1.23	.222
	Gender	.65	.94	.08	.70	.489
Model summary	$F(5 ,61) = 2.54$, $p = .037$, $R^2 = 0.17$					
Total Course Points	Constant	179.70	19.69			
	Time 2 Total Critical Thinking	11.82	2.93	.44	4.03	.000
	Department Major	4.09	3.06	.15	1.34	.187
	Discussion Postings	-7.87	3.42	-.25	-2.30	.025
	Age	.07	.46	.02	.16	.875
	Gender	10.88	7.03	.17	1.55	.127
Model summary	$F(5 ,62) = 4.78$, $p = .001$, $R^2 = 0.28$					
Quiz Points	Constant	139.30	15.84			
	Time 2 Critical Thinking - Forced Choice	12.58	2.40	.54	5.25	.000
	Department Major	3.27	2.46	.14	1.33	.189
	Discussion Postings	-9.81	2.77	-.36	-3.54	.001
	Age	.12	.37	.03	.32	.749
	Gender	12.16	5.66	.22	2.15	.036
Model summary	$F(5 ,62) = 7.74$, $p < .001$, $R^2 = 0.38$					
Final Exam	Constant	28.81	2.63			

	Time 2 Critical Thinking - Forced Choice	1.19	.40	.35	2.96	.004
	Department Major	-.16	.41	-.05	-.38	.705
	Discussion Postings	-.76	.46	-.20	-1.64	.105
	Age	.09	.06	.16	1.38	.173
	Gender	.83	.94	.10	.89	.379
Model summary	$F(5, 61) = 2.67$, $p = .030$, $R^2 = 0.18$					
Total Course Points	Constant	174.75	19.07			
	Time 2 Critical Thinking - Forced Choice	13.46	2.89	.50	4.66	.000
	Department Major	4.21	2.96	.15	1.42	.160
	Discussion Postings	-9.99	3.34	-.32	-3.00	.004
	Age	.14	.44	.03	.33	.746
	Gender	12.92	6.82	.20	1.90	.063
Model summary	$F(5, 62) = 5.99$, $p < .001$, $R^2 = 0.33$					
Quiz Points	Constant	134.75	18.09			
	Time 2 Verbal Reasoning - Forced Choice	8.61	2.92	.34	2.95	.004
	Department Major	2.60	2.77	.11	.94	.350
	Discussion Postings	-8.37	3.09	-.31	-2.70	.009
	Age	.45	.42	.12	1.08	.285
	Gender	12.19	6.40	.22	1.91	.061
Model summary	$F(5, 62) = 3.51$, $p = .007$, $R^2 = 0.22$					
Final Exam	Constant	27.77	2.64			
	Time 2 Verbal Reasoning - Forced Choice	1.33	.43	.37	3.13	.003
	Department Major	-.12	.41	-.04	-.29	.771
	Discussion Postings	-.65	.45	-.17	-1.43	.159
	Age	.12	.06	.24	2.02	.048
	Gender	.96	.94	.12	1.02	.310
Model summary	$F(5, 61) = 2.89$, $p = .021$, $R^2 = 0.19$					
Total Course Points	Constant	168.78	21.00			
	Time 2 Verbal Reasoning - Forced Choice	10.21	3.39	.35	3.02	.004
	Department Major	3.64	3.21	.13	1.13	.262
	Discussion Postings	-8.52	3.59	-.27	-2.37	.021
	Age	.52	.48	.12	1.07	.290
	Gender	13.22	7.43	.21	1.78	.080
Model summary	$F(5, 62) = 3.21$, $p = .012$, $R^2 = 0.21$					
Quiz Points	Constant	146.46	17.88			
	Time 2 Total Argument Analysis	7.88	2.76	.33	2.86	.006
	Department Major	2.66	2.78	.11	.95	.344
	Discussion Postings	-7.21	3.10	-.27	-2.32	.023
	Age	.18	.42	.05	.43	.666
	Gender	7.91	6.42	.14	1.23	.222
Model summary	$F(5, 62) = 3.39$, $p = .009$, $R^2 = 0.21$					

Final Exam	Constant	29.44	2.75			
	Time 2 Total Argument Analysis	.69	.43	.20	1.61	.113
	Department Major	-.20	.44	-.06	-.46	.647
	Discussion Postings	-.51	.48	-.13	-1.06	.295
	Age	.09	.06	.17	1.39	.169
	Gender	.43	.99	.05	.44	.662
Model summary	$F(5, 61) = 1.35$, $p = .254$, $R^2 = 0.10$					
Total Course Points	Constant	182.39	21.05			
	Time 2 Total Argument Analysis	8.33	3.25	.30	2.57	.013
	Department Major	3.54	3.28	.13	1.08	.284
	Discussion Postings	-7.22	3.66	-.23	-1.98	.053
	Age	.21	.49	.05	.43	.667
	Gender	8.40	7.56	.13	1.11	.271
Model summary	$F(5, 62) = 2.66$, $p = .030$, $R^2 = 0.18$					
Quiz Points	Constant	140.70	17.82			
	Time 2 Argument Analysis - Forced Choice	8.01	2.70	.34	2.97	.004
	Department Major	2.84	2.78	.12	1.02	.310
	Discussion Postings	-7.27	3.09	-.27	-2.35	.022
	Age	.28	.41	.08	.68	.496
	Gender	9.50	6.35	.17	1.50	.140
Model summary	$F(5, 62) = 3.53$, $p = .007$, $R^2 = 0.22$					
Final Exam	Constant	28.82	2.68			
	Time 2 Argument Analysis - Forced Choice	.99	.41	.29	2.41	.019
	Department Major	-.15	.43	-.04	-.35	.730
	Discussion Postings	-.50	.47	-.13	-1.08	.287
	Age	.10	.06	.19	1.59	.118
	Gender	.56	.96	.07	.59	.558
Model summary	$F(5, 61) = 2.04$, $p = .085$, $R^2 = 0.14$					
Total Course Points	Constant	176.17	20.93			
	Time 2 Argument Analysis - Forced Choice	8.73	3.17	.32	2.75	.008
	Department Major	3.78	3.26	.14	1.16	.250
	Discussion Postings	-7.27	3.63	-.23	-2.00	.050
	Age	.32	.49	.08	.66	.512
	Gender	10.07	7.46	.16	1.35	.182
Model summary	$F(5, 62) = 2.88$, $p = .021$, $R^2 = 0.19$					
Quiz Points	Constant	148.63	18.73			
	Time 2 Argument Analysis - Constructed Response	4.92	2.85	.21	1.73	.089
	Department Major	1.85	2.87	.08	.65	.521
	Discussion Postings	-7.47	3.22	-.28	-2.32	.024
	Age	.18	.44	.05	.42	.676
	Gender	8.11	6.71	.15	1.21	.231

Model summary	$F(5, 62) = 2.22$, $p = .063$, $R^2 = 0.15$					
Total Course Points	Constant	184.46	21.94			
	Time 2 Argument Analysis - Constructed Response	4.94	3.34	.18	1.48	.144
	Department Major	2.67	3.36	.10	.79	.430
	Discussion Postings	-7.50	3.78	-.24	-1.99	.051
	Age	.22	.51	.05	.43	.668
	Gender	8.71	7.86	.14	1.11	.272
Model summary	$F(5, 62) = 1.70$, $p = .148$, $R^2 = 0.12$					
Quiz Points	Constant	141.42	17.88			
	Time 2 Total Hypothesis Testing	7.66	2.66	.34	2.88	.006
	Department Major	3.10	2.81	.13	1.11	.274
	Discussion Postings	-6.79	3.11	-.25	-2.18	.033
	Age	.11	.42	.03	.26	.799
	Gender	10.56	6.38	.19	1.66	.103
Model summary	$F(5, 62) = 3.41$, $p = .009$, $R^2 = 0.22$					
Total Course Points	Constant	176.92	20.95			
	Time 2 Total Hypothesis Testing	8.48	3.12	.32	2.72	.009
	Department Major	4.10	3.29	.15	1.25	.218
	Discussion Postings	-6.72	3.65	-.22	-1.84	.070
	Age	.13	.49	.03	.26	.799
	Gender	11.23	7.47	.17	1.50	.138
Model summary	$F(5, 62) = 2.84$, $p = .023$, $R^2 = 0.19$					
Quiz Points	Constant	139.78	17.77			
	Time 2 Hypothesis Testing - Forced Choice	7.70	2.51	.35	3.07	.003
	Department Major	2.53	2.75	.11	.92	.362
	Discussion Postings	-7.86	3.07	-.29	-2.56	.013
	Age	.14	.41	.04	.35	.730
	Gender	12.21	6.36	.22	1.92	.060
Model summary	$F(5, 62) = 3.67$, $p = .006$, $R^2 = 0.23$					
Discussion Points	Constant	6.44	4.72			
	Time 2 Hypothesis Testing - Forced Choice	-.06	.77	-.01	-.08	.933
	Department Major	-.37	.68	-.06	-.55	.589
	Discussion Postings	8.16	1.11	.82	7.32	.000
	Age	-.03	.10	-.03	-.30	.764
	Gender	-2.08	1.56	-.15	-1.33	.193
Model summary	$F(5, 31) = 11.84$, $p < .001$, $R^2 = 0.66$					
Quiz Points	Constant	144.40	18.79			
	Time 2 Hypothesis Testing - Constructed Response	3.20	2.69	.15	1.19	.239
	Department Major	2.13	2.95	.09	.72	.473
	Discussion Postings	-6.96	3.32	-.26	-2.09	.040
	Age	.23	.44	.06	.52	.608

	Gender	9.27	6.73	.17	1.38	.174
Model summary	$F(5 ,62) = 1.87$, $p = .113$, $R^2 = 0.13$					
Total Course Points	Constant	180.23	21.86			
	Time 2 Hypothesis Testing - Constructed Response	3.85	3.13	.16	1.23	.223
	Department Major	3.09	3.43	.11	.90	.372
	Discussion Postings	-6.84	3.87	-.22	-1.77	.082
	Age	.25	.51	.06	.49	.625
	Gender	9.74	7.83	.15	1.24	.218
Model summary	$F(5 ,62) = 1.55$, $p = .188$, $R^2 = 0.11$					
Quiz Points	Constant	147.89	17.74			
	Time 2 Total Problem Solving	8.38	2.73	.35	3.07	.003
	Department Major	1.88	2.73	.08	.69	.494
	Discussion Postings	-9.30	3.11	-.34	-2.99	.004
	Age	.14	.41	.04	.35	.731
	Gender	9.21	6.32	.16	1.46	.151
Model summary	$F(5 ,62) = 3.68$, $p = .006$, $R^2 = 0.23$					
Final Exam	Constant	29.62	2.73			
	Time 2 Total Problem Solving	.80	.43	.23	1.85	.069
	Department Major	-.29	.43	-.08	-.67	.508
	Discussion Postings	-.71	.48	-.18	-1.47	.147
	Age	.09	.06	.17	1.35	.181
	Gender	.55	.97	.07	.57	.574
Model summary	$F(5 ,61) = 1.54$, $p = .192$, $R^2 = 0.11$					
Total Course Points	Constant	183.72	21.05			
	Time 2 Total Problem Solving	8.44	3.23	.31	2.61	.011
	Department Major	2.69	3.24	.10	.83	.408
	Discussion Postings	-9.35	3.69	-.30	-2.53	.014
	Age	.18	.49	.04	.37	.716
	Gender	9.80	7.50	.15	1.31	.196
Model summary	$F(5 ,62) = 2.71$, $p = .028$, $R^2 = 0.18$					
Quiz Points	Constant	145.67	17.51			
	Time 2 Problem Solving - Forced Choice	8.70	2.61	.38	3.33	.001
	Department Major	1.69	2.69	.07	.63	.532
	Discussion Postings	-10.24	3.13	-.38	-3.27	.002
	Age	.12	.41	.03	.30	.767
	Gender	11.06	6.26	.20	1.77	.082
Model summary	$F(5 ,62) = 4.04$, $p = .003$, $R^2 = 0.25$					
Final Exam	Constant	29.37	2.75			
	Time 2 Problem Solving - Forced Choice	.67	.42	.21	1.61	.112
	Department Major	-.30	.43	-.09	-.69	.494
	Discussion Postings	-.75	.50	-.19	-1.51	.135

	Age	.09	.06	.17	1.35	.183
	Gender	.70	.98	.09	.71	.478
Model summary	F(5 ,61) = 1.36, p = .253, R^2 = 0.10					
Total Course Points	Constant	181.50	20.80			
	Time 2 Problem Solving - Forced Choice	8.86	3.11	.34	2.85	.006
	Department Major	2.51	3.20	.09	.79	.435
	Discussion Postings	-10.32	3.72	-.33	-2.78	.007
	Age	.16	.49	.04	.32	.749
	Gender	11.68	7.44	.18	1.57	.121
Model summary	F(5 ,62) = 3.00, p = .017, R^2 = 0.20					
Quiz Points	Constant	143.89	17.29			
	Time 2 Total Critical Thinking	10.86	2.45	.47	4.43	.000
	College Major	2.50	2.54	.11	.99	.329
	Discussion Postings	-7.53	2.85	-.28	-2.64	.010
	Age	.04	.39	.01	.11	.915
	Gender	11.42	6.21	.20	1.84	.071
Model summary	F(5 ,62) = 5.98, p < .001, R^2 = 0.33					
Total Course Points	Constant	179.65	20.67			
	Time 2 Total Critical Thinking	11.51	2.93	.43	3.93	.000
	College Major	3.24	3.04	.13	1.07	.290
	Discussion Postings	-7.48	3.41	-.24	-2.20	.032
	Age	.06	.47	.02	.13	.896
	Gender	12.39	7.43	.19	1.67	.100
Model summary	F(5 ,62) = 4.61, p = .001, R^2 = 0.27					
Quiz Points	Constant	142.04	16.68			
	Time 2 Critical Thinking - Forced Choice	12.17	2.40	.52	5.07	.000
	College Major	1.78	2.44	.08	.73	.470
	Discussion Postings	-9.37	2.77	-.35	-3.38	.001
	Age	.13	.38	.04	.34	.734
	Gender	12.66	6.00	.23	2.11	.039
Model summary	F(5 ,62) = 7.35, p < .001, R^2 = 0.37					
Total Course Points	Constant	177.69	20.08			
	Time 2 Critical Thinking - Forced Choice	12.93	2.89	.48	4.48	.000
	College Major	2.47	2.94	.10	.84	.405
	Discussion Postings	-9.44	3.34	-.30	-2.83	.006
	Age	.15	.45	.04	.34	.737
	Gender	13.71	7.23	.21	1.90	.062
Model summary	F(5 ,62) = 5.61, p < .001, R^2 = 0.31					
Quiz Points	Constant	143.62	18.61			
	Time 2 Total Argument Analysis	8.04	2.77	.34	2.90	.005
	College Major	3.01	2.78	.13	1.09	.282

	Discussion Postings	-7.01	3.08	-.26	-2.28	.026
	Age	.15	.42	.04	.35	.728
	Gender	9.56	6.70	.17	1.43	.158
Model summary	F(5 ,62) = 3.45, p = .008, R^2 = 0.22					
Final Exam	Constant	29.67	2.87			
	Time 2 Total Argument Analysis	.67	.43	.20	1.57	.122
	College Major	-.23	.43	-.07	-.53	.596
	Discussion Postings	-.52	.48	-.13	-1.09	.278
	Age	.09	.07	.18	1.42	.160
	Gender	.31	1.03	.04	.30	.767
Model summary	F(5 ,61) = 1.37, p = .248, R^2 = 0.10					
Total Course Points	Constant	179.37	21.94			
	Time 2 Total Argument Analysis	8.50	3.26	.31	2.60	.012
	College Major	3.78	3.27	.15	1.16	.253
	Discussion Postings	-6.94	3.63	-.22	-1.91	.060
	Age	.17	.50	.04	.35	.728
	Gender	10.43	7.89	.16	1.32	.191
Model summary	F(5 ,62) = 2.70, p = .028, R^2 = 0.18					
Quiz Points	Constant	140.39	18.64			
	Time 2 Argument Analysis - Forced Choice	7.78	2.68	.33	2.90	.005
	College Major	2.36	2.74	.11	.86	.393
	Discussion Postings	-7.02	3.08	-.26	-2.28	.026
	Age	.27	.42	.07	.64	.524
	Gender	10.66	6.69	.19	1.59	.116
Model summary	F(5 ,62) = 3.45, p = .008, R^2 = 0.22					
Final Exam	Constant	29.30	2.79			
	Time 2 Argument Analysis - Forced Choice	.99	.41	.29	2.43	.018
	College Major	-.27	.42	-.08	-.64	.527
	Discussion Postings	-.51	.46	-.13	-1.09	.278
	Age	.10	.06	.20	1.65	.105
	Gender	.39	1.00	.05	.39	.695
Model summary	F(5 ,61) = 2.11, p = .077, R^2 = 0.15					
Total Course Points	Constant	175.88	21.90			
	Time 2 Argument Analysis - Forced Choice	8.43	3.15	.31	2.67	.010
	College Major	3.11	3.22	.12	.96	.339
	Discussion Postings	-6.93	3.62	-.22	-1.92	.060
	Age	.30	.49	.07	.61	.542
	Gender	11.58	7.86	.18	1.47	.146
Model summary	F(5 ,62) = 2.78, p = .025, R^2 = 0.18					
Quiz Points	Constant	142.25	18.73			
	Time 2 Total Hypothesis Testing	7.25	2.63	.32	2.76	.008

	College Major	2.20	2.76	.10	.80	.428
	Discussion Postings	-6.53	3.11	-.24	-2.10	.040
	Age	.11	.42	.03	.26	.799
	Gender	11.49	6.73	.21	1.71	.093
Model summary	F(5 ,62) = 3.27, p = .011, R^2 = 0.21					
Total Course Points	Constant	177.88	21.96			
	Time 2 Total Hypothesis Testing	7.93	3.08	.30	2.57	.013
	College Major	2.94	3.23	.11	.91	.366
	Discussion Postings	-6.39	3.65	-.20	-1.75	.085
	Age	.13	.50	.03	.25	.800
	Gender	12.49	7.89	.19	1.58	.119
Model summary	F(5 ,62) = 2.67, p = .030, R^2 = 0.18					
Quiz Points	Constant	142.49	18.58			
	Time 2 Hypothesis Testing - Forced Choice	7.36	2.50	.33	2.94	.005
	College Major	1.21	2.72	.05	.44	.658
	Discussion Postings	-7.56	3.06	-.28	-2.47	.016
	Age	.16	.42	.04	.37	.710
	Gender	12.42	6.70	.22	1.85	.068
Model summary	F(5 ,62) = 3.51, p = .007, R^2 = 0.22					
Quiz Points	Constant	142.77	19.61			
	Time 2 Hypothesis Testing - Constructed Response	3.22	2.69	.15	1.20	.236
	College Major	2.20	2.93	.10	.75	.456
	Discussion Postings	-6.79	3.31	-.25	-2.05	.044
	Age	.21	.44	.06	.46	.645
	Gender	10.46	7.05	.19	1.48	.143
Model summary	F(5 ,62) = 1.88, p = .111, R^2 = 0.13					
Total Course Points	Constant	178.41	22.83			
	Time 2 Hypothesis Testing - Constructed Response	3.84	3.13	.16	1.23	.224
	College Major	3.01	3.41	.12	.88	.381
	Discussion Postings	-6.58	3.85	-.21	-1.71	.092
	Age	.23	.52	.05	.44	.664
	Gender	11.33	8.20	.18	1.38	.172
Model summary	F(5 ,62) = 1.54, p = .190, R^2 = 0.11					
Quiz Points	Constant	134.51	16.28			
	Time 2 Total Likelihood and Uncertainty	11.16	2.01	.55	5.55	.000
	College Major	2.72	2.39	.12	1.14	.259
	Discussion Postings	-6.99	2.68	-.26	-2.61	.011
	Age	.12	.37	.03	.34	.739
	Gender	15.33	5.88	.27	2.61	.011
Model summary	F(5 ,62) = 8.50, p < .001, R^2 = 0.41					
Total Course Points	Constant	179.88	18.04			

	Time 2 Likelihood and Uncertainty - Forced Choice	14.86	2.36	.60	6.30	.000
	College Major	2.62	2.64	.10	.99	.326
	Discussion Postings	-10.53	3.01	-.34	-3.50	.001
	Age	.29	.41	.07	.71	.479
	Gender	12.39	6.48	.19	1.91	.060
Model summary	$F(5 ,62) = 9.92$, $p < .001$, $R^2 = 0.44$					
Quiz Points	Constant	145.36	18.30			
	Time 2 Problem Solving - Forced Choice	8.64	2.61	.38	3.31	.002
	College Major	1.44	2.68	.06	.54	.593
	Discussion Postings	-10.07	3.11	-.37	-3.24	.002
	Age	.11	.41	.03	.27	.785
	Gender	11.75	6.58	.21	1.79	.079
Model summary	$F(5 ,62) = 4.01$, $p = .003$, $R^2 = 0.24$					
Total Course Points	Constant	181.11	21.76			
	Time 2 Problem Solving - Forced Choice	8.77	3.11	.34	2.82	.006
	College Major	2.12	3.19	.08	.66	.509
	Discussion Postings	-10.06	3.69	-.32	-2.73	.008
	Age	.14	.49	.03	.29	.770
	Gender	12.70	7.82	.20	1.62	.109
Model summary	$F(5 ,62) = 2.96$, $p = .018$, $R^2 = 0.19$					

Appendix H.

Moderated regression summary table for CT measures on course outcomes with age and gender controlled.

Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS), with subcomponents of forced-choice (F) and free-response (R).

Outcome	Predictor	*B*	*SE*	*t*	*p*	*LLCI*	*ULCI*
Quiz Points (n = 120)	Constant	165.53	15.94	10.39	.000	133.95	197.11
	Department Major	5.95	3.58	1.66	.100	-1.15	13.05
	t2 CT	28.62	7.28	3.93	.000	14.20	43.04
	t2 CT X Department Major	-6.45	2.82	-2.29	.024	-12.04	-.87
	Discussion Posts	12.76	8.08	1.58	.117	-3.26	28.77
	t2 CT X Discussion Posts	-22.46	9.77	-2.30	.024	-41.82	-3.09
	Department Major X Discussion Posts	-4.85	3.15	-1.54	.126	-11.08	1.38
	t2 CT X Department Major X Discussion Posts	5.50	3.58	1.53	.128	-1.61	12.60
	Age	-.33	.39	-.83	.407	-1.11	.45
	Gender	-2.34	5.30	-.44	.659	-12.84	8.15
Model Summary	$F(9,110) = 3.65$, $p = .001$, $R^2 = .23$.						
Discussion Points (n = 66)	Constant	9.36	8.34	1.12	.266	-7.33	26.06
	Department Major	-1.78	2.74	-.65	.517	-7.26	3.69
	t2 CT	5.95	6.32	.94	.350	-6.71	18.62
	t2 CT X Department Major	-3.00	2.96	-1.01	.315	-8.93	2.93
	Discussion Posts	7.48	4.21	1.78	.081	-.96	15.92
	t2 CT X Discussion Posts	-3.57	4.13	-.87	.390	-11.85	4.70

	Department Major X Discussion Posts	.70	1.64	.42	.674	-2.60	3.99
	t2 CT X Department Major X Discussion Posts	2.09	1.79	1.17	.249	-1.50	5.68
	Age	-.01	.13	-.05	.959	-.26	.25
	Gender	-2.15	1.75	-1.23	.226	-5.66	1.36
Model Summary	$F(9,56) = 8.31, p < .001, R^2 = .57.$						
Final Exam (n = 118)	Constant	30.40	2.13	14.26	.000	26.17	34.62
	Department Major	-.27	.51	-.54	.592	-1.28	.73
	t2 CT	3.61	1.11	3.24	.002	1.40	5.81
	t2 CT X Department Major	-.82	.42	-1.97	.051	-1.65	.00
	Discussion Posts	.44	1.11	.39	.696	-1.77	2.64
	t2 CT X Discussion Posts	-3.26	1.35	-2.41	.018	-5.94	-.58
	Department Major X Discussion Posts	-.06	.43	-.15	.885	-.92	.79
	t2 CT X Department Major X Discussion Posts	.83	.49	1.69	.093	-.14	1.81
	Age	.06	.05	1.07	.288	-.05	.16
	Gender	.36	.71	.50	.618	-1.05	1.76
Model Summary	$F(9,108) = 2.74, p = .006, R^2 = .19.$						
Total Course Points (n = 120)	Constant	194.41	17.76	10.95	.000	159.22	229.59
	Department Major	8.26	3.99	2.07	.041	.35	16.17
	t2 CT	33.30	8.11	4.11	.000	17.24	49.37
	t2 CT X Department Major	-7.63	3.14	-2.43	.017	-13.85	-1.41
	Discussion Posts	9.34	9.01	1.04	.302	-8.51	27.18
	t2 CT X Discussion Posts	-21.44	10.89	-1.97	.051	-43.02	.14
	Department Major X Discussion Posts	-5.01	3.50	-1.43	.156	-11.96	1.93
	t2 CT X Department Major X Discussion Posts	4.97	3.99	1.25	.216	-2.94	12.88
	Age	-.21	.44	-.49	.625	-1.08	.65
	Gender	-1.08	5.90	-.18	.856	-12.77	10.62
Model Summary	$F(9,110) = 4.31, p < .001, R^2 = .26.$						
Quiz Points (n = 120)	Constant	164.94	15.26	10.81	.000	134.70	195.17
	Department Major	6.22	3.44	1.81	.073	-.60	13.05
	t2 CTF	33.82	7.26	4.66	.000	19.44	48.21
	t2 CTF X Department Major	-7.65	2.73	-2.80	.006	-13.06	-2.24

	Discussion Posts	15.68	7.80	2.01	.047	.22	31.14
	t2 CTF X Discussion Posts	-36.37	10.30	-3.53	.001	-56.78	-15.96
	Department Major X Discussion Posts	-5.75	3.03	-1.90	.061	-11.77	.26
	t2 CTF X Department Major X Discussion Posts	9.30	3.63	2.56	.012	2.10	16.50
	Age	-.30	.38	-.79	.429	-1.04	.45
	Gender	-2.28	5.07	-.45	.654	-12.32	7.76
Model Summary	$F(9,110) = 5.08$, $p < .001$, $R^2 = .29$.						
Discussion Points (n = 66)	Constant	9.07	8.22	1.10	.275	-7.39	25.53
	Department Major	-1.53	2.67	-.57	.568	-6.88	3.82
	t2 CTF	5.72	5.96	.96	.341	-6.21	17.65
	t2 CTF X Department Major	-2.22	2.60	-.85	.397	-7.44	2.99
	Discussion Posts	8.19	4.27	1.92	.060	-.37	16.75
	t2 CTF X Discussion Posts	-6.32	4.11	-1.54	.129	-14.54	1.91
	Department Major X Discussion Posts	.32	1.62	.19	.847	-2.94	3.57
	t2 CTF X Department Major X Discussion Posts	2.53	1.68	1.50	.139	-.85	5.90
	Age	-.03	.12	-.25	.803	-.28	.22
	Gender	-1.65	1.72	-.96	.342	-5.09	1.80
Model Summary	$F(9,56) = 8.39$, $p < .001$, $R^2 = .57$.						
Final Exam (n = 118)	Constant	30.28	2.13	14.24	.000	26.06	34.49
	Department Major	-.29	.51	-.57	.572	-1.29	.72
	t2 CTF	3.91	1.12	3.51	.001	1.70	6.13
	t2 CTF X Department Major	-.94	.41	-2.30	.023	-1.75	-.13
	Discussion Posts	.50	1.12	.44	.658	-1.72	2.71
	t2 CTF X Discussion Posts	-4.02	1.47	-2.74	.007	-6.93	-1.12
	Department Major X Discussion Posts	-.10	.43	-.23	.818	-.96	.76
	t2 CTF X Department Major X Discussion Posts	1.10	.51	2.14	.035	.08	2.12
	Age	.06	.05	1.21	.227	-.04	.17
	Gender	.43	.71	.61	.545	-.97	1.83
Model Summary	$F(9,108) = 2.81$, $p = .005$, $R^2 = .19$.						
Total Course Points (n = 120)	Constant	194.01	17.28	11.23	.000	159.76	228.26
	Department Major	8.55	3.90	2.19	.031	.82	16.28

	t2 CTF	38.05	8.22	4.63	.000	21.75	54.35
	t2 CTF X Department Major	-8.68	3.09	-2.81	.006	-14.81	-2.56
	Discussion Posts	11.79	8.84	1.33	.185	-5.72	29.31
	t2 CTF X Discussion Posts	-33.33	11.67	-2.86	.005	-56.45	-10.21
	Department Major X Discussion Posts	-5.85	3.44	-1.70	.091	-12.67	.96
	t2 CTF X Department Major X Discussion Posts	8.23	4.12	2.00	.048	.07	16.39
	Age	-.19	.43	-.44	.659	-1.03	.66
	Gender	-.98	5.74	-.17	.865	-12.35	10.40
Model Summary	$F(9,110) = 5.21$, $p < .001$, $R^2 = .30$.						
Quiz Points (n = 120)	Constant	163.15	16.85	9.68	.000	129.75	196.55
	Department Major	5.76	3.78	1.52	.131	-1.73	13.26
	t2 CTR	21.39	8.08	2.65	.009	5.36	37.41
	t2 CTR X Department Major	-5.03	3.32	-1.51	.133	-11.60	1.55
	Discussion Posts	9.94	8.37	1.19	.237	-6.64	26.52
	t2 CTR X Discussion Posts	-10.30	9.57	-1.08	.284	-29.26	8.67
	Department Major X Discussion Posts	-3.99	3.28	-1.22	.227	-10.48	2.51
	t2 CTR X Department Major X Discussion Posts	2.48	3.71	.67	.504	-4.86	9.83
	Age	-.29	.42	-.69	.489	-1.11	.53
	Gender	-1.22	5.60	-.22	.829	-12.32	9.89
Model Summary	$F(9,110) = 2.00$, $p = .046$, $R^2 = .14$.						
Discussion Points (n = 66)	Constant	9.79	7.96	1.23	.224	-6.16	25.74
	Department Major	-2.71	2.69	-1.01	.317	-8.10	2.67
	t2 CTR	7.49	7.01	1.07	.290	-6.56	21.54
	t2 CTR X Department Major	-4.36	3.30	-1.32	.192	-10.97	2.25
	Discussion Posts	6.37	3.99	1.60	.116	-1.63	14.37
	t2 CTR X Discussion Posts	-2.49	4.30	-.58	.565	-11.10	6.13
	Department Major X Discussion Posts	1.40	1.61	.87	.387	-1.82	4.62
	t2 CTR X Department Major X Discussion Posts	2.14	1.92	1.11	.271	-1.71	5.98
	Age	.03	.12	.28	.779	-.21	.28
	Gender	-2.19	1.68	-1.31	.196	-5.55	1.16
Model Summary	$F(9,56) = 8.80$, $p < .001$, $R^2 = .59$.						

Final Exam (n = 118)	Constant	30.13	2.21	13.66	.000	25.76	34.51
	Department Major	-.31	.52	-.59	.550	-1.35	.73
	t2 CTR	2.43	1.21	2.01	.050	.03	4.83
	t2 CTR X Department Major	-.46	.48	-.95	.340	-1.41	.49
	Discussion Posts	.14	1.13	.12	.900	-2.10	2.38
	t2 CTR X Discussion Posts	-1.81	1.30	-1.39	.170	-4.39	.77
	Department Major X Discussion Posts	.04	.44	.08	.940	-.84	.91
	t2 CTR X Department Major X Discussion Posts	.37	.50	.74	.460	-.62	1.36
	Age	.06	.06	1.07	.290	-.05	.17
	Gender	.51	.74	.69	.490	-.95	1.97
Model Summary	F(9,108) = 1.79, p = .079, R^2 = .13.						
Total Course Points (n = 120)	Constant	191.82	18.71	10.25	.000	154.74	228.90
	Department Major	8.11	4.20	1.93	.056	-.21	16.43
	t2 CTR	26.10	8.97	2.91	.004	8.32	43.89
	t2 CTR X Department Major	-6.29	3.68	-1.71	.090	-13.59	1.01
	Discussion Posts	7.09	9.29	.76	.447	-11.32	25.49
	t2 CTR X Discussion Posts	-10.76	10.62	-1.01	.313	-31.82	10.29
	Department Major X Discussion Posts	-4.32	3.64	-1.19	.237	-11.54	2.89
	t2 CTR X Department Major X Discussion Posts	2.37	4.11	.58	.565	-5.78	10.52
	Age	-.18	.46	-.39	.694	-1.10	.73
	Gender	.15	6.22	.02	.981	-12.18	12.48
Model Summary	F(9,110) = 2.70, p = .007, R^2 = .18.						
Quiz Points (n = 120)	Constant	164.13	17.55	9.35	.000	129.34	198.92
	Department Major	4.71	3.94	1.20	.230	-3.10	12.53
	t2 VR	16.71	9.14	1.83	.070	-1.41	34.83
	t2 VR X Department Major	-2.24	3.61	-.62	.540	-9.40	4.92
	Discussion Posts	8.33	8.56	.97	.330	-8.63	25.29
	t2 VR X Discussion Posts	-8.13	8.98	-.91	.370	-25.92	9.67
	Department Major X Discussion Posts	-3.75	3.33	-1.13	.260	-10.35	2.85
	t2 VR X Department Major X Discussion Posts	.52	3.43	.15	.880	-6.28	7.32
	Age	-.20	.42	-.47	.640	-1.02	.63

	Gender	-.43	5.75	-.07	.940	-11.82	10.96
Model Summary	F(9,110) = 1.93, p = .056, R^2 = .14.						
Discussion Points (n = 66)	Constant	10.77	9.38	1.15	.256	-8.02	29.55
	Department Major	-2.75	3.21	-.86	.395	-9.18	3.67
	t2 VR	4.34	4.83	.90	.373	-5.34	14.02
	t2 VR X Department Major	-2.08	2.22	-.94	.352	-6.53	2.37
	Discussion Posts	6.04	4.78	1.26	.211	-3.54	15.62
	t2 VR X Discussion Posts	-2.11	3.10	-.68	.498	-8.33	4.10
	Department Major X Discussion Posts	1.42	1.87	.76	.449	-2.32	5.16
	t2 VR X Department Major X Discussion Posts	1.24	1.39	.89	.376	-1.55	4.04
	Age	.00	.13	.03	.974	-.25	.26
	Gender	-1.96	1.77	-1.11	.273	-5.50	1.58
Model Summary	F(9,56) = 7.82, p < .001, R^2 = .56.						
Final Exam (n = 118)	Constant	30.37	2.29	13.28	.000	25.84	34.90
	Department Major	-.47	.54	-.87	.390	-1.55	.60
	t2 VR	2.31	1.21	1.91	.060	-.09	4.71
	t2 VR X Department Major	-.36	.48	-.76	.450	-1.31	.58
	Discussion Posts	-.21	1.14	-.18	.860	-2.48	2.06
	t2 VR X Discussion Posts	-1.91	1.17	-1.63	.110	-4.23	.42
	Department Major X Discussion Posts	.12	.44	.27	.790	-.76	1.00
	t2 VR X Department Major X Discussion Posts	.42	.45	.94	.350	-.47	1.31
	Age	.07	.05	1.32	.190	-.04	.18
	Gender	.60	.75	.81	.420	-.88	2.08
Model Summary	F(9,108) = 1.93, p = .055, R^2 = .14.						
Total Course Points (n = 120)	Constant	193.09	19.56	9.87	.000	154.32	231.86
	Department Major	6.89	4.39	1.57	.120	-1.81	15.60
	t2 VR	19.74	10.19	1.94	.055	-.46	39.93
	t2 VR X Department Major	-2.71	4.03	-.67	.503	-10.69	5.28
	Discussion Posts	5.12	9.54	.54	.593	-13.78	24.02
	t2 VR X Discussion Posts	-8.76	10.01	-.88	.383	-28.59	11.07
	Department Major X Discussion Posts	-4.01	3.71	-1.08	.282	-11.37	3.35

	t2 VR X Department Major X Discussion Posts	.46	3.82	.12	.903	-7.11	8.04
	Age	-.08	.46	-.18	.858	-1.00	.84
	Gender	1.09	6.40	.17	.865	-11.60	13.78
Model Summary	*F*(9,110) = 2.50, *p* = .012, R^2 = .17.						
Quiz Points (n = 120)	Constant	166.11	17.44	9.53	.000	131.55	200.67
	Department Major	3.06	4.01	.76	.447	-4.88	11.00
	Zv2VRR	36.95	9.66	3.82	.000	17.80	56.11
	t2 VRF X Department Major	-11.77	4.11	-2.87	.005	-19.91	-3.63
	Discussion Posts	6.74	8.26	.82	.416	-9.63	23.11
	t2 VRF X Discussion Posts	-22.53	8.81	-2.56	.012	-39.98	-5.08
	Department Major X Discussion Posts	-2.90	3.26	-.89	.376	-9.37	3.56
	t2 VRF X Department Major X Discussion Posts	7.60	3.64	2.09	.039	.39	14.82
	Age	-.03	.42	-.06	.953	-.86	.81
	Gender	-1.96	5.55	-.35	.725	-12.96	9.04
Model Summary	*F*(9,110) = 2.43, *p* = .015, R^2 = .17.						
Discussion Points (n = 66)	Constant	10.27	8.44	1.22	.229	-6.63	27.17
	Department Major	-2.11	2.78	-.76	.451	-7.67	3.45
	Zv2VRR	5.44	4.70	1.16	.252	-3.98	14.85
	t2 VRF X Department Major	-2.55	2.04	-1.25	.216	-6.64	1.54
	Discussion Posts	6.57	4.30	1.53	.132	-2.05	15.19
	t2 VRF X Discussion Posts	-4.50	3.11	-1.45	.154	-10.73	1.73
	Department Major X Discussion Posts	1.06	1.65	.64	.523	-2.24	4.36
	t2 VRF X Department Major X Discussion Posts	2.33	1.37	1.71	.093	-.40	5.07
	Age	-.03	.12	-.26	.798	-.28	.21
	Gender	-1.77	1.66	-1.06	.291	-5.09	1.56
Model Summary	*F*(9,56) = 8.93, *p* < .001, R^2 = .59.						
Final Exam (n = 118)	Constant	29.94	2.36	12.68	.000	25.26	34.62
	Department Major	-.38	.57	-.68	.500	-1.51	.74
	Zv2VRR	2.83	1.37	2.07	.040	.12	5.54
	t2 VRF X Department Major	-.81	.57	-1.42	.160	-1.95	.32
	Discussion Posts	-.12	1.15	-.10	.920	-2.39	2.16

	t2 VRF X Discussion Posts	-2.78	1.22	-2.28	.020	-5.18	-.37
	Department Major X Discussion Posts	.09	.45	.20	.840	-.80	.98
	t2 VRF X Department Major X Discussion Posts	.95	.50	1.90	.060	-.04	1.94
	Age	.08	.06	1.43	.160	-.03	.20
	Gender	.56	.75	.75	.460	-.93	2.06
Model Summary	*F*(9,108) = 1.27, *p* = .259, R^2 = .10.						
Total Course Points (n = 120)	Constant	195.27	19.32	10.11	.000	156.99	233.56
	Department Major	4.98	4.44	1.12	.264	-3.81	13.78
	Zv2VRR	43.91	10.71	4.10	.000	22.69	65.13
	t2 VRF X Department Major	-13.79	4.55	-3.03	.003	-22.80	-4.78
	Discussion Posts	4.11	9.15	.45	.654	-14.03	22.24
	t2 VRF X Discussion Posts	-26.63	9.75	-2.73	.007	-45.96	-7.30
	Department Major X Discussion Posts	-3.30	3.61	-.91	.363	-10.46	3.86
	t2 VRF X Department Major X Discussion Posts	8.57	4.03	2.13	.036	.58	16.56
	Age	.13	.46	.29	.772	-.79	1.05
	Gender	-.88	6.15	-.14	.887	-13.07	11.31
Model Summary	*F*(9,110) = 3.21, *p* = .002, R^2 = .21.						
Quiz Points (n = 120)	Constant	161.93	17.77	9.11	.000	126.70	197.15
	Department Major	5.14	3.95	1.30	.200	-2.68	12.95
	t2 VRR	5.23	10.17	.51	.610	-14.93	25.38
	t2 VRR X Department Major	1.98	3.96	.50	.620	-5.86	9.83
	Discussion Posts	8.55	8.60	.99	.320	-8.50	25.60
	t2 VRR X Discussion Posts	.05	9.70	.01	1.000	-19.18	19.28
	Department Major X Discussion Posts	-3.83	3.36	-1.14	.260	-10.49	2.84
	t2 VRR X Department Major X Discussion Posts	-2.74	3.80	-.72	.470	-10.27	4.78
	Age	-.31	.42	-.74	.460	-1.15	.52
	Gender	1.49	5.84	.26	.800	-10.07	13.06
Model Summary	*F*(9,110) = 1.52, *p* = .149, R^2 = .11.						
Discussion Points (n = 66)	Constant	9.92	9.08	1.09	.279	-8.27	28.12
	Department Major	-2.62	3.14	-.83	.407	-8.91	3.67
	t2 VRR	4.07	5.59	.73	.470	-7.13	15.27

	t2 VRR X Department Major	-1.82	2.55	-.71	.478	-6.92	3.29
	Discussion Posts	6.46	4.65	1.39	.170	-2.85	15.76
	t2 VRR X Discussion Posts	-1.52	3.57	-.43	.671	-8.67	5.62
	Department Major X Discussion Posts	1.28	1.83	.70	.489	-2.40	4.95
	t2 VRR X Department Major X Discussion Posts	.77	1.61	.48	.634	-2.46	4.01
	Age	.01	.13	.10	.921	-.25	.28
	Gender	-1.85	1.76	-1.05	.298	-5.37	1.68
Model Summary	$F(9,56) = 7.58$, $p < .001$, $R^2 = .55$.						
Final Exam (n = 118)	Constant	30.65	2.30	13.32	.000	26.09	35.21
	Department Major	-.56	.54	-1.03	.310	-1.64	.52
	t2 VRR	1.97	1.33	1.48	.140	-.67	4.61
	t2 VRR X Department Major	-.23	.52	-.44	.660	-1.25	.80
	Discussion Posts	-.41	1.14	-.36	.720	-2.68	1.85
	t2 VRR X Discussion Posts	-1.26	1.25	-1.01	.320	-3.75	1.22
	Department Major X Discussion Posts	.19	.44	.43	.670	-.69	1.07
	t2 VRR X Department Major X Discussion Posts	.16	.49	.33	.740	-.81	1.13
	Age	.06	.06	1.11	.270	-.05	.17
	Gender	.70	.75	.93	.350	-.79	2.19
Model Summary	$F(9,108) = 1.73$, $p = .090$, $R^2 = .13$.						
Total Course Points (n = 120)	Constant	190.45	19.89	9.58	.000	151.04	229.87
	Department Major	7.48	4.41	1.69	.090	-1.27	16.23
	t2 VRR	5.85	11.38	.51	.610	-16.70	28.39
	t2 VRR X Department Major	2.31	4.43	.52	.600	-6.46	11.09
	Discussion Posts	5.14	9.63	.53	.590	-13.93	24.22
	t2 VRR X Discussion Posts	1.18	10.86	.11	.910	-20.34	22.69
	Department Major X Discussion Posts	-3.99	3.76	-1.06	.290	-11.45	3.46
	t2 VRR X Department Major X Discussion Posts	-3.21	4.25	-.76	.450	-11.64	5.21
	Age	-.23	.47	-.48	.630	-1.16	.71
	Gender	3.35	6.53	.51	.610	-9.59	16.29
Model Summary	$F(9,110) = 1.97$, $p = .050$, $R^2 = .14$.						
Quiz Points (n = 120)	Constant	162.60	16.18	10.05	.000	130.54	194.67

	Department Major	7.36	3.64	2.02	.046	.15	14.57
	t2 AA	36.02	8.37	4.31	.000	19.44	52.59
	t2 AA X Department Major	-9.84	3.12	-3.15	.002	-16.02	-3.65
	Discussion Posts	12.87	8.11	1.59	.116	-3.21	28.95
	t2 AA X Discussion Posts	-18.74	9.42	-1.99	.049	-37.41	-.06
	Department Major X Discussion Posts	-5.16	3.20	-1.61	.110	-11.50	1.18
	t2 AA X Department Major X Discussion Posts	5.81	3.56	1.63	.105	-1.24	12.85
	Age	-.26	.40	-.65	.519	-1.04	.53
	Gender	-3.94	5.46	-.72	.472	-14.77	6.88
Model Summary	$F(9,110) = 3.15$, $p = .002$, $R^2 = .20$.						
Discussion Points (n = 66)	Constant	5.97	7.16	.83	.407	-8.37	20.31
	Department Major	-.80	2.28	-.35	.728	-5.37	3.78
	t2 AA	3.45	6.04	.57	.570	-8.65	15.55
	t2 AA X Department Major	-2.13	2.51	-.85	.401	-7.16	2.91
	Discussion Posts	9.05	3.62	2.50	.015	1.80	16.29
	t2 AA X Discussion Posts	-1.00	4.19	-.24	.812	-9.40	7.40
	Department Major X Discussion Posts	.17	1.44	.12	.904	-2.71	3.06
	t2 AA X Department Major X Discussion Posts	1.18	1.71	.69	.492	-2.24	4.61
	Age	-.01	.12	-.06	.949	-.25	.23
	Gender	-1.89	1.66	-1.14	.261	-5.22	1.44
Model Summary	$F(9,56) = 8.79$, $p < .001$, $R^2 = .59$.						
Final Exam (n = 118)	Constant	30.11	2.17	13.91	.000	25.82	34.41
	Department Major	-.09	.52	-.18	.860	-1.12	.93
	t2 AA	4.39	1.23	3.56	.001	1.95	6.83
	t2 AA X Department Major	-1.21	.45	-2.69	.008	-2.09	-.32
	Discussion Posts	.64	1.12	.57	.568	-1.58	2.86
	t2 AA X Discussion Posts	-3.78	1.30	-2.91	.004	-6.35	-1.20
	Department Major X Discussion Posts	-.17	.44	-.38	.702	-1.04	.70
	t2 AA X Department Major X Discussion Posts	1.14	.49	2.34	.021	.17	2.10
	Age	.06	.05	1.18	.241	-.04	.17
	Gender	.14	.73	.19	.847	-1.31	1.60

Model Summary	$F(9,108) = 2.25$, $p = .024$, $R^2 = .16$.						
Total Course Points (n = 120)	Constant	191.47	17.97	10.65	.000	155.85	227.09
	Department Major	10.01	4.04	2.47	.015	1.99	18.02
	t2 AA	43.13	9.29	4.64	.000	24.71	61.54
	t2 AA X Department Major	-11.85	3.47	-3.42	.001	-18.73	-4.98
	Discussion Posts	11.15	9.01	1.24	.218	-6.71	29.01
	t2 AA X Discussion Posts	-24.31	10.47	-2.32	.022	-45.06	-3.57
	Department Major X Discussion Posts	-5.85	3.55	-1.65	.103	-12.89	1.19
	t2 AA X Department Major X Discussion Posts	7.24	3.95	1.83	.070	-.59	15.07
	Age	-.16	.44	-.36	.721	-1.03	.72
	Gender	-3.08	6.07	-.51	.612	-15.11	8.94
Model Summary	$F(9,110) = 3.88$, $p < .001$, $R^2 = .24$.						
Quiz Points (n = 120)	Constant	162.43	16.43	9.89	.000	129.87	194.98
	Department Major	7.10	3.70	1.92	.058	-.23	14.44
	t2 AAF	32.50	8.63	3.77	.000	15.40	49.59
	t2 AAF X Department Major	-8.66	3.39	-2.55	.012	-15.38	-1.93
	Discussion Posts	12.46	8.05	1.55	.124	-3.49	28.42
	t2 AAF X Discussion Posts	-18.18	8.96	-2.03	.045	-35.94	-.43
	Department Major X Discussion Posts	-4.92	3.17	-1.55	.124	-11.21	1.37
	t2 AAF X Department Major X Discussion Posts	4.96	3.38	1.47	.146	-1.75	11.66
	Age	-.27	.40	-.67	.502	-1.07	.53
	Gender	-3.15	5.50	-.57	.568	-14.05	7.75
Model Summary	$F(9,110) = 2.71$, $p = .007$, $R^2 = .18$.						
Discussion Points (n = 66)	Constant	8.42	7.88	1.07	.289	-7.36	24.20
	Department Major	-1.22	2.51	-.49	.629	-6.24	3.80
	t2 AAF	4.54	4.76	.95	.345	-5.00	14.07
	t2 AAF X Department Major	-2.32	2.07	-1.12	.267	-6.48	1.83
	Discussion Posts	8.45	4.01	2.10	.040	.41	16.49
	t2 AAF X Discussion Posts	-3.72	3.30	-1.13	.264	-10.32	2.88
	Department Major X Discussion Posts	.27	1.54	.18	.860	-2.82	3.37
	t2 AAF X Department Major X Discussion Posts	2.03	1.39	1.46	.149	-.75	4.81

	Age	-.03	.12	-.21	.835	-.27	.22
	Gender	-2.08	1.67	-1.24	.220	-5.43	1.28
Model Summary	*F*(9,56) = 8.60, *p* < .001, R^2 = .58.						
Final Exam (n = 118)	Constant	30.10	2.18	13.83	.000	25.78	34.41
	Department Major	-.22	.52	-.43	.669	-1.25	.81
	t2 AAF	3.85	1.22	3.16	.002	1.43	6.27
	t2 AAF X Department Major	-1.02	.47	-2.17	.032	-1.96	-.09
	Discussion Posts	.25	1.10	.23	.819	-1.92	2.43
	t2 AAF X Discussion Posts	-3.20	1.21	-2.64	.009	-5.60	-.80
	Department Major X Discussion Posts	-.03	.43	-.08	.938	-.89	.82
	t2 AAF X Department Major X Discussion Posts	.95	.46	2.09	.039	.05	1.85
	Age	.07	.05	1.26	.211	-.04	.18
	Gender	.32	.73	.44	.664	-1.13	1.76
Model Summary	*F*(9,108) = 2.15, *p* = .031, R^2 = .15.						
Total Course Points (n = 120)	Constant	190.81	18.42	10.36	.000	154.31	227.31
	Department Major	9.67	4.15	2.33	.022	1.44	17.90
	t2 AAF	36.03	9.67	3.72	.000	16.86	55.20
	t2 AAF X Department Major	-9.47	3.80	-2.49	.014	-17.01	-1.93
	Discussion Posts	10.25	9.03	1.14	.259	-7.64	28.15
	t2 AAF X Discussion Posts	-20.89	10.05	-2.08	.040	-40.80	-.98
	Department Major X Discussion Posts	-5.47	3.56	-1.54	.127	-12.52	1.58
	t2 AAF X Department Major X Discussion Posts	5.48	3.79	1.44	.151	-2.04	13.00
	Age	-.17	.45	-.38	.706	-1.07	.72
	Gender	-1.81	6.17	-.29	.769	-14.03	10.41
Model Summary	*F*(9,110) = 3.13, *p* = .002, R^2 = .20.						
Quiz Points (n = 120)	Constant	159.50	17.09	9.33	.000	125.63	193.38
	Department Major	6.92	3.84	1.80	.070	-.70	14.53
	t2 AAR	25.30	8.90	2.84	.010	7.67	42.94
	t2 AAR X Department Major	-7.57	3.48	-2.18	.030	-14.46	-.68
	Discussion Posts	11.26	8.60	1.31	.190	-5.79	28.31
	t2 AAR X Discussion Posts	-12.21	10.45	-1.17	.250	-32.93	8.50

	Department Major X Discussion Posts	-4.94	3.40	-1.45	.150	-11.67	1.79
	t2 AAR X Department Major X Discussion Posts	4.81	4.07	1.18	.240	-3.26	12.88
	Age	-.24	.42	-.58	.570	-1.07	.59
	Gender	-.80	5.75	-.14	.890	-12.19	10.59
Model Summary	$F(9,110) = 1.72$, $p = .092$, $R^2 = .12$.						
Discussion Points (n = 66)	Constant	4.94	6.19	.80	.428	-7.45	17.33
	Department Major	-1.24	2.11	-.59	.558	-5.47	2.98
	t2 AAR	-3.15	8.85	-.36	.723	-20.87	14.58
	t2 AAR X Department Major	.33	3.46	.10	.924	-6.60	7.26
	Discussion Posts	7.69	3.40	2.26	.028	.88	14.49
	t2 AAR X Discussion Posts	5.60	5.74	.98	.334	-5.90	17.10
	Department Major X Discussion Posts	.83	1.38	.60	.550	-1.93	3.59
	t2 AAR X Department Major X Discussion Posts	-1.38	2.25	-.61	.541	-5.88	3.12
	Age	.01	.12	.06	.956	-.23	.25
	Gender	-1.07	1.59	-.67	.503	-4.26	2.11
Model Summary	$F(9,56) = 9.27$, $p < .001$, $R^2 = .60$.						
Final Exam (n = 118)	Constant	29.73	2.29	13.00	.000	25.20	34.27
	Department Major	-.15	.55	-.27	.790	-1.24	.94
	t2 AAR	2.73	1.29	2.11	.040	.17	5.29
	t2 AAR X Department Major	-.81	.49	-1.65	.100	-1.79	.16
	Discussion Posts	.38	1.19	.32	.750	-1.98	2.74
	t2 AAR X Discussion Posts	-2.38	1.43	-1.67	.100	-5.22	.45
	Department Major X Discussion Posts	-.11	.47	-.24	.810	-1.04	.81
	t2 AAR X Department Major X Discussion Posts	.74	.55	1.33	.190	-.36	1.84
	Age	.07	.06	1.16	.250	-.05	.18
	Gender	.53	.77	.68	.500	-1.00	2.06
Model Summary	$F(9,108) = .95$, $p = .489$, $R^2 = .07$.						
Total Course Points (n = 120)	Constant	187.73	19.03	9.87	.000	150.01	225.44
	Department Major	9.62	4.28	2.25	.026	1.14	18.10
	t2 AAR	33.14	9.90	3.35	.001	13.51	52.76
	t2 AAR X Department Major	-10.08	3.87	-2.60	.011	-17.75	-2.40

	Discussion Posts	9.59	9.58	1.00	.319	-9.39	28.57
	t2 AAR X Discussion Posts	-18.25	11.64	-1.57	.120	-41.31	4.81
	Department Major X Discussion Posts	-5.72	3.78	-1.51	.133	-13.22	1.77
	t2 AAR X Department Major X Discussion Posts	6.55	4.53	1.44	.151	-2.44	15.53
	Age	-.14	.46	-.30	.764	-1.06	.78
	Gender	.47	6.40	.07	.942	-12.21	13.15
Model Summary	*F*(9,110) = 2.33, *p* = .019, R^2 = .16.						
Quiz Points (n = 120)	Constant	154.91	15.81	9.80	.000	123.57	186.25
	Department Major	8.26	3.56	2.32	.022	1.20	15.32
	t2 HT	31.81	8.41	3.78	.000	15.14	48.48
	t2 HT X Department Major	-6.53	3.14	-2.08	.040	-12.74	-.31
	Discussion Posts	14.69	7.69	1.91	.059	-.55	29.93
	t2 HT X Discussion Posts	-26.72	8.51	-3.14	.002	-43.60	-9.85
	Department Major X Discussion Posts	-5.33	3.01	-1.77	.080	-11.31	.64
	t2 HT X Department Major X Discussion Posts	5.92	3.08	1.92	.057	-.19	12.04
	Age	-.48	.39	-1.23	.223	-1.25	.29
	Gender	1.44	5.23	.27	.784	-8.92	11.79
Model Summary	*F*(9,110) = 4.03, *p* < .001, R^2 = .25.						
Discussion Points (n = 66)	Constant	10.64	7.49	1.42	.161	-4.36	25.64
	Department Major	-1.58	2.51	-.63	.531	-6.60	3.44
	t2 HT	12.16	10.01	1.21	.230	-7.90	32.22
	t2 HT X Department Major	-4.84	4.32	-1.12	.267	-13.49	3.81
	Discussion Posts	7.74	3.63	2.13	.037	.48	15.00
	t2 HT X Discussion Posts	-9.82	5.81	-1.69	.097	-21.46	1.82
	Department Major X Discussion Posts	.70	1.49	.47	.640	-2.28	3.68
	t2 HT X Department Major X Discussion Posts	3.99	2.42	1.65	.105	-.86	8.84
	Age	-.07	.12	-.57	.571	-.31	.17
	Gender	-2.44	1.66	-1.47	.147	-5.76	.88
Model Summary	*F*(9,56) = 9.33, *p* < .001, R^2 = .60.						
Final Exam (n = 118)	Constant	29.11	2.19	13.29	.000	24.77	33.46
	Department Major	-.01	.53	-.02	.986	-1.05	1.03

	t2 HT	3.04	1.28	2.37	.020	.50	5.59
	t2 HT X Department Major	-.55	.47	-1.18	.240	-1.48	.37
	Discussion Posts	.48	1.10	.43	.665	-1.71	2.67
	t2 HT X Discussion Posts	-2.26	1.22	-1.85	.067	-4.69	.16
	Department Major X Discussion Posts	-.07	.43	-.17	.863	-.92	.78
	t2 HT X Department Major X Discussion Posts	.45	.44	1.02	.309	-.42	1.32
	Age	.04	.05	.77	.443	-.07	.15
	Gender	.82	.72	1.13	.262	-.62	2.25
Model Summary	$F(9,108) = 2.10$, $p = .035$, $R^2 = .15$.						
Total Course Points (n = 120)	Constant	181.23	17.71	10.24	.000	146.14	216.32
	Department Major	10.98	3.99	2.75	.007	3.08	18.89
	t2 HT	37.59	9.42	3.99	.000	18.92	56.25
	t2 HT X Department Major	-7.96	3.51	-2.27	.025	-14.92	-1.00
	Discussion Posts	12.88	8.61	1.50	.138	-4.19	29.94
	t2 HT X Discussion Posts	-24.51	9.53	-2.57	.011	-43.41	-5.62
	Department Major X Discussion Posts	-6.05	3.38	-1.79	.076	-12.74	.64
	t2 HT X Department Major X Discussion Posts	4.92	3.45	1.43	.157	-1.92	11.77
	Age	-.38	.44	-.86	.392	-1.24	.49
	Gender	3.52	5.85	.60	.549	-8.08	15.11
Model Summary	$F(9,110) = 4.54$, $p < .001$, $R^2 = .27$.						
Quiz Points (n = 120)	Constant	160.16	16.51	9.70	.000	127.44	192.87
	Department Major	7.80	3.73	2.09	.039	.42	15.19
	t2 HTF	19.11	9.51	2.01	.047	.27	37.95
	t2 HTF X Department Major	-2.51	3.52	-.71	.477	-9.48	4.46
	Discussion Posts	13.63	8.06	1.69	.093	-2.34	29.60
	t2 HTF X Discussion Posts	-24.45	10.02	-2.44	.016	-44.31	-4.59
	Department Major X Discussion Posts	-5.29	3.16	-1.68	.097	-11.55	.97
	t2 HTF X Department Major X Discussion Posts	5.43	3.82	1.42	.159	-2.15	13.01
	Age	-.51	.41	-1.24	.218	-1.32	.30
	Gender	.81	5.47	.15	.883	-10.03	11.65
Model Summary	$F(9,110) = 2.61$, $p = .009$, $R^2 = .18$.						

Discussion Points (n = 66)	Constant	6.44	6.26	1.03	.308	-6.10	18.98
	Department Major	-.34	2.08	-.16	.870	-4.51	3.82
	t2 HTF	8.21	8.13	1.01	.317	-8.09	24.50
	t2 HTF X Department Major	-3.14	3.50	-.90	.373	-10.16	3.87
	Discussion Posts	9.71	3.25	2.99	.004	3.20	16.22
	t2 HTF X Discussion Posts	-10.19	5.02	-2.03	.047	-20.24	-.14
	Department Major X Discussion Posts	-.07	1.30	-.06	.956	-2.68	2.53
	t2 HTF X Department Major X Discussion Posts	3.95	2.14	1.85	.070	-.33	8.23
	Age	-.04	.12	-.31	.761	-.27	.20
	Gender	-2.28	1.63	-1.39	.169	-5.55	1.00
Model Summary	$F(9,56) = 10.17$, $p < .001$, $R^2 = .62$.						
Final Exam (n = 118)	Constant	29.59	2.22	13.35	.000	25.20	33.98
	Department Major	-.16	.53	-.31	.760	-1.21	.88
	t2 HTF	2.55	1.31	1.95	.050	-.05	5.15
	t2 HTF X Department Major	-.45	.48	-.92	.360	-1.40	.51
	Discussion Posts	.21	1.11	.19	.850	-1.99	2.41
	t2 HTF X Discussion Posts	-1.72	1.35	-1.27	.210	-4.40	.96
	Department Major X Discussion Posts	-.02	.43	-.05	.960	-.88	.84
	t2 HTF X Department Major X Discussion Posts	.28	.52	.54	.590	-.74	1.30
	Age	.05	.06	.85	.400	-.06	.16
	Gender	.86	.73	1.16	.250	-.60	2.31
Model Summary	$F(9,108) = 1.67$, $p = .105$, $R^2 = .12$.						
Total Course Points (n = 120)	Constant	187.68	18.85	9.96	.000	150.33	225.03
	Department Major	10.24	4.25	2.41	.018	1.81	18.67
	t2 HTF	19.38	10.85	1.79	.077	-2.13	40.89
	t2 HTF X Department Major	-2.20	4.02	-.55	.584	-10.17	5.76
	Discussion Posts	10.88	9.20	1.18	.240	-7.35	29.11
	t2 HTF X Discussion Posts	-18.75	11.44	-1.64	.104	-41.43	3.93
	Department Major X Discussion Posts	-5.79	3.60	-1.61	.111	-12.93	1.36
	t2 HTF X Department Major X Discussion Posts	3.38	4.37	.77	.440	-5.27	12.04
	Age	-.41	.47	-.88	.380	-1.34	.51

	Gender	3.04	6.25	.49	.627	-9.34	15.42
Model Summary	$F(9,110) = 2.49$, $p = .013$, $R^2 = .17$.						
Quiz Points (n = 120)	Constant	153.30	16.50	9.29	.000	120.60	186.01
	Department Major	7.08	3.70	1.91	.058	-.25	14.41
	t2 HTR	30.36	8.40	3.61	.001	13.71	47.01
	t2 HTR X Department Major	-7.79	3.34	-2.33	.022	-14.41	-1.17
	Discussion Posts	12.45	7.99	1.56	.122	-3.38	28.28
	t2 HTR X Discussion Posts	-17.05	7.92	-2.15	.034	-32.75	-1.36
	Department Major X Discussion Posts	-4.79	3.15	-1.52	.131	-11.03	1.44
	t2 HTR X Department Major X Discussion Posts	3.92	2.89	1.36	.177	-1.80	9.64
	Age	-.27	.41	-.66	.513	-1.07	.54
	Gender	1.51	5.45	.28	.782	-9.29	12.30
Model Summary	$F(9,110) = 2.70$, $p = .007$, $R^2 = .18$.						
Discussion Points (n = 66)	Constant	9.78	7.50	1.30	.197	-5.24	24.81
	Department Major	-2.19	2.64	-.83	.411	-7.47	3.10
	t2 HTR	8.25	8.33	.99	.326	-8.43	24.93
	t2 HTR X Department Major	-4.15	3.67	-1.13	.263	-11.50	3.20
	Discussion Posts	7.44	3.76	1.98	.053	-.10	14.98
	t2 HTR X Discussion Posts	-4.30	4.75	-.90	.370	-13.82	5.23
	Department Major X Discussion Posts	1.03	1.57	.66	.514	-2.11	4.17
	t2 HTR X Department Major X Discussion Posts	2.47	2.01	1.23	.224	-1.55	6.49
	Age	-.03	.12	-.22	.830	-.27	.22
	Gender	-2.19	1.62	-1.35	.183	-5.44	1.06
Model Summary	$F(9,56) = 8.85$, $p < .001$, $R^2 = .59$.						
Final Exam (n = 118)	Constant	29.06	2.28	12.76	.000	24.55	33.57
	Department Major	-.12	.55	-.21	.830	-1.21	.97
	t2 HTR	1.98	1.39	1.43	.160	-.77	4.73
	t2 HTR X Department Major	-.32	.52	-.62	.540	-1.36	.71
	Discussion Posts	.24	1.15	.21	.830	-2.04	2.52
	t2 HTR X Discussion Posts	-1.46	1.18	-1.24	.220	-3.79	.88
	Department Major X Discussion Posts	-.01	.45	-.01	.990	-.89	.88

	t2 HTR X Department Major X Discussion Posts	.27	.42	.65	.520	-.56	1.11
	Age	.06	.06	1.05	.300	-.05	.17
	Gender	.80	.75	1.07	.290	-.68	2.29
Model Summary	F(9,108) = 1.11, p = .362, R^2 = .08.						
Total Course Points (n = 120)	Constant	179.49	18.05	9.94	.000	143.72	215.26
	Department Major	9.80	4.04	2.42	.017	1.79	17.82
	t2 HTR	39.00	9.19	4.24	.000	20.79	57.20
	t2 HTR X Department Major	-10.34	3.65	-2.83	.005	-17.58	-3.10
	Discussion Posts	10.78	8.74	1.23	.220	-6.53	28.10
	t2 HTR X Discussion Posts	-18.98	8.66	-2.19	.031	-36.14	-1.81
	Department Major X Discussion Posts	-5.52	3.44	-1.60	.112	-12.34	1.30
	t2 HTR X Department Major X Discussion Posts	4.27	3.16	1.35	.179	-1.99	10.52
	Age	-.15	.44	-.34	.736	-1.03	.73
	Gender	3.39	5.96	.57	.571	-8.42	15.19
Model Summary	F(9,110) = 3.91, p < .001, R^2 = .24.						
Quiz Points (n = 120)	Constant	155.15	16.67	9.31	.000	122.11	188.20
	Department Major	6.58	3.72	1.77	.080	-.79	13.94
	t2 LU	19.66	7.69	2.56	.012	4.41	34.90
	t2 LU X Department Major	-3.91	3.18	-1.23	.221	-10.21	2.39
	Discussion Posts	11.44	8.07	1.42	.159	-4.55	27.42
	t2 LU X Discussion Posts	-10.44	9.16	-1.14	.257	-28.60	7.72
	Department Major X Discussion Posts	-4.58	3.17	-1.44	.151	-10.85	1.70
	t2 LU X Department Major X Discussion Posts	1.66	3.59	.46	.644	-5.45	8.77
	Age	-.24	.41	-.58	.562	-1.05	.57
	Gender	1.49	5.61	.26	.792	-9.64	12.61
Model Summary	F(9,110) = 2.49, p = .013, R^2 = .17.						
Discussion Points (n = 66)	Constant	7.58	7.93	.96	.343	-8.29	23.46
	Department Major	-1.94	2.63	-.74	.463	-7.21	3.33
	t2 LU	4.32	5.47	.79	.433	-6.64	15.28
	t2 LU X Department Major	-2.08	2.57	-.81	.422	-7.23	3.07
	Discussion Posts	7.16	4.17	1.72	.091	-1.19	15.52

	t2 LU X Discussion Posts	.03	3.47	.01	.994	-6.92	6.98
	Department Major X Discussion Posts	.96	1.60	.60	.551	-2.24	4.16
	t2 LU X Department Major X Discussion Posts	.57	1.56	.36	.719	-2.56	3.69
	Age	.04	.13	.31	.759	-.22	.29
	Gender	-1.76	1.67	-1.05	.298	-5.11	1.59
Model Summary	$F(9,56) = 8.43$, $p < .001$, $R^2 = .58$.						
Final Exam (n = 118)	Constant	28.92	2.24	12.88	.000	24.47	33.36
	Department Major	-.21	.53	-.40	.690	-1.26	.84
	t2 LU	1.27	1.15	1.10	.270	-1.02	3.55
	t2 LU X Department Major	-.07	.46	-.15	.880	-.99	.85
	Discussion Posts	.09	1.12	.08	.940	-2.13	2.30
	t2 LU X Discussion Posts	-1.08	1.26	-.86	.390	-3.59	1.42
	Department Major X Discussion Posts	.02	.44	.04	.970	-.85	.88
	t2 LU X Department Major X Discussion Posts	.26	.49	.53	.600	-.71	1.24
	Age	.07	.06	1.18	.240	-.04	.18
	Gender	1.03	.76	1.36	.180	-.47	2.53
Model Summary	$F(9,108) = 1.50$, $p = .158$, $R^2 = .11$.						
Total Course Points (n = 120)	Constant	182.38	18.64	9.79	.000	145.44	219.31
	Department Major	9.14	4.16	2.20	.030	.90	17.37
	t2 LU	22.32	8.60	2.60	.011	5.29	39.36
	t2 LU X Department Major	-4.40	3.55	-1.24	.218	-11.44	2.64
	Discussion Posts	9.20	9.02	1.02	.310	-8.67	27.06
	t2 LU X Discussion Posts	-12.73	10.24	-1.24	.217	-33.02	7.57
	Department Major X Discussion Posts	-5.15	3.54	-1.45	.149	-12.17	1.87
	t2 LU X Department Major X Discussion Posts	2.35	4.01	.59	.559	-5.59	10.29
	Age	-.14	.46	-.30	.764	-1.04	.77
	Gender	3.51	6.28	.56	.577	-8.93	15.95
Model Summary	$F(9,110) = 3.00$, $p = .003$, $R^2 = .20$.						
Quiz Points (n = 120)	Constant	158.69	16.01	9.91	.000	126.97	190.42
	Department Major	5.55	3.71	1.50	.138	-1.81	12.91
	t2 LUF	27.20	8.38	3.24	.002	10.58	43.81

	t2 LUF X Department Major	-5.39	3.38	-1.59	.114	-12.09	1.31
	Discussion Posts	8.82	7.90	1.12	.267	-6.83	24.48
	t2 LUF X Discussion Posts	-16.70	8.43	-1.98	.050	-33.40	.00
	Department Major X Discussion Posts	-4.12	3.09	-1.33	.186	-10.25	2.01
	t2 LUF X Department Major X Discussion Posts	3.96	3.42	1.16	.249	-2.81	10.73
	Age	-.08	.39	-.21	.831	-.86	.69
	Gender	.46	5.30	.09	.931	-10.04	10.96
Model Summary	$F(9,110) = 3.88$, $p < .001$, $R^2 = .24$.						
Discussion Points (n = 66)	Constant	7.87	9.12	.86	.392	-10.41	26.15
	Department Major	-1.28	3.19	-.40	.689	-7.67	5.10
	t2 LUF	3.73	5.86	.64	.527	-8.00	15.47
	t2 LUF X Department Major	-1.58	2.78	-.57	.573	-7.16	4.00
	Discussion Posts	8.00	4.76	1.68	.098	-1.53	17.53
	t2 LUF X Discussion Posts	-3.81	3.47	-1.10	.276	-10.76	3.13
	Department Major X Discussion Posts	.41	1.86	.22	.829	-3.33	4.14
	t2 LUF X Department Major X Discussion Posts	1.79	1.63	1.09	.279	-1.49	5.06
	Age	-.02	.13	-.18	.858	-.28	.23
	Gender	-1.53	1.73	-.89	.379	-4.99	1.93
Model Summary	$F(9,56) = 8.16$, $p < .001$, $R^2 = .57$.						
Final Exam (n = 118)	Constant	29.44	2.28	12.94	.000	24.93	33.94
	Department Major	-.19	.55	-.34	.730	-1.28	.90
	t2 LUF	1.41	1.24	1.13	.260	-1.06	3.88
	t2 LUF X Department Major	-.19	.50	-.38	.700	-1.17	.79
	Discussion Posts	-.11	1.15	-.10	.920	-2.39	2.17
	t2 LUF X Discussion Posts	-1.06	1.21	-.88	.380	-3.47	1.34
	Department Major X Discussion Posts	.01	.45	.03	.980	-.88	.90
	t2 LUF X Department Major X Discussion Posts	.36	.49	.74	.460	-.61	1.33
	Age	.07	.06	1.29	.200	-.04	.18
	Gender	.78	.76	1.03	.300	-.72	2.28
Model Summary	$F(9,108) = 1.22$, $p = .288$, $R^2 = .09$.						
Total Course Points (n = 120)	Constant	187.42	17.82	10.52	.000	152.10	222.74

	Department Major	7.50	4.13	1.81	.072	-.69	15.69
	t2 LUF	32.92	9.33	3.53	.001	14.42	51.42
	t2 LUF X Department Major	-6.92	3.76	-1.84	.069	-14.38	.54
	Discussion Posts	5.75	8.79	.65	.515	-11.68	23.17
	t2 LUF X Discussion Posts	-18.13	9.38	-1.93	.056	-36.72	.46
	Department Major X Discussion Posts	-4.35	3.44	-1.26	.209	-11.18	2.47
	t2 LUF X Department Major X Discussion Posts	3.83	3.80	1.01	.316	-3.70	11.37
	Age	.07	.44	.16	.876	-.80	.93
	Gender	1.91	5.90	.32	.747	-9.78	13.60
Model Summary	$F(9,110) = 4.58$, $p < .001$, $R^2 = .27$.						
Quiz Points (n = 120)	Constant	156.40	17.41	8.98	.000	121.90	190.90
	Department Major	6.91	3.90	1.77	.080	-.82	14.64
	t2 LUR	14.53	8.27	1.76	.080	-1.86	30.92
	t2 LUR X Department Major	-3.17	3.48	-.91	.360	-10.07	3.72
	Discussion Posts	11.51	8.40	1.37	.170	-5.14	28.16
	t2 LUR X Discussion Posts	-7.28	9.16	-.79	.430	-25.44	10.88
	Department Major X Discussion Posts	-4.74	3.30	-1.44	.150	-11.28	1.80
	t2 LUR X Department Major X Discussion Posts	.73	3.51	.21	.840	-6.23	7.69
	Age	-.30	.43	-.71	.480	-1.15	.55
	Gender	1.20	5.87	.20	.840	-10.44	12.84
Model Summary	$F(9,110) = 1.31$, $p = .242$, $R^2 = .10$.						
Discussion Points (n = 66)	Constant	3.50	7.14	.49	.625	-10.80	17.81
	Department Major	-1.00	2.30	-.44	.664	-5.60	3.60
	t2 LUR	2.00	5.86	.34	.734	-9.74	13.74
	t2 LUR X Department Major	-1.14	2.38	-.48	.632	-5.91	3.62
	Discussion Posts	9.14	3.72	2.46	.017	1.69	16.58
	t2 LUR X Discussion Posts	2.85	3.79	.75	.454	-4.73	10.44
	Department Major X Discussion Posts	.37	1.44	.26	.799	-2.51	3.24
	t2 LUR X Department Major X Discussion Posts	-.53	1.50	-.35	.727	-3.54	2.48
	Age	.06	.12	.49	.629	-.19	.31
	Gender	-1.35	1.60	-.85	.402	-4.56	1.85

Model Summary	$F(9,56) = 9.19$, $p < .001$, $R^2 = .60$.						
Final Exam (n = 118)	Constant	29.08	2.26	12.85	.000	24.60	33.57
	Department Major	-.28	.53	-.53	.600	-1.34	.78
	t2 LUR	1.02	1.25	.82	.410	-1.46	3.50
	t2 LUR X Department Major	.01	.51	.03	.980	-1.00	1.03
	Discussion Posts	.01	1.12	.01	.990	-2.21	2.24
	t2 LUR X Discussion Posts	-.98	1.24	-.79	.430	-3.44	1.49
	Department Major X Discussion Posts	.06	.44	.14	.890	-.81	.93
	t2 LUR X Department Major X Discussion Posts	.11	.48	.24	.810	-.83	1.05
	Age	.06	.06	1.08	.280	-.05	.17
	Gender	1.04	.77	1.37	.170	-.47	2.56
Model Summary	$F(9,108) = 1.29$, $p = .249$, $R^2 = .10$.						
Total Course Points (n = 120)	Constant	183.22	19.55	9.37	.000	144.48	221.96
	Department Major	9.38	4.38	2.14	.030	.70	18.05
	t2 LUR	15.42	9.29	1.66	.100	-2.98	33.82
	t2 LUR X Department Major	-3.10	3.91	-.79	.430	-10.85	4.65
	Discussion Posts	9.26	9.44	.98	.330	-9.44	27.96
	t2 LUR X Discussion Posts	-8.99	10.29	-.87	.380	-29.39	11.40
	Department Major X Discussion Posts	-5.26	3.70	-1.42	.160	-12.60	2.08
	t2 LUR X Department Major X Discussion Posts	1.52	3.94	.39	.700	-6.29	9.34
	Age	-.21	.48	-.43	.670	-1.16	.74
	Gender	3.61	6.60	.55	.590	-9.46	16.68
Model Summary	$F(9,110) = 1.65$, $p = .110$, $R^2 = .12$.						
Quiz Points (n = 120)	Constant	168.93	16.79	10.06	.000	135.66	202.20
	Department Major	4.70	3.75	1.25	.212	-2.73	12.13
	t2 PS	24.99	7.53	3.32	.001	10.07	39.91
	t2 PS X Department Major	-6.23	2.84	-2.19	.030	-11.86	-.60
	Discussion Posts	11.74	8.75	1.34	.182	-5.60	29.08
	t2 PS X Discussion Posts	-22.27	10.00	-2.23	.028	-42.08	-2.46
	Department Major X Discussion Posts	-4.69	3.39	-1.39	.168	-11.40	2.02
	t2 PS X Department Major X Discussion Posts	5.72	3.57	1.60	.112	-1.35	12.79

	Age	-.30	.41	-.73	.470	-1.11	.51
	Gender	-1.78	5.55	-.32	.748	-12.78	9.21
Model Summary	$F(9,110) = 2.34$, $p = .019$, $R^2 = .16$.						
Discussion Points (n = 66)	Constant	7.59	8.01	.95	.347	-8.46	23.63
	Department Major	-1.57	2.62	-.60	.552	-6.82	3.69
	t2 PS	3.97	7.20	.55	.584	-10.46	18.39
	t2 PS X Department Major	-1.22	3.10	-.40	.694	-7.43	4.98
	Discussion Posts	8.06	4.28	1.88	.065	-.53	16.64
	t2 PS X Discussion Posts	-3.09	4.39	-.70	.484	-11.89	5.70
	Department Major X Discussion Posts	.55	1.63	.34	.735	-2.71	3.82
	t2 PS X Department Major X Discussion Posts	1.01	1.79	.57	.574	-2.57	4.60
	Age	-.01	.13	-.09	.928	-.27	.24
	Gender	-1.40	1.71	-.82	.415	-4.83	2.02
Model Summary	$F(9,56) = 7.55$, $p < .001$, $R^2 = .55$.						
Final Exam (n = 118)	Constant	31.00	2.22	13.97	.000	26.60	35.40
	Department Major	-.53	.52	-1.01	.320	-1.56	.51
	t2 PS	3.44	1.15	2.98	.000	1.15	5.72
	t2 PS X Department Major	-.88	.42	-2.10	.040	-1.71	-.05
	Discussion Posts	-.14	1.18	-.12	.910	-2.49	2.21
	t2 PS X Discussion Posts	-2.38	1.36	-1.75	.080	-5.08	.32
	Department Major X Discussion Posts	.12	.46	.25	.800	-.79	1.02
	t2 PS X Department Major X Discussion Posts	.55	.48	1.15	.250	-.40	1.51
	Age	.07	.05	1.22	.220	-.04	.17
	Gender	.40	.73	.54	.590	-1.05	1.85
Model Summary	$F(9,108) = 1.92$, $p = .056$, $R^2 = .14$.						
Total Course Points (n = 120)	Constant	198.80	18.88	10.53	.000	161.38	236.22
	Department Major	6.83	4.22	1.62	.108	-1.52	15.19
	t2 PS	28.47	8.47	3.36	.001	11.69	45.25
	t2 PS X Department Major	-7.23	3.19	-2.26	.026	-13.56	-.90
	Discussion Posts	6.48	9.84	.66	.511	-13.02	25.98
	t2 PS X Discussion Posts	-17.77	11.24	-1.58	.117	-40.05	4.51

	Department Major X Discussion Posts	-4.40	3.81	-1.16	.250	-11.95	3.15
	t2 PS X Department Major X Discussion Posts	4.52	4.01	1.13	.263	-3.44	12.47
	Age	-.19	.46	-.41	.679	-1.10	.72
	Gender	-.47	6.24	-.08	.940	-12.84	11.90
Model Summary	$F(9,110) = 2.66$, $p = .008$, $R^2 = .18$.						
Quiz Points (n = 120)	Constant	168.09	16.14	10.42	.000	136.11	200.07
	Department Major	4.26	3.59	1.19	.238	-2.86	11.39
	t2 PSF	32.33	7.86	4.11	.000	16.75	47.90
	t2 PSF X Department Major	-7.90	2.83	-2.79	.006	-13.51	-2.30
	Discussion Posts	12.18	8.20	1.49	.140	-4.07	28.44
	t2 PSF X Discussion Posts	-32.43	9.49	-3.42	.001	-51.24	-13.62
	Department Major X Discussion Posts	-4.60	3.19	-1.44	.152	-10.91	1.71
	t2 PSF X Department Major X Discussion Posts	7.90	3.13	2.52	.013	1.69	14.11
	Age	-.22	.39	-.55	.585	-.99	.56
	Gender	-1.48	5.33	-.28	.782	-12.05	9.09
Model Summary	$F(9,110) = 3.62$, $p = .001$, $R^2 = .23$.						
Discussion Points (n = 66)	Constant	8.12	7.95	1.02	.311	-7.81	24.05
	Department Major	-1.89	2.61	-.72	.472	-7.11	3.33
	t2 PSF	4.47	7.68	.58	.563	-10.91	19.85
	t2 PSF X Department Major	-1.20	2.98	-.40	.690	-7.17	4.78
	Discussion Posts	7.38	4.29	1.72	.090	-1.20	15.97
	t2 PSF X Discussion Posts	-2.80	4.56	-.61	.542	-11.94	6.33
	Department Major X Discussion Posts	.84	1.61	.52	.605	-2.38	4.06
	t2 PSF X Department Major X Discussion Posts	.72	1.69	.42	.673	-2.66	4.10
	Age	.00	.13	-.02	.982	-.26	.26
	Gender	-1.35	1.70	-.79	.431	-4.74	2.05
Model Summary	$F(9,56) = 7.55$, $p < .001$, $R^2 = .55$.						
Final Exam (n = 118)	Constant	30.71	2.21	13.87	.000	26.32	35.10
	Department Major	-.53	.52	-1.02	.311	-1.56	.50
	t2 PSF	3.96	1.23	3.23	.002	1.53	6.39
	t2 PSF X Department Major	-1.04	.43	-2.43	.017	-1.89	-.19

	Discussion Posts	-.04	1.15	-.04	.971	-2.33	2.25
	t2 PSF X Discussion Posts	-3.30	1.34	-2.46	.015	-5.97	-.64
	Department Major X Discussion Posts	.08	.45	.18	.859	-.80	.96
	t2 PSF X Department Major X Discussion Posts	.84	.44	1.91	.059	-.03	1.72
	Age	.07	.05	1.34	.182	-.03	.18
	Gender	.52	.73	.71	.478	-.93	1.97
Model Summary	$F(9,108) = 2.02$, $p = .044$, $R^2 = .14$.						
Total Course Points (n = 120)	Constant	198.69	18.34	10.84	.000	162.36	235.03
	Department Major	6.44	4.08	1.58	.117	-1.65	14.53
	t2 PSF	36.95	8.93	4.14	.000	19.26	54.65
	t2 PSF X Department Major	-9.25	3.21	-2.88	.005	-15.62	-2.88
	Discussion Posts	7.33	9.32	.79	.433	-11.14	25.79
	t2 PSF X Discussion Posts	-28.36	10.78	-2.63	.010	-49.74	-6.99
	Department Major X Discussion Posts	-4.55	3.62	-1.26	.211	-11.72	2.62
	t2 PSF X Department Major X Discussion Posts	6.98	3.56	1.96	.053	-.08	14.04
	Age	-.14	.45	-.32	.752	-1.03	.74
	Gender	-.14	6.06	-.02	.981	-12.15	11.87
Model Summary	$F(9,110) = 3.64$, $p = .001$, $R^2 = .23$.						
Quiz Points (n = 120)	Constant	164.80	17.59	9.37	.000	129.95	199.66
	Department Major	5.41	3.92	1.38	.170	-2.36	13.19
	t2 PSR	17.55	8.96	1.96	.050	-.21	35.32
	t2 PSR X Department Major	-5.24	3.69	-1.42	.160	-12.54	2.07
	Discussion Posts	9.44	8.83	1.07	.290	-8.06	26.94
	t2 PSR X Discussion Posts	-12.10	10.36	-1.17	.250	-32.63	8.42
	Department Major X Discussion Posts	-4.17	3.43	-1.22	.230	-10.98	2.63
	t2 PSR X Department Major X Discussion Posts	4.48	4.12	1.09	.280	-3.68	12.64
	Age	-.25	.43	-.58	.570	-1.10	.60
	Gender	-1.10	5.84	-.19	.850	-12.67	10.47
Model Summary	$F(9,110) = .99$, $p = .453$, $R^2 = .07$.						
Discussion Points (n = 66)	Constant	7.82	7.93	.99	.329	-8.07	23.71
	Department Major	-1.44	2.61	-.55	.584	-6.66	3.79

	t2 PSR	5.70	7.86	.72	.472	-10.05	21.45
	t2 PSR X Department Major	-2.60	3.55	-.73	.468	-9.72	4.52
	Discussion Posts	8.52	4.04	2.11	.040	.42	16.62
	t2 PSR X Discussion Posts	-5.12	4.75	-1.08	.286	-14.64	4.41
	Department Major X Discussion Posts	.44	1.59	.28	.783	-2.75	3.64
	t2 PSR X Department Major X Discussion Posts	2.32	2.09	1.11	.273	-1.87	6.51
	Age	-.01	.13	-.09	.927	-.26	.24
	Gender	-1.89	1.68	-1.13	.265	-5.24	1.47
Model Summary	$F(9,56) = 7.91$, $p < .001$, $R^2 = .56$.						
Final Exam (n = 118)	Constant	30.49	2.28	13.39	.000	25.97	35.00
	Department Major	-.46	.54	-.86	.390	-1.52	.60
	t2 PSR	2.18	1.31	1.67	.100	-.41	4.77
	t2 PSR X Department Major	-.50	.52	-.96	.340	-1.54	.54
	Discussion Posts	-.36	1.17	-.31	.760	-2.69	1.96
	t2 PSR X Discussion Posts	-.66	1.38	-.48	.640	-3.40	2.08
	Department Major X Discussion Posts	.17	.45	.38	.710	-.73	1.07
	t2 PSR X Department Major X Discussion Posts	.04	.55	.08	.940	-1.04	1.12
	Age	.07	.06	1.20	.230	-.04	.18
	Gender	.54	.76	.72	.470	-.96	2.04
Model Summary	$F(9,108) = 1.16$, $p = .327$, $R^2 = .09$.						
Total Course Points (n = 120)	Constant	193.35	19.70	9.81	.000	154.30	232.40
	Department Major	7.64	4.40	1.74	.080	-1.07	16.35
	t2 PSR	19.71	10.04	1.96	.050	-.19	39.61
	t2 PSR X Department Major	-5.83	4.13	-1.41	.160	-14.01	2.36
	Discussion Posts	5.45	9.89	.55	.580	-14.15	25.06
	t2 PSR X Discussion Posts	-8.44	11.61	-.73	.470	-31.44	14.56
	Department Major X Discussion Posts	-4.19	3.85	-1.09	.280	-11.82	3.43
	t2 PSR X Department Major X Discussion Posts	3.01	4.61	.65	.510	-6.13	12.15
	Age	-.14	.48	-.28	.780	-1.09	.82
	Gender	.62	6.54	.09	.930	-12.34	13.58
Model Summary	$F(9,110) = 1.38$, $p = .205$, $R^2 = .10$.						

Quiz Points (n = 120)	Constant	165.21	16.00	10.33	.000	133.50	196.91
	College Major	6.35	3.55	1.79	.076	-.67	13.38
	t2 CT	25.22	7.25	3.48	.001	10.84	39.59
	t2 CT X College Major	-5.42	3.03	-1.79	.077	-11.43	.59
	Discussion Posts	11.96	7.25	1.65	.102	-2.40	26.33
	t2 CT X Discussion Posts	-17.05	8.50	-2.01	.047	-33.89	-.21
	College Major X Discussion Posts	-4.91	2.94	-1.67	.098	-10.74	.92
	t2 CT X College Major X Discussion Posts	3.50	3.06	1.14	.256	-2.57	9.57
	Age	-.25	.40	-.64	.524	-1.04	.53
	Gender	-3.01	5.50	-.55	.586	-13.91	7.89
Model Summary	$F(9,110) = 3.25$, $p = .002$, $R^2 = .21$.						
Discussion Points (n = 66)	Constant	6.53	7.90	.83	.412	-9.29	22.35
	College Major	-.91	2.39	-.38	.704	-5.70	3.87
	t2 CT	4.23	6.09	.69	.490	-7.97	16.43
	t2 CT X College Major	-2.36	2.84	-.83	.410	-8.06	3.33
	Discussion Posts	7.91	3.66	2.16	.035	.59	15.23
	t2 CT X Discussion Posts	-1.16	3.80	-.30	.762	-8.77	6.46
	College Major X Discussion Posts	.59	1.42	.42	.678	-2.25	3.43
	t2 CT X College Major X Discussion Posts	1.21	1.66	.73	.469	-2.12	4.54
	Age	.00	.13	.03	.973	-.25	.26
	Gender	-2.12	1.92	-1.11	.272	-5.96	1.71
Model Summary	$F(9,56) = 8.14$, $p < .001$, $R^2 = .57$.						
Final Exam (n = 118)	Constant	29.85	2.12	14.09	.000	25.65	34.05
	College Major	-.09	.49	-.19	.851	-1.07	.88
	t2 CT	2.71	1.09	2.48	.015	.54	4.87
	t2 CT X College Major	-.51	.44	-1.17	.246	-1.39	.36
	Discussion Posts	.77	1.00	.77	.441	-1.20	2.74
	t2 CT X Discussion Posts	-1.21	1.18	-1.03	.307	-3.54	1.12
	College Major X Discussion Posts	-.24	.40	-.60	.549	-1.04	.55
	t2 CT X College Major X Discussion Posts	.05	.42	.13	.899	-.78	.89
	Age	.07	.05	1.24	.217	-.04	.17

	Gender	.29	.74	.39	.697	-1.17	1.75
Model Summary	$F(9,108) = 2.58$, $p = .010$, $R^2 = .18$.						
Total Course Points (n = 120)	Constant	194.03	17.81	10.89	.000	158.73	229.33
	College Major	8.70	3.95	2.20	.030	.88	16.52
	t2 CT	30.60	8.08	3.79	.000	14.59	46.61
	t2 CT X College Major	-6.99	3.38	-2.07	.041	-13.69	-.30
	Discussion Posts	10.18	8.07	1.26	.210	-5.82	26.18
	t2 CT X Discussion Posts	-18.96	9.46	-2.00	.048	-37.72	-.21
	College Major X Discussion Posts	-5.81	3.28	-1.77	.079	-12.31	.68
	t2 CT X College Major X Discussion Posts	4.17	3.41	1.22	.224	-2.59	10.93
	Age	-.12	.44	-.27	.790	-.99	.75
	Gender	-1.77	6.12	-.29	.773	-13.91	10.37
Model Summary	$F(9,110) = 3.90$, $p < .001$, $R^2 = .24$.						
Quiz Points (n = 120)	Constant	166.69	15.47	10.78	.000	136.04	197.35
	College Major	6.32	3.44	1.83	.069	-.51	13.15
	t2 CTF	31.34	7.80	4.02	.000	15.87	46.80
	t2 CTF X College Major	-7.35	3.21	-2.29	.024	-13.71	-.99
	Discussion Posts	13.27	7.34	1.81	.073	-1.28	27.82
	t2 CTF X Discussion Posts	-22.73	8.18	-2.78	.006	-38.93	-6.52
	College Major X Discussion Posts	-5.39	2.96	-1.82	.072	-11.26	.49
	t2 CTF X College Major X Discussion Posts	4.66	2.98	1.56	.121	-1.25	10.57
	Age	-.20	.38	-.53	.596	-.96	.55
	Gender	-3.71	5.30	-.70	.485	-14.22	6.80
Model Summary	$F(9,110) = 4.21$, $p < .001$, $R^2 = .26$.						
Discussion Points (n = 66)	Constant	4.76	7.50	.63	.528	-10.26	19.78
	College Major	-.14	2.27	-.06	.953	-4.68	4.41
	t2 CTF	1.90	5.18	.37	.715	-8.47	12.27
	t2 CTF X College Major	-.71	2.21	-.32	.749	-5.14	3.72
	Discussion Posts	9.61	3.74	2.57	.013	2.11	17.11
	t2 CTF X Discussion Posts	-1.78	3.31	-.54	.593	-8.42	4.86
	College Major X Discussion Posts	-.11	1.41	-.08	.937	-2.94	2.72

	t2 CTF X College Major X Discussion Posts	.82	1.38	.59	.554	-1.95	3.59
	Age	-.03	.13	-.21	.835	-.28	.23
	Gender	-1.64	1.84	-.89	.378	-5.32	2.05
Model Summary	$F(9,56) = 7.65$, $p < .001$, $R^2 = .55$.						
Final Exam (n = 118)	Constant	30.12	2.11	14.29	.000	25.94	34.30
	College Major	-.11	.49	-.23	.821	-1.08	.86
	t2 CTF	3.31	1.18	2.81	.006	.98	5.64
	t2 CTF X College Major	-.77	.47	-1.63	.107	-1.70	.17
	Discussion Posts	.52	1.03	.50	.618	-1.52	2.55
	t2 CTF X Discussion Posts	-1.37	1.16	-1.19	.238	-3.67	.92
	College Major X Discussion Posts	-.17	.41	-.41	.686	-.99	.65
	t2 CTF X College Major X Discussion Posts	.15	.42	.36	.718	-.68	.99
	Age	.07	.05	1.33	.188	-.03	.17
	Gender	.22	.73	.30	.761	-1.22	1.66
Model Summary	$F(9,108) = 2.63$, $p = .009$, $R^2 = .18$.						
Total Course Points (n = 120)	Constant	195.86	17.39	11.26	.000	161.39	230.33
	College Major	8.70	3.87	2.25	.027	1.02	16.37
	t2 CTF	37.32	8.77	4.25	.000	19.93	54.71
	t2 CTF X College Major	-9.26	3.61	-2.57	.012	-16.41	-2.11
	Discussion Posts	11.28	8.25	1.37	.175	-5.08	27.63
	t2 CTF X Discussion Posts	-24.96	9.19	-2.71	.008	-43.18	-6.74
	College Major X Discussion Posts	-6.34	3.33	-1.90	.060	-12.94	.27
	t2 CTF X College Major X Discussion Posts	5.67	3.35	1.69	.094	-.98	12.32
	Age	-.07	.43	-.17	.862	-.92	.77
	Gender	-2.44	5.96	-.41	.683	-14.26	9.37
Model Summary	$F(9,110) = 4.58$, $p < .001$, $R^2 = .27$.						
Quiz Points (n = 120)	Constant	162.44	16.85	9.64	.000	129.04	195.83
	College Major	5.85	3.69	1.58	.120	-1.47	13.16
	t2 CTR	17.93	7.38	2.43	.020	3.31	32.55
	t2 CTR X College Major	-3.58	3.17	-1.13	.260	-9.86	2.70
	Discussion Posts	8.97	7.14	1.25	.210	-5.19	23.13

	t2 CTR X Discussion Posts	-9.02	7.90	-1.14	.260	-24.66	6.63
	College Major X Discussion Posts	-3.81	2.99	-1.27	.200	-9.73	2.11
	t2 CTR X College Major X Discussion Posts	1.94	2.95	.66	.510	-3.91	7.78
	Age	-.24	.42	-.57	.570	-1.06	.59
	Gender	-1.18	5.77	-.20	.840	-12.61	10.25
Model Summary	$F(9,110) = 1.84$, $p = .069$, $R^2 = .13$.						
Discussion Points (n = 66)	Constant	7.25	7.68	.94	.349	-8.14	22.65
	College Major	-1.94	2.41	-.81	.422	-6.77	2.88
	t2 CTR	6.04	6.18	.98	.333	-6.34	18.42
	t2 CTR X College Major	-3.66	2.78	-1.32	.192	-9.23	1.90
	Discussion Posts	7.00	3.47	2.02	.048	.05	13.94
	t2 CTR X Discussion Posts	-1.05	3.80	-.28	.783	-8.67	6.56
	College Major X Discussion Posts	1.17	1.41	.83	.409	-1.65	3.99
	t2 CTR X College Major X Discussion Posts	1.55	1.61	.96	.341	-1.68	4.78
	Age	.04	.12	.36	.720	-.20	.29
	Gender	-2.06	1.76	-1.17	.247	-5.60	1.47
Model Summary	$F(9,56) = 9.04$, $p < .001$, $R^2 = .59$.						
Final Exam (n = 118)	Constant	29.66	2.19	13.56	.000	25.32	33.99
	College Major	-.16	.50	-.31	.760	-1.15	.84
	t2 CTR	1.67	1.07	1.56	.120	-.45	3.80
	t2 CTR X College Major	-.16	.44	-.36	.720	-1.04	.72
	Discussion Posts	.70	.96	.73	.470	-1.20	2.60
	t2 CTR X Discussion Posts	-.79	1.07	-.74	.460	-2.90	1.33
	College Major X Discussion Posts	-.21	.40	-.54	.590	-1.00	.57
	t2 CTR X College Major X Discussion Posts	-.05	.40	-.13	.900	-.84	.73
	Age	.06	.05	1.13	.260	-.05	.17
	Gender	.50	.75	.66	.510	-.99	2.00
Model Summary	$F(9,108) = 1.81$, $p = .075$, $R^2 = .13$.						
Total Course Points (n = 120)	Constant	190.90	18.74	10.19	.000	153.77	228.03
	College Major	8.09	4.10	1.97	.051	-.04	16.23
	t2 CTR	22.52	8.20	2.75	.007	6.27	38.78

	t2 CTR X College Major	-4.82	3.52	-1.37	.174	-11.80	2.16
	Discussion Posts	7.45	7.94	.94	.350	-8.29	23.19
	t2 CTR X Discussion Posts	-10.74	8.78	-1.22	.224	-28.14	6.66
	College Major X Discussion Posts	-4.75	3.32	-1.43	.155	-11.33	1.83
	t2 CTR X College Major X Discussion Posts	2.34	3.28	.71	.477	-4.16	8.83
	Age	-.10	.46	-.21	.830	-1.02	.82
	Gender	.26	6.41	.04	.968	-12.45	12.97
Model Summary	$F(9,110) = 2.48$, $p = .013$, $R^2 = .17$.						
Quiz Points (n = 120)	Constant	166.28	16.87	9.86	.000	132.86	199.71
	College Major	3.50	3.68	.95	.340	-3.79	10.79
	t2 VR	15.69	8.30	1.89	.060	-.76	32.15
	t2 VR X College Major	-1.93	3.40	-.57	.570	-8.67	4.80
	Discussion Posts	5.69	7.26	.78	.430	-8.69	20.08
	t2 VR X Discussion Posts	-6.32	7.71	-.82	.410	-21.60	8.96
	College Major X Discussion Posts	-3.01	3.02	-.99	.320	-9.00	2.98
	t2 VR X College Major X Discussion Posts	-.24	2.96	-.08	.940	-6.11	5.63
	Age	-.11	.41	-.27	.790	-.93	.71
	Gender	-.58	6.02	-.10	.920	-12.51	11.35
Model Summary	$F(9,110) = 1.80$, $p = .076$, $R^2 = .13$.						
Discussion Points (n = 66)	Constant	5.32	7.77	.68	.497	-10.26	20.89
	College Major	-.82	2.35	-.35	.730	-5.53	3.90
	t2 VR	2.11	4.03	.52	.602	-5.97	10.20
	t2 VR X College Major	-1.04	1.82	-.57	.570	-4.70	2.61
	Discussion Posts	7.80	3.75	2.08	.042	.28	15.31
	t2 VR X Discussion Posts	.54	2.63	.20	.839	-4.73	5.80
	College Major X Discussion Posts	.63	1.43	.44	.663	-2.23	3.48
	t2 VR X College Major X Discussion Posts	.14	1.17	.12	.908	-2.22	2.49
	Age	.00	.13	.00	.998	-.25	.26
	Gender	-1.43	1.80	-.79	.431	-5.04	2.18
Model Summary	$F(9,56) = 7.94$, $p < .001$, $R^2 = .56$.						
Final Exam (n = 118)	Constant	30.01	2.16	13.88	.000	25.73	34.30

	College Major	-.53	.49	-1.07	.285	-1.50	.44
	t2 VR	.86	1.08	.80	.427	-1.28	3.01
	t2 VR X College Major	.28	.44	.64	.526	-.59	1.16
	Discussion Posts	.08	.95	.08	.937	-1.82	1.97
	t2 VR X Discussion Posts	-.36	1.00	-.36	.718	-2.34	1.61
	College Major X Discussion Posts	-.01	.40	-.01	.990	-.79	.78
	t2 VR X College Major X Discussion Posts	-.26	.38	-.68	.496	-1.02	.50
	Age	.07	.05	1.40	.165	-.03	.18
	Gender	.77	.78	.99	.326	-.77	2.30
Model Summary	$F(9,108) = 2.10$, $p = .035$, $R^2 = .15$.						
Total Course Points (n = 120)	Constant	196.27	18.85	10.41	.000	158.91	233.64
	College Major	5.30	4.11	1.29	.200	-2.84	13.45
	t2 VR	19.61	9.28	2.11	.037	1.21	38.00
	t2 VR X College Major	-2.86	3.80	-.75	.453	-10.39	4.67
	Discussion Posts	3.52	8.11	.43	.666	-12.56	19.60
	t2 VR X Discussion Posts	-8.70	8.62	-1.01	.315	-25.78	8.37
	College Major X Discussion Posts	-3.74	3.38	-1.11	.271	-10.43	2.96
	t2 VR X College Major X Discussion Posts	.38	3.31	.11	.910	-6.18	6.93
	Age	.04	.46	.08	.934	-.88	.96
	Gender	.69	6.73	.10	.919	-12.65	14.02
Model Summary	$F(9,110) = 2.28$, $p = .022$, $R^2 = .16$.						
Quiz Points (n = 120)	Constant	167.93	17.47	9.61	.000	133.30	202.56
	College Major	1.68	3.77	.44	.660	-5.80	9.15
	Zv2VRR	25.13	9.96	2.52	.010	5.40	44.86
	t2 VRF X College Major	-7.22	4.50	-1.60	.110	-16.15	1.70
	Discussion Posts	2.06	7.50	.27	.780	-12.81	16.92
	t2 VRF X Discussion Posts	-10.93	8.00	-1.37	.170	-26.79	4.93
	College Major X Discussion Posts	-1.67	3.08	-.54	.590	-7.77	4.44
	t2 VRF X College Major X Discussion Posts	2.90	3.49	.83	.410	-4.02	9.83
	Age	.18	.44	.41	.690	-.69	1.04
	Gender	-2.36	6.02	-.39	.700	-14.29	9.56

Model Summary	*F*(9,110) = 1.41, *p* = .192, R^2 = .10.						
Discussion Points (n = 66)	Constant	5.10	7.47	.68	.497	-9.86	20.06
	College Major	-.59	2.32	-.25	.800	-5.23	4.05
	Zv2VRR	2.47	4.36	.57	.574	-6.27	11.20
	t2 VRF X College Major	-1.18	1.89	-.62	.535	-4.97	2.61
	Discussion Posts	8.43	3.73	2.26	.028	.95	15.91
	t2 VRF X Discussion Posts	-1.20	2.68	-.45	.656	-6.56	4.16
	College Major X Discussion Posts	.39	1.41	.28	.781	-2.43	3.22
	t2 VRF X College Major X Discussion Posts	.92	1.20	.77	.444	-1.47	3.32
	Age	-.02	.13	-.14	.893	-.27	.23
	Gender	-1.40	1.73	-.81	.420	-4.86	2.05
Model Summary	*F*(9,56) = 8.22, *p* < .001, R^2 = .57.						
Final Exam (n = 118)	Constant	29.57	2.29	12.89	.000	25.02	34.11
	College Major	-.53	.51	-1.03	.310	-1.54	.49
	Zv2VRR	1.03	1.36	.76	.450	-1.67	3.73
	t2 VRF X College Major	.08	.61	.13	.900	-1.13	1.29
	Discussion Posts	-.05	1.01	-.05	.960	-2.04	1.94
	t2 VRF X Discussion Posts	-.39	1.07	-.37	.710	-2.52	1.74
	College Major X Discussion Posts	.03	.41	.08	.940	-.78	.85
	t2 VRF X College Major X Discussion Posts	-.15	.47	-.31	.760	-1.07	.78
	Age	.11	.06	1.90	.060	.00	.22
	Gender	.61	.80	.77	.450	-.97	2.19
Model Summary	*F*(9,108) = 1.10, *p* = .369, R^2 = .08.						
Total Course Points (n = 120)	Constant	199.39	19.47	10.24	.000	160.81	237.97
	College Major	3.00	4.20	.71	.477	-5.33	11.33
	Zv2VRR	31.81	11.09	2.87	.005	9.83	53.80
	t2 VRF X College Major	-9.53	5.02	-1.90	.060	-19.48	.41
	Discussion Posts	.08	8.36	.01	.992	-16.48	16.64
	t2 VRF X Discussion Posts	-16.23	8.92	-1.82	.071	-33.90	1.44
	College Major X Discussion Posts	-2.45	3.43	-.71	.477	-9.26	4.35
	t2 VRF X College Major X Discussion Posts	4.57	3.89	1.17	.243	-3.14	12.29

	Age	.37	.49	.76	.450	-.59	1.33
	Gender	-1.72	6.70	-.26	.798	-15.00	11.57
Model Summary	F(9,110) = 1.98, p = .049, R^2 = .14.						
Quiz Points (n = 120)	Constant	165.72	17.01	9.74	.000	132.02	199.43
	College Major	3.82	3.78	1.01	.310	-3.66	11.30
	t2 VRR	7.70	8.25	.93	.350	-8.65	24.06
	t2 VRR X College Major	1.15	3.44	.33	.740	-5.66	7.96
	Discussion Posts	6.29	7.24	.87	.390	-8.05	20.64
	t2 VRR X Discussion Posts	-2.01	7.76	-.26	.800	-17.39	13.38
	College Major X Discussion Posts	-3.22	3.07	-1.05	.300	-9.30	2.85
	t2 VRR X College Major X Discussion Posts	-2.08	3.07	-.68	.500	-8.17	4.01
	Age	-.30	.42	-.72	.470	-1.13	.53
	Gender	1.60	6.00	.27	.790	-10.30	13.49
Model Summary	F(9,110) = 1.46, p = .171, R^2 = .11.						
Discussion Points (n = 66)	Constant	4.27	7.70	.55	.582	-11.16	19.70
	College Major	-.31	2.33	-.13	.894	-4.98	4.36
	t2 VRR	1.79	4.73	.38	.706	-7.68	11.26
	t2 VRR X College Major	-.79	2.12	-.37	.711	-5.03	3.45
	Discussion Posts	8.93	3.66	2.44	.018	1.59	16.27
	t2 VRR X Discussion Posts	.78	3.04	.26	.799	-5.31	6.87
	College Major X Discussion Posts	.13	1.43	.09	.925	-2.72	2.99
	t2 VRR X College Major X Discussion Posts	-.21	1.36	-.16	.876	-2.94	2.51
	Age	-.01	.13	-.05	.959	-.26	.25
	Gender	-1.39	1.81	-.77	.444	-5.01	2.23
Model Summary	F(9,56) = 7.85, p < .001, R^2 = .56.						
Final Exam (n = 118)	Constant	30.17	2.16	13.95	.000	25.88	34.45
	College Major	-.51	.50	-1.02	.310	-1.49	.48
	t2 VRR	.28	1.05	.26	.792	-1.81	2.37
	t2 VRR X College Major	.51	.44	1.16	.247	-.36	1.38
	Discussion Posts	.08	.94	.09	.929	-1.78	1.95
	t2 VRR X Discussion Posts	.01	.99	.01	.991	-1.95	1.97

	College Major X Discussion Posts	-.01	.40	-.03	.980	-.80	.78
	t2 VRR X College Major X Discussion Posts	-.41	.39	-1.04	.299	-1.18	.37
	Age	.05	.05	.98	.332	-.05	.16
	Gender	.93	.77	1.22	.225	-.58	2.45
Model Summary	*F*(9,108) = 2.01, *p* = .045, R^2 = .14.						
Total Course Points (n = 120)	Constant	195.31	19.08	10.24	.000	157.51	233.12
	College Major	5.65	4.23	1.34	.180	-2.74	14.05
	t2 VRR	9.64	9.26	1.04	.300	-8.70	27.98
	t2 VRR X College Major	.95	3.85	.25	.810	-6.69	8.58
	Discussion Posts	3.76	8.12	.46	.640	-12.33	19.85
	t2 VRR X Discussion Posts	-2.29	8.71	-.26	.790	-19.54	14.97
	College Major X Discussion Posts	-3.81	3.44	-1.11	.270	-10.63	3.01
	t2 VRR X College Major X Discussion Posts	-2.07	3.45	-.60	.550	-8.90	4.76
	Age	-.18	.47	-.39	.700	-1.12	.75
	Gender	3.43	6.73	.51	.610	-9.91	16.77
Model Summary	*F*(9,110) = 1.84, *p* = .068, R^2 = .13.						
Quiz Points (n = 120)	Constant	163.32	16.43	9.94	.000	130.76	195.88
	College Major	7.29	3.58	2.04	.044	.20	14.39
	t2 AA	31.64	8.54	3.70	.000	14.72	48.57
	t2 AA X College Major	-8.77	3.53	-2.49	.014	-15.75	-1.78
	Discussion Posts	11.08	7.00	1.58	.116	-2.79	24.96
	t2 AA X Discussion Posts	-15.38	7.15	-2.15	.034	-29.54	-1.22
	College Major X Discussion Posts	-4.75	2.89	-1.64	.103	-10.49	.98
	t2 AA X College Major X Discussion Posts	4.81	2.66	1.81	.073	-.46	10.07
	Age	-.23	.40	-.57	.569	-1.03	.57
	Gender	-3.99	5.70	-.70	.485	-15.28	7.30
Model Summary	*F*(9,110) = 2.62, *p* = .009, R^2 = .18.						
Discussion Points (n = 66)	Constant	8.20	7.52	1.09	.280	-6.86	23.27
	College Major	-1.34	2.33	-.58	.567	-6.02	3.33
	t2 AA	7.58	6.73	1.13	.265	-5.91	21.07
	t2 AA X College Major	-4.10	2.97	-1.38	.173	-10.05	1.85

	Discussion Posts	7.98	3.37	2.37	.021	1.23	14.73
	t2 AA X Discussion Posts	-3.36	3.84	-.88	.385	-11.05	4.33
	College Major X Discussion Posts	.68	1.37	.49	.624	-2.07	3.42
	t2 AA X College Major X Discussion Posts	2.29	1.64	1.40	.168	-1.00	5.57
	Age	-.02	.12	-.14	.886	-.26	.23
	Gender	-2.43	1.77	-1.37	.175	-5.98	1.11
Model Summary	$F(9,56) = 9.07$, $p < .001$, $R^2 = .59$.						
Final Exam (n = 118)	Constant	29.68	2.18	13.60	.000	25.35	34.01
	College Major	.04	.50	.09	.930	-.94	1.03
	t2 AA	3.65	1.24	2.94	.000	1.19	6.12
	t2 AA X College Major	-1.02	.50	-2.04	.040	-2.01	-.03
	Discussion Posts	.98	.96	1.01	.310	-.93	2.88
	t2 AA X Discussion Posts	-1.86	.99	-1.87	.060	-3.83	.11
	College Major X Discussion Posts	-.32	.39	-.81	.420	-1.10	.46
	t2 AA X College Major X Discussion Posts	.44	.37	1.19	.240	-.29	1.16
	Age	.07	.05	1.23	.220	-.04	.17
	Gender	.13	.76	.17	.860	-1.38	1.65
Model Summary	$F(9,108) = 1.91$, $p = .059$, $R^2 = .14$.						
Total Course Points (n = 120)	Constant	192.61	18.30	10.53	.000	156.35	228.88
	College Major	9.68	3.99	2.43	.017	1.78	17.58
	t2 AA	38.35	9.51	4.03	.000	19.50	57.20
	t2 AA X College Major	-10.78	3.93	-2.75	.007	-18.56	-3.00
	Discussion Posts	10.34	7.80	1.33	.188	-5.11	25.79
	t2 AA X Discussion Posts	-19.99	7.96	-2.51	.013	-35.76	-4.21
	College Major X Discussion Posts	-5.93	3.22	-1.84	.069	-12.31	.46
	t2 AA X College Major X Discussion Posts	5.96	2.96	2.01	.046	.09	11.82
	Age	-.11	.45	-.24	.813	-1.00	.78
	Gender	-3.12	6.34	-.49	.624	-15.69	9.45
Model Summary	$F(9,110) = 3.25$, $p = .002$, $R^2 = .21$.						
Quiz Points (n = 120)	Constant	164.57	16.36	10.06	.000	132.16	196.98
	College Major	7.30	3.63	2.01	.047	.10	14.50

	t2 AAF	32.70	8.69	3.76	.000	15.47	49.93
	t2 AAF X College Major	-9.65	3.71	-2.60	.011	-17.00	-2.29
	Discussion Posts	11.32	7.06	1.60	.112	-2.67	25.31
	t2 AAF X Discussion Posts	-16.59	7.24	-2.29	.024	-30.94	-2.23
	College Major X Discussion Posts	-5.02	2.93	-1.72	.089	-10.82	.78
	t2 AAF X College Major X Discussion Posts	4.74	2.82	1.68	.096	-.85	10.33
	Age	-.32	.41	-.79	.431	-1.12	.48
	Gender	-2.88	5.62	-.51	.610	-14.01	8.26
Model Summary	$F(9,110) = 2.52$, $p = .011$, $R^2 = .17$.						
Discussion Points (n = 66)	Constant	5.19	8.10	.64	.524	-11.04	21.42
	College Major	-.50	2.48	-.20	.841	-5.47	4.47
	t2 AAF	2.15	5.32	.40	.688	-8.51	12.80
	t2 AAF X College Major	-1.29	2.45	-.53	.599	-6.20	3.61
	Discussion Posts	8.74	3.75	2.33	.023	1.23	16.24
	t2 AAF X Discussion Posts	-.53	3.08	-.17	.865	-6.70	5.65
	College Major X Discussion Posts	.37	1.46	.25	.802	-2.56	3.30
	t2 AAF X College Major X Discussion Posts	.75	1.38	.54	.592	-2.03	3.52
	Age	-.03	.12	-.21	.833	-.28	.22
	Gender	-1.71	1.78	-.96	.340	-5.28	1.86
Model Summary	$F(9,56) = 8.04$, $p < .001$, $R^2 = .56$.						
Final Exam (n = 118)	Constant	29.78	2.14	13.93	.000	25.54	34.02
	College Major	-.03	.49	-.06	.955	-1.00	.95
	t2 AAF	3.64	1.20	3.02	.003	1.25	6.02
	t2 AAF X College Major	-1.01	.51	-2.00	.048	-2.01	-.01
	Discussion Posts	.75	.95	.80	.427	-1.12	2.63
	t2 AAF X Discussion Posts	-1.41	.97	-1.45	.150	-3.34	.52
	College Major X Discussion Posts	-.28	.39	-.71	.477	-1.05	.49
	t2 AAF X College Major X Discussion Posts	.27	.38	.73	.468	-.47	1.02
	Age	.06	.05	1.17	.243	-.04	.17
	Gender	.31	.74	.42	.678	-1.16	1.77
Model Summary	$F(9,108) = 2.26$, $p = .023$, $R^2 = .16$.						

Total Course Points (n = 120)	Constant	194.28	18.34	10.59	.000	157.92	230.63
	College Major	9.63	4.07	2.36	.020	1.56	17.70
	t2 AAF	37.39	9.75	3.83	.000	18.06	56.71
	t2 AAF X College Major	-11.13	4.16	-2.67	.009	-19.38	-2.88
	Discussion Posts	10.38	7.92	1.31	.192	-5.30	26.07
	t2 AAF X Discussion Posts	-20.94	8.12	-2.58	.011	-37.03	-4.84
	College Major X Discussion Posts	-6.18	3.28	-1.88	.062	-12.68	.33
	t2 AAF X College Major X Discussion Posts	6.05	3.16	1.91	.058	-.22	12.32
	Age	-.22	.46	-.48	.634	-1.12	.68
	Gender	-1.67	6.30	-.26	.792	-14.16	10.83
Model Summary	F(9,110) = 2.93, p = .004, R^2 = .19.						
Quiz Points (n = 120)	Constant	162.45	17.18	9.45	.000	128.40	196.51
	College Major	6.00	3.72	1.61	.110	-1.36	13.36
	t2 AAR	18.99	9.03	2.10	.040	1.10	36.88
	t2 AAR X College Major	-4.93	3.84	-1.28	.200	-12.54	2.68
	Discussion Posts	8.84	7.15	1.24	.220	-5.33	23.02
	t2 AAR X Discussion Posts	-8.24	7.16	-1.15	.250	-22.43	5.96
	College Major X Discussion Posts	-4.11	2.99	-1.38	.170	-10.04	1.81
	t2 AAR X College Major X Discussion Posts	3.17	2.77	1.14	.260	-2.33	8.67
	Age	-.17	.42	-.41	.680	-1.01	.66
	Gender	-1.85	5.93	-.31	.760	-13.60	9.89
Model Summary	F(9,110) = 1.39, p = .203, R^2 = .10.						
Discussion Points (n = 66)	Constant	4.82	6.15	.78	.436	-7.50	17.15
	College Major	-.10	1.96	-.05	.958	-4.04	3.83
	t2 AAR	9.00	7.38	1.22	.227	-5.77	23.78
	t2 AAR X College Major	-4.43	2.78	-1.59	.117	-10.00	1.14
	Discussion Posts	10.08	2.97	3.39	.001	4.12	16.03
	t2 AAR X Discussion Posts	-4.68	4.21	-1.11	.270	-13.11	3.75
	College Major X Discussion Posts	-.14	1.22	-.11	.909	-2.58	2.30
	t2 AAR X College Major X Discussion Posts	2.67	1.57	1.70	.095	-.48	5.81
	Age	-.03	.12	-.21	.831	-.27	.22

	Gender	-2.25	1.65	-1.36	.179	-5.56	1.06
Model Summary	$F(9,56) = 9.25$, $p < .001$, $R^2 = .60$.						
Final Exam (n = 118)	Constant	29.70	2.28	13.02	.000	25.18	34.22
	College Major	-.15	.52	-.29	.770	-1.17	.87
	t2 AAR	1.88	1.30	1.45	.150	-.68	4.45
	t2 AAR X College Major	-.52	.54	-.98	.330	-1.59	.54
	Discussion Posts	.58	.98	.59	.560	-1.37	2.52
	t2 AAR X Discussion Posts	-1.15	.99	-1.16	.250	-3.12	.81
	College Major X Discussion Posts	-.19	.41	-.46	.650	-.99	.62
	t2 AAR X College Major X Discussion Posts	.27	.38	.72	.480	-.48	1.03
	Age	.07	.06	1.25	.210	-.04	.18
	Gender	.42	.79	.53	.600	-1.15	1.99
Model Summary	$F(9,108) = .77$, $p = .641$, $R^2 = .06$.						
Total Course Points (n = 120)	Constant	190.76	19.24	9.92	.000	152.64	228.87
	College Major	8.08	4.16	1.94	.050	-.16	16.33
	t2 AAR	25.20	10.11	2.49	.010	5.18	45.23
	t2 AAR X College Major	-6.79	4.30	-1.58	.120	-15.31	1.73
	Discussion Posts	7.18	8.00	.90	.370	-8.68	23.04
	t2 AAR X Discussion Posts	-11.25	8.02	-1.40	.160	-27.14	4.64
	College Major X Discussion Posts	-4.91	3.35	-1.47	.140	-11.54	1.72
	t2 AAR X College Major X Discussion Posts	3.73	3.11	1.20	.230	-2.43	9.88
	Age	-.01	.47	-.03	.970	-.95	.92
	Gender	-.50	6.63	-.08	.940	-13.65	12.65
Model Summary	$F(9,110) = 1.82$, $p = .073$, $R^2 = .13$.						
Quiz Points (n = 120)	Constant	154.83	15.94	9.71	.000	123.24	186.42
	College Major	8.40	3.64	2.31	.023	1.19	15.61
	t2 HT	32.62	8.74	3.73	.000	15.30	49.95
	t2 HT X College Major	-7.60	3.58	-2.12	.036	-14.69	-.51
	Discussion Posts	13.89	6.79	2.05	.043	.44	27.35
	t2 HT X Discussion Posts	-23.99	7.25	-3.31	.001	-38.36	-9.62
	College Major X Discussion Posts	-5.51	2.85	-1.94	.055	-11.15	.13

	t2 HT X College Major X Discussion Posts	5.38	2.78	1.93	.056	-.14	10.89
	Age	-.35	.39	-.89	.373	-1.12	.42
	Gender	.60	5.36	.11	.911	-10.03	11.23
Model Summary	$F(9,110) = 3.79$, $p < .001$, $R^2 = .24$.						
Discussion Points (n = 66)	Constant	4.91	6.74	.73	.469	-8.59	18.40
	College Major	-.19	2.10	-.09	.927	-4.40	4.01
	t2 HT	4.16	8.21	.51	.614	-12.28	20.61
	t2 HT X College Major	-1.68	3.45	-.49	.629	-8.60	5.24
	Discussion Posts	9.39	3.14	2.99	.004	3.09	15.69
	t2 HT X Discussion Posts	-2.29	4.70	-.49	.627	-11.70	7.11
	College Major X Discussion Posts	.08	1.28	.06	.952	-2.49	2.65
	t2 HT X College Major X Discussion Posts	1.11	1.94	.57	.571	-2.78	4.99
	Age	-.02	.13	-.18	.861	-.28	.23
	Gender	-1.92	1.83	-1.05	.300	-5.58	1.75
Model Summary	$F(9,56) = 7.70$, $p < .001$, $R^2 = .55$.						
Final Exam (n = 118)	Constant	28.99	2.19	13.25	.000	24.65	33.32
	College Major	-.04	.53	-.08	.934	-1.09	1.01
	t2 HT	2.16	1.33	1.62	.108	-.48	4.79
	t2 HT X College Major	-.24	.53	-.46	.650	-1.29	.81
	Discussion Posts	.74	.97	.76	.446	-1.18	2.67
	t2 HT X Discussion Posts	-.67	1.04	-.64	.520	-2.74	1.40
	College Major X Discussion Posts	-.21	.40	-.53	.598	-1.01	.59
	t2 HT X College Major X Discussion Posts	-.15	.40	-.38	.704	-.94	.64
	Age	.05	.05	.96	.338	-.05	.16
	Gender	.83	.74	1.13	.260	-.63	2.29
Model Summary	$F(9,108) = 2.18$, $p = .029$, $R^2 = .15$.						
Total Course Points (n = 120)	Constant	181.71	17.81	10.20	.000	146.41	217.01
	College Major	11.25	4.06	2.77	.007	3.20	19.30
	t2 HT	39.80	9.77	4.08	.000	20.45	59.16
	t2 HT X College Major	-9.77	4.00	-2.44	.016	-17.70	-1.85
	Discussion Posts	13.03	7.59	1.72	.089	-2.01	28.06

	t2 HT X Discussion Posts	-26.57	8.10	-3.28	.001	-42.63	-10.52
	College Major X Discussion Posts	-6.73	3.18	-2.12	.036	-13.03	-.43
	t2 HT X College Major X Discussion Posts	6.30	3.11	2.03	.045	.14	12.46
	Age	-.22	.43	-.52	.608	-1.08	.64
	Gender	2.27	5.99	.38	.705	-9.60	14.15
Model Summary	*F*(9,110) = 4.36, p < .001, R^2 = .26.						
Quiz Points (n = 120)	Constant	163.62	16.99	9.63	.000	129.95	197.30
	College Major	5.99	4.02	1.49	.139	-1.98	13.97
	t2 HTF	16.91	10.89	1.55	.123	-4.68	38.50
	t2 HTF X College Major	-1.93	4.41	-.44	.663	-10.67	6.81
	Discussion Posts	10.21	7.35	1.39	.168	-4.35	24.78
	t2 HTF X Discussion Posts	-18.29	8.73	-2.10	.038	-35.59	-.99
	College Major X Discussion Posts	-4.27	3.10	-1.38	.171	-10.41	1.87
	t2 HTF X College Major X Discussion Posts	2.97	3.27	.91	.366	-3.51	9.44
	Age	-.42	.41	-1.01	.313	-1.23	.40
	Gender	.91	5.62	.16	.872	-10.23	12.05
Model Summary	*F*(9,110) = 2.24, p = .025, R^2 = .15.						
Discussion Points (n = 66)	Constant	4.18	6.29	.66	.510	-8.43	16.78
	College Major	-.13	2.07	-.06	.949	-4.27	4.01
	t2 HTF	1.71	7.09	.24	.811	-12.50	15.91
	t2 HTF X College Major	-.18	2.90	-.06	.951	-6.00	5.64
	Discussion Posts	9.91	3.17	3.12	.003	3.55	16.27
	t2 HTF X Discussion Posts	-3.06	4.17	-.73	.466	-11.42	5.30
	College Major X Discussion Posts	-.11	1.30	-.08	.935	-2.70	2.49
	t2 HTF X College Major X Discussion Posts	.82	1.68	.49	.626	-2.55	4.19
	Age	-.03	.12	-.23	.821	-.28	.22
	Gender	-1.53	1.78	-.85	.396	-5.10	2.05
Model Summary	*F*(9,56) = 8.00, p < .001, R^2 = .56.						
Final Exam (n = 118)	Constant	29.89	2.25	13.30	.000	25.43	34.34
	College Major	-.25	.55	-.46	.650	-1.34	.84
	t2 HTF	1.32	1.48	.89	.370	-1.61	4.25

	t2 HTF X College Major	.04	.60	.06	.950	-1.14	1.22
	Discussion Posts	.31	.99	.32	.750	-1.65	2.28
	t2 HTF X Discussion Posts	-.52	1.17	-.44	.660	-2.83	1.80
	College Major X Discussion Posts	-.07	.42	-.17	.860	-.90	.75
	t2 HTF X College Major X Discussion Posts	-.18	.44	-.41	.690	-1.04	.69
	Age	.05	.05	.84	.400	-.06	.15
	Gender	.82	.74	1.10	.270	-.66	2.29
Model Summary	F(9,108) = 1.72, p = .094, R^2 = .13.						
Total Course Points (n = 120)	Constant	192.37	19.35	9.94	.000	154.01	230.73
	College Major	8.04	4.58	1.75	.082	-1.04	17.12
	t2 HTF	18.49	12.41	1.49	.139	-6.10	43.08
	t2 HTF X College Major	-2.21	5.03	-.44	.661	-12.17	7.75
	Discussion Posts	8.01	8.37	.96	.341	-8.58	24.60
	t2 HTF X Discussion Posts	-17.36	9.94	-1.75	.084	-37.06	2.34
	College Major X Discussion Posts	-5.07	3.53	-1.44	.154	-12.06	1.92
	t2 HTF X College Major X Discussion Posts	2.87	3.72	.77	.442	-4.51	10.25
	Age	-.29	.47	-.63	.532	-1.22	.63
	Gender	2.89	6.40	.45	.653	-9.80	15.58
Model Summary	F(9,110) = 2.19, p = .028, R^2 = .15.						
Quiz Points (n = 120)	Constant	155.94	16.33	9.55	.000	123.58	188.30
	College Major	6.57	3.55	1.85	.067	-.47	13.61
	t2 HTR	30.59	7.90	3.87	.000	14.93	46.24
	t2 HTR X College Major	-8.68	3.45	-2.51	.013	-15.52	-1.83
	Discussion Posts	10.70	6.83	1.57	.120	-2.83	24.22
	t2 HTR X Discussion Posts	-18.76	7.05	-2.66	.009	-32.74	-4.78
	College Major X Discussion Posts	-4.41	2.89	-1.53	.129	-10.13	1.31
	t2 HTR X College Major X Discussion Posts	5.11	2.90	1.76	.081	-.64	10.85
	Age	-.19	.40	-.48	.635	-.99	.60
	Gender	.41	5.54	.07	.942	-10.57	11.38
Model Summary	F(9,110) = 2.72, p = .007, R^2 = .18.						
Discussion Points (n = 66)	Constant	6.50	7.24	.90	.373	-7.99	20.99

	College Major	-1.56	2.62	-.59	.554	-6.82	3.69
	t2 HTR	5.18	7.03	.74	.464	-8.90	19.26
	t2 HTR X College Major	-2.78	3.03	-.92	.364	-8.85	3.30
	Discussion Posts	8.16	3.47	2.35	.022	1.21	15.11
	t2 HTR X Discussion Posts	-1.13	4.07	-.28	.781	-9.29	7.02
	College Major X Discussion Posts	.83	1.51	.55	.584	-2.19	3.85
	t2 HTR X College Major X Discussion Posts	1.17	1.73	.68	.502	-2.30	4.64
	Age	.01	.13	.08	.933	-.24	.26
	Gender	-1.98	1.68	-1.17	.245	-5.35	1.40
Model Summary	*F*(9,56) = 8.78, *p* < .001, R^2 = .59.						
Final Exam (n = 118)	Constant	28.78	2.23	12.93	.000	24.37	33.19
	College Major	-.13	.51	-.26	.790	-1.15	.88
	t2 HTR	1.58	1.24	1.27	.210	-.89	4.04
	t2 HTR X College Major	-.19	.52	-.37	.710	-1.22	.83
	Discussion Posts	.78	.97	.80	.420	-1.14	2.70
	t2 HTR X Discussion Posts	-.08	1.03	-.08	.940	-2.11	1.96
	College Major X Discussion Posts	-.27	.40	-.66	.510	-1.07	.54
	t2 HTR X College Major X Discussion Posts	-.28	.41	-.67	.510	-1.10	.55
	Age	.07	.06	1.31	.190	-.04	.18
	Gender	.81	.76	1.06	.290	-.70	2.31
Model Summary	*F*(9,108) = 1.36, *p* = .213, R^2 = .10.						
Total Course Points (n = 120)	Constant	182.96	17.92	10.21	.000	147.45	218.47
	College Major	8.98	3.90	2.31	.023	1.26	16.71
	t2 HTR	38.78	8.67	4.47	.000	21.60	55.96
	t2 HTR X College Major	-11.26	3.79	-2.97	.004	-18.77	-3.75
	Discussion Posts	9.72	7.49	1.30	.197	-5.12	24.56
	t2 HTR X Discussion Posts	-22.19	7.74	-2.87	.005	-37.53	-6.85
	College Major X Discussion Posts	-5.54	3.17	-1.75	.083	-11.81	.74
	t2 HTR X College Major X Discussion Posts	6.11	3.18	1.92	.057	-.19	12.41
	Age	-.05	.44	-.10	.918	-.92	.83
	Gender	2.13	6.08	.35	.727	-9.91	14.17

Model Summary	*F*(9,110) = 3.82, *p* < .001, R^2 = .24.						
Quiz Points (n = 120)	Constant	154.41	16.56	9.32	.000	121.59	187.22
	College Major	6.59	3.61	1.82	.071	-.57	13.75
	t2 LU	10.38	6.46	1.61	.111	-2.43	23.19
	t2 LU X College Major	.35	2.79	.13	.899	-5.17	5.88
	Discussion Posts	9.52	6.90	1.38	.170	-4.14	23.19
	t2 LU X Discussion Posts	-7.63	9.19	-.83	.408	-25.84	10.58
	College Major X Discussion Posts	-4.21	2.88	-1.46	.147	-9.91	1.50
	t2 LU X College Major X Discussion Posts	.24	3.81	.06	.949	-7.31	7.80
	Age	-.27	.41	-.66	.508	-1.09	.54
	Gender	3.23	5.65	.57	.569	-7.96	14.42
Model Summary	*F*(9,110) = 2.29, *p* = .021, R^2 = .16.						
Discussion Points (n = 66)	Constant	6.26	8.08	.77	.442	-9.93	22.45
	College Major	-.91	2.41	-.38	.706	-5.74	3.91
	t2 LU	4.25	5.47	.78	.441	-6.71	15.21
	t2 LU X College Major	-2.21	2.61	-.85	.402	-7.44	3.02
	Discussion Posts	8.32	3.76	2.21	.031	.79	15.85
	t2 LU X Discussion Posts	-1.93	3.84	-.50	.618	-9.62	5.77
	College Major X Discussion Posts	.44	1.42	.31	.759	-2.41	3.29
	t2 LU X College Major X Discussion Posts	1.47	1.78	.83	.412	-2.10	5.05
	Age	.00	.13	.01	.993	-.25	.25
	Gender	-1.81	1.78	-1.01	.315	-5.38	1.76
Model Summary	*F*(9,56) = 8.22, *p* < .001, R^2 = .57.						
Final Exam (n = 118)	Constant	28.85	2.21	13.08	.000	24.48	33.22
	College Major	-.09	.50	-.17	.860	-1.08	.91
	t2 LU	.73	.93	.79	.430	-1.10	2.57
	t2 LU X College Major	.17	.39	.43	.670	-.60	.94
	Discussion Posts	.55	.94	.58	.560	-1.32	2.42
	t2 LU X Discussion Posts	-.43	1.24	-.34	.730	-2.89	2.04
	College Major X Discussion Posts	-.19	.39	-.49	.630	-.97	.59
	t2 LU X College Major X Discussion Posts	-.01	.51	-.02	.980	-1.03	1.01

	Age	.06	.06	1.10	.280	-.05	.17
	Gender	.98	.75	1.30	.200	-.52	2.47
Model Summary	F(9,108) = 1.57, p = .134, R^2 = .12.						
Total Course Points (n = 120)	Constant	181.91	18.53	9.82	.000	145.20	218.63
	College Major	8.85	4.04	2.19	.031	.84	16.86
	t2 LU	12.88	7.23	1.78	.078	-1.45	27.21
	t2 LU X College Major	-.04	3.12	-.01	.989	-6.22	6.13
	Discussion Posts	7.92	7.72	1.03	.307	-7.37	23.21
	t2 LU X Discussion Posts	-9.71	10.28	-.94	.347	-30.09	10.66
	College Major X Discussion Posts	-5.13	3.22	-1.59	.114	-11.51	1.26
	t2 LU X College Major X Discussion Posts	.82	4.26	.19	.848	-7.63	9.27
	Age	-.14	.46	-.31	.754	-1.06	.77
	Gender	5.38	6.32	.85	.396	-7.14	17.90
Model Summary	F(9,110) = 2.77, p = .006, R^2 = .18.						
Quiz Points (n = 120)	Constant	159.29	15.82	10.07	.000	127.95	190.64
	College Major	5.06	3.53	1.43	.155	-1.94	12.05
	t2 LUF	21.59	7.36	2.93	.004	7.00	36.17
	t2 LUF X College Major	-3.06	3.00	-1.02	.309	-9.01	2.88
	Discussion Posts	7.91	7.16	1.10	.272	-6.27	22.09
	t2 LUF X Discussion Posts	-13.61	7.32	-1.86	.066	-28.12	.91
	College Major X Discussion Posts	-4.06	2.99	-1.36	.176	-9.98	1.85
	t2 LUF X College Major X Discussion Posts	2.67	3.12	.86	.393	-3.51	8.85
	Age	-.05	.39	-.13	.896	-.83	.73
	Gender	1.09	5.35	.20	.839	-9.51	11.69
Model Summary	F(9,110) = 3.51, p = .001, R^2 = .22.						
Discussion Points (n = 66)	Constant	4.86	7.82	.62	.537	-10.80	20.51
	College Major	.03	2.44	.01	.989	-4.85	4.91
	t2 LUF	2.60	4.53	.57	.568	-6.47	11.68
	t2 LUF X College Major	-1.16	2.15	-.54	.593	-5.46	3.15
	Discussion Posts	9.94	3.91	2.54	.014	2.11	17.78
	t2 LUF X Discussion Posts	-2.60	3.03	-.86	.394	-8.68	3.47

	College Major X Discussion Posts	-.36	1.50	-.24	.810	-3.37	2.65
	t2 LUF X College Major X Discussion Posts	1.38	1.47	.94	.350	-1.56	4.33
	Age	-.02	.13	-.14	.886	-.27	.23
	Gender	-1.83	1.75	-1.04	.301	-5.34	1.68
Model Summary	$F(9,56) = 7.93$, $p < .001$, $R^2 = .56$.						
Final Exam (n = 118)	Constant	29.53	2.21	13.35	.000	25.15	33.92
	College Major	-.19	.51	-.38	.710	-1.20	.82
	t2 LUF	1.48	1.07	1.39	.170	-.63	3.60
	t2 LUF X College Major	-.22	.43	-.52	.610	-1.07	.63
	Discussion Posts	.39	1.02	.38	.700	-1.64	2.42
	t2 LUF X Discussion Posts	-.85	1.04	-.82	.410	-2.92	1.21
	College Major X Discussion Posts	-.20	.42	-.46	.640	-1.04	.65
	t2 LUF X College Major X Discussion Posts	.28	.44	.64	.530	-.59	1.15
	Age	.08	.06	1.38	.170	-.03	.19
	Gender	.65	.75	.87	.390	-.83	2.14
Model Summary	$F(9,108) = 1.31$, $p = .243$, $R^2 = .10$.						
Total Course Points (n = 120)	Constant	187.85	17.66	10.64	.000	152.86	222.84
	College Major	6.74	3.94	1.71	.090	-1.07	14.55
	t2 LUF	26.74	8.22	3.26	.002	10.46	43.02
	t2 LUF X College Major	-4.41	3.35	-1.32	.191	-11.05	2.22
	Discussion Posts	5.91	7.99	.74	.461	-9.92	21.74
	t2 LUF X Discussion Posts	-17.01	8.18	-2.08	.040	-33.21	-.81
	College Major X Discussion Posts	-4.78	3.33	-1.44	.154	-11.39	1.82
	t2 LUF X College Major X Discussion Posts	3.36	3.48	.96	.337	-3.54	10.25
	Age	.12	.44	.27	.784	-.75	.99
	Gender	2.99	5.97	.50	.617	-8.84	14.82
Model Summary	$F(9,110) = 4.10$, $p < .001$, $R^2 = .25$.						
Quiz Points (n = 120)	Constant	157.46	17.45	9.02	.000	122.88	192.05
	College Major	5.69	3.87	1.47	.140	-1.98	13.36
	t2 LUR	4.60	6.93	.66	.510	-9.12	18.33
	t2 LUR X College Major	1.59	3.09	.51	.610	-4.54	7.72

	Discussion Posts	8.04	7.60	1.06	.290	-7.02	23.10
	t2 LUR X Discussion Posts	-3.02	9.14	-.33	.740	-21.13	15.10
	College Major X Discussion Posts	-3.64	3.15	-1.16	.250	-9.88	2.59
	t2 LUR X College Major X Discussion Posts	-1.50	3.84	-.39	.700	-9.11	6.11
	Age	-.33	.43	-.76	.450	-1.18	.53
	Gender	3.26	5.95	.55	.580	-8.53	15.05
Model Summary	$F(9,110) = 1.21$, $p = .297$, $R^2 = .09$.						
Discussion Points (n = 66)	Constant	4.67	7.89	.59	.557	-11.14	20.48
	College Major	-.81	2.30	-.35	.724	-5.41	3.79
	t2 LUR	5.06	6.64	.76	.449	-8.24	18.36
	t2 LUR X College Major	-2.60	2.77	-.94	.353	-8.16	2.96
	Discussion Posts	8.99	3.72	2.42	.019	1.54	16.44
	t2 LUR X Discussion Posts	-1.28	4.48	-.29	.776	-10.25	7.69
	College Major X Discussion Posts	.33	1.43	.23	.818	-2.54	3.20
	t2 LUR X College Major X Discussion Posts	1.24	1.90	.65	.519	-2.58	5.05
	Age	.02	.13	.18	.862	-.23	.27
	Gender	-1.56	1.75	-.89	.377	-5.07	1.95
Model Summary	$F(9,56) = 8.34$, $p < .001$, $R^2 = .57$.						
Final Exam (n = 118)	Constant	29.09	2.25	12.93	.000	24.63	33.55
	College Major	-.22	.52	-.42	.680	-1.24	.81
	t2 LUR	.16	.98	.17	.870	-1.78	2.10
	t2 LUR X College Major	.41	.42	.97	.340	-.43	1.25
	Discussion Posts	.38	1.00	.38	.710	-1.61	2.37
	t2 LUR X Discussion Posts	-.13	1.20	-.11	.910	-2.51	2.24
	College Major X Discussion Posts	-.10	.41	-.25	.800	-.92	.71
	t2 LUR X College Major X Discussion Posts	-.25	.50	-.50	.610	-1.24	.74
	Age	.05	.06	.92	.360	-.06	.16
	Gender	1.09	.77	1.42	.160	-.43	2.61
Model Summary	$F(9,108) = 1.44$, $p = .178$, $R^2 = .11$.						
Total Course Points (n = 120)	Constant	184.85	19.59	9.44	.000	146.03	223.66
	College Major	7.79	4.34	1.79	.080	-.82	16.39

	t2 LUR	5.69	7.77	.73	.470	-9.72	21.09
	t2 LUR X College Major	1.65	3.47	.47	.640	-5.23	8.53
	Discussion Posts	6.17	8.53	.72	.470	-10.73	23.08
	t2 LUR X Discussion Posts	-3.56	10.26	-.35	.730	-23.89	16.78
	College Major X Discussion Posts	-4.41	3.53	-1.25	.210	-11.40	2.59
	t2 LUR X College Major X Discussion Posts	-1.18	4.31	-.27	.790	-9.71	7.36
	Age	-.20	.48	-.42	.680	-1.16	.75
	Gender	5.73	6.68	.86	.390	-7.50	18.96
Model Summary	$F(9,110) = 1.56$, $p = .136$, $R^2 = .11$.						
Quiz Points (n = 120)	Constant	170.66	16.75	10.19	.000	137.46	203.86
	College Major	4.73	3.69	1.28	.202	-2.57	12.04
	t2 PS	21.85	7.89	2.77	.007	6.21	37.49
	t2 PS X College Major	-5.54	3.38	-1.64	.104	-12.24	1.16
	Discussion Posts	7.39	7.89	.94	.351	-8.24	23.02
	t2 PS X Discussion Posts	-9.60	8.84	-1.09	.280	-27.10	7.91
	College Major X Discussion Posts	-3.51	3.17	-1.11	.271	-9.79	2.77
	t2 PS X College Major X Discussion Posts	1.07	3.51	.30	.761	-5.89	8.02
	Age	-.24	.41	-.59	.557	-1.05	.57
	Gender	-2.92	5.70	-.51	.610	-14.20	8.37
Model Summary	$F(9,110) = 2.03$, $p = .042$, $R^2 = .14$.						
Discussion Points (n = 66)	Constant	3.97	7.54	.53	.600	-11.13	19.07
	College Major	-.16	2.30	-.07	.945	-4.77	4.45
	t2 PS	1.01	6.13	.17	.869	-11.27	13.30
	t2 PS X College Major	-.19	2.50	-.08	.938	-5.20	4.81
	Discussion Posts	9.55	3.75	2.55	.014	2.04	17.07
	t2 PS X Discussion Posts	-.89	3.85	-.23	.819	-8.60	6.82
	College Major X Discussion Posts	.02	1.42	.01	.990	-2.83	2.87
	t2 PS X College Major X Discussion Posts	.26	1.61	.16	.872	-2.96	3.48
	Age	-.02	.13	-.19	.848	-.28	.23
	Gender	-1.38	1.80	-.77	.447	-4.97	2.22
Model Summary	$F(9,56) = 7.36$, $p < .001$, $R^2 = .54$.						

Final Exam (n = 118)	Constant	30.78	2.17	14.21	.000	26.49	35.07
	College Major	-.25	.50	-.51	.614	-1.24	.73
	t2 PS	2.98	1.17	2.54	.013	.66	5.31
	t2 PS X College Major	-.78	.49	-1.62	.109	-1.75	.18
	Discussion Posts	.32	1.05	.31	.759	-1.75	2.40
	t2 PS X Discussion Posts	-1.00	1.20	-.84	.404	-3.37	1.37
	College Major X Discussion Posts	-.11	.42	-.26	.797	-.94	.72
	t2 PS X College Major X Discussion Posts	.02	.47	.05	.963	-.91	.96
	Age	.07	.05	1.22	.226	-.04	.17
	Gender	.14	.74	.19	.853	-1.33	1.61
Model Summary	$F(9,108) = 2.11$, $p = .035$, $R^2 = .15$.						
Total Course Points (n = 120)	Constant	200.14	18.79	10.65	.000	162.90	237.39
	College Major	6.93	4.14	1.67	.097	-1.27	15.12
	t2 PS	26.96	8.86	3.04	.003	9.41	44.51
	t2 PS X College Major	-7.39	3.79	-1.95	.054	-14.90	.13
	Discussion Posts	4.09	8.85	.46	.645	-13.45	21.63
	t2 PS X Discussion Posts	-10.35	9.91	-1.04	.298	-30.00	9.29
	College Major X Discussion Posts	-4.07	3.55	-1.14	.255	-11.11	2.98
	t2 PS X College Major X Discussion Posts	2.06	3.94	.52	.603	-5.75	9.86
	Age	-.12	.46	-.26	.792	-1.03	.79
	Gender	-1.34	6.39	-.21	.834	-14.01	11.32
Model Summary	$F(9,110) = 2.42$, $p = .015$, $R^2 = .17$.						
Quiz Points (n = 120)	Constant	169.80	16.33	10.40	.000	137.44	202.17
	College Major	5.41	3.56	1.52	.132	-1.65	12.47
	t2 PSF	29.11	8.33	3.50	.001	12.61	45.61
	t2 PSF X College Major	-7.40	3.37	-2.20	.030	-14.07	-.72
	Discussion Posts	9.64	7.66	1.26	.211	-5.54	24.81
	t2 PSF X Discussion Posts	-18.68	8.93	-2.09	.039	-36.38	-.98
	College Major X Discussion Posts	-4.22	3.12	-1.35	.179	-10.41	1.97
	t2 PSF X College Major X Discussion Posts	3.66	3.37	1.09	.279	-3.01	10.34
	Age	-.19	.40	-.47	.637	-.98	.60

	Gender	-3.68	5.54	-.66	.508	-14.65	7.29
Model Summary	$F(9,110) = 2.98$, $p = .003$, $R^2 = .20$.						
Discussion Points (n = 66)	Constant	3.73	7.28	.51	.610	-10.85	18.31
	College Major	-.20	2.23	-.09	.930	-4.65	4.26
	t2 PSF	1.66	5.92	.28	.780	-10.19	13.51
	t2 PSF X College Major	-.36	2.13	-.17	.868	-4.61	3.90
	Discussion Posts	9.87	3.66	2.70	.009	2.54	17.21
	t2 PSF X Discussion Posts	-1.91	3.88	-.49	.625	-9.68	5.87
	College Major X Discussion Posts	-.08	1.41	-.06	.954	-2.91	2.75
	t2 PSF X College Major X Discussion Posts	.52	1.47	.35	.726	-2.42	3.45
	Age	-.01	.13	-.11	.915	-.28	.25
	Gender	-1.34	1.75	-.76	.448	-4.85	2.17
Model Summary	$F(9,56) = 7.45$, $p < .001$, $R^2 = .54$.						
Final Exam (n = 118)	Constant	30.58	2.20	13.93	.000	26.23	34.93
	College Major	-.15	.50	-.30	.760	-1.14	.84
	t2 PSF	3.39	1.28	2.66	.010	.86	5.92
	t2 PSF X College Major	-.92	.50	-1.84	.070	-1.92	.07
	Discussion Posts	.38	1.06	.36	.720	-1.72	2.47
	t2 PSF X Discussion Posts	-1.49	1.26	-1.18	.240	-3.99	1.00
	College Major X Discussion Posts	-.13	.43	-.31	.750	-.99	.72
	t2 PSF X College Major X Discussion Posts	.26	.47	.55	.580	-.68	1.20
	Age	.07	.05	1.24	.220	-.04	.17
	Gender	.13	.75	.17	.860	-1.35	1.61
Model Summary	$F(9,108) = 1.92$, $p = .056$, $R^2 = .14$.						
Total Course Points (n = 120)	Constant	200.28	18.36	10.91	.000	163.89	236.67
	College Major	7.74	4.01	1.93	.056	-.20	15.68
	t2 PSF	35.71	9.36	3.81	.000	17.15	54.26
	t2 PSF X College Major	-9.66	3.79	-2.55	.012	-17.16	-2.16
	Discussion Posts	6.04	8.61	.70	.484	-11.02	23.11
	t2 PSF X Discussion Posts	-18.20	10.04	-1.81	.073	-38.10	1.70
	College Major X Discussion Posts	-4.77	3.51	-1.36	.178	-11.73	2.20

	t2 PSF X College Major X Discussion Posts	4.11	3.79	1.09	.280	-3.39	11.61
	Age	-.10	.45	-.21	.830	-.98	.79
	Gender	-2.43	6.23	-.39	.697	-14.77	9.90
Model Summary	*F*(9,110) = 3.33, *p* = .001, R^2 = .21.						
Quiz Points (n = 120)	Constant	165.88	17.45	9.51	.000	131.31	200.46
	College Major	4.33	3.82	1.13	.260	-3.25	11.90
	t2 PSR	13.99	8.09	1.73	.090	-2.04	30.02
	t2 PSR X College Major	-3.99	3.53	-1.13	.260	-11.00	3.01
	Discussion Posts	5.01	7.57	.66	.510	-10.00	20.01
	t2 PSR X Discussion Posts	-4.30	7.23	-.59	.550	-18.62	10.02
	College Major X Discussion Posts	-2.78	3.16	-.88	.380	-9.04	3.48
	t2 PSR X College Major X Discussion Posts	1.36	3.01	.45	.650	-4.59	7.32
	Age	-.20	.43	-.48	.640	-1.06	.65
	Gender	-.26	5.91	-.04	.970	-11.98	11.46
Model Summary	*F*(9,110) = .78, *p* = .634, R^2 = .06.						
Discussion Points (n = 66)	Constant	4.90	8.18	.60	.552	-11.49	21.28
	College Major	-.58	2.56	-.23	.822	-5.70	4.54
	t2 PSR	2.10	7.60	.28	.783	-13.12	17.33
	t2 PSR X College Major	-1.05	3.39	-.31	.757	-7.83	5.73
	Discussion Posts	8.75	3.81	2.30	.025	1.12	16.38
	t2 PSR X Discussion Posts	-.73	4.20	-.17	.862	-9.14	7.68
	College Major X Discussion Posts	.36	1.52	.24	.812	-2.68	3.41
	t2 PSR X College Major X Discussion Posts	.50	1.87	.27	.789	-3.24	4.25
	Age	-.02	.13	-.13	.895	-.27	.24
	Gender	-1.52	1.74	-.87	.387	-5.00	1.97
Model Summary	*F*(9,56) = 7.41, *p* < .001, R^2 = .54.						
Final Exam (n = 118)	Constant	30.44	2.21	13.75	.000	26.05	34.83
	College Major	-.35	.50	-.70	.480	-1.35	.64
	t2 PSR	2.14	1.12	1.90	.060	-.09	4.37
	t2 PSR X College Major	-.51	.48	-1.07	.290	-1.46	.44
	Discussion Posts	.34	.98	.35	.730	-1.61	2.29

	t2 PSR X Discussion Posts	-.81	.95	-.86	.390	-2.70	1.07
	College Major X Discussion Posts	-.13	.41	-.32	.750	-.94	.68
	t2 PSR X College Major X Discussion Posts	.06	.39	.16	.870	-.71	.84
	Age	.06	.06	1.16	.250	-.05	.17
	Gender	.44	.75	.58	.560	-1.05	1.93
Model Summary	$F(9,108) = 1.36$, $p = .215$, $R^2 = .10$.						
Total Course Points (n = 120)	Constant	195.27	19.55	9.99	.000	156.52	234.02
	College Major	6.24	4.28	1.46	.150	-2.25	14.73
	t2 PSR	16.65	9.06	1.84	.070	-1.31	34.62
	t2 PSR X College Major	-4.87	3.96	-1.23	.220	-12.72	2.97
	Discussion Posts	2.55	8.48	.30	.760	-14.27	19.36
	t2 PSR X Discussion Posts	-6.15	8.10	-.76	.450	-22.20	9.90
	College Major X Discussion Posts	-3.38	3.54	-.95	.340	-10.39	3.64
	t2 PSR X College Major X Discussion Posts	2.24	3.37	.67	.510	-4.43	8.92
	Age	-.07	.48	-.16	.880	-1.03	.88
	Gender	1.45	6.63	.22	.830	-11.69	14.58
Model Summary	$F(9,110) = 1.16$, $p = .328$, $R^2 = .09$.						

Appendix I.

Moderated regression summary table for CT measures on course outcomes with student metrics.

Measures represent total critical thinking (CT), verbal response (VR), argument analysis (AA), hypothesis testing (HT), likelihood and uncertainty (LU), and problem solving (PS), with subcomponents of forced-choice (F) and free-response (R).

Outcome	Predictor	*B*	*SE*	*t*	*p*	LLCI	ULCI
Quiz Points (n = 28)	Constant	174.44	46.45	3.76	.002	75.97	272.91
	Department Major	-18.25	11.38	-1.60	.128	-42.38	5.87
	t2 CT	-31.57	20.03	-1.58	.135	-74.03	10.90
	t2 CT X Department Major	14.87	10.18	1.46	.164	-6.71	36.45
	Discussion Posts	-42.74	26.05	-1.64	.120	-97.97	12.50
	t2 CT X Discussion Posts	30.08	24.73	1.22	.241	-22.35	82.50
	Department Major X Discussion Posts	17.52	11.76	1.49	.156	-7.42	42.45
	t2 CT X Department Major X Discussion Posts	-14.28	11.97	-1.19	.250	-39.67	11.10
	Age	-.45	1.03	-.43	.670	-2.64	1.74
	Gender	-2.64	7.32	-.36	.723	-18.17	12.89
	ENGL1	-4.25	4.55	-0.94	.363	-13.89	5.39
	curGPA	23.29	4.05	5.74	.000	14.70	31.89
Model Summary	$F(11,16) = 4.05$, $p = .006$, $R^2 = .74$.						
Discussion Points (n = 66)	Constant	9.36	8.34	1.12	.266	-7.33	26.06
	Department Major	-1.78	2.74	-.65	.517	-7.26	3.69
	t2 CT	5.95	6.32	.94	.350	-6.71	18.62
	t2 CT X Department Major	-3.00	2.96	-1.01	.315	-8.93	2.93
	Discussion Posts	7.48	4.21	1.78	.081	-.96	15.92
	t2 CT X Discussion Posts	-3.57	4.13	-.87	.390	-11.85	4.70

	Department Major X Discussion Posts	.70	1.64	.42	.674	-2.60	3.99
	t2 CT X Department Major X Discussion Posts	2.09	1.79	1.17	.249	-1.50	5.68
	Age	-0.01	0.13	-0.05	.959	-0.26	0.25
	Gender	-2.15	1.75	-1.23	.226	-5.66	1.36
Model Summary	*F*(9,56) = 8.31, *p* < .001, R^2 = .57.						
Final Exam (n = 23)	Constant	24.57	9.24	2.66	.020	3.98	45.16
	Department Major	.10	2.28	.04	.970	-4.98	5.17
	t2 CT	3.72	5.25	.71	.500	-7.99	15.43
	t2 CT X Department Major	-1.49	2.33	-.64	.540	-6.69	3.72
	Discussion Posts	4.33	4.87	.89	.390	-6.51	15.18
	t2 CT X Discussion Posts	-10.59	6.29	-1.68	.120	-24.60	3.43
	Department Major X Discussion Posts	-1.89	2.17	-.87	.400	-6.72	2.94
	t2 CT X Department Major X Discussion Posts	4.76	2.64	1.80	.100	-1.13	10.65
	Age	0.24	0.2	1.22	.250	-0.2	0.68
	Gender	-3.01	1.55	-1.95	.080	-6.46	.44
	ENGL1	1.52	1.01	1.51	.160	-.73	3.77
	ENGL2	1.57	1.90	.82	.430	-2.67	5.81
	curGPA	-.73	1.72	-.42	.680	-4.56	3.11
Model Summary	*F*(12,10) = 1.78, *p* = .186, R^2 = .68.						
Total Course Points (n = 28)	Constant	185.56	51.69	3.59	.003	75.97	295.16
	Department Major	-16.30	12.66	-1.29	.216	-43.15	10.55
	t2 CT	-52.87	22.29	-2.37	.031	-100.13	-5.60
	t2 CT X Department Major	22.24	11.33	1.96	.067	-1.79	46.26
	Discussion Posts	-46.87	29.00	-1.62	.126	-108.35	14.60
	t2 CT X Discussion Posts	61.55	27.5	2.24	.040	3.2	119.9
	Department Major X Discussion Posts	17.86	13.09	1.36	.191	-9.89	45.61
	t2 CT X Department Major X Discussion Posts	-25.89	13.33	-1.94	.070	-54.14	2.36
	Age	.14	1.15	.12	.904	-2.30	2.58
	Gender	-1.68	8.15	-.21	.840	-18.96	15.60
	ENGL1	-2.31	5.06	-.46	.655	-13.03	8.42

	curGPA	23.65	4.51	5.24	.000	14.08	33.22
Model Summary	$F(11,16) = 3.89$, $p = .007$, $R^2 = .73$.						
Quiz Points (n = 28)	Constant	162.92	37.94	4.29	.001	82.47	243.36
	Department Major	-11.74	7.75	-1.51	.149	-28.18	4.69
	t2 CTF	-25.70	19.66	-1.31	.210	-67.39	15.98
	t2 CTF X Department Major	13.49	9.87	1.37	.191	-7.43	34.4
	Discussion Posts	-25.81	21.50	-1.20	.247	-71.39	19.77
	t2 CTF X Discussion Posts	12.91	22.39	.58	.572	-34.56	60.37
	Department Major X Discussion Posts	9.76	9.42	1.04	.316	-10.22	29.74
	t2 CTF X Department Major X Discussion Posts	-7.76	10.34	-.75	.464	-29.67	14.15
	Age	-.59	.94	-.63	.536	-2.58	1.39
	Gender	.19	7.75	.02	.981	-16.25	16.62
	ENGL1	-5.00	4.64	-1.08	.298	-14.84	4.85
	curGPA	22.77	4.17	5.46	.000	13.93	31.61
Model Summary	$F(11,16) = 3.99$, $p = .006$, $R^2 = .73$.						
Discussion Points (n = 66)	Constant	9.07	8.22	1.10	.275	-7.39	25.53
	Department Major	-1.53	2.67	-0.57	.568	-6.88	3.82
	t2 CTF	5.72	5.96	.96	.341	-6.21	17.65
	t2 CTF X Department Major	-2.22	2.60	-.85	.397	-7.44	2.99
	Discussion Posts	8.19	4.27	1.92	.060	-.37	16.75
	t2 CTF X Discussion Posts	-6.32	4.11	-1.54	.129	-14.54	1.91
	Department Major X Discussion Posts	.32	1.62	.19	.847	-2.94	3.57
	t2 CTF X Department Major X Discussion Posts	2.53	1.68	1.50	.139	-.85	5.90
	Age	-.03	.12	-.25	.803	-.28	.22
	Gender	-1.65	1.72	-.96	.342	-5.09	1.80
Model Summary	$F(9,56) = 8.39$, $p < .001$, $R^2 = .57$.						
Final Exam (n = 23)	Constant	27.18	7.21	3.77	.000	11.12	43.24
	Department Major	-0.61	1.47	-0.42	.680	-3.88	2.65
	t2 CTF	2.75	5.65	.49	.640	-9.83	15.34
	t2 CTF X Department Major	-.96	2.62	-.37	.720	-6.80	4.87
	Discussion Posts	4.51	4.04	1.12	.290	-4.49	13.50

	t2 CTF X Discussion Posts	-10.09	5.91	-1.71	.120	-23.26	3.08
	Department Major X Discussion Posts	-1.99	1.75	-1.14	.280	-5.88	1.91
	t2 CTF X Department Major X Discussion Posts	4.44	2.50	1.78	.110	-1.12	10.00
	Age	.22	.19	1.17	.270	-.20	.64
	Gender	-3.48	1.73	-2.01	.070	-7.34	.38
	ENGL1	1.37	1.04	1.32	.220	-.95	3.69
	ENGL2	1.81	1.79	1.01	.340	-2.18	5.79
	curGPA	-0.76	1.53	-0.5	.630	-4.18	2.65
Model Summary	$F(12,10) = 1.77$, $p = .187$, $R^2 = .68$.						
Total Course Points (n = 28)	Constant	181.58	42.55	4.27	.001	91.37	271.80
	Department Major	-11.57	8.69	-1.33	.202	-30.00	6.86
	t2 CTF	-58.47	22.05	-2.65	.017	-105.22	-11.72
	t2 CTF X Department Major	27.84	11.06	2.52	.023	4.39	51.30
	Discussion Posts	-36.45	24.11	-1.51	.150	-87.57	14.66
	t2 CTF X Discussion Posts	51.04	25.11	2.03	.059	-2.19	104.26
	Department Major X Discussion Posts	12.47	10.57	1.18	.255	-9.93	34.88
	t2 CTF X Department Major X Discussion Posts	-23.51	11.59	-2.03	.059	-48.08	1.06
	Age	-.44	1.05	-.42	.677	-2.67	1.78
	Gender	5.96	8.7	0.69	.503	-12.48	24.39
	ENGL1	-3.95	5.21	-.76	.459	-14.99	7.09
	curGPA	23.65	4.68	5.06	.000	13.73	33.56
Model Summary	$F(11,16) = 3.76$, $p = .008$, $R^2 = .72$.						
Quiz Points (n = 28)	Constant	175.36	46.32	3.79	.002	77.15	273.57
	Department Major	-21.19	12.83	-1.65	.118	-48.39	6.00
	t2 CTR	-41.56	21.07	-1.97	.066	-86.24	3.12
	t2 CTR X Department Major	16.54	9.93	1.67	.115	-4.51	37.59
	Discussion Posts	-45.60	26.09	-1.75	.100	-100.91	9.72
	t2 CTR X Discussion Posts	48.75	30.00	1.62	.124	-14.85	112.35
	Department Major X Discussion Posts	18.98	12.05	1.58	.135	-6.57	44.52
	t2 CTR X Department Major X Discussion Posts	-20.42	14.5	-1.41	.178	-51.16	10.32

	Age	.16	.98	.16	.872	-1.91	2.23
	Gender	-7.89	7.09	-1.11	.282	-22.92	7.13
	ENGL1	-3.56	4.21	-.85	.410	-12.49	5.37
	curGPA	22.95	3.79	6.06	.000	14.92	30.98
Model Summary	$F(11,16) = 4.75$, $p = .003$, $R^2 = .77$.						
Discussion Points (n = 66)	Constant	9.79	7.96	1.23	.224	-6.16	25.74
	Department Major	-2.71	2.69	-1.01	.317	-8.10	2.67
	t2 CTR	7.49	7.01	1.07	.290	-6.56	21.54
	t2 CTR X Department Major	-4.36	3.30	-1.32	.192	-10.97	2.25
	Discussion Posts	6.37	3.99	1.60	.116	-1.63	14.37
	t2 CTR X Discussion Posts	-2.49	4.3	-0.58	.565	-11.1	6.13
	Department Major X Discussion Posts	1.40	1.61	.87	.387	-1.82	4.62
	t2 CTR X Department Major X Discussion Posts	2.14	1.92	1.11	.271	-1.71	5.98
	Age	.03	.12	.28	.779	-.21	.28
	Gender	-2.19	1.68	-1.31	.196	-5.55	1.16
Model Summary	$F(9,56) = 8.80$, $p < .001$, $R^2 = .59$.						
Final Exam (n = 23)	Constant	20.21	9.38	2.15	.060	-.70	41.13
	Department Major	1.19	2.55	.47	.650	-4.50	6.87
	t2 CTR	3.33	6.44	.52	.620	-11.01	17.67
	t2 CTR X Department Major	-1.62	2.44	-.66	.520	-7.06	3.83
	Discussion Posts	4.12	5.16	.80	.440	-7.38	15.62
	t2 CTR X Discussion Posts	-11.55	8	-1.44	.180	-29.38	6.28
	Department Major X Discussion Posts	-1.79	2.34	-.77	.460	-7.00	3.42
	t2 CTR X Department Major X Discussion Posts	5.56	3.33	1.67	.130	-1.86	12.98
	Age	.27	.20	1.37	.200	-.17	.71
	Gender	-2.36	1.57	-1.50	.160	-5.87	1.14
	ENGL1	1.57	1.01	1.56	.150	-.67	3.82
	ENGL2	1.08	1.66	.65	.530	-2.62	4.78
	curGPA	-.17	1.80	-.10	.930	-4.19	3.84
Model Summary	$F(12,10) = 1.77$, $p = .188$, $R^2 = .68$.						
Total Course Points (n = 28)	Constant	173.71	50.38	3.45	.003	66.89	280.52

	Department Major	-13.75	13.95	-.99	.339	-43.33	15.83
	t2 CTR	-54.74	22.9	-2.39	.030	-103.33	-6.14
	t2 CTR X Department Major	18.95	10.80	1.75	.098	-3.94	41.85
	Discussion Posts	-33.81	28.38	-1.19	.251	-93.97	26.36
	t2 CTR X Discussion Posts	69.62	32.63	2.13	.049	.44	138.80
	Department Major X Discussion Posts	12.34	13.11	.94	.360	-15.45	40.12
	t2 CTR X Department Major X Discussion Posts	-26.27	15.77	-1.67	.115	-59.70	7.16
	Age	1.08	1.06	1.02	.324	-1.17	3.34
	Gender	-8.73	7.71	-1.13	.274	-25.07	7.61
	ENGL1	-1.94	4.58	-.42	.677	-11.65	7.77
	curGPA	22.57	4.12	5.48	.000	13.83	31.30
Model Summary	*F*(11,16) = 4.86, *p* = .002, R^2 = .77.						
Quiz Points (n = 28)	Constant	139.9	36.6	3.82	.002	62.19	217.5
	Department Major	-4.50	7.13	-.63	.537	-19.61	10.61
	t2 VR	-1.59	20.37	-.08	.939	-44.78	41.59
	t2 VR X Department Major	.97	8.56	.11	.911	-17.16	19.11
	Discussion Posts	-7.76	17.97	-.43	.672	-45.86	30.34
	t2 VR X Discussion Posts	1.42	21.15	.07	.947	-43.42	46.26
	Department Major X Discussion Posts	2.02	7.39	.27	.788	-13.65	17.70
	t2 VR X Department Major X Discussion Posts	-2.04	9.30	-.22	.829	-21.75	17.67
	Age	-.12	.91	-.13	.895	-2.05	1.81
	Gender	-4.52	8.04	-.56	.582	-21.57	12.52
	ENGL1	-4.02	4.82	-.83	.417	-14.24	6.20
	curGPA	22.88	4.53	5.05	.000	13.27	32.5
Model Summary	*F*(11,16) = 3.53, *p* = .011, R^2 = .71.						
Discussion Points (n = 66)	Constant	10.77	9.38	1.15	.256	-8.02	29.55
	Department Major	-2.75	3.21	-.86	.395	-9.18	3.67
	t2 VR	4.34	4.83	.90	.373	-5.34	14.02
	t2 VR X Department Major	-2.08	2.22	-.94	.352	-6.53	2.37
	Discussion Posts	6.04	4.78	1.26	.211	-3.54	15.62

	t2 VR X Discussion Posts	-2.11	3.10	-.68	.498	-8.33	4.10
	Department Major X Discussion Posts	1.42	1.87	.76	.449	-2.32	5.16
	t2 VR X Department Major X Discussion Posts	1.24	1.39	.89	.376	-1.55	4.04
	Age	.00	.13	.03	.974	-.25	.26
	Gender	-1.96	1.77	-1.11	.273	-5.5	1.58
Model Summary	$F(9,56) = 7.82, p < .001, R^2 = .56.$						
Final Exam (n = 23)	Constant	20.35	6.69	3.04	.010	5.45	35.26
	Department Major	.42	1.54	.28	.790	-3.00	3.85
	t2 VR	-3.36	4.09	-.82	.430	-12.48	5.75
	t2 VR X Department Major	1.75	1.72	1.02	.330	-2.08	5.57
	Discussion Posts	1.48	3.63	.41	.690	-6.61	9.56
	t2 VR X Discussion Posts	-1.04	4.34	-.24	.820	-10.72	8.64
	Department Major X Discussion Posts	-.14	1.44	-.09	.930	-3.36	3.08
	t2 VR X Department Major X Discussion Posts	.06	1.90	.03	.970	-4.18	4.30
	Age	.31	.16	1.86	.090	-.06	.67
	Gender	-1.77	1.52	-1.17	.270	-5.15	1.61
	ENGL1	1.51	1.01	1.50	.160	-.73	3.76
	ENGL2	.85	1.43	.59	.570	-2.34	4.05
	curGPA	-.11	1.31	-.09	.930	-3.03	2.80
Model Summary	$F(12,10) = 1.92, p = .155, R^2 = .70.$						
Total Course Points (n = 28)	Constant	128.92	44.16	2.92	.010	35.30	222.55
	Department Major	7.19	8.59	.84	.415	-11.03	25.41
	t2 VR	-35.19	24.56	-1.43	.171	-87.27	16.88
	t2 VR X Department Major	15.24	10.32	1.48	.159	-6.63	37.12
	Discussion Posts	4.32	21.67	.20	.845	-41.62	50.25
	t2 VR X Discussion Posts	36.34	25.50	1.42	.173	-17.73	90.41
	Department Major X Discussion Posts	-5.54	8.92	-0.62	.543	-24.44	13.37
	t2 VR X Department Major X Discussion Posts	-15.73	11.21	-1.40	.180	-39.49	8.04
	Age	.47	1.10	.43	.671	-1.85	2.80
	Gender	-.10	9.69	-.01	.992	-20.65	20.45
	ENGL1	-1.75	5.81	-.30	.768	-14.07	10.58

	curGPA	21.24	5.47	3.88	.001	9.65	32.83
Model Summary	$F(11,16) = 2.67$, $p = .036$, $R^2 = .65$.						
Quiz Points (n = 28)	Constant	138.88	35.61	3.90	.001	63.39	214.38
	Department Major	-4.29	5.98	-.72	.484	-16.96	8.39
	Zv2VRR	16.19	21.19	.76	.456	-28.73	61.11
	t2 VRF X Department Major	-6.07	8.39	-.72	.480	-23.86	11.72
	Discussion Posts	-12.9	15.7	-0.82	.423	-46.14	20.34
	t2 VRF X Discussion Posts	-4.86	19.70	-.25	.808	-46.63	36.91
	Department Major X Discussion Posts	4.74	6.46	.73	.473	-8.95	18.44
	t2 VRF X Department Major X Discussion Posts	.15	8.43	.02	.986	-17.73	18.03
	Age	-.22	.90	-.24	.812	-2.11	1.68
	Gender	-7.34	8.01	-.92	.373	-24.32	9.65
	ENGL1	-3.07	4.66	-.66	.519	-12.95	6.81
	curGPA	24.19	4.21	5.74	.000	15.26	33.11
Model Summary	$F(11,16) = 4.01$, $p = .006$, $R^2 = .73$.						
Discussion Points (n = 66)	Constant	10.27	8.44	1.22	.229	-6.63	27.17
	Department Major	-2.11	2.78	-.76	.451	-7.67	3.45
	Zv2VRR	5.44	4.7	1.16	.252	-3.98	14.85
	t2 VRF X Department Major	-2.55	2.04	-1.25	.216	-6.64	1.54
	Discussion Posts	6.57	4.30	1.53	.132	-2.05	15.19
	t2 VRF X Discussion Posts	-4.50	3.11	-1.45	.154	-10.73	1.73
	Department Major X Discussion Posts	1.06	1.65	.64	.523	-2.24	4.36
	t2 VRF X Department Major X Discussion Posts	2.33	1.37	1.71	.093	-.40	5.07
	Age	-.03	.12	-.26	.798	-.28	.21
	Gender	-1.77	1.66	-1.06	.291	-5.09	1.56
Model Summary	$F(9,56) = 8.93$, $p < .001$, $R^2 = .59$.						
Final Exam (n = 23)	Constant	26.80	6.26	4.28	.000	12.85	40.75
	Department Major	-.80	1.16	-.69	.510	-3.39	1.79
	Zv2VRR	3	3.92	0.77	.460	-5.74	11.75
	t2 VRF X Department Major	-1.18	1.54	-.76	.460	-4.61	2.26
	Discussion Posts	1.86	3.14	.59	.570	-5.13	8.85

	t2 VRF X Discussion Posts	-7.40	3.58	-2.07	.070	-15.38	.58
	Department Major X Discussion Posts	-.28	1.22	-.23	.820	-3.01	2.45
	t2 VRF X Department Major X Discussion Posts	3.06	1.52	2.01	.070	-.33	6.44
	Age	.22	.17	1.25	.240	-.17	.60
	Gender	-2.51	1.55	-1.62	.140	-5.97	.95
	ENGL1	1.13	.94	1.20	.260	-.98	3.23
	ENGL2	.51	1.25	.41	.690	-2.28	3.31
	curGPA	.48	1.26	.38	.710	-2.34	3.29
Model Summary	$F(12,10) = 2.06$, $p = .130$, $R^2 = .71$.						
Total Course Points (n = 28)	Constant	148.11	46.90	3.16	.010	48.68	247.53
	Department Major	3.13	7.88	.40	.700	-13.56	19.83
	Zv2VRR	15.75	27.90	.56	.580	-43.41	74.91
	t2 VRF X Department Major	-5.90	11.05	-.53	.600	-29.32	17.53
	Discussion Posts	3.15	20.65	.15	.880	-40.63	46.92
	t2 VRF X Discussion Posts	-11.07	25.95	-.43	.680	-66.08	43.94
	Department Major X Discussion Posts	-3.38	8.51	-.40	.700	-21.41	14.65
	t2 VRF X Department Major X Discussion Posts	3.18	11.11	.29	.780	-20.37	26.73
	Age	.14	1.18	.12	.900	-2.36	2.64
	Gender	-3.78	10.55	-.36	.720	-26.15	18.59
	ENGL1	-3.8	6.14	-0.62	.540	-16.81	9.2
	curGPA	23.76	5.55	4.29	.000	12.01	35.52
Model Summary	$F(11,16) = 2.34$, $p = .060$, $R^2 = .62$.						
Quiz Points (n = 28)	Constant	136.97	36.42	3.76	.002	59.76	214.19
	Department Major	-4.49	7.10	-.63	.536	-19.55	10.57
	t2 VRR	-7.12	18.87	-.38	.711	-47.14	32.89
	t2 VRR X Department Major	2.36	7.26	.33	.749	-13.04	17.76
	Discussion Posts	-11.02	18.08	-.61	.551	-49.36	27.31
	t2 VRR X Discussion Posts	3.76	19.03	.20	.846	-36.59	44.10
	Department Major X Discussion Posts	3.16	7.53	.42	.680	-12.80	19.12
	t2 VRR X Department Major X Discussion Posts	-1.76	7.73	-.23	.823	-18.15	14.63
	Age	-0.05	0.97	-0.05	.962	-2.09	2

	Gender	-3.04	8.18	-.37	.715	-20.39	14.31
	ENGL1	-4.50	4.81	-.93	.364	-14.70	5.71
	curGPA	23.05	5.02	4.59	.000	12.41	33.68
Model Summary	*F*(11,16) = 3.41, *p* = .013, R^2 = .70.						
Discussion Points (n = 66)	Constant	9.92	9.08	1.09	.279	-8.27	28.12
	Department Major	-2.62	3.14	-.83	.407	-8.91	3.67
	t2 VRR	4.07	5.59	.73	.470	-7.13	15.27
	t2 VRR X Department Major	-1.82	2.55	-.71	.478	-6.92	3.29
	Discussion Posts	6.46	4.65	1.39	.170	-2.85	15.76
	t2 VRR X Discussion Posts	-1.52	3.57	-.43	.671	-8.67	5.62
	Department Major X Discussion Posts	1.28	1.83	0.7	.489	-2.4	4.95
	t2 VRR X Department Major X Discussion Posts	.77	1.61	.48	.634	-2.46	4.01
	Age	.01	.13	.10	.921	-.25	.28
	Gender	-1.85	1.76	-1.05	.298	-5.37	1.68
Model Summary	*F*(9,56) = 7.58, *p* < .001, R^2 = .55.						
Final Exam (n = 23)	Constant	19.44	6.72	2.89	.020	4.46	34.42
	Department Major	.84	1.52	.55	.590	-2.54	4.22
	t2 VRR	-4.70	3.79	-1.24	.240	-13.15	3.75
	t2 VRR X Department Major	2.27	1.45	1.57	.150	-.96	5.49
	Discussion Posts	1.61	3.63	.44	.670	-6.48	9.70
	t2 VRR X Discussion Posts	.81	4.01	.20	.840	-8.13	9.76
	Department Major X Discussion Posts	-0.2	1.46	-0.14	.890	-3.44	3.05
	t2 VRR X Department Major X Discussion Posts	-.68	1.61	-.42	.680	-4.26	2.90
	Age	.35	.17	2.05	.070	-.03	.74
	Gender	-1.63	1.52	-1.07	.310	-5.01	1.76
	ENGL1	1.86	1.05	1.77	.110	-.48	4.20
	ENGL2	.59	1.48	.40	.700	-2.70	3.89
	curGPA	-.65	1.53	-.42	.680	-4.06	2.77
Model Summary	*F*(12,10) = 1.80, *p* = .180, R^2 = .68.						
Total Course Points (n = 28)	Constant	133.16	41.44	3.21	.005	45.30	221.02
	Department Major	6.04	8.08	.75	.466	-11.10	23.18

	t2 VRR	-37.71	21.48	-1.76	.098	-83.25	7.82
	t2 VRR X Department Major	14.18	8.27	1.72	.106	-3.35	31.7
	Discussion Posts	-.71	20.57	-.03	.973	-44.33	42.91
	t2 VRR X Discussion Posts	39.01	21.65	1.80	.090	-6.89	84.91
	Department Major X Discussion Posts	-3.48	8.57	-.41	.690	-21.64	14.68
	t2 VRR X Department Major X Discussion Posts	-14.28	8.80	-1.62	.124	-32.93	4.37
	Age	.42	1.10	.38	.709	-1.91	2.75
	Gender	-1.74	9.31	-.19	.854	-21.48	18.00
	ENGL1	-2.26	5.48	-.41	.685	-13.88	9.35
	curGPA	22.57	5.71	3.95	.001	10.47	34.67
Model Summary	$F(11,16) = 3.06$, $p = .021$, $R^2 = .68$.						
Quiz Points (n = 28)	Constant	151.36	37.95	3.99	.001	70.90	231.82
	Department Major	-14.75	10.1	-1.46	.164	-36.18	6.68
	t2 AA	-33.92	17.12	-1.98	.065	-70.22	2.38
	t2 AA X Department Major	10.79	6.70	1.61	.127	-3.41	25.00
	Discussion Posts	-41.32	25.33	-1.63	.122	-95.02	12.37
	t2 AA X Discussion Posts	38.95	19.70	1.98	.066	-2.81	80.71
	Department Major X Discussion Posts	16.82	11.98	1.40	.180	-8.59	42.23
	t2 AA X Department Major X Discussion Posts	-14.26	8.70	-1.64	.121	-32.71	4.19
	Age	.27	.80	.33	.746	-1.44	1.97
	Gender	-4.10	6.76	-.61	.553	-18.43	10.23
	ENGL1	-4.71	4.11	-1.15	.269	-13.42	4.00
	curGPA	25.09	3.78	6.63	.000	17.07	33.11
Model Summary	$F(11,16) = 5.24$, $p = .002$, $R^2 = .78$.						
Discussion Points (n = 66)	Constant	5.97	7.16	.83	.407	-8.37	20.31
	Department Major	-.80	2.28	-.35	.728	-5.37	3.78
	t2 AA	3.45	6.04	.57	.570	-8.65	15.55
	t2 AA X Department Major	-2.13	2.51	-.85	.401	-7.16	2.91
	Discussion Posts	9.05	3.62	2.50	.015	1.80	16.29
	t2 AA X Discussion Posts	-1.00	4.19	-.24	.812	-9.40	7.40
	Department Major X Discussion Posts	.17	1.44	.12	.904	-2.71	3.06

	t2 AA X Department Major X Discussion Posts	1.18	1.71	.69	.492	-2.24	4.61
	Age	-.01	.12	-.06	.949	-.25	.23
	Gender	-1.89	1.66	-1.14	.261	-5.22	1.44
Model Summary	$F(9,56) = 8.79$, $p < .001$, $R^2 = .59$.						
Final Exam (n = 23)	Constant	19.81	7.40	2.68	.020	3.33	36.30
	Department Major	1.59	2.10	.75	.470	-3.10	6.28
	t2 AA	4.01	5.12	.78	.450	-7.40	15.43
	t2 AA X Department Major	-1.74	1.78	-.98	.350	-5.71	2.23
	Discussion Posts	10.82	5.57	1.94	.080	-1.59	23.22
	t2 AA X Discussion Posts	-10.58	6.00	-1.76	.110	-23.96	2.79
	Department Major X Discussion Posts	-4.96	2.51	-1.98	.080	-10.56	.63
	t2 AA X Department Major X Discussion Posts	4.86	2.32	2.10	.060	-.31	10.02
	Age	.28	.15	1.87	.090	-.05	.61
	Gender	-2.12	1.51	-1.40	.190	-5.49	1.25
	ENGL1	1.91	1.05	1.83	.100	-0.42	4.25
	ENGL2	.87	1.45	.60	.560	-2.36	4.10
	curGPA	-.71	1.70	-.42	.690	-4.49	3.07
Model Summary	$F(12,10) = 2.20$, $p = .111$, $R^2 = .72$.						
Total Course Points (n = 28)	Constant	134.47	46.25	2.91	.010	36.41	232.53
	Department Major	-1.69	12.32	-.14	.893	-27.80	24.43
	t2 AA	-34.85	20.87	-1.67	.114	-79.09	9.39
	t2 AA X Department Major	8.80	8.16	1.08	.297	-8.51	26.10
	Discussion Posts	-20.27	30.86	-.66	.521	-85.71	45.16
	t2 AA X Discussion Posts	41.95	24.00	1.75	.100	-8.94	92.84
	Department Major X Discussion Posts	6.13	14.60	.42	.680	-24.83	37.10
	t2 AA X Department Major X Discussion Posts	-13.89	10.6	-1.31	.209	-36.37	8.6
	Age	1.01	.98	1.03	.320	-1.07	3.08
	Gender	.07	8.24	.01	.994	-17.39	17.53
	ENGL1	-3.66	5.01	-.73	.475	-14.28	6.96
	curGPA	24.64	4.61	5.35	.000	14.87	34.41
Model Summary	$F(11,16) = 3.97$, $p = .006$, $R^2 = .73$.						

Quiz Points (n = 28)	Constant	161.27	41.55	3.88	.001	73.19	249.35
	Department Major	-14.29	10.93	-1.31	.210	-37.47	8.89
	t2 AAF	-21.86	19.07	-1.15	.268	-62.29	18.57
	t2 AAF X Department Major	9.30	9.03	1.03	.318	-9.83	28.44
	Discussion Posts	-40.20	24.18	-1.66	.116	-91.46	11.05
	t2 AAF X Discussion Posts	25.81	19.6	1.32	.206	-15.68	67.31
	Department Major X Discussion Posts	16.65	11.00	1.51	.150	-6.67	39.98
	t2 AAF X Department Major X Discussion Posts	-11.92	9.19	-1.30	.213	-31.41	7.56
	Age	-.31	.85	-.37	.719	-2.10	1.48
	Gender	-5.32	7.46	-.71	.486	-21.15	10.50
	ENGL1	-3.66	4.69	-.78	.446	-13.60	6.27
	curGPA	24.79	4.07	6.09	.000	16.16	33.42
Model Summary	$F(11,16) = 3.94$, $p = .007$, $R^2 = .73$.						
Discussion Points (n = 66)	Constant	8.42	7.88	1.07	.289	-7.36	24.20
	Department Major	-1.22	2.51	-.49	.629	-6.24	3.80
	t2 AAF	4.54	4.76	.95	.345	-5.00	14.07
	t2 AAF X Department Major	-2.32	2.07	-1.12	.267	-6.48	1.83
	Discussion Posts	8.45	4.01	2.10	.040	.41	16.49
	t2 AAF X Discussion Posts	-3.72	3.30	-1.13	.264	-10.32	2.88
	Department Major X Discussion Posts	.27	1.54	.18	.860	-2.82	3.37
	t2 AAF X Department Major X Discussion Posts	2.03	1.39	1.46	.149	-.75	4.81
	Age	-.03	.12	-.21	.835	-.27	.22
	Gender	-2.08	1.67	-1.24	.220	-5.43	1.28
Model Summary	$F(9,56) = 8.60$, $p < .001$, $R^2 = .58$.						
Final Exam (n = 23)	Constant	20.30	7.12	2.85	.020	4.44	36.17
	Department Major	1.14	2.00	.57	.580	-3.31	5.58
	t2 AAF	4.07	4.29	.95	.370	-5.50	13.65
	t2 AAF X Department Major	-2.08	1.91	-1.09	.300	-6.34	2.18
	Discussion Posts	6.77	4.44	1.52	.160	-3.14	16.67
	t2 AAF X Discussion Posts	-8.61	3.94	-2.18	.050	-17.40	.18
	Department Major X Discussion Posts	-2.93	1.95	-1.50	.170	-7.28	1.43

	t2 AAF X Department Major X Discussion Posts	4.05	1.79	2.27	.050	.07	8.03
	Age	.29	.15	1.89	.090	-.05	.63
	Gender	-1.88	1.45	-1.30	.220	-5.10	1.35
	ENGL1	1.73	.98	1.77	.110	-.45	3.92
	ENGL2	.43	1.39	.31	.760	-2.66	3.52
	curGPA	-.09	1.41	-.06	.950	-3.23	3.05
Model Summary	$F(12,10) = 2.19$, $p = .111$, $R^2 = .72$.						
Total Course Points (n = 28)	Constant	167.4	50.8	3.29	.005	59.68	275.1
	Department Major	-8.14	13.37	-.61	.551	-36.49	20.20
	t2 AAF	-31.57	23.32	-1.35	.195	-81.01	17.88
	t2 AAF X Department Major	11.84	11.04	1.07	.299	-11.56	35.24
	Discussion Posts	-27.06	29.57	-.92	.374	-89.74	35.62
	t2 AAF X Discussion Posts	32.64	23.93	1.36	.192	-18.10	83.38
	Department Major X Discussion Posts	9.27	13.45	.69	.501	-19.25	37.79
	t2 AAF X Department Major X Discussion Posts	-13.18	11.24	-1.17	.258	-37.01	10.65
	Age	.29	1.03	.28	.780	-1.90	2.49
	Gender	-2.42	9.13	-.27	.794	-21.78	16.93
	ENGL1	-3.58	5.73	-.62	.541	-15.73	8.57
	curGPA	24.47	4.98	4.91	.000	13.91	35.03
Model Summary	$F(11,16) = 2.89$, $p = .027$, $R^2 = .67$.						
Quiz Points (n = 28)	Constant	142.54	29.49	4.83	.000	80.01	205.07
	Department Major	-14.28	7.92	-1.80	.090	-31.06	2.51
	t2 AAR	-61.60	18.85	-3.27	.005	-101.56	-21.65
	t2 AAR X Department Major	18.22	6.52	2.79	.013	4.39	32.05
	Discussion Posts	-26.64	21.37	-1.25	.230	-71.94	18.65
	t2 AAR X Discussion Posts	51.16	21.16	2.42	.028	6.31	96.02
	Department Major X Discussion Posts	10.39	10.33	1.01	.330	-11.51	32.30
	t2 AAR X Department Major X Discussion Posts	-16.30	9.20	-1.77	.096	-35.81	3.22
	Age	.79	.67	1.18	.256	-.63	2.21
	Gender	-1.5	5.68	-0.26	.795	-13.53	10.54

	ENGL1	-7.96	3.70	-2.15	.047	-15.80	-.11
	curGPA	25.68	3.15	8.14	.000	18.99	32.37
Model Summary	F(11,16) = 8.91, p < .001, R^2 = .86.						
Discussion Points (n = 66)	Constant	4.94	6.19	.80	.428	-7.45	17.33
	Department Major	-1.24	2.11	-.59	.558	-5.47	2.98
	t2 AAR	-3.15	8.85	-.36	.723	-20.87	14.58
	t2 AAR X Department Major	.33	3.46	.10	.924	-6.60	7.26
	Discussion Posts	7.69	3.40	2.26	.028	.88	14.49
	t2 AAR X Discussion Posts	5.60	5.74	.98	.334	-5.90	17.10
	Department Major X Discussion Posts	.83	1.38	.60	.550	-1.93	3.59
	t2 AAR X Department Major X Discussion Posts	-1.38	2.25	-0.61	.541	-5.88	3.12
	Age	.01	.12	.06	.956	-.23	.25
	Gender	-1.07	1.59	-.67	.503	-4.26	2.11
Model Summary	F(9,56) = 9.27, p < .001, R^2 = .60.						
Final Exam (n = 23)	Constant	19.40	8.19	2.37	.040	1.14	37.66
	Department Major	1.94	2.65	.73	.480	-3.96	7.84
	t2 AAR	2.90	7.85	.37	.720	-14.59	20.39
	t2 AAR X Department Major	-1.43	2.60	-.55	.590	-7.22	4.36
	Discussion Posts	6.94	6.81	1.02	.330	-8.25	22.12
	t2 AAR X Discussion Posts	-3.69	8.18	-.45	.660	-21.93	14.54
	Department Major X Discussion Posts	-3.22	3.13	-1.03	.330	-10.20	3.76
	t2 AAR X Department Major X Discussion Posts	2.39	3.22	0.74	.480	-4.8	9.57
	Age	.18	.17	1.06	.310	-.20	.57
	Gender	-2.20	1.77	-1.24	.240	-6.15	1.76
	ENGL1	2.81	1.52	1.85	.090	-.57	6.19
	ENGL2	-.02	1.64	-.01	.990	-3.68	3.64
	curGPA	-.06	1.62	-.04	.970	-3.67	3.55
Model Summary	F(12,10) = 1.61, p = .228, R^2 = .66.						
Total Course Points (n = 28)	Constant	118.91	45.18	2.63	.018	23.12	214.69
	Department Major	3.73	12.13	.31	.763	-21.99	29.44
	t2 AAR	-38.82	28.87	-1.34	.198	-	22.38

						100.03	
	t2 AAR X Department Major	8.51	9.99	.85	.407	-12.68	29.69
	Discussion Posts	-7.17	32.7	-0.22	.829	-76.55	62.21
	t2 AAR X Discussion Posts	45.85	32.41	1.41	.176	-22.86	114.56
	Department Major X Discussion Posts	.82	15.83	.05	.959	-32.73	34.38
	t2 AAR X Department Major X Discussion Posts	-14.68	14.10	-1.04	.313	-44.57	15.22
	Age	1.09	1.03	1.06	.305	-1.09	3.26
	Gender	5.15	8.70	.59	.562	-13.29	23.58
	ENGL1	-6.18	5.67	-1.09	.292	-18.19	5.84
	curGPA	24.68	4.83	5.11	.000	14.43	34.92
Model Summary	$F(11,16) = 3.86$, $p = .007$, $R^2 = .73$.						
Quiz Points (n = 28)	Constant	161.10	41.78	3.86	.001	72.52	249.67
	Department Major	-12.34	9.93	-1.24	.232	-33.40	8.72
	t2 HT	-27.86	26	-1.07	.300	-83.05	27.33
	t2 HT X Department Major	14.27	13.17	1.08	.295	-13.66	42.20
	Discussion Posts	-29.46	24.71	-1.19	.251	-81.84	22.92
	t2 HT X Discussion Posts	14.94	25.61	.58	.568	-39.35	69.24
	Department Major X Discussion Posts	11.49	11.10	1.03	.316	-12.05	35.03
	t2 HT X Department Major X Discussion Posts	-7.84	12.58	-.62	.542	-34.50	18.83
	Age	-.59	1.12	-.53	.605	-2.97	1.79
	Gender	-.13	8.52	-.02	.988	-18.19	17.92
	ENGL1	-3.66	4.56	-.80	.434	-13.31	6.00
	curGPA	22.03	4.33	5.09	.000	12.85	31.20
Model Summary	$F(11,16) = 3.73$, $p = .009$, $R^2 = .72$.						
Discussion Points (n = 66)	Constant	10.64	7.49	1.42	.161	-4.36	25.64
	Department Major	-1.58	2.51	-.63	.531	-6.60	3.44
	t2 HT	12.16	10.01	1.21	.230	-7.90	32.22
	t2 HT X Department Major	-4.84	4.32	-1.12	.267	-13.49	3.81
	Discussion Posts	7.74	3.63	2.13	.037	.48	15.00
	t2 HT X Discussion Posts	-9.82	5.81	-1.69	.097	-21.46	1.82
	Department Major X Discussion Posts	.70	1.49	.47	.640	-2.28	3.68

	t2 HT X Department Major X Discussion Posts	3.99	2.42	1.65	.105	-.86	8.84
	Age	-.07	.12	-.57	.571	-.31	.17
	Gender	-2.44	1.66	-1.47	.147	-5.76	.88
Model Summary	$F(9,56) = 9.33$, $p < .001$, $R^2 = .60$.						
Final Exam (n = 23)	Constant	26	8.23	3.16	.010	7.65	44.35
	Department Major	-1.21	1.92	-.63	.540	-5.50	3.07
	t2 HT	-3.84	5.75	-.67	.520	-16.65	8.97
	t2 HT X Department Major	1.84	2.82	.65	.530	-4.44	8.12
	Discussion Posts	-.22	4.69	-.05	.960	-10.68	10.24
	t2 HT X Discussion Posts	-2.47	5.60	-.44	.670	-14.97	10.02
	Department Major X Discussion Posts	.45	2.10	.21	.840	-4.24	5.14
	t2 HT X Department Major X Discussion Posts	.93	2.61	.36	.730	-4.90	6.76
	Age	.20	.21	.92	.380	-.28	.67
	Gender	-2.71	1.82	-1.49	.170	-6.76	1.34
	ENGL1	1.67	1.05	1.59	.140	-.67	4.02
	ENGL2	1.2	1.55	0.77	.460	-2.26	4.66
	curGPA	.00	1.46	.00	1.000	-3.26	3.27
Model Summary	$F(12,10) = 1.37$, $p = .312$, $R^2 = .62$.						
Total Course Points (n = 28)	Constant	192.84	47.09	4.10	.001	93.01	292.67
	Department Major	-15.65	11.20	-1.40	.181	-39.39	8.08
	t2 HT	-66.56	29.34	-2.27	.037	-128.76	-4.35
	t2 HT X Department Major	32.21	14.85	2.17	.045	.73	63.69
	Discussion Posts	-46.82	27.84	-1.68	.112	-105.85	12.22
	t2 HT X Discussion Posts	61.22	28.86	2.12	.050	.03	122.42
	Department Major X Discussion Posts	18.14	12.51	1.45	.166	-8.38	44.67
	t2 HT X Department Major X Discussion Posts	-28.32	14.18	-2.00	.063	-58.37	1.73
	Age	-0.51	1.27	-0.4	.694	-3.19	2.17
	Gender	4.92	9.60	.51	.615	-15.43	25.27
	ENGL1	-3.04	5.13	-.59	.562	-13.92	7.85
	curGPA	21.60	4.88	4.43	.000	11.26	31.95

Model Summary	$F(11,16) = 3.46$, $p = .012$, $R^2 = .70$.						
Quiz Points (n = 28)	Constant	154.45	35.24	4.38	.001	79.75	229.16
	Department Major	-3.62	5.74	-.63	.537	-15.78	8.54
	t2 HTF	-18.80	19.95	-.94	.360	-61.10	23.51
	t2 HTF X Department Major	12.07	9.51	1.27	.223	-8.10	32.23
	Discussion Posts	-5.10	17.24	-.30	.771	-41.64	31.45
	t2 HTF X Discussion Posts	-8.43	20.35	-.41	.684	-51.57	34.72
	Department Major X Discussion Posts	0.38	7	0.05	.958	-14.46	15.21
	t2 HTF X Department Major X Discussion Posts	1.00	8.97	.11	.913	-18.03	20.02
	Age	-.91	1.07	-.85	.407	-3.17	1.35
	Gender	.47	7.98	.06	.954	-16.45	17.39
	ENGL1	-4.97	4.67	-1.06	.303	-14.87	4.93
	curGPA	21.83	3.95	5.53	.000	13.46	30.21
Model Summary	$F(11,16) = 4.43$, $p = .004$, $R^2 = .75$.						
Discussion Points (n = 66)	Constant	6.44	6.26	1.03	.308	-6.10	18.98
	Department Major	-.34	2.08	-.16	.870	-4.51	3.82
	t2 HTF	8.21	8.13	1.01	.317	-8.09	24.50
	t2 HTF X Department Major	-3.14	3.50	-.90	.373	-10.16	3.87
	Discussion Posts	9.71	3.25	2.99	.004	3.2	16.22
	t2 HTF X Discussion Posts	-10.19	5.02	-2.03	.047	-20.24	-.14
	Department Major X Discussion Posts	-.07	1.30	-.06	.956	-2.68	2.53
	t2 HTF X Department Major X Discussion Posts	3.95	2.14	1.85	.070	-.33	8.23
	Age	-.04	.12	-.31	.761	-.27	.20
	Gender	-2.28	1.63	-1.39	.169	-5.55	1.00
Model Summary	$F(9,56) = 10.17$, $p < .001$, $R^2 = .62$.						
Final Exam (n = 23)	Constant	24.50	8.38	2.92	.020	5.83	43.18
	Department Major	-.40	1.59	-.25	.810	-3.94	3.13
	t2 HTF	-2.10	6.18	-.34	.740	-15.88	11.68
	t2 HTF X Department Major	.87	2.94	.30	.770	-5.68	7.43
	Discussion Posts	2.03	4.15	0.49	.640	-7.22	11.27
	t2 HTF X Discussion Posts	-4.02	5.63	-.71	.490	-16.56	8.53

	Department Major X Discussion Posts	-.40	1.68	-.24	.820	-4.15	3.35
	t2 HTF X Department Major X Discussion Posts	1.52	2.38	.64	.540	-3.77	6.81
	Age	.21	.24	.88	.400	-.32	.74
	Gender	-2.91	2.07	-1.40	.190	-7.53	1.71
	ENGL1	1.55	1.18	1.32	.220	-1.07	4.18
	ENGL2	.60	1.61	.37	.720	-2.98	4.18
	curGPA	.72	1.46	.50	.630	-2.53	3.98
Model Summary	*F*(12,10) = 1.17, *p* = .407, R^2 = .58.						
Total Course Points (n = 28)	Constant	156.55	38.94	4.02	.001	73.99	239.11
	Department Major	3	6.34	0.47	.643	-10.44	16.44
	t2 HTF	-61.68	22.05	-2.80	.013	-108.43	-14.93
	t2 HTF X Department Major	32.35	10.51	3.08	.007	10.07	54.64
	Discussion Posts	-6.26	19.05	-.33	.747	-46.65	34.13
	t2 HTF X Discussion Posts	30.96	22.49	1.38	.188	-16.72	78.64
	Department Major X Discussion Posts	-1.85	7.73	-.24	.814	-18.25	14.55
	t2 HTF X Department Major X Discussion Posts	-16.23	9.92	-1.64	.121	-37.25	4.80
	Age	-.74	1.18	-.63	.537	-3.24	1.76
	Gender	10.66	8.82	1.21	.245	-8.04	29.36
	ENGL1	-2.97	5.16	-.57	.574	-13.91	7.98
	curGPA	20.10	4.37	4.60	.000	10.84	29.35
Model Summary	*F*(11,16) = 4.34, *p* = .004, R^2 = .75.						
Quiz Points (n = 28)	Constant	159.10	53.06	3.00	.009	46.60	271.59
	Department Major	-12.01	18.72	-.64	.530	-51.70	27.67
	t2 HTR	-23.55	39.44	-.60	.559	-107.17	60.07
	t2 HTR X Department Major	9.47	18.52	.51	.616	-29.80	48.74
	Discussion Posts	-26.57	37.68	-.70	.491	-106.46	53.33
	t2 HTR X Discussion Posts	21.30	43.43	.49	.630	-70.78	113.38
	Department Major X Discussion Posts	10.59	18.52	.57	.575	-28.67	49.85
	t2 HTR X Department Major X Discussion Posts	-8.59	20.96	-.41	.687	-53.03	35.85

	Age	-.16	.96	-.17	.866	-2.20	1.87
	Gender	-6.52	8.16	-.80	.436	-23.82	10.78
	ENGL1	-4.9	4.62	-1.06	.305	-14.69	4.9
	curGPA	24.01	4.30	5.59	.000	14.90	33.12
Model Summary	F(11,16) = 3.59, p = .010, R^2 = .71.						
Discussion Points (n = 66)	Constant	9.78	7.50	1.30	.197	-5.24	24.81
	Department Major	-2.19	2.64	-.83	.411	-7.47	3.10
	t2 HTR	8.25	8.33	.99	.326	-8.43	24.93
	t2 HTR X Department Major	-4.15	3.67	-1.13	.263	-11.50	3.20
	Discussion Posts	7.44	3.76	1.98	.053	-.10	14.98
	t2 HTR X Discussion Posts	-4.30	4.75	-.90	.370	-13.82	5.23
	Department Major X Discussion Posts	1.03	1.57	.66	.514	-2.11	4.17
	t2 HTR X Department Major X Discussion Posts	2.47	2.01	1.23	.224	-1.55	6.49
	Age	-0.03	0.12	-0.22	.830	-0.27	0.22
	Gender	-2.19	1.62	-1.35	.183	-5.44	1.06
Model Summary	F(9,56) = 8.85, p < .001, R^2 = .59.						
Final Exam (n = 23)	Constant	24.46	10.45	2.34	.040	1.17	47.75
	Department Major	-.24	3.89	-.06	.950	-8.90	8.42
	t2 HTR	-.73	7.41	-.10	.920	-17.25	15.79
	t2 HTR X Department Major	.16	3.51	.05	.960	-7.67	7.99
	Discussion Posts	1.14	7.70	.15	.880	-16.02	18.31
	t2 HTR X Discussion Posts	-5.60	8.26	-.68	.510	-24.02	12.81
	Department Major X Discussion Posts	-.37	3.73	-.10	.920	-8.68	7.93
	t2 HTR X Department Major X Discussion Posts	2.78	3.96	.70	.500	-6.04	11.60
	Age	0.25	0.18	1.45	.180	-0.14	0.65
	Gender	-3.13	1.78	-1.76	.110	-7.09	.83
	ENGL1	1.62	1.04	1.55	.150	-.70	3.94
	ENGL2	1.00	1.52	.66	.520	-2.38	4.38
	curGPA	-.03	1.49	-.02	.980	-3.36	3.30
Model Summary	F(12,10) = 1.49, p = .268, R^2 = .64.						
Total Course Points (n = 28)	Constant	156.11	63.05	2.48	.025	22.44	289.79

	Department Major	1.72	22.24	.08	.939	-45.44	48.88
	t2 HTR	-14.92	46.87	-.32	.754	-114.28	84.44
	t2 HTR X Department Major	3.54	22.01	.16	.874	-43.12	50.20
	Discussion Posts	-1.10	44.78	-.02	.981	-96.04	93.84
	t2 HTR X Discussion Posts	23.16	51.6	0.45	.660	-86.26	132.6
	Department Major X Discussion Posts	-2.48	22.01	-.11	.912	-49.13	44.17
	t2 HTR X Department Major X Discussion Posts	-7.33	24.91	-.29	.772	-60.13	45.48
	Age	.33	1.14	.28	.779	-2.10	2.75
	Gender	-7.01	9.70	-.72	.480	-27.58	13.55
	ENGL1	-5.64	5.49	-1.03	.320	-17.28	6.00
	curGPA	25.09	5.11	4.91	.000	14.27	35.92
Model Summary	$F(11,16) = 2.84$, $p = .029$, $R^2 = .66$.						
Quiz Points (n = 28)	Constant	156.54	32.07	4.88	.000	88.54	224.54
	Department Major	-8.92	6.18	-1.44	.168	-22.02	4.18
	t2 LU	-22.60	13.66	-1.65	.118	-51.56	6.37
	t2 LU X Department Major	10.06	6.22	1.62	.125	-3.12	23.24
	Discussion Posts	-21.45	14.52	-1.48	.159	-52.24	9.34
	t2 LU X Discussion Posts	25.39	25.08	1.01	.327	-27.79	78.56
	Department Major X Discussion Posts	7.31	6.05	1.21	.245	-5.53	20.15
	t2 LU X Department Major X Discussion Posts	-12.08	12.14	-1.00	.335	-37.81	13.65
	Age	-.27	.84	-.33	.749	-2.05	1.50
	Gender	-3.76	7.41	-.51	.619	-19.46	11.95
	ENGL1	-3.80	4.36	-.87	.397	-13.05	5.45
	curGPA	21.77	4.28	5.09	.000	12.70	30.84
Model Summary	$F(11,16) = 4.16$, $p = .005$, $R^2 = .74$.						
Discussion Points (n = 66)	Constant	7.58	7.93	.96	.343	-8.29	23.46
	Department Major	-1.94	2.63	-0.74	.463	-7.21	3.33
	t2 LU	4.32	5.47	.79	.433	-6.64	15.28
	t2 LU X Department Major	-2.08	2.57	-.81	.422	-7.23	3.07
	Discussion Posts	7.16	4.17	1.72	.091	-1.19	15.52

	t2 LU X Discussion Posts	.03	3.47	.01	.994	-6.92	6.98
	Department Major X Discussion Posts	.96	1.60	.60	.551	-2.24	4.16
	t2 LU X Department Major X Discussion Posts	.57	1.56	.36	.719	-2.56	3.69
	Age	.04	.13	.31	.759	-.22	.29
	Gender	-1.76	1.67	-1.05	.298	-5.11	1.59
Model Summary	$F(9,56) = 8.43$, $p < .001$, $R^2 = .58$.						
Final Exam (n = 23)	Constant	27.33	4.92	5.55	.000	16.35	38.30
	Department Major	-0.19	1.01	-0.19	.852	-2.45	2.06
	t2 LU	-4.24	3.04	-1.40	.193	-11.02	2.54
	t2 LU X Department Major	1.54	1.29	1.20	.258	-1.32	4.41
	Discussion Posts	-.89	2.43	-.37	.722	-6.31	4.53
	t2 LU X Discussion Posts	-2.54	4.64	-.55	.596	-12.89	7.81
	Department Major X Discussion Posts	.70	.97	.72	.486	-1.47	2.87
	t2 LU X Department Major X Discussion Posts	2.18	2.10	1.04	.324	-2.50	6.87
	Age	.19	.13	1.46	.176	-.10	.48
	Gender	-1.72	1.29	-1.34	.210	-4.59	1.15
	ENGL1	1.41	.80	1.76	.109	-.37	3.20
	ENGL2	-.61	1.36	-.45	.664	-3.64	2.42
	curGPA	0.61	1.21	0.5	.627	-2.1	3.32
Model Summary	$F(12,10) = 2.96$, $p = .047$, $R^2 = .78$.						
Total Course Points (n = 28)	Constant	178.50	35.61	5.01	.000	103.02	253.99
	Department Major	-4.65	6.86	-.68	.507	-19.20	9.89
	t2 LU	-43.38	15.17	-2.86	.011	-75.54	-11.23
	t2 LU X Department Major	19.25	6.90	2.79	.013	4.62	33.88
	Discussion Posts	-13.87	16.12	-.86	.403	-48.05	20.31
	t2 LU X Discussion Posts	45.01	27.84	1.62	.126	-14.02	104.04
	Department Major X Discussion Posts	2.65	6.72	.39	.698	-11.60	16.90
	t2 LU X Department Major X Discussion Posts	-20.79	13.47	-1.54	.142	-49.36	7.77
	Age	.06	.93	.07	.948	-1.91	2.03
	Gender	-1.23	8.22	-0.15	.883	-18.67	16.2
	ENGL1	-3.69	4.84	-.76	.457	-13.96	6.58

	curGPA	19.89	4.75	4.19	.001	9.83	29.96
Model Summary	$F(11,16) = 4.03$, $p = .006$, $R^2 = .73$.						
Quiz Points (n = 28)	Constant	135.70	33.87	4.01	.001	63.88	207.51
	Department Major	-1.16	8.82	-.13	.897	-19.86	17.53
	t2 LUF	-15.91	19.01	-.84	.415	-56.21	24.39
	t2 LUF X Department Major	6.65	7.99	.83	.417	-10.29	23.60
	Discussion Posts	-10.20	16.60	-.61	.547	-45.39	24.98
	t2 LUF X Discussion Posts	13.72	16.59	.83	.420	-21.45	48.88
	Department Major X Discussion Posts	2.17	7.39	.29	.772	-13.49	17.84
	t2 LUF X Department Major X Discussion Posts	-5.72	7.06	-0.81	.430	-20.68	9.25
	Age	-.46	.83	-.55	.588	-2.21	1.29
	Gender	-1.98	7.82	-.25	.803	-18.56	14.60
	ENGL1	-4.53	4.61	-.98	.341	-14.30	5.25
	curGPA	23.90	4.89	4.89	.000	13.53	34.26
Model Summary	$F(11,16) = 3.57$, $p = .011$, $R^2 = .71$.						
Discussion Points (n = 66)	Constant	7.87	9.12	.86	.392	-10.41	26.15
	Department Major	-1.28	3.19	-.40	.689	-7.67	5.10
	t2 LUF	3.73	5.86	.64	.527	-8.00	15.47
	t2 LUF X Department Major	-1.58	2.78	-.57	.573	-7.16	4.00
	Discussion Posts	8.00	4.76	1.68	.098	-1.53	17.53
	t2 LUF X Discussion Posts	-3.81	3.47	-1.1	.276	-10.76	3.13
	Department Major X Discussion Posts	.41	1.86	.22	.829	-3.33	4.14
	t2 LUF X Department Major X Discussion Posts	1.79	1.63	1.09	.279	-1.49	5.06
	Age	-.02	.13	-.18	.858	-.28	.23
	Gender	-1.53	1.73	-.89	.379	-4.99	1.93
Model Summary	$F(9,56) = 8.16$, $p < .001$, $R^2 = .57$.						
Final Exam (n = 23)	Constant	24.41	4.44	5.50	.000	14.52	34.31
	Department Major	1.24	1.34	.93	.375	-1.74	4.23
	t2 LUF	-5.39	2.49	-2.17	.056	-10.93	.15
	t2 LUF X Department Major	2.09	1.05	2.00	.074	-.24	4.43
	Discussion Posts	2.32	2.56	.90	.387	-3.40	8.04

	t2 LUF X Discussion Posts	2.16	2.34	0.92	.378	-3.05	7.36
	Department Major X Discussion Posts	-.78	1.09	-.72	.491	-3.22	1.65
	t2 LUF X Department Major X Discussion Posts	-.18	.95	-.19	.853	-2.30	1.94
	Age	.16	.11	1.44	.179	-.09	.40
	Gender	-1.35	1.12	-1.21	.256	-3.84	1.14
	ENGL1	1.69	.67	2.51	.031	.19	3.19
	ENGL2	-.96	1.06	-.91	.386	-3.33	1.40
	curGPA	.68	1.10	.61	.553	-1.78	3.13
Model Summary	$F(12,10) = 4.39$, $p = .013$, $R^2 = .84$.						
Total Course Points (n = 28)	Constant	129.42	39.23	3.30	.004	46.25	212.59
	Department Major	15.84	10.21	1.55	.140	-5.81	37.49
	t2 LUF	-38.82	22	-1.76	.097	-85.49	7.85
	t2 LUF X Department Major	18.00	9.25	1.94	.070	-1.62	37.62
	Discussion Posts	15.10	19.22	.79	.444	-25.65	55.85
	t2 LUF X Discussion Posts	22.76	19.21	1.19	.253	-17.96	63.48
	Department Major X Discussion Posts	-10.83	8.56	-1.27	.224	-28.97	7.31
	t2 LUF X Department Major X Discussion Posts	-10.52	8.17	-1.29	.216	-27.85	6.81
	Age	-.23	.96	-.24	.816	-2.25	1.80
	Gender	3.40	9.06	.38	.712	-15.79	22.60
	ENGL1	-4.31	5.34	-.81	.431	-15.64	7.01
	curGPA	21.30	5.66	3.76	.002	9.30	33.31
Model Summary	$F(11,16) = 3.06$, $p = .021$, $R^2 = .68$.						
Quiz Points (n = 28)	Constant	171.2	35.9	4.76	.000	94.99	247.4
	Department Major	-15.05	8.09	-1.86	.081	-32.20	2.11
	t2 LUR	-23.61	13.43	-1.76	.098	-52.09	4.88
	t2 LUR X Department Major	11.01	6.50	1.69	.110	-2.77	24.79
	Discussion Posts	-30.01	17.66	-1.70	.109	-67.45	7.43
	t2 LUR X Discussion Posts	18.84	35.65	.53	.604	-56.75	94.44
	Department Major X Discussion Posts	11.41	7.63	1.50	.154	-4.77	27.59
	t2 LUR X Department Major X Discussion Posts	-9.72	17.39	-.56	.584	-46.59	27.16
	Age	-.14	.86	-.17	.871	-1.96	1.67

	Gender	-4.94	7.49	-.66	.519	-20.83	10.94
	ENGL1	-3.61	4.28	-.84	.411	-12.68	5.46
	curGPA	20.72	4.22	4.91	.000	11.78	29.66
Model Summary	$F(11,16) = 4.29$, $p = .004$, $R^2 = .75$.						
Discussion Points (n = 66)	Constant	3.50	7.14	.49	.625	-10.80	17.81
	Department Major	-1.00	2.30	-.44	.664	-5.60	3.60
	t2 LUR	2.00	5.86	.34	.734	-9.74	13.74
	t2 LUR X Department Major	-1.14	2.38	-.48	.632	-5.91	3.62
	Discussion Posts	9.14	3.72	2.46	.017	1.69	16.58
	t2 LUR X Discussion Posts	2.85	3.79	.75	.454	-4.73	10.44
	Department Major X Discussion Posts	.37	1.44	.26	.799	-2.51	3.24
	t2 LUR X Department Major X Discussion Posts	-.53	1.50	-.35	.727	-3.54	2.48
	Age	.06	.12	.49	.629	-.19	.31
	Gender	-1.35	1.6	-0.85	.402	-4.56	1.85
Model Summary	$F(9,56) = 9.19$, $p < .001$, $R^2 = .60$.						
Final Exam (n = 23)	Constant	29.96	8.10	3.70	.000	11.91	48.00
	Department Major	-1.63	1.82	-.89	.390	-5.68	2.43
	t2 LUR	-4.99	4.90	-1.02	.330	-15.92	5.93
	t2 LUR X Department Major	1.97	2.10	.94	.370	-2.72	6.65
	Discussion Posts	-2.42	4.05	-.60	.560	-11.43	6.60
	t2 LUR X Discussion Posts	3.78	9.52	.40	.700	-17.43	25.00
	Department Major X Discussion Posts	1.40	1.71	.82	.430	-2.41	5.22
	t2 LUR X Department Major X Discussion Posts	-1.39	4.39	-.32	.760	-11.17	8.39
	Age	.19	.19	1.01	.340	-.23	.61
	Gender	-2.54	1.83	-1.39	.200	-6.61	1.54
	ENGL1	1.38	1.14	1.21	.250	-1.16	3.92
	ENGL2	-.23	1.93	-.12	.910	-4.54	4.07
	curGPA	.84	1.59	.53	.610	-2.70	4.39
Model Summary	$F(12,10) = 1.05$, $p = .475$, $R^2 = .56$.						
Total Course Points (n = 28)	Constant	200.38	41.49	4.83	.000	112.41	288.35
	Department Major	-14.22	9.34	-1.52	.147	-34.03	5.58

	t2 LUR	-40.56	15.51	-2.61	.019	-73.45	-7.66
	t2 LUR X Department Major	17.96	7.51	2.39	.029	2.04	33.87
	Discussion Posts	-28.49	20.39	-1.40	.181	-71.72	14.75
	t2 LUR X Discussion Posts	33.30	41.17	.81	.430	-53.99	120.59
	Department Major X Discussion Posts	9.55	8.81	1.08	.294	-9.13	28.23
	t2 LUR X Department Major X Discussion Posts	-14.32	20.09	-.71	.486	-56.91	28.26
	Age	.27	.99	.27	.788	-1.82	2.37
	Gender	-2.93	8.65	-.34	.740	-21.27	15.42
	ENGL1	-3.81	4.94	-.77	.453	-14.28	6.67
	curGPA	18.96	4.87	3.89	.001	8.63	29.29
Model Summary	$F(11,16) = 3.73$, $p = .009$, $R^2 = .72$.						
Quiz Points (n = 28)	Constant	163.36	42.19	3.87	.001	73.92	252.80
	Department Major	-13.64	9.42	-1.45	.167	-33.60	6.32
	t2 PS	-19.68	15.24	-1.29	.215	-51.99	12.63
	t2 PS X Department Major	9.55	7.22	1.32	.205	-5.76	24.86
	Discussion Posts	-29.9	23.3	-1.28	.218	-79.3	19.5
	t2 PS X Discussion Posts	11.12	29.29	.38	.709	-50.99	73.22
	Department Major X Discussion Posts	11.65	10.34	1.13	.276	-10.27	33.56
	t2 PS X Department Major X Discussion Posts	-6.21	14.12	-.44	.666	-36.14	23.72
	Age	-.50	1.01	-.50	.627	-2.64	1.64
	Gender	-1.40	7.58	-.18	.856	-17.46	14.66
	ENGL1	-4.68	5.03	-.93	.366	-15.34	5.99
	curGPA	23.61	4.26	5.55	.000	14.58	32.64
Model Summary	$F(11,16) = 3.97$, $p = .006$, $R^2 = .73$.						
Discussion Points (n = 66)	Constant	7.59	8.01	.95	.347	-8.46	23.63
	Department Major	-1.57	2.62	-.60	.552	-6.82	3.69
	t2 PS	3.97	7.2	0.55	.584	-10.46	18.39
	t2 PS X Department Major	-1.22	3.10	-.40	.694	-7.43	4.98
	Discussion Posts	8.06	4.28	1.88	.065	-.53	16.64
	t2 PS X Discussion Posts	-3.09	4.39	-.70	.484	-11.89	5.70
	Department Major X Discussion Posts	.55	1.63	.34	.735	-2.71	3.82

	t2 PS X Department Major X Discussion Posts	1.01	1.79	.57	.574	-2.57	4.60
	Age	-.01	.13	-.09	.928	-.27	.24
	Gender	-1.40	1.71	-.82	.415	-4.83	2.02
Model Summary	$F(9,56) = 7.55$, $p < .001$, $R^2 = .55$.						
Final Exam (n = 23)	Constant	28.09	8.65	3.25	.010	8.80	47.38
	Department Major	.29	1.92	.15	.880	-4.00	4.57
	t2 PS	6.33	4.26	1.49	.170	-3.17	15.83
	t2 PS X Department Major	-2.57	1.81	-1.42	.190	-6.62	1.47
	Discussion Posts	4.50	4.73	.95	.360	-6.04	15.03
	t2 PS X Discussion Posts	-13.34	6.87	-1.94	.080	-28.65	1.98
	Department Major X Discussion Posts	-1.97	2.04	-.96	.360	-6.51	2.58
	t2 PS X Department Major X Discussion Posts	6.17	3.10	1.99	.070	-.75	13.08
	Age	.28	.20	1.35	.210	-.18	.73
	Gender	-3.55	1.65	-2.15	.060	-7.24	.13
	ENGL1	1.73	1.11	1.56	.150	-.75	4.20
	ENGL2	.51	1.65	.31	.760	-3.17	4.19
	curGPA	-.93	1.62	-.58	.580	-4.54	2.67
Model Summary	$F(12,10) = 1.61$, $p = .230$, $R^2 = .66$.						
Total Course Points (n = 28)	Constant	156.40	50.55	3.09	.007	49.23	263.57
	Department Major	-8.51	11.28	-.75	.462	-32.43	15.41
	t2 PS	-34.22	18.26	-1.87	.079	-72.93	4.50
	t2 PS X Department Major	13.77	8.65	1.59	.131	-4.58	32.11
	Discussion Posts	-31.56	27.92	-1.13	.275	-90.75	27.64
	t2 PS X Discussion Posts	48.25	35.10	1.37	.188	-26.16	122.67
	Department Major X Discussion Posts	11.33	12.39	.91	.374	-14.93	37.59
	t2 PS X Department Major X Discussion Posts	-20.55	16.92	-1.21	.242	-56.41	15.32
	Age	.16	1.21	.13	.896	-2.40	2.72
	Gender	.34	9.08	.04	.971	-18.91	19.58
	ENGL1	-0.71	6.03	-0.12	.908	-13.49	12.07
	curGPA	24.26	5.10	4.76	.000	13.45	35.08
Model Summary	$F(11,16) = 3.09$, $p = .020$, $R^2 = .68$.						

Quiz Points (n = 28)	Constant	160.77	39.82	4.04	.001	76.35	245.19
	Department Major	-11.77	8.89	-1.32	.204	-30.62	7.08
	t2 PSF	-27.04	19.62	-1.38	.187	-68.63	14.56
	t2 PSF X Department Major	13.66	9.77	1.40	.181	-7.05	34.36
	Discussion Posts	-19.71	23.16	-.85	.407	-68.82	29.40
	t2 PSF X Discussion Posts	-5.64	28.49	-.20	.846	-66.04	54.77
	Department Major X Discussion Posts	6.81	10.42	.65	.523	-15.28	28.90
	t2 PSF X Department Major X Discussion Posts	1.00	13.69	.07	.943	-28.02	30.02
	Age	-0.42	0.91	-0.46	.650	-2.35	1.51
	Gender	-1.37	7.53	-.18	.858	-17.34	14.60
	ENGL1	-3.35	4.72	-.71	.488	-13.35	6.65
	curGPA	21.06	4.26	4.94	.000	12.02	30.10
Model Summary	F(11,16) = 4.43, p = .004, R^2 = .75.						
Discussion Points (n = 66)	Constant	8.12	7.95	1.02	.311	-7.81	24.05
	Department Major	-1.89	2.61	-.72	.472	-7.11	3.33
	t2 PSF	4.47	7.68	.58	.563	-10.91	19.85
	t2 PSF X Department Major	-1.20	2.98	-.40	.690	-7.17	4.78
	Discussion Posts	7.38	4.29	1.72	.090	-1.20	15.97
	t2 PSF X Discussion Posts	-2.80	4.56	-.61	.542	-11.94	6.33
	Department Major X Discussion Posts	0.84	1.61	0.52	.605	-2.38	4.06
	t2 PSF X Department Major X Discussion Posts	.72	1.69	.42	.673	-2.66	4.10
	Age	.00	.13	-.02	.982	-.26	.26
	Gender	-1.35	1.70	-.79	.431	-4.74	2.05
Model Summary	F(9,56) = 7.55, p < .001, R^2 = .55.						
Final Exam (n = 23)	Constant	27.52	9.27	2.97	.010	6.86	48.17
	Department Major	-.33	2.02	-.16	.870	-4.83	4.17
	t2 PSF	4.31	6.44	.67	.520	-10.04	18.67
	t2 PSF X Department Major	-1.85	2.87	-.64	.530	-8.25	4.55
	Discussion Posts	1.42	5.11	.28	.790	-9.96	12.81
	t2 PSF X Discussion Posts	-4.89	8.36	-.58	.570	-23.51	13.74
	Department Major X Discussion Posts	-0.58	2.27	-0.26	.800	-5.63	4.47

	t2 PSF X Department Major X Discussion Posts	2.54	3.64	.70	.500	-5.58	10.65
	Age	.21	.21	1.00	.340	-.26	.68
	Gender	-3.24	2.02	-1.60	.140	-7.74	1.26
	ENGL1	1.82	1.26	1.44	.180	-1.00	4.63
	ENGL2	.08	1.97	.04	.970	-4.32	4.48
	curGPA	.36	1.80	.20	.850	-3.66	4.37
Model Summary	$F(12,10) = 1.14$, $p = .423$, $R^2 = .58$.						
Total Course Points (n = 28)	Constant	181.00	48.29	3.75	.002	78.63	283.37
	Department Major	-12.67	10.78	-1.18	.257	-35.53	10.19
	t2 PSF	-53.74	23.79	-2.26	.038	-104.17	-3.30
	t2 PSF X Department Major	25.09	11.8	2.12	.050	-0.02	50.19
	Discussion Posts	-37.33	28.09	-1.33	.203	-96.88	22.22
	t2 PSF X Discussion Posts	53.17	34.55	1.54	.143	-20.07	126.42
	Department Major X Discussion Posts	13.63	12.63	1.08	.297	-13.15	40.42
	t2 PSF X Department Major X Discussion Posts	-24.05	16.60	-1.45	.167	-59.24	11.14
	Age	-.44	1.10	-.40	.693	-2.79	1.90
	Gender	3.56	9.14	.39	.702	-15.80	22.93
	ENGL1	-2.97	5.72	-.52	.611	-15.09	9.15
	curGPA	24.30	5.17	4.70	.000	13.34	35.27
Model Summary	$F(11,16) = 3.36$, $p = .014$, $R^2 = .70$.						
Quiz Points (n = 28)	Constant	146.08	40.96	3.57	.003	59.24	232.93
	Department Major	-11.45	8.43	-1.36	.193	-29.32	6.43
	t2 PSR	-19.87	15.04	-1.32	.205	-51.76	12.03
	t2 PSR X Department Major	7.69	6.08	1.27	.224	-5.20	20.59
	Discussion Posts	-27.19	18.08	-1.50	.152	-65.53	11.15
	t2 PSR X Discussion Posts	21.66	19.95	1.09	.294	-20.63	63.95
	Department Major X Discussion Posts	10.25	7.68	1.33	.201	-6.04	26.54
	t2 PSR X Department Major X Discussion Posts	-9.52	8.95	-1.06	.303	-28.49	9.44
	Age	-.05	1.09	-.05	.962	-2.36	2.25
	Gender	-3.73	7.31	-.51	.617	-19.24	11.77

	ENGL1	-2.64	5.28	-.50	.624	-13.82	8.55
	curGPA	23.78	4.34	5.48	.000	14.57	32.98
Model Summary	F(11,16) = 3.94, p = .007, R^2 = .73.						
Discussion Points (n = 66)	Constant	7.82	7.93	.99	.329	-8.07	23.71
	Department Major	-1.44	2.61	-.55	.584	-6.66	3.79
	t2 PSR	5.70	7.86	.72	.472	-10.05	21.45
	t2 PSR X Department Major	-2.60	3.55	-.73	.468	-9.72	4.52
	Discussion Posts	8.52	4.04	2.11	.040	.42	16.62
	t2 PSR X Discussion Posts	-5.12	4.75	-1.08	.286	-14.64	4.41
	Department Major X Discussion Posts	.44	1.59	.28	.783	-2.75	3.64
	t2 PSR X Department Major X Discussion Posts	2.32	2.09	1.11	.273	-1.87	6.51
	Age	-.01	.13	-.09	.927	-.26	.24
	Gender	-1.89	1.68	-1.13	.265	-5.24	1.47
Model Summary	F(9,56) = 7.91, p < .001, R^2 = .56.						
Final Exam (n = 23)	Constant	30.85	8.78	3.52	.010	11.29	50.41
	Department Major	-.43	1.80	-.24	.820	-4.43	3.58
	t2 PSR	5.76	4.31	1.34	.210	-3.84	15.36
	t2 PSR X Department Major	-1.96	1.58	-1.24	.240	-5.48	1.56
	Discussion Posts	1.31	4.04	.32	.750	-7.70	10.33
	t2 PSR X Discussion Posts	-9.63	5.13	-1.88	.090	-21.05	1.80
	Department Major X Discussion Posts	-.20	1.61	-.13	.900	-3.80	3.39
	t2 PSR X Department Major X Discussion Posts	3.91	2.12	1.85	.090	-.81	8.63
	Age	.15	.22	.68	.510	-.34	.64
	Gender	-2.34	1.61	-1.46	.180	-5.93	1.24
	ENGL1	1.25	1.09	1.15	.280	-1.17	3.68
	ENGL2	.29	1.57	.18	.860	-3.21	3.78
	curGPA	-.49	1.49	-.33	.750	-3.81	2.84
Model Summary	F(12,10) = 1.45, p = .281, R^2 = .64.						
Total Course Points (n = 28)	Constant	118.95	48.61	2.45	.026	15.90	222.00
	Department Major	-1.24	10.00	-.12	.903	-22.45	19.96
	t2 PSR	-31.28	17.85	-1.75	.099	-69.13	6.56

	t2 PSR X Department Major	8.72	7.22	1.21	.244	-6.58	24.02
	Discussion Posts	-11.79	21.46	-.55	.590	-57.29	33.70
	t2 PSR X Discussion Posts	34.01	23.67	1.44	.170	-16.17	84.19
	Department Major X Discussion Posts	2.67	9.12	.29	.773	-16.66	22.00
	t2 PSR X Department Major X Discussion Posts	-11.98	10.6	-1.13	.276	-34.49	10.53
	Age	1.47	1.29	1.14	.271	-1.26	4.21
	Gender	-3.19	8.68	-.37	.718	-21.59	15.21
	ENGL1	2.06	6.26	.33	.747	-11.22	15.33
	curGPA	20.87	5.15	4.05	.001	9.95	31.79
Model Summary	$F(11,16) = 3.16$, $p = .018$, $R^2 = .68$.						
Quiz Points (n = 28)	Constant	130.60	37.45	3.49	.003	51.20	210.01
	College Major	-5.49	7.47	-.73	.473	-21.32	10.35
	t2 CT	-13.05	18.60	-.70	.493	-52.49	26.38
	t2 CT X College Major	4.24	9.69	.44	.667	-16.31	24.80
	Discussion Posts	-20.95	25.72	-.81	.427	-75.48	33.59
	t2 CT X Discussion Posts	13.35	28	0.48	.641	-46.11	72.8
	College Major X Discussion Posts	7.83	12.13	.65	.528	-17.88	33.53
	t2 CT X College Major X Discussion Posts	-4.99	13.90	-.36	.724	-34.46	24.49
	Age	.20	1.00	.20	.842	-1.92	2.33
	Gender	-5.87	8.14	-.72	.481	-23.13	11.38
	ENGL1	-2.41	4.76	-.51	.619	-12.51	7.69
	curGPA	23.43	4.32	5.43	.000	14.28	32.58
Model Summary	$F(11,16) = 3.62$, $p = .010$, $R^2 = .71$.						
Discussion Points (n = 66)	Constant	6.53	7.90	.83	.412	-9.29	22.35
	College Major	-.91	2.39	-.38	.704	-5.70	3.87
	t2 CT	4.23	6.09	.69	.490	-7.97	16.43
	t2 CT X College Major	-2.36	2.84	-0.83	.410	-8.06	3.33
	Discussion Posts	7.91	3.66	2.16	.035	.59	15.23
	t2 CT X Discussion Posts	-1.16	3.80	-.30	.762	-8.77	6.46
	College Major X Discussion Posts	.59	1.42	.42	.678	-2.25	3.43
	t2 CT X College Major X Discussion Posts	1.21	1.66	.73	.469	-2.12	4.54

	Age	.00	.13	.03	.973	-.25	.26
	Gender	-2.12	1.92	-1.11	.272	-5.96	1.71
Model Summary	$F(9,56) = 8.14$, $p < .001$, $R^2 = .57$.						
Final Exam (n = 23)	Constant	22.88	7.86	2.91	.020	5.36	40.41
	College Major	.24	1.53	.15	.880	-3.17	3.64
	t2 CT	1.72	4.76	.36	.730	-8.88	12.33
	t2 CT X College Major	-1.3	2.37	-0.55	.600	-6.59	3.99
	Discussion Posts	4.07	5.65	.72	.490	-8.52	16.67
	t2 CT X Discussion Posts	-2.90	6.60	-.44	.670	-17.61	11.80
	College Major X Discussion Posts	-1.67	2.60	-.64	.530	-7.47	4.12
	t2 CT X College Major X Discussion Posts	2.00	3.13	.64	.540	-4.98	8.97
	Age	.24	.20	1.19	.260	-.21	.69
	Gender	-1.87	1.90	-.98	.350	-6.10	2.36
	ENGL1	1.73	1.19	1.46	.180	-.92	4.38
	ENGL2	-.29	1.81	-.16	.880	-4.31	3.74
	curGPA	.75	1.65	.45	.660	-2.93	4.44
Model Summary	$F(12,10) = 1.09$, $p = .452$, $R^2 = .57$.						
Total Course Points (n = 28)	Constant	155.2	44.8	3.47	.003	60.34	250.1
	College Major	-4.47	8.93	-.50	.624	-23.39	14.46
	t2 CT	-26.02	22.23	-1.17	.259	-73.15	21.11
	t2 CT X College Major	9.06	11.59	.78	.446	-15.50	33.62
	Discussion Posts	-20.17	30.74	-.66	.521	-85.35	45.00
	t2 CT X Discussion Posts	20.28	33.52	.60	.554	-50.78	91.33
	College Major X Discussion Posts	5.24	14.49	.36	.722	-25.48	35.97
	t2 CT X College Major X Discussion Posts	-6.13	16.61	-.37	.717	-41.36	29.09
	Age	.83	1.20	.69	.500	-1.71	3.36
	Gender	-6.86	9.72	-.71	.491	-27.47	13.76
	ENGL1	-1.92	5.69	-.34	.740	-13.99	10.15
	curGPA	23.1	5.16	4.48	.000	12.17	34.04
Model Summary	$F(11,16) = 2.82$, $p = .029$, $R^2 = .66$.						
Quiz Points (n = 28)	Constant	136.13	37.99	3.58	.003	55.59	216.66

	College Major	-4.59	6.84	-.67	.511	-19.09	9.91
	t2 CTF	-12.32	21.69	-.57	.578	-58.30	33.67
	t2 CTF X College Major	6.38	11.73	.54	.594	-18.50	31.25
	Discussion Posts	-16.82	29.42	-.57	.576	-79.20	45.56
	t2 CTF X Discussion Posts	9.01	27.88	.32	.751	-50.09	68.11
	College Major X Discussion Posts	6.89	14.08	.49	.631	-22.96	36.73
	t2 CTF X College Major X Discussion Posts	-5.59	13.97	-.40	.695	-35.21	24.03
	Age	-.03	.99	-.03	.978	-2.13	2.08
	Gender	-4.77	8.03	-0.59	.561	-21.79	12.26
	ENGL1	-3.23	4.96	-.65	.525	-13.75	7.29
	curGPA	22.46	4.73	4.75	.000	12.44	32.49
Model Summary	$F(11,16) = 3.47$, $p = .012$, $R^2 = .70$.						
Discussion Points (n = 66)	Constant	4.76	7.50	.63	.528	-10.26	19.78
	College Major	-.14	2.27	-.06	.953	-4.68	4.41
	t2 CTF	1.90	5.18	.37	.715	-8.47	12.27
	t2 CTF X College Major	-.71	2.21	-.32	.749	-5.14	3.72
	Discussion Posts	9.61	3.74	2.57	.013	2.11	17.11
	t2 CTF X Discussion Posts	-1.78	3.31	-.54	.593	-8.42	4.86
	College Major X Discussion Posts	-.11	1.41	-.08	.937	-2.94	2.72
	t2 CTF X College Major X Discussion Posts	0.82	1.38	0.59	.554	-1.95	3.59
	Age	-.03	.13	-.21	.835	-.28	.23
	Gender	-1.64	1.84	-.89	.378	-5.32	2.05
Model Summary	$F(9,56) = 7.65$, $p < .001$, $R^2 = .55$.						
Final Exam (n = 23)	Constant	25.31	8.19	3.09	.010	7.06	43.57
	College Major	-.25	1.45	-.17	.870	-3.49	2.99
	t2 CTF	-.89	5.49	-.16	.870	-13.14	11.36
	t2 CTF X College Major	.30	2.89	.10	.920	-6.15	6.75
	Discussion Posts	3.44	6.41	.54	.600	-10.85	17.72
	t2 CTF X Discussion Posts	-.97	6.43	-.15	.880	-15.30	13.36
	College Major X Discussion Posts	-1.41	3.02	-.47	.650	-8.14	5.32
	t2 CTF X College Major X Discussion Posts	0.87	3.12	0.28	.790	-6.09	7.83

	Age	.24	.21	1.16	.270	-.22	.70
	Gender	-2.08	1.92	-1.08	.300	-6.35	2.20
	ENGL1	1.56	1.21	1.29	.230	-1.14	4.27
	ENGL2	-.30	1.83	-.16	.870	-4.37	3.78
	curGPA	.63	1.68	.37	.720	-3.11	4.37
Model Summary	$F(12,10) = 1.01$, $p = .504$, $R^2 = .55$.						
Total Course Points (n = 28)	Constant	161.19	45.71	3.53	.003	64.28	258.11
	College Major	-3.90	8.23	-.47	.642	-21.35	13.54
	t2 CTF	-37.81	26.10	-1.45	.167	-93.14	17.52
	t2 CTF X College Major	18.62	14.12	1.32	.206	-11.32	48.55
	Discussion Posts	-9.52	35.4	-0.27	.791	-84.58	65.54
	t2 CTF X Discussion Posts	16.30	33.54	.49	.633	-54.81	87.42
	College Major X Discussion Posts	1.48	16.94	.09	.932	-34.44	37.39
	t2 CTF X College Major X Discussion Posts	-8.10	16.81	-.48	.636	-43.74	27.54
	Age	.80	1.20	.67	.512	-1.73	3.34
	Gender	-5.57	9.66	-.58	.573	-26.06	14.92
	ENGL1	-3.16	5.97	-.53	.604	-15.82	9.50
	curGPA	21.00	5.69	3.69	.002	8.94	33.07
Model Summary	$F(11,16) = 2.64$, $p = .038$, $R^2 = .64$.						
Quiz Points (n = 28)	Constant	142.12	34.41	4.13	.001	69.16	215.08
	College Major	-8.97	7.41	-1.21	.244	-24.68	6.74
	t2 CTR	-20.21	16.5	-1.23	.237	-55.09	14.68
	t2 CTR X College Major	5.11	7.94	.64	.529	-11.73	21.94
	Discussion Posts	-24.22	19.89	-1.22	.241	-66.38	17.95
	t2 CTR X Discussion Posts	21.02	31.65	.66	.516	-46.08	88.13
	College Major X Discussion Posts	8.74	9.21	.95	.357	-10.79	28.26
	t2 CTR X College Major X Discussion Posts	-6.06	15.58	-.39	.702	-39.10	26.97
	Age	.48	.93	.52	.613	-1.50	2.46
	Gender	-8.90	7.74	-1.15	.267	-25.31	7.51
	ENGL1	-3.08	4.39	-.70	.494	-12.38	6.23
	curGPA	23.18	3.89	5.96	.000	14.93	31.42

Model Summary	$F(11,16) = 4.51$, $p = .003$, $R^2 = .76$.						
Discussion Points (n = 66)	Constant	7.25	7.68	0.94	.349	-8.14	22.65
	College Major	-1.94	2.41	-.81	.422	-6.77	2.88
	t2 CTR	6.04	6.18	.98	.333	-6.34	18.42
	t2 CTR X College Major	-3.66	2.78	-1.32	.192	-9.23	1.90
	Discussion Posts	7.00	3.47	2.02	.048	.05	13.94
	t2 CTR X Discussion Posts	-1.05	3.80	-.28	.783	-8.67	6.56
	College Major X Discussion Posts	1.17	1.41	.83	.409	-1.65	3.99
	t2 CTR X College Major X Discussion Posts	1.55	1.61	.96	.341	-1.68	4.78
	Age	.04	.12	.36	.720	-.20	.29
	Gender	-2.06	1.76	-1.17	.247	-5.60	1.47
Model Summary	$F(9,56) = 9.04$, $p < .001$, $R^2 = .59$.						
Final Exam (n = 23)	Constant	22.23	7.47	2.98	.010	5.58	38.88
	College Major	.40	1.59	.25	.810	-3.13	3.93
	t2 CTR	2.39	4.48	.53	.610	-7.61	12.38
	t2 CTR X College Major	-1.65	2.03	-.81	.440	-6.17	2.88
	Discussion Posts	5.54	4.69	1.18	.270	-4.92	16.00
	t2 CTR X Discussion Posts	-7.05	7.87	-.90	.390	-24.58	10.48
	College Major X Discussion Posts	-2.25	2.09	-1.08	.310	-6.89	2.40
	t2 CTR X College Major X Discussion Posts	3.93	3.71	1.06	.310	-4.33	12.20
	Age	.27	.19	1.41	.190	-.16	.71
	Gender	-1.93	1.87	-1.03	.330	-6.11	2.24
	ENGL1	1.57	1.20	1.30	.220	-1.11	4.24
	ENGL2	0.17	1.69	0.1	.920	-3.59	3.94
	curGPA	.31	1.64	.19	.850	-3.36	3.97
Model Summary	$F(12,10) = 1.24$, $p = .372$, $R^2 = .60$.						
Total Course Points (n = 28)	Constant	168.43	41.30	4.08	.001	80.86	256.00
	College Major	-6.89	8.90	-.78	.450	-25.75	11.96
	t2 CTR	-25.42	19.75	-1.29	.216	-67.29	16.45
	t2 CTR X College Major	5.95	9.53	.62	.541	-14.26	26.15
	Discussion Posts	-23.49	23.87	-.98	.340	-74.10	27.12

	t2 CTR X Discussion Posts	26.31	37.99	.69	.498	-54.23	106.86
	College Major X Discussion Posts	6.44	11.05	.58	.568	-16.99	29.87
	t2 CTR X College Major X Discussion Posts	-6.12	18.70	-.33	.748	-45.77	33.53
	Age	0.9	1.12	0.81	.431	-1.47	3.28
	Gender	-9.65	9.29	-1.04	.314	-29.35	10.04
	ENGL1	-2.60	5.27	-.49	.628	-13.77	8.57
	curGPA	22.76	4.67	4.88	.000	12.87	32.66
Model Summary	$F(11,16) = 3.53$, $p = .011$, $R^2 = .71$.						
Quiz Points (n = 28)	Constant	132.96	32.89	4.04	.001	63.23	202.69
	College Major	-4.13	6.15	-.67	.511	-17.16	8.90
	t2 VR	-7.31	17.29	-.42	.678	-43.96	29.35
	t2 VR X College Major	4.62	8.11	.57	.577	-12.58	21.81
	Discussion Posts	-11.07	10.70	-1.03	.316	-33.77	11.62
	t2 VR X Discussion Posts	7.49	23.19	.32	.751	-41.68	56.66
	College Major X Discussion Posts	3.97	4.65	0.85	.406	-5.89	13.83
	t2 VR X College Major X Discussion Posts	-5.67	11.24	-.50	.621	-29.49	18.16
	Age	-.29	.83	-.35	.732	-2.06	1.48
	Gender	-1.80	8.55	-.21	.836	-19.93	16.34
	ENGL1	-2.71	4.43	-.61	.549	-12.11	6.68
	curGPA	22.64	4.39	5.15	.000	13.32	31.95
Model Summary	$F(11,16) = 3.66$, $p = .009$, $R^2 = .72$.						
Discussion Points (n = 66)	Constant	5.32	7.77	.68	.497	-10.26	20.89
	College Major	-.82	2.35	-.35	.730	-5.53	3.90
	t2 VR	2.11	4.03	.52	.602	-5.97	10.20
	t2 VR X College Major	-1.04	1.82	-.57	.570	-4.70	2.61
	Discussion Posts	7.8	3.75	2.08	.042	0.28	15.31
	t2 VR X Discussion Posts	.54	2.63	.20	.839	-4.73	5.80
	College Major X Discussion Posts	.63	1.43	.44	.663	-2.23	3.48
	t2 VR X College Major X Discussion Posts	.14	1.17	.12	.908	-2.22	2.49
	Age	.00	.13	.00	.998	-.25	.26
	Gender	-1.43	1.80	-.79	.431	-5.04	2.18

Model Summary	$F(9,56) = 7.94$, $p < .001$, $R^2 = .56$.						
Final Exam (n = 23)	Constant	25.12	4.93	5.09	.001	14.12	36.11
	College Major	-1.13	1.00	-1.12	.287	-3.36	1.11
	t2 VR	-2.55	2.62	-.97	.354	-8.39	3.29
	t2 VR X College Major	1.73	1.22	1.42	.186	-.98	4.44
	Discussion Posts	0.18	1.66	0.11	.916	-3.52	3.88
	t2 VR X Discussion Posts	-5.37	3.50	-1.53	.156	-13.18	2.44
	College Major X Discussion Posts	.48	.71	.67	.517	-1.11	2.07
	t2 VR X College Major X Discussion Posts	1.97	1.69	1.17	.271	-1.80	5.74
	Age	.26	.13	1.92	.084	-.04	.55
	Gender	-1.57	1.35	-1.16	.271	-4.57	1.43
	ENGL1	1.56	.81	1.93	.083	-.24	3.37
	ENGL2	1.37	1.16	1.18	.265	-1.21	3.95
	curGPA	-.98	1.24	-.79	.448	-3.76	1.79
Model Summary	$F(12,10) = 2.93$, $p = .049$, $R^2 = .78$.						
Total Course Points (n = 28)	Constant	154.53	40.52	3.81	.002	68.63	240.42
	College Major	-1.83	7.57	-0.24	.812	-17.88	14.22
	t2 VR	-27.38	21.30	-1.29	.217	-72.53	17.77
	t2 VR X College Major	13.02	9.99	1.30	.211	-8.17	34.20
	Discussion Posts	-10.86	13.19	-.82	.422	-38.82	17.09
	t2 VR X Discussion Posts	33.74	28.57	1.18	.255	-26.83	94.31
	College Major X Discussion Posts	1.50	5.73	.26	.797	-10.65	13.65
	t2 VR X College Major X Discussion Posts	-15.52	13.84	-1.12	.279	-44.87	13.83
	Age	-.38	1.03	-.37	.719	-2.56	1.80
	Gender	4.38	10.54	.42	.683	-17.96	26.72
	ENGL1	-2.67	5.46	-.49	.632	-14.24	8.91
	curGPA	23.56	5.41	4.35	.001	12.09	35.03
Model Summary	$F(11,16) = 2.60$, $p = .041$, $R^2 = .64$.						
Quiz Points (n = 28)	Constant	145.33	33.48	4.34	.001	74.36	216.30
	College Major	-3.10	6.33	-.49	.632	-16.52	10.33
	Zv2VRR	13.23	13.91	.95	.356	-16.26	42.72

	t2 VRF X College Major	-5.52	7.18	-.77	.453	-20.73	9.69
	Discussion Posts	-8.81	10.43	-.84	.411	-30.93	13.30
	t2 VRF X Discussion Posts	1.40	13.97	.10	.921	-28.22	31.02
	College Major X Discussion Posts	1.96	4.65	.42	.679	-7.90	11.81
	t2 VRF X College Major X Discussion Posts	-2.64	6.65	-.40	.697	-16.73	11.45
	Age	-.34	.86	-.40	.697	-2.15	1.48
	Gender	-10.28	8.93	-1.15	.267	-29.22	8.66
	ENGL1	-2.97	4.75	-0.63	.541	-13.03	7.1
	curGPA	24.28	4.28	5.67	.000	15.21	33.35
Model Summary	F(11,16) = 4.10, p = .005, R^2 = .74.						
Discussion Points (n = 66)	Constant	5.10	7.47	.68	.497	-9.86	20.06
	College Major	-.59	2.32	-.25	.800	-5.23	4.05
	Zv2VRR	2.47	4.36	.57	.574	-6.27	11.20
	t2 VRF X College Major	-1.18	1.89	-.62	.535	-4.97	2.61
	Discussion Posts	8.43	3.73	2.26	.028	.95	15.91
	t2 VRF X Discussion Posts	-1.20	2.68	-.45	.656	-6.56	4.16
	College Major X Discussion Posts	.39	1.41	.28	.781	-2.43	3.22
	t2 VRF X College Major X Discussion Posts	.92	1.20	.77	.444	-1.47	3.32
	Age	-0.02	0.13	-0.14	.893	-0.27	0.23
	Gender	-1.40	1.73	-.81	.420	-4.86	2.05
Model Summary	F(9,56) = 8.22, p < .001, R^2 = .57.						
Final Exam (n = 23)	Constant	24.59	5.89	4.18	.000	11.46	37.71
	College Major	-1.48	1.33	-1.11	.290	-4.44	1.49
	Zv2VRR	-3.38	2.59	-1.30	.220	-9.15	2.39
	t2 VRF X College Major	2.31	1.34	1.72	.120	-.69	5.31
	Discussion Posts	2.78	2.05	1.35	.210	-1.80	7.35
	t2 VRF X Discussion Posts	2.45	2.58	.95	.360	-3.29	8.19
	College Major X Discussion Posts	-.35	.87	-.40	.700	-2.30	1.60
	t2 VRF X College Major X Discussion Posts	-1.95	1.21	-1.61	.140	-4.65	.75
	Age	0.31	0.18	1.75	.110	-0.08	0.7
	Gender	-2.43	1.72	-1.42	.190	-6.26	1.39

	ENGL1	2.16	1.02	2.11	.060	-.13	4.44
	ENGL2	.39	1.27	.31	.760	-2.44	3.23
	curGPA	-.35	1.36	-.26	.800	-3.37	2.67
Model Summary	$F(12,10) = 2.00$, $p = .141$, $R^2 = .71$.						
Total Course Points (n = 28)	Constant	155.06	45.03	3.44	.000	59.60	250.53
	College Major	.51	8.52	.06	.950	-17.56	18.57
	Zv2VRR	-1.91	18.71	-.10	.920	-41.58	37.77
	t2 VRF X College Major	1.25	9.65	.13	.900	-19.22	21.71
	Discussion Posts	-5.59	14.03	-.40	.700	-35.34	24.16
	t2 VRF X Discussion Posts	-4.91	18.8	-0.26	.800	-44.75	34.93
	College Major X Discussion Posts	.31	6.25	.05	.960	-12.96	13.57
	t2 VRF X College Major X Discussion Posts	1.19	8.94	.13	.900	-17.76	20.15
	Age	-.05	1.15	-.04	.960	-2.49	2.39
	Gender	-2.19	12.02	-.18	.860	-27.67	23.28
	ENGL1	-3.92	6.39	-.61	.550	-17.46	9.62
	curGPA	24.22	5.76	4.21	.000	12.01	36.42
Model Summary	$F(11,16) = 2.24$, $p = .069$, $R^2 = .61$.						
Quiz Points (n = 28)	Constant	134.46	33.06	4.07	.001	64.36	204.56
	College Major	-4.43	6.12	-.72	.480	-17.41	8.55
	t2 VRR	-14.88	16.13	-.92	.370	-49.07	19.32
	t2 VRR X College Major	7.74	7.87	0.98	.340	-8.94	24.41
	Discussion Posts	-14.93	10.64	-1.40	.179	-37.49	7.62
	t2 VRR X Discussion Posts	6.77	16.20	.42	.682	-27.58	41.12
	College Major X Discussion Posts	5.14	4.59	1.12	.280	-4.59	14.86
	t2 VRR X College Major X Discussion Posts	-4.77	8.21	-.58	.569	-22.16	12.63
	Age	-.36	.84	-.42	.677	-2.13	1.42
	Gender	.99	8.35	.12	.907	-16.71	18.70
	ENGL1	-3.56	4.39	-.81	.429	-12.86	5.74
	curGPA	22.60	4.62	4.90	.000	12.81	32.39
Model Summary	$F(11,16) = 3.71$, $p = .009$, $R^2 = .72$.						
Discussion Points (n = 66)	Constant	4.27	7.70	.55	.582	-11.16	19.70

	College Major	-0.31	2.33	-0.13	.894	-4.98	4.36
	t2 VRR	1.79	4.73	.38	.706	-7.68	11.26
	t2 VRR X College Major	-.79	2.12	-.37	.711	-5.03	3.45
	Discussion Posts	8.93	3.66	2.44	.018	1.59	16.27
	t2 VRR X Discussion Posts	.78	3.04	.26	.799	-5.31	6.87
	College Major X Discussion Posts	.13	1.43	.09	.925	-2.72	2.99
	t2 VRR X College Major X Discussion Posts	-.21	1.36	-.16	.876	-2.94	2.51
	Age	-.01	.13	-.05	.959	-.26	.25
	Gender	-1.39	1.81	-.77	.444	-5.01	2.23
Model Summary	$F(9,56) = 7.85$, $p < .001$, $R^2 = .56$.						
Final Exam (n = 23)	Constant	26.54	5.52	4.80	.000	14.23	38.86
	College Major	-0.83	1.07	-0.77	.460	-3.22	1.57
	t2 VRR	-1.81	2.71	-.67	.520	-7.86	4.24
	t2 VRR X College Major	1.41	1.30	1.09	.300	-1.48	4.31
	Discussion Posts	-.05	1.89	-.03	.980	-4.25	4.16
	t2 VRR X Discussion Posts	-3.47	2.72	-1.28	.230	-9.53	2.59
	College Major X Discussion Posts	.28	.79	.35	.730	-1.49	2.04
	t2 VRR X College Major X Discussion Posts	1.17	1.34	.87	.400	-1.82	4.17
	Age	.23	.15	1.55	.150	-.10	.55
	Gender	-2.04	1.49	-1.37	.200	-5.35	1.28
	ENGL1	1.85	.92	2.00	.070	-.21	3.91
	ENGL2	1.19	1.29	.92	.380	-1.69	4.06
	curGPA	-1.15	1.49	-0.77	.460	-4.46	2.17
Model Summary	$F(12,10) = 2.19$, $p = .111$, $R^2 = .72$.						
Total Course Points (n = 28)	Constant	162.06	40.33	4.02	.001	76.56	247.56
	College Major	-2.00	7.47	-.27	.792	-17.83	13.83
	t2 VRR	-25.76	19.67	-1.31	.209	-67.47	15.94
	t2 VRR X College Major	12.23	9.59	1.27	.221	-8.11	32.56
	Discussion Posts	-12.12	12.98	-.93	.364	-39.63	15.39
	t2 VRR X Discussion Posts	26.33	19.76	1.33	.201	-15.56	68.22
	College Major X Discussion Posts	1.77	5.60	.32	.755	-10.09	13.64

	t2 VRR X College Major X Discussion Posts	-11.62	10.01	-1.16	.263	-32.83	9.60
	Age	-.46	1.02	-.45	.660	-2.62	1.71
	Gender	3.89	10.2	0.38	.708	-17.7	25.48
	ENGL1	-4.68	5.35	-.87	.395	-16.02	6.66
	curGPA	24.92	5.63	4.43	.000	12.98	36.85
Model Summary	$F(11,16) = 2.72$, $p = .034$, $R^2 = .65$.						
Quiz Points (n = 28)	Constant	137.39	29.63	4.64	.000	74.57	200.21
	College Major	-7.33	5.56	-1.32	.206	-19.12	4.46
	t2 AA	-22.33	12.74	-1.75	.099	-49.34	4.67
	t2 AA X College Major	5.60	4.89	1.14	.270	-4.78	15.97
	Discussion Posts	-17.66	30.78	-.57	.574	-82.90	47.59
	t2 AA X Discussion Posts	12.41	20.77	.60	.559	-31.63	56.44
	College Major X Discussion Posts	4.83	15.01	.32	.752	-26.99	36.65
	t2 AA X College Major X Discussion Posts	-1.85	10.7	-0.17	.866	-24.62	20.92
	Age	.30	.80	.38	.709	-1.38	1.99
	Gender	-4.42	6.99	-.63	.536	-19.24	10.40
	ENGL1	-3.83	4.21	-.91	.376	-12.75	5.09
	curGPA	23.70	3.75	6.31	.000	15.74	31.66
Model Summary	$F(11,16) = 5.19$, $p = .002$, $R^2 = .78$.						
Discussion Points (n = 66)	Constant	8.20	7.52	1.09	.280	-6.86	23.27
	College Major	-1.34	2.33	-.58	.567	-6.02	3.33
	t2 AA	7.58	6.73	1.13	.265	-5.91	21.07
	t2 AA X College Major	-4.10	2.97	-1.38	.173	-10.05	1.85
	Discussion Posts	7.98	3.37	2.37	.021	1.23	14.73
	t2 AA X Discussion Posts	-3.36	3.84	-0.88	.385	-11.05	4.33
	College Major X Discussion Posts	.68	1.37	.49	.624	-2.07	3.42
	t2 AA X College Major X Discussion Posts	2.29	1.64	1.40	.168	-1.00	5.57
	Age	-.02	.12	-.14	.886	-.26	.23
	Gender	-2.43	1.77	-1.37	.175	-5.98	1.11
Model Summary	$F(9,56) = 9.07$, $p < .001$, $R^2 = .59$.						
Final Exam (n = 23)	Constant	25.44	6.47	3.94	.000	11.03	39.85

	College Major	-.40	1.20	-.33	.740	-3.08	2.28
	t2 AA	1.68	3.84	.44	.670	-6.87	10.24
	t2 AA X College Major	-1.12	1.43	-.79	.450	-4.31	2.06
	Discussion Posts	3.52	6.91	.51	.620	-11.88	18.92
	t2 AA X Discussion Posts	-1.68	4.64	-0.36	.720	-12.02	8.66
	College Major X Discussion Posts	-1.49	3.39	-.44	.670	-9.05	6.08
	t2 AA X College Major X Discussion Posts	1.45	2.43	.60	.560	-3.97	6.88
	Age	.23	.17	1.39	.200	-.14	.61
	Gender	-1.46	1.69	-.87	.410	-5.23	2.31
	ENGL1	2.00	1.25	1.60	.140	-.78	4.78
	ENGL2	-.42	1.45	-.29	.780	-3.64	2.81
	curGPA	.04	1.69	.02	.980	-3.74	3.81
Model Summary	$F(12,10) = 1.43$, $p = .288$, $R^2 = .63$.						
Total Course Points (n = 28)	Constant	158.36	38.11	4.16	.001	77.56	239.16
	College Major	-4.14	7.15	-.58	.571	-19.30	11.02
	t2 AA	-27.28	16.4	-1.67	.115	-62.01	7.45
	t2 AA X College Major	6.86	6.29	1.09	.292	-6.48	20.19
	Discussion Posts	15.58	39.58	.39	.699	-68.33	99.50
	t2 AA X Discussion Posts	-6.10	26.71	-.23	.822	-62.73	50.54
	College Major X Discussion Posts	-12.85	19.30	-.67	.515	-53.77	28.08
	t2 AA X College Major X Discussion Posts	8.42	13.81	.61	.551	-20.87	37.70
	Age	.82	1.02	.80	.437	-1.35	2.98
	Gender	-1.31	8.99	-.15	.886	-20.37	17.75
	ENGL1	-5.93	5.41	-1.09	.290	-17.40	5.55
	curGPA	24.04	4.83	4.98	.000	13.80	34.28
Model Summary	$F(11,16) = 3.38$, $p = .014$, $R^2 = .70$.						
Quiz Points (n = 28)	Constant	132.7	33.5	3.96	.001	61.63	203.7
	College Major	-4.13	6.25	-.66	.519	-17.37	9.12
	t2 AAF	-11.46	15.87	-.72	.480	-45.11	22.18
	t2 AAF X College Major	3.92	7.46	.52	.607	-11.91	19.74
	Discussion Posts	-28.41	17.54	-1.62	.125	-65.59	8.77

	t2 AAF X Discussion Posts	21.11	18.21	1.16	.263	-17.49	59.72
	College Major X Discussion Posts	11.42	8.04	1.42	.174	-5.62	28.46
	t2 AAF X College Major X Discussion Posts	-10.03	9.38	-1.07	.301	-29.91	9.85
	Age	-.04	.86	-.05	.961	-1.87	1.79
	Gender	-7.51	8.25	-.91	.376	-25.00	9.98
	ENGL1	-.91	4.69	-.19	.848	-10.86	9.04
	curGPA	23.07	4.21	5.48	.000	14.14	32
Model Summary	$F(11,16) = 3.86$, $p = .007$, $R^2 = .73$.						
Discussion Points (n = 66)	Constant	5.19	8.10	.64	.524	-11.04	21.42
	College Major	-.50	2.48	-.20	.841	-5.47	4.47
	t2 AAF	2.15	5.32	.40	.688	-8.51	12.80
	t2 AAF X College Major	-1.29	2.45	-.53	.599	-6.20	3.61
	Discussion Posts	8.74	3.75	2.33	.023	1.23	16.24
	t2 AAF X Discussion Posts	-.53	3.08	-.17	.865	-6.70	5.65
	College Major X Discussion Posts	.37	1.46	.25	.802	-2.56	3.30
	t2 AAF X College Major X Discussion Posts	.75	1.38	.54	.592	-2.03	3.52
	Age	-.03	.12	-.21	.833	-.28	.22
	Gender	-1.71	1.78	-0.96	.340	-5.28	1.86
Model Summary	$F(9,56) = 8.04$, $p < .001$, $R^2 = .56$.						
Final Exam (n = 23)	Constant	24.80	7.32	3.39	.010	8.49	41.10
	College Major	-.18	1.34	-.14	.890	-3.17	2.80
	t2 AAF	1.04	4.69	.22	.830	-9.43	11.50
	t2 AAF X College Major	-.76	2.09	-.36	.730	-5.41	3.90
	Discussion Posts	.47	3.89	.12	.910	-8.21	9.15
	t2 AAF X Discussion Posts	.77	4.25	.18	.860	-8.70	10.25
	College Major X Discussion Posts	.17	1.75	.10	.920	-3.73	4.07
	t2 AAF X College Major X Discussion Posts	-.28	2.16	-.13	.900	-5.09	4.53
	Age	.22	.18	1.21	.260	-.19	.63
	Gender	-2.24	2.04	-1.1	.300	-6.79	2.3
	ENGL1	1.84	1.24	1.49	.170	-.92	4.60
	ENGL2	-.20	1.66	-.12	.910	-3.89	3.49

	curGPA	.57	1.79	.32	.760	-3.42	4.56
Model Summary	$F(12,10) = 1.01$, $p = .502$, $R^2 = .55$.						
Total Course Points (n = 28)	Constant	151.87	41.52	3.66	.002	63.85	239.90
	College Major	-2.22	7.74	-.29	.778	-18.64	14.20
	t2 AAF	-22.21	19.67	-1.13	.276	-63.90	19.49
	t2 AAF X College Major	7.39	9.25	.80	.436	-12.23	27.00
	Discussion Posts	-9.10	21.73	-.42	.681	-55.18	36.98
	t2 AAF X Discussion Posts	7.15	22.57	.32	.756	-40.70	54.99
	College Major X Discussion Posts	0.43	9.96	0.04	.966	-20.69	21.55
	t2 AAF X College Major X Discussion Posts	-.92	11.62	-.08	.938	-25.56	23.72
	Age	.57	1.07	.54	.600	-1.70	2.84
	Gender	-2.57	10.22	-.25	.805	-24.24	19.10
	ENGL1	-3.69	5.82	-.63	.535	-16.02	8.64
	curGPA	23.82	5.22	4.56	.000	12.75	34.88
Model Summary	$F(11,16) = 2.71$, $p = .034$, $R^2 = .65$.						
Quiz Points (n = 28)	Constant	152.96	24.94	6.13	.000	100.08	205.84
	College Major	-8.75	4.68	-1.87	.080	-18.67	1.17
	t2 AAR	-34.02	12.02	-2.83	.012	-59.49	-8.55
	t2 AAR X College Major	9.01	4.30	2.10	.052	-.10	18.12
	Discussion Posts	2.14	30.3	0.07	.944	-61.98	66.27
	t2 AAR X Discussion Posts	5.87	20.45	.29	.778	-37.48	49.22
	College Major X Discussion Posts	-5.44	14.95	-.36	.721	-37.12	26.25
	t2 AAR X College Major X Discussion Posts	3.17	9.97	.32	.754	-17.96	24.31
	Age	.21	.64	.32	.753	-1.15	1.56
	Gender	-4.94	5.78	-.85	.406	-17.20	7.32
	ENGL1	-6.22	3.63	-1.71	.106	-13.92	1.48
	curGPA	23.79	3.19	7.47	.000	17.04	30.54
Model Summary	$F(11,16) = 8.19$, $p < .001$, $R^2 = .85$.						
Discussion Points (n = 66)	Constant	4.82	6.15	.78	.436	-7.50	17.15
	College Major	-.10	1.96	-.05	.958	-4.04	3.83
	t2 AAR	9	7.38	1.22	.227	-5.77	23.78

	t2 AAR X College Major	-4.43	2.78	-1.59	.117	-10.00	1.14
	Discussion Posts	10.08	2.97	3.39	.001	4.12	16.03
	t2 AAR X Discussion Posts	-4.68	4.21	-1.11	.270	-13.11	3.75
	College Major X Discussion Posts	-.14	1.22	-.11	.909	-2.58	2.30
	t2 AAR X College Major X Discussion Posts	2.67	1.57	1.70	.095	-.48	5.81
	Age	-.03	.12	-.21	.831	-.27	.22
	Gender	-2.25	1.65	-1.36	.179	-5.56	1.06
Model Summary	*F*(9,56) = 9.25, *p* < .001, R^2 = .60.						
Final Exam (n = 23)	Constant	25.66	5.50	4.67	.000	13.42	37.91
	College Major	-.47	1.09	-.43	.680	-2.91	1.97
	t2 AAR	3.38	3.49	0.97	.360	-4.4	11.15
	t2 AAR X College Major	-1.68	1.23	-1.36	.200	-4.44	1.07
	Discussion Posts	2.93	6.99	.42	.680	-12.64	18.51
	t2 AAR X Discussion Posts	-1.22	4.79	-.25	.800	-11.90	9.46
	College Major X Discussion Posts	-1.09	3.44	-.32	.760	-8.76	6.59
	t2 AAR X College Major X Discussion Posts	1.29	2.31	.56	.590	-3.87	6.44
	Age	.20	.15	1.35	.210	-.13	.52
	Gender	-1.91	1.56	-1.22	.250	-5.40	1.58
	ENGL1	3.07	1.20	2.55	.030	.39	5.76
	ENGL2	-.29	1.38	-.21	.840	-3.37	2.80
	curGPA	-.83	1.37	-.61	.560	-3.88	2.22
Model Summary	*F*(12,10) = 2.29, *p* = .099, R^2 = .73.						
Total Course Points (n = 28)	Constant	164.83	40.93	4.03	.001	78.07	251.60
	College Major	-3.62	7.68	-.47	.644	-19.90	12.67
	t2 AAR	-21.71	19.71	-1.10	.287	-63.51	20.08
	t2 AAR X College Major	4.69	7.05	.66	.516	-10.27	19.64
	Discussion Posts	-14.59	49.63	-.29	.772	-119.81	90.62
	t2 AAR X Discussion Posts	14.06	33.55	.42	.681	-57.06	85.18
	College Major X Discussion Posts	2.43	24.52	.10	.922	-49.56	54.43
	t2 AAR X College Major X Discussion Posts	-2.61	16.36	-.16	.875	-37.29	32.07

	Age	.37	1.05	.36	.727	-1.86	2.60
	Gender	-1.04	9.49	-.11	.914	-21.15	19.07
	ENGL1	-5.58	5.96	-0.94	.363	-18.21	7.05
	curGPA	23.72	5.23	4.54	.000	12.63	34.80
Model Summary	$F(11,16) = 2.86$, $p = .028$, $R^2 = .66$.						
Quiz Points (n = 28)	Constant	144.36	43.60	3.31	.004	51.92	236.79
	College Major	-8.32	12.18	-.68	.504	-34.15	17.50
	t2 HT	-20.89	33.45	-.62	.541	-91.82	50.03
	t2 HT X College Major	10.03	17.02	.59	.564	-26.05	46.12
	Discussion Posts	-10.84	27.79	-.39	.702	-69.75	48.07
	t2 HT X Discussion Posts	3.28	28.46	.12	.910	-57.06	63.62
	College Major X Discussion Posts	3.25	13.33	.24	.811	-25.01	31.51
	t2 HT X College Major X Discussion Posts	-1.66	14.08	-.12	.908	-31.50	28.18
	Age	0.09	1.11	0.08	.938	-2.26	2.44
	Gender	-5.58	8.50	-.66	.521	-23.59	12.44
	ENGL1	-3.62	4.47	-.81	.429	-13.10	5.85
	curGPA	22.76	4.53	5.03	.000	13.16	32.35
Model Summary	$F(11,16) = 3.49$, $p = .012$, $R^2 = .71$.						
Discussion Points (n = 66)	Constant	4.91	6.74	.73	.469	-8.59	18.40
	College Major	-.19	2.10	-.09	.927	-4.40	4.01
	t2 HT	4.16	8.21	.51	.614	-12.28	20.61
	t2 HT X College Major	-1.68	3.45	-.49	.629	-8.60	5.24
	Discussion Posts	9.39	3.14	2.99	.004	3.09	15.69
	t2 HT X Discussion Posts	-2.29	4.70	-.49	.627	-11.70	7.11
	College Major X Discussion Posts	0.08	1.28	0.06	.952	-2.49	2.65
	t2 HT X College Major X Discussion Posts	1.11	1.94	.57	.571	-2.78	4.99
	Age	-.02	.13	-.18	.861	-.28	.23
	Gender	-1.92	1.83	-1.05	.300	-5.58	1.75
Model Summary	$F(9,56) = 7.70$, $p < .001$, $R^2 = .55$.						
Final Exam (n = 23)	Constant	25.54	8.69	2.94	.010	6.18	44.90
	College Major	-.75	2.34	-.32	.750	-5.97	4.46

	t2 HT	-2.23	6.43	-.35	.740	-16.57	12.11
	t2 HT X College Major	.91	3.28	.28	.790	-6.39	8.22
	Discussion Posts	6.66	5.49	1.21	.250	-5.58	18.90
	t2 HT X Discussion Posts	-4.50	5.91	-.76	.460	-17.68	8.67
	College Major X Discussion Posts	-2.79	2.62	-1.06	.310	-8.63	3.05
	t2 HT X College Major X Discussion Posts	2.13	2.84	.75	.470	-4.19	8.45
	Age	.31	.21	1.50	.170	-.15	.78
	Gender	-3.25	1.88	-1.73	.120	-7.45	.95
	ENGL1	1.39	1.06	1.31	.220	-.97	3.74
	ENGL2	.86	1.58	.54	.600	-2.67	4.39
	curGPA	-.03	1.55	-.02	.990	-3.48	3.43
Model Summary	$F(12,10) = 1.28$, $p = .351$, $R^2 = .61$.						
Total Course Points (n = 28)	Constant	175.07	53.88	3.25	.010	60.84	289.29
	College Major	-9.22	15.05	-.61	.550	-41.13	22.69
	t2 HT	-34.41	41.34	-.83	.420	-122.05	53.24
	t2 HT X College Major	16	21	0.76	.460	-28.59	60.59
	Discussion Posts	-33.70	34.34	-.98	.340	-106.50	39.09
	t2 HT X Discussion Posts	32.49	35.17	.92	.370	-42.07	107.05
	College Major X Discussion Posts	12.08	16.47	.73	.470	-22.84	47.00
	t2 HT X College Major X Discussion Posts	-14.05	17.39	-.81	.430	-50.92	22.83
	Age	.40	1.37	.29	.780	-2.51	3.30
	Gender	-5.59	10.50	-.53	.600	-27.85	16.67
	ENGL1	-3.43	5.52	-.62	.540	-15.14	8.28
	curGPA	23.47	5.59	4.20	.000	11.61	35.32
Model Summary	$F(11,16) = 2.45$, $p = .051$, $R^2 = .63$.						
Quiz Points (n = 28)	Constant	158.08	38.44	4.11	.001	76.58	239.58
	College Major	-5.3	5.98	-0.89	.389	-17.97	7.37
	t2 HTF	-18.29	25.03	-.73	.475	-71.36	34.78
	t2 HTF X College Major	12.07	12.23	.99	.338	-13.85	38.00
	Discussion Posts	2.37	17.81	.13	.896	-35.39	40.13

	t2 HTF X Discussion Posts	-10.88	18.87	-.58	.572	-50.88	29.12
	College Major X Discussion Posts	-1.95	8.51	-.23	.822	-19.98	16.09
	t2 HTF X College Major X Discussion Posts	1.39	8.79	.16	.876	-17.24	20.02
	Age	-.41	1.17	-.35	.733	-2.89	2.08
	Gender	-6.02	7.59	-.79	.440	-22.12	10.08
	ENGL1	-4.47	4.48	-1.00	.333	-13.97	5.03
	curGPA	20.68	4.54	4.55	.000	11.05	30.31
Model Summary	$F(11,16) = 4.26$, $p = .004$, $R^2 = .75$.						
Discussion Points (n = 66)	Constant	4.18	6.29	.66	.510	-8.43	16.78
	College Major	-.13	2.07	-.06	.949	-4.27	4.01
	t2 HTF	1.71	7.09	.24	.811	-12.50	15.91
	t2 HTF X College Major	-.18	2.90	-.06	.951	-6.00	5.64
	Discussion Posts	9.91	3.17	3.12	.003	3.55	16.27
	t2 HTF X Discussion Posts	-3.06	4.17	-.73	.466	-11.42	5.30
	College Major X Discussion Posts	-.11	1.30	-.08	.935	-2.70	2.49
	t2 HTF X College Major X Discussion Posts	.82	1.68	.49	.626	-2.55	4.19
	Age	-.03	.12	-.23	.821	-.28	.22
	Gender	-1.53	1.78	-.85	.396	-5.10	2.05
Model Summary	$F(9,56) = 8.00$, $p < .001$, $R^2 = .56$.						
Final Exam (n = 23)	Constant	26.42	7.32	3.61	.000	10.11	42.73
	College Major	-.63	1.13	-.56	.590	-3.15	1.89
	t2 HTF	-6.87	5.22	-1.32	.220	-18.50	4.77
	t2 HTF X College Major	3.33	2.52	1.32	.220	-2.29	8.95
	Discussion Posts	7.45	3.29	2.27	.050	.12	14.78
	t2 HTF X Discussion Posts	-3.43	3.99	-.86	.410	-12.31	5.46
	College Major X Discussion Posts	-2.97	1.54	-1.93	.080	-6.41	.47
	t2 HTF X College Major X Discussion Posts	1.22	1.78	.69	.510	-2.75	5.20
	Age	.37	.22	1.69	.120	-.12	.85
	Gender	-3.86	1.62	-2.38	.040	-7.46	-.25
	ENGL1	1.77	0.97	1.82	.100	-0.4	3.93
	ENGL2	.40	1.35	.30	.770	-2.60	3.41

	curGPA	-.36	1.41	-.26	.800	-3.52	2.79
Model Summary	$F(12,10) = 1.91$, $p = .157$, $R^2 = .70$.						
Total Course Points (n = 28)	Constant	169.81	47.91	3.54	.003	68.24	271.38
	College Major	-4.38	7.45	-.59	.565	-20.17	11.42
	t2 HTF	-54.53	31.19	-1.75	.100	-120.66	11.61
	t2 HTF X College Major	28.59	15.24	1.88	.079	-3.72	60.90
	Discussion Posts	-10.41	22.19	-.47	.645	-57.46	36.65
	t2 HTF X Discussion Posts	23.44	23.51	1.00	.334	-26.40	73.29
	College Major X Discussion Posts	2.74	10.60	.26	.800	-19.74	25.21
	t2 HTF X College Major X Discussion Posts	-13.75	11	-1.26	.228	-36.97	9.47
	Age	.73	1.46	.50	.623	-2.37	3.83
	Gender	-5.21	9.46	-.55	.590	-25.27	14.86
	ENGL1	-3.37	5.59	-.60	.555	-15.21	8.47
	curGPA	19.03	5.66	3.36	.004	7.03	31.03
Model Summary	$F(11,16) = 2.98$, $p = .024$, $R^2 = .67$.						
Quiz Points (n = 28)	Constant	142.23	52.19	2.73	.015	31.59	252.87
	College Major	-4.48	16.58	-.27	.791	-39.64	30.68
	t2 HTR	-6.88	33.49	-.21	.840	-77.89	64.12
	t2 HTR X College Major	.93	17.16	.05	.957	-35.45	37.31
	Discussion Posts	-11.31	33.98	-.33	.744	-83.36	60.74
	t2 HTR X Discussion Posts	0.46	39.3	0.01	.991	-82.9	83.81
	College Major X Discussion Posts	3.04	16.11	.19	.853	-31.11	37.19
	t2 HTR X College Major X Discussion Posts	2.06	19.97	.10	.919	-40.28	44.40
	Age	-.11	.89	-.12	.905	-2.00	1.78
	Gender	-7.34	8.66	-.85	.409	-25.71	11.02
	ENGL1	-4.62	4.68	-.99	.338	-14.54	5.30
	curGPA	24.35	4.25	5.73	.000	15.35	33.36
Model Summary	$F(11,16) = 3.72$, $p = .009$, $R^2 = .72$.						
Discussion Points (n = 66)	Constant	6.50	7.24	.90	.373	-7.99	20.99
	College Major	-1.56	2.62	-.59	.554	-6.82	3.69

	t2 HTR	5.18	7.03	.74	.464	-8.90	19.26
	t2 HTR X College Major	-2.78	3.03	-0.92	.364	-8.85	3.3
	Discussion Posts	8.16	3.47	2.35	.022	1.21	15.11
	t2 HTR X Discussion Posts	-1.13	4.07	-.28	.781	-9.29	7.02
	College Major X Discussion Posts	.83	1.51	.55	.584	-2.19	3.85
	t2 HTR X College Major X Discussion Posts	1.17	1.73	.68	.502	-2.30	4.64
	Age	.01	.13	.08	.933	-.24	.26
	Gender	-1.98	1.68	-1.17	.245	-5.35	1.40
Model Summary	*F*(9,56) = 8.78, *p* < .001, R^2 = .59.						
Final Exam (n = 23)	Constant	22.06	12.07	1.83	.100	-4.83	48.96
	College Major	1.38	4.17	.33	.750	-7.92	10.69
	t2 HTR	2.92	8.10	.36	.730	-15.14	20.98
	t2 HTR X College Major	-1.87	4.17	-0.45	.660	-11.16	7.42
	Discussion Posts	6.08	8.46	.72	.490	-12.77	24.93
	t2 HTR X Discussion Posts	-4.83	9.34	-.52	.620	-25.66	15.99
	College Major X Discussion Posts	-2.51	3.93	-.64	.540	-11.26	6.24
	t2 HTR X College Major X Discussion Posts	2.79	4.79	.58	.570	-7.87	13.46
	Age	.24	.19	1.28	.230	-.18	.67
	Gender	-2.54	2.12	-1.20	.260	-7.27	2.19
	ENGL1	1.40	1.21	1.16	.270	-1.29	4.09
	ENGL2	.03	1.67	.02	.990	-3.70	3.75
	curGPA	.61	1.58	.38	.710	-2.92	4.13
Model Summary	*F*(12,10) = 1.00, *p* = .504, R^2 = .55.						
Total Course Points (n = 28)	Constant	95.95	60.1	1.6	.130	-31.46	223.4
	College Major	27.55	19.10	1.44	.168	-12.94	68.04
	t2 HTR	53.77	38.57	1.39	.182	-27.99	135.54
	t2 HTR X College Major	-30.66	19.76	-1.55	.140	-72.55	11.23
	Discussion Posts	43.83	39.13	1.12	.279	-39.14	126.80
	t2 HTR X Discussion Posts	-58.41	45.28	-1.29	.215	-154.41	37.58
	College Major X Discussion Posts	-24.93	18.55	-1.34	.198	-64.26	14.40

	t2 HTR X College Major X Discussion Posts	33.08	23.00	1.44	.170	-15.68	81.83
	Age	.21	1.02	.20	.842	-1.97	2.38
	Gender	-2.06	9.98	-.21	.839	-23.21	19.09
	ENGL1	-3.50	5.39	-.65	.525	-14.92	7.92
	curGPA	23.21	4.89	4.74	.000	12.84	33.58
Model Summary	F(11,16) = 3.24, p = .016, R^2 = .69.						
Quiz Points (n = 28)	Constant	143.50	34.31	4.18	.001	70.76	216.24
	College Major	-4.47	7.02	-.64	.534	-19.36	10.42
	t2 LU	-17.03	13.29	-1.28	.218	-45.20	11.14
	t2 LU X College Major	7.52	6.45	1.17	.261	-6.16	21.20
	Discussion Posts	-16.11	11.25	-1.43	.171	-39.95	7.73
	t2 LU X Discussion Posts	29.48	39.60	.74	.467	-54.48	113.44
	College Major X Discussion Posts	4.90	4.96	.99	.338	-5.62	15.41
	t2 LU X College Major X Discussion Posts	-14.35	19.78	-.73	.478	-56.28	27.57
	Age	-.03	.87	-.04	.969	-1.89	1.82
	Gender	-7.82	8.29	-0.94	.359	-25.4	9.76
	ENGL1	-3.18	4.70	-.68	.508	-13.14	6.77
	curGPA	22.85	4.23	5.40	.000	13.88	31.82
Model Summary	F(11,16) = 3.85, p = .007, R^2 = .73.						
Discussion Points (n = 66)	Constant	6.26	8.08	.77	.442	-9.93	22.45
	College Major	-.91	2.41	-.38	.706	-5.74	3.91
	t2 LU	4.25	5.47	.78	.441	-6.71	15.21
	t2 LU X College Major	-2.21	2.61	-.85	.402	-7.44	3.02
	Discussion Posts	8.32	3.76	2.21	.031	.79	15.85
	t2 LU X Discussion Posts	-1.93	3.84	-.50	.618	-9.62	5.77
	College Major X Discussion Posts	.44	1.42	.31	.759	-2.41	3.29
	t2 LU X College Major X Discussion Posts	1.47	1.78	0.83	.412	-2.1	5.05
	Age	.00	.13	.01	.993	-.25	.25
	Gender	-1.81	1.78	-1.01	.315	-5.38	1.76
Model Summary	F(9,56) = 8.22, p < .001, R^2 = .57.						
Final Exam (n = 23)	Constant	30.33	5.70	5.32	.000	17.61	43.04

	College Major	-1.56	1.13	-1.38	.200	-4.09	.96
	t2 LU	1.87	2.86	.65	.530	-4.50	8.23
	t2 LU X College Major	-1.65	1.32	-1.26	.240	-4.59	1.28
	Discussion Posts	.78	1.84	.42	.680	-3.32	4.88
	t2 LU X Discussion Posts	1.74	6.78	.26	.800	-13.38	16.85
	College Major X Discussion Posts	.30	.79	.38	.720	-1.47	2.06
	t2 LU X College Major X Discussion Posts	0.35	3.3	0.11	.920	-7.01	7.72
	Age	.21	.14	1.55	.150	-.09	.52
	Gender	-1.13	1.47	-.77	.460	-4.42	2.15
	ENGL1	1.82	.98	1.86	.090	-.36	4.01
	ENGL2	-1.89	1.39	-1.36	.200	-4.98	1.20
	curGPA	.76	1.27	.60	.560	-2.08	3.59
Model Summary	F(12,10) = 2.49, p = .079, R^2 = .75.						
Total Course Points (n = 28)	Constant	169.82	42.36	4.01	.001	80.00	259.63
	College Major	-.97	8.67	-.11	.912	-19.36	17.41
	t2 LU	-26.63	16.41	-1.62	.124	-61.41	8.15
	t2 LU X College Major	11.92	7.97	1.50	.154	-4.97	28.81
	Discussion Posts	-11.11	13.9	-0.8	.435	-40.55	18.33
	t2 LU X Discussion Posts	8.50	48.90	.17	.864	-95.17	112.17
	College Major X Discussion Posts	1.04	6.12	.17	.867	-11.94	14.03
	t2 LU X College Major X Discussion Posts	-3.40	24.42	-.14	.891	-55.17	48.36
	Age	.47	1.08	.44	.669	-1.82	2.76
	Gender	-6.71	10.24	-.66	.521	-28.42	14.99
	ENGL1	-5.22	5.80	-.90	.381	-17.52	7.07
	curGPA	22.70	5.23	4.34	.001	11.62	33.78
Model Summary	F(11,16) = 2.74, p = .033, R^2 = .65.						
Quiz Points (n = 28)	Constant	127.10	33.89	3.75	.002	55.26	198.94
	College Major	3.21	9.08	.35	.729	-16.05	22.46
	t2 LUF	-19.25	21.46	-.90	.383	-64.75	26.26
	t2 LUF X College Major	8.64	9.23	.94	.363	-10.94	28.21
	Discussion Posts	-9.34	12.90	-.72	.480	-36.69	18.02

	t2 LUF X Discussion Posts	15.71	16.73	.94	.362	-19.76	51.19
	College Major X Discussion Posts	1.42	6.22	.23	.823	-11.77	14.61
	t2 LUF X College Major X Discussion Posts	-6.94	8.20	-.85	.410	-24.33	10.45
	Age	-.30	.83	-.36	.725	-2.06	1.46
	Gender	-5.66	8.11	-.70	.495	-22.86	11.54
	ENGL1	-3.69	4.89	-.76	.461	-14.06	6.67
	curGPA	24.14	4.66	5.18	.000	14.26	34.01
Model Summary	*F*(11,16) = 3.66, *p* = .009, R^2 = .72.						
Discussion Points (n = 66)	Constant	4.86	7.82	.62	.537	-10.80	20.51
	College Major	.03	2.44	.01	.989	-4.85	4.91
	t2 LUF	2.60	4.53	.57	.568	-6.47	11.68
	t2 LUF X College Major	-1.16	2.15	-.54	.593	-5.46	3.15
	Discussion Posts	9.94	3.91	2.54	.014	2.11	17.78
	t2 LUF X Discussion Posts	-2.60	3.03	-.86	.394	-8.68	3.47
	College Major X Discussion Posts	-.36	1.50	-.24	.810	-3.37	2.65
	t2 LUF X College Major X Discussion Posts	1.38	1.47	.94	.350	-1.56	4.33
	Age	-.02	.13	-.14	.886	-.27	.23
	Gender	-1.83	1.75	-1.04	.301	-5.34	1.68
Model Summary	*F*(9,56) = 7.93, *p* < .001, R^2 = .56.						
Final Exam (n = 23)	Constant	28.52	5.25	5.43	.000	16.81	40.23
	College Major	-1.29	1.58	-.82	.430	-4.81	2.22
	t2 LUF	.63	3.75	.17	.870	-7.72	8.98
	t2 LUF X College Major	-.69	1.57	-.44	.670	-4.18	2.81
	Discussion Posts	-.19	2.07	-.09	.930	-4.80	4.42
	t2 LUF X Discussion Posts	1.37	2.70	.51	.620	-4.65	7.39
	College Major X Discussion Posts	.61	1.01	.60	.560	-1.65	2.87
	t2 LUF X College Major X Discussion Posts	.13	1.30	.10	.920	-2.77	3.04
	Age	.17	.13	1.32	.210	-.12	.46
	Gender	-1.66	1.34	-1.24	.240	-4.66	1.33
	ENGL1	1.93	.94	2.05	.070	-.16	4.03
	ENGL2	-1.13	1.21	-.93	.370	-3.82	1.56

	curGPA	.88	1.36	.64	.530	-2.15	3.91
Model Summary	$F(12,10) = 2.71$, $p = .062$, $R^2 = .76$.						
Total Course Points (n = 28)	Constant	142.82	42.91	3.33	.000	51.85	233.79
	College Major	10.16	11.50	.88	.390	-14.22	34.55
	t2 LUF	-22.48	27.18	-.83	.420	-80.10	35.14
	t2 LUF X College Major	11.10	11.69	.95	.360	-13.69	35.88
	Discussion Posts	1.69	16.34	.10	.920	-32.95	36.33
	t2 LUF X Discussion Posts	4.58	21.19	.22	.830	-40.34	49.51
	College Major X Discussion Posts	-4.93	7.88	-.63	.540	-21.64	11.77
	t2 LUF X College Major X Discussion Posts	-2.16	10.38	-.21	.840	-24.18	19.86
	Age	.14	1.05	.13	.900	-2.09	2.37
	Gender	-2.77	10.27	-.27	.790	-24.56	19.01
	ENGL1	-5.42	6.19	-.88	.390	-18.54	7.70
	curGPA	23.95	5.90	4.06	.000	11.45	36.45
Model Summary	$F(11,16) = 2.38$, $p = .056$, $R^2 = .62$.						
Quiz Points (n = 28)	Constant	147.14	35.05	4.20	.001	72.84	221.45
	College Major	-7.65	7.10	-1.08	.298	-22.70	7.41
	t2 LUR	-17.37	13.01	-1.33	.201	-44.95	10.22
	t2 LUR X College Major	8.00	6.85	1.17	.260	-6.52	22.52
	Discussion Posts	-19.05	11.23	-1.70	.109	-42.86	4.76
	t2 LUR X Discussion Posts	-2.54	36.40	-.07	.945	-79.71	74.63
	College Major X Discussion Posts	6.62	4.78	1.38	.185	-3.52	16.76
	t2 LUR X College Major X Discussion Posts	.34	18.44	.02	.985	-38.75	39.44
	Age	.15	.88	.17	.869	-1.71	2.01
	Gender	-7.46	7.92	-.94	.361	-24.26	9.35
	ENGL1	-3.27	4.36	-.75	.464	-12.51	5.96
	curGPA	22.33	4.24	5.27	.000	13.35	31.32
Model Summary	$F(11,16) = 3.96$, $p = .006$, $R^2 = .73$.						
Discussion Points (n = 66)	Constant	4.67	7.89	.59	.557	-11.14	20.48
	College Major	-.81	2.30	-.35	.724	-5.41	3.79
	t2 LUR	5.06	6.64	.76	.449	-8.24	18.36

	t2 LUR X College Major	-2.60	2.77	-.94	.353	-8.16	2.96
	Discussion Posts	8.99	3.72	2.42	.019	1.54	16.44
	t2 LUR X Discussion Posts	-1.28	4.48	-.29	.776	-10.25	7.69
	College Major X Discussion Posts	.33	1.43	.23	.818	-2.54	3.20
	t2 LUR X College Major X Discussion Posts	1.24	1.90	.65	.519	-2.58	5.05
	Age	.02	.13	.18	.862	-.23	.27
	Gender	-1.56	1.75	-.89	.377	-5.07	1.95
Model Summary	$F(9,56) = 8.34$, $p < .001$, $R^2 = .57$.						
Final Exam (n = 23)	Constant	26.81	6.05	4.43	.000	13.33	40.30
	College Major	-.37	1.16	-.32	.750	-2.95	2.21
	t2 LUR	3.00	3.19	.94	.370	-4.11	10.10
	t2 LUR X College Major	-2.09	1.56	-1.34	.210	-5.57	1.39
	Discussion Posts	1.16	2.01	.58	.580	-3.32	5.64
	t2 LUR X Discussion Posts	-14.60	6.29	-2.32	.040	-28.62	-.57
	College Major X Discussion Posts	-.19	.80	-.23	.820	-1.97	1.60
	t2 LUR X College Major X Discussion Posts	8.11	3.16	2.57	.030	1.07	15.15
	Age	.25	.14	1.75	.110	-.07	.57
	Gender	-1.80	1.55	-1.16	.270	-5.26	1.66
	ENGL1	1.90	.95	2.00	.070	-.22	4.02
	ENGL2	-.53	1.34	-.39	.700	-3.52	2.47
	curGPA	-.22	1.26	-.17	.870	-3.03	2.60
Model Summary	$F(12,10) = 2.38$, $p = .089$, $R^2 = .74$.						
Total Course Points (n = 28)	Constant	184.44	42.66	4.32	.001	94.00	274.88
	College Major	-8.19	8.64	-.95	.358	-26.51	10.14
	t2 LUR	-28.29	15.84	-1.79	.093	-61.87	5.28
	t2 LUR X College Major	12.50	8.34	1.50	.153	-5.17	30.17
	Discussion Posts	-17.11	13.67	-1.25	.229	-46.09	11.87
	t2 LUR X Discussion Posts	31.56	44.30	.71	.486	-62.36	125.49
	College Major X Discussion Posts	4.26	5.82	.73	.475	-8.08	16.61
	t2 LUR X College Major X Discussion Posts	-14.48	22.44	-.65	.528	-62.06	33.10
	Age	.59	1.07	.55	.590	-1.68	2.85

	Gender	-7.33	9.65	-.76	.458	-27.78	13.12
	ENGL1	-5.17	5.30	-.97	.344	-16.41	6.07
	curGPA	22.14	5.16	4.29	.001	11.20	33.08
Model Summary	$F(11,16) = 2.95$, $p = .025$, $R^2 = .67$.						
Quiz Points (n = 28)	Constant	127.64	40.59	3.14	.006	41.60	213.69
	College Major	-3.22	7.89	-.41	.689	-19.94	13.50
	t2 PS	-4.03	16.82	-.24	.814	-39.68	31.62
	t2 PS X College Major	1.25	9.11	.14	.893	-18.06	20.55
	Discussion Posts	-15.20	21.12	-.72	.482	-59.99	29.58
	t2 PS X Discussion Posts	7.62	33.46	.23	.823	-63.31	78.55
	College Major X Discussion Posts	5.69	9.77	.58	.569	-15.03	26.41
	t2 PS X College Major X Discussion Posts	-4.00	16.89	-.24	.816	-39.80	31.80
	Age	-.03	1.03	-.03	.975	-2.22	2.16
	Gender	-3.28	8.64	-.38	.709	-21.59	15.02
	ENGL1	-3.00	5.24	-.57	.575	-14.12	8.12
	curGPA	23.15	4.60	5.03	.000	13.40	32.90
Model Summary	$F(11,16) = 3.41$, $p = .013$, $R^2 = .70$.						
Discussion Points (n = 66)	Constant	3.97	7.54	.53	.600	-11.13	19.07
	College Major	-.16	2.30	-.07	.945	-4.77	4.45
	t2 PS	1.01	6.13	.17	.869	-11.27	13.30
	t2 PS X College Major	-.19	2.50	-.08	.938	-5.20	4.81
	Discussion Posts	9.55	3.75	2.55	.014	2.04	17.07
	t2 PS X Discussion Posts	-.89	3.85	-.23	.819	-8.60	6.82
	College Major X Discussion Posts	.02	1.42	.01	.990	-2.83	2.87
	t2 PS X College Major X Discussion Posts	.26	1.61	.16	.872	-2.96	3.48
	Age	-.02	.13	-.19	.848	-.28	.23
	Gender	-1.38	1.80	-.77	.447	-4.97	2.22
Model Summary	$F(9,56) = 7.36$, $p < .001$, $R^2 = .54$.						
Final Exam (n = 23)	Constant	26.13	8.59	3.04	.010	6.98	45.28
	College Major	-.37	1.68	-.22	.830	-4.12	3.38
	t2 PS	.13	3.89	.03	.970	-8.54	8.80

	t2 PS X College Major	-.07	2.05	-.03	.970	-4.64	4.50
	Discussion Posts	-1.60	4.46	-.36	.730	-11.55	8.35
	t2 PS X Discussion Posts	5.56	6.95	.80	.440	-9.94	21.06
	College Major X Discussion Posts	1.05	2.03	.52	.620	-3.48	5.57
	t2 PS X College Major X Discussion Posts	-2.66	3.54	-.75	.470	-10.55	5.23
	Age	.19	.22	.87	.400	-.29	.67
	Gender	-2.11	1.99	-1.07	.310	-6.54	2.31
	ENGL1	1.69	1.19	1.42	.190	-.96	4.35
	ENGL2	-.37	1.72	-.21	.840	-4.20	3.46
	curGPA	.74	1.64	.45	.660	-2.91	4.40
Model Summary	$F(12,10) = 1.02$, $p = .496$, $R^2 = .55$.						
Total Course Points (n = 28)	Constant	142.24	49.41	2.88	.011	37.50	246.98
	College Major	-.63	9.60	-.07	.949	-20.98	19.73
	t2 PS	-15.16	20.47	-.74	.470	-58.56	28.24
	t2 PS X College Major	5.31	11.08	.48	.638	-18.19	28.81
	Discussion Posts	-5.38	25.71	-.21	.837	-59.89	49.14
	t2 PS X Discussion Posts	-2.53	40.72	-.06	.951	-88.87	83.81
	College Major X Discussion Posts	-.77	11.90	-.06	.950	-25.99	24.46
	t2 PS X College Major X Discussion Posts	3.92	20.55	.19	.851	-39.66	47.50
	Age	.72	1.26	.57	.575	-1.95	3.39
	Gender	-5.56	10.51	-.53	.604	-27.85	16.72
	ENGL1	-.92	6.38	-.14	.888	-14.45	12.62
	curGPA	22.91	5.60	4.09	.001	11.04	34.78
Model Summary	$F(11,16) = 2.50$, $p = .047$, $R^2 = .63$.						
Quiz Points (n = 28)	Constant	142.96	40.75	3.51	.003	56.58	229.35
	College Major	-6.17	8.76	-.70	.491	-24.74	12.40
	t2 PSF	-17.51	25.27	-.69	.498	-71.09	36.08
	t2 PSF X College Major	9.23	13.87	.67	.515	-20.16	38.63
	Discussion Posts	10.18	28.06	.36	.721	-49.30	69.66
	t2 PSF X Discussion Posts	-21.62	30.23	-.72	.485	-85.72	42.48
	College Major X Discussion Posts	-6.42	13.66	-.47	.645	-35.37	22.54

	t2 PSF X College Major X Discussion Posts	8.90	14.76	.60	.555	-22.40	40.21
	Age	.24	.99	.24	.810	-1.86	2.34
	Gender	-6.08	8.55	-.71	.487	-24.20	12.04
	ENGL1	-3.63	4.61	-.79	.443	-13.40	6.14
	curGPA	20.59	5.08	4.05	.001	9.82	31.37
Model Summary	$F(11,16) = 3.77$, $p = .008$, $R^2 = .72$.						
Discussion Points (n = 66)	Constant	3.73	7.28	.51	.610	-10.85	18.31
	College Major	-.20	2.23	-.09	.930	-4.65	4.26
	t2 PSF	1.66	5.92	.28	.780	-10.19	13.51
	t2 PSF X College Major	-.36	2.13	-.17	.868	-4.61	3.90
	Discussion Posts	9.87	3.66	2.70	.009	2.54	17.21
	t2 PSF X Discussion Posts	-1.91	3.88	-.49	.625	-9.68	5.87
	College Major X Discussion Posts	-.08	1.41	-.06	.954	-2.91	2.75
	t2 PSF X College Major X Discussion Posts	.52	1.47	.35	.726	-2.42	3.45
	Age	-.01	.13	-.11	.915	-.28	.25
	Gender	-1.34	1.75	-.76	.448	-4.85	2.17
Model Summary	$F(9,56) = 7.45$, $p < .001$, $R^2 = .54$.						
Final Exam (n = 23)	Constant	27.77	8.64	3.21	.010	8.51	47.02
	College Major	-.58	1.86	-.31	.760	-4.72	3.56
	t2 PSF	-1.81	5.76	-.32	.760	-14.64	11.01
	t2 PSF X College Major	.96	3.11	.31	.760	-5.97	7.90
	Discussion Posts	3.89	6.00	.65	.530	-9.49	17.26
	t2 PSF X Discussion Posts	-.87	7.24	-.12	.910	-17.01	15.27
	College Major X Discussion Posts	-1.60	2.91	-.55	.600	-8.09	4.89
	t2 PSF X College Major X Discussion Posts	.89	3.34	.26	.800	-6.57	8.34
	Age	.22	.20	1.08	.310	-.23	.67
	Gender	-2.86	2.11	-1.35	.210	-7.56	1.85
	ENGL1	1.85	1.14	1.62	.140	-.69	4.39
	ENGL2	-.49	1.86	-.26	.800	-4.65	3.67
	curGPA	.59	1.80	.33	.750	-3.42	4.60
Model Summary	$F(12,10) = 1.21$, $p = .386$, $R^2 = .59$.						

Total Course Points (n = 28)	Constant	166.25	51.44	3.23	.005	57.19	275.31
	College Major	-6.37	11.06	-.58	.573	-29.82	17.08
	t2 PSF	-34.16	31.91	-1.07	.300	-101.81	33.49
	t2 PSF X College Major	16.73	17.50	.96	.353	-20.38	53.84
	Discussion Posts	-16.51	35.42	-.47	.647	-91.60	58.59
	t2 PSF X Discussion Posts	19.58	38.17	.51	.615	-61.34	100.51
	College Major X Discussion Posts	4.73	17.24	.27	.787	-31.83	41.29
	t2 PSF X College Major X Discussion Posts	-8.88	18.64	-.48	.640	-48.40	30.64
	Age	.64	1.25	.51	.619	-2.02	3.29
	Gender	-6.92	10.79	-.64	.531	-29.79	15.96
	ENGL1	-2.33	5.82	-.40	.695	-14.66	10.01
	curGPA	21.95	6.42	3.42	.004	8.34	35.55
Model Summary	$F(11,16) = 2.49$, $p = .048$, $R^2 = .63$.						
Quiz Points (n = 28)	Constant	119.10	38.33	3.11	.007	37.83	200.36
	College Major	-1.73	6.73	-.26	.800	-16.00	12.54
	t2 PSR	-3.94	14.56	-.27	.790	-34.80	26.92
	t2 PSR X College Major	-.20	7.19	-.03	.978	-15.44	15.04
	Discussion Posts	-10.30	11.27	-.91	.374	-34.19	13.58
	t2 PSR X Discussion Posts	13.15	17.29	.76	.458	-23.49	49.80
	College Major X Discussion Posts	2.56	5.17	.50	.627	-8.40	13.51
	t2 PSR X College Major X Discussion Posts	-5.20	8.05	-.65	.527	-22.27	11.86
	Age	.20	1.13	.18	.861	-2.20	2.60
	Gender	-4.88	8.63	-.57	.580	-23.18	13.42
	ENGL1	-.85	5.40	-.16	.877	-12.30	10.60
	curGPA	22.24	4.72	4.71	.000	12.23	32.24
Model Summary	$F(11,16) = 3.59$, $p = .010$, $R^2 = .71$.						
Discussion Points (n = 66)	Constant	4.90	8.18	.60	.552	-11.49	21.28
	College Major	-.58	2.56	-.23	.822	-5.70	4.54
	t2 PSR	2.10	7.60	.28	.783	-13.12	17.33
	t2 PSR X College Major	-1.05	3.39	-.31	.757	-7.83	5.73

	Discussion Posts	8.75	3.81	2.30	.025	1.12	16.38
	t2 PSR X Discussion Posts	-.73	4.20	-.17	.862	-9.14	7.68
	College Major X Discussion Posts	.36	1.52	.24	.812	-2.68	3.41
	t2 PSR X College Major X Discussion Posts	.50	1.87	.27	.789	-3.24	4.25
	Age	-.02	.13	-.13	.895	-.27	.24
	Gender	-1.52	1.74	-.87	.387	-5.00	1.97
Model Summary	*F*(9,56) = 7.41, *p* < .001, R^2 = .54.						
Final Exam (n = 23)	Constant	26.09	7.56	3.45	.010	9.24	42.93
	College Major	-.36	1.35	-.27	.800	-3.36	2.65
	t2 PSR	.73	3.15	.23	.820	-6.29	7.75
	t2 PSR X College Major	-.39	1.51	-.26	.800	-3.76	2.98
	Discussion Posts	2.73	2.33	1.17	.270	-2.46	7.92
	t2 PSR X Discussion Posts	3.05	3.39	.90	.390	-4.51	10.61
	College Major X Discussion Posts	-1.03	1.00	-1.04	.320	-3.25	1.19
	t2 PSR X College Major X Discussion Posts	-1.73	1.57	-1.10	.300	-5.22	1.77
	Age	.21	.22	.94	.370	-.29	.70
	Gender	-2.67	1.86	-1.44	.180	-6.82	1.48
	ENGL1	1.84	1.09	1.69	.120	-.59	4.27
	ENGL2	.45	1.53	.30	.770	-2.95	3.86
	curGPA	-.12	1.50	-.08	.940	-3.46	3.22
Model Summary	*F*(12,10) = 1.33, *p* = .331, R^2 = .61.						
Total Course Points (n = 28)	Constant	126.43	46.78	2.70	.016	27.26	225.60
	College Major	1.25	8.21	.15	.881	-16.17	18.66
	t2 PSR	-14.22	17.76	-.80	.435	-51.88	23.44
	t2 PSR X College Major	2.61	8.77	.30	.770	-15.99	21.22
	Discussion Posts	-10.77	13.75	-.78	.445	-39.92	18.38
	t2 PSR X Discussion Posts	8.34	21.09	.40	.698	-36.38	53.06
	College Major X Discussion Posts	2.19	6.31	.35	.733	-11.18	15.56
	t2 PSR X College Major X Discussion Posts	-.74	9.82	-.07	.941	-21.56	20.09
	Age	1.27	1.38	.92	.373	-1.66	4.20
	Gender	-4.77	10.53	-.45	.657	-27.10	17.56

	ENGL1	.31	6.59	.05	.963	-13.66	14.29
	curGPA	21.11	5.76	3.67	.002	8.90	33.32
Model Summary	$F(11,16) = 2.62$, $p = .039$, $R^2 = .64$.						