THE RELATIONSHIP OF COGNITIVE LOAD AND MOTIVATION AS A PREDICTOR OF PERSISTENCE IN ACCELERATED ONLINE ASYNCHRONOUS COURSES

Alan Wesley Kinsey

Follow this and additional works at: https://digitalcommons.memphis.edu/etd

Recommended Citation
https://digitalcommons.memphis.edu/etd/3430

This Dissertation is brought to you for free and open access by University of Memphis Digital Commons. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of University of Memphis Digital Commons. For more information, please contact khggerty@memphis.edu.
THE RELATIONSHIP OF COGNITIVE LOAD AND MOTIVATION AS A PREDICTOR OF PERSISTENCE IN ACCELERATED ONLINE ASYNCHRONOUS COURSES

by

Alan Wesley Kinsey

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Education

Major: Instruction and Curriculum Leadership

The University of Memphis

April 2022
Dedication

This dissertation is dedicated to my family and friends. There are too many to name individually here who have supported this work, including my wife and children, mother, late father, coworkers, friends, community members, and fellow learners. I could spend pages writing about the individual support and encouragement I have received from so many who made this dedication possible. However, to be succinct, thank you for long nights, angry rants, weird article requests, and always pointing me to the end.
Acknowledgments

I would like to thank the following people who were instrumental in this project and without whom I would not have been able to complete it:

My advisor and chair, Dr. Andrew Tawfik, for countless meetings, emails, tracked changes, and his enthusiasm and support for this project.

Dr. Amanda Rockinson-Szapkiw, for her instrumental knowledge of persistence, methodology, and statistics, and her encouragement to constantly push to answer the questions.

My committee members, Dr. Jenny Jones, Dr. Scott Vann, and Dr. Clif Mims, for your support and work completing this research.

My colleagues and friends at Holmes Community College who took the time to support this work and provide research data were instrumental in completing the project.

My colleagues and friends at Germanna Community College, who have listened to me stress and encouraged me to keep going.

Finally, I would like to acknowledge the work of the IDT EdD 2019 Cohort, each of whom contributed substantially to my growth as a scholar and the finished product that follows.

Thank you all for your work and support. I would not have made it without you.
Abstract

With the increase in online course enrollments each year, there is a continued examination of online course persistence, particularly in accelerated online courses. This examination of online course persistence has typically examined individual learner factors as contributors to persistence. However, research examining the institutional and pedagogical factors of persistence can continue to further understanding what factors lead to learner persistence decisions. The purpose of this quantitative, predictive correlational study is to examine to what extent, if any, community college learners’ perceived online course cognitive load and motivation predict persistence in an accelerated online course. The theoretical framework for this study includes Cognitive Load Theory and Self-Determination Theory as predictive elements within a persistence model influenced by Rovai’s 2003 synthesis of Tinto’s Integration Framework and Bean and Metzner’s conceptual models. However, the model of this study uses these predictive elements with a focus on course design as a predictor for persistence. The perceived cognitive load includes extraneous, intrinsic, and germane load. Online course motivation includes extrinsic motivation, intrinsic motivation, and amotivation. Results from a binary logistic regression show a statistically significant model of persistence, including the interplay of cognitive load and motivation as a predictor for persistence. Germane cognitive load, intrinsic, and extrinsic motivation showed individual significance within the model. Findings suggest that cognitive and affective factors of course design can lead to learner persistence in accelerated online asynchronous courses. Further discussion of theoretical and practical implications are discussed, as well as limitations and areas of future research.

Keywords: cognitive load, motivation, online course, course design, persistence
Table of Contents

CHAPTER ONE: INTRODUCTION ............................................................................... 8
   Problem of Practice Statement ........................................................................... 10
   Purpose Statement ............................................................................................. 12
   Theoretical Framework ...................................................................................... 15
   Research Questions ............................................................................................ 18
   Null Hypotheses ................................................................................................. 19
   Definitions .......................................................................................................... 20

CHAPTER TWO: REVIEW OF THE LITERATURE ................................................... 22
   Introduction ........................................................................................................ 22
   Theoretical Context ............................................................................................ 23
   Summary ............................................................................................................ 39

CHAPTER THREE: METHODOLOGY ...................................................................... 40
   Introduction ........................................................................................................ 40
   The Investigation Plan ....................................................................................... 41
   Learner Characteristics ..................................................................................... 42
   Setting ............................................................................................................... 43
   Instrumentation ................................................................................................ 45
   Procedures ........................................................................................................ 49
   Role of the Researcher ...................................................................................... 52
   Summary ............................................................................................................ 52

CHAPTER FOUR: RESULTS ................................................................................. 54
   Introduction ........................................................................................................ 54
   Descriptive Statistics ....................................................................................... 54
   Statistical Analysis ........................................................................................... 60
   Summary ............................................................................................................ 62

CHAPTER FIVE: DISCUSSION AND CONCLUSIONS .......................................... 63
   Introduction ........................................................................................................ 63
   Discussion of Results ....................................................................................... 63
   Implications for Practice .................................................................................. 76
   Limitations and Considerations for Future Research ....................................... 81
   Conclusion ....................................................................................................... 85

REFERENCES ..................................................................................................... 86

Appendix A .......................................................................................................... 100
Appendix B .......................................................................................................... 101
List of Tables

Table 1 ...........................................................................................................48
Table 2 ...........................................................................................................55
Table 3 ...........................................................................................................56
Table 4 ...........................................................................................................57
Table 5 ...........................................................................................................59
Table 6 ...........................................................................................................62
List of Abbreviations

Extraneous Cognitive Load (ECL) ................................................................. 43
Germane Cognitive Load (GCL) ................................................................. 43
Intrinsic Cognitive Load (ICL) ................................................................. 43
Learning Management System (LMS) ..................................................... 42
Self-Determination Theory (SDT) ............................................................ 12
Intrinsic Motivation (IM) ......................................................................... 10
Extrinsic Motivation (EM) ......................................................................... 10
Amotivation (AM) ................................................................................. 10
CHAPTER ONE: INTRODUCTION

Online courses have shown an increase in enrollment since 2016 (Allen & Seaman, 2017; Seaman et al., 2018), both in community colleges and traditional four-year institutions of higher learning. According to National Clearinghouse, of the 2.6 million learners who began college in the Fall 2019 semester, only 73.9 percent returned to college the following fall, showing the most significant one-year persistence drop since 2009 (National Learner Clearinghouse Research Center, 2021). This drop was even more significant in community colleges, which saw percentage point drops of -3.5 percent in persistence. These trends can also be applied to online courses, as numerous models and theories predict both online and residential community college course persistence and are similar to other higher education settings (Aragon & Johnson, 2008; Huntington-Klein et al., 2017; Karp et al., 2010). While course enrollments have increased, current research shows that the rate of persistence has not reflected this growth. For this study, course persistence can be defined as the ability of an individual learner to complete a course without withdrawal or dropping out (Rovai, 2003; Tinto, 1975).

Several theories and theoretical frameworks have been developed to explain the complex factors associated with persistence and attrition. Tinto’s learner integration model (1975, 1988) and Bean and Metzner’s framework (1985) are among the most often applied and extended in research, including research into online persistence and attrition (Rovai, 2003). Tinto’s model examines the multifaceted process leading to learner persistence decisions, including individual and institutional factors. Within the academic system, or the role of academic and social integration, Tinto’s (1975) model proposes that undergraduate learners need to integrate into academic, or cognitive, and social, or affective, systems within the university. Bean and Metzner (1985) apply this model to non-traditional learners and expand it to include various background,
academic, environmental, social integration, and psychological variables. Specifically, for non-traditional learners, environmental factors seem to be the most important: lack of finances, work schedules, lack of encouragement, family responsibilities, and a perceived opportunity to transfer. Rovai (2003) synthesizes these two models to explain persistence in online education, including learner characteristics, learner skills, external factors (e.g., environmental factors), and internal factors (e.g., academic and social integration). One key element of Rovai’s synthesized model suggests that pedagogy in the online class can contribute to persistence. While this framework has been relatively untested, it provides a foundation for developing a model of online learners’ experience in online courses to understand persistence better.

Research recognizes that online learning is complex, as it exists in a technology-mediated environment and includes multiple components, all contributing to an increase in learner autonomy through the course experience (Çakiroğlu & Aksoy, 2017; Croxton, 2014; Darabi & Jin, 2013; Mayer & Moreno, 2002; Morris et al., 2005). However, research validating and investing these persistence theories and frameworks in online learning has primarily focused on the learner's factors, like personal satisfaction and course experience (Bickle et al., 2019; Bradford, 2011). However, research and meta-analyses on online learning effectiveness, which have examined both achievement and persistence, have suggested that pedagogy may be an integral factor to consider. In a 2010 report written by Means et al. for the U.S. Department of Education, Office of Planning, Evaluation, and Policy Development, over a thousand learning studies published between 1996 and 2008 were examined and found that learners in online learning programs performed slightly better than their face-to-face counterparts (Means et al., 2010). This meta-analysis found that a combination of pedagogical approaches from online and face-to-face instruction had a more considerable advantage than purely face-to-face courses,
contributing to learner outcomes. In another meta-analysis of 232 studies, Bernard et al. (2004) especially highlighted that course design generally takes precedence over technology in online courses. To that end, design aligns with Rovai’s model of including pedagogy as an internal factor contributing to a research decision. Focusing on elements of pedagogy, particularly learner perceptions of cognitive and motivational aspects of design, can address a current literature gap regarding how course design elements predict persistence decisions in online community college learners.

**Problem of Practice Statement**

If learners continue to enroll in online courses and community colleges continue to increase their online course offerings, particularly as colleges explore increasing accelerated courses, such as half-term or mini-term offerings, the decrease in course persistence must not be overlooked. Research investigating online course persistence can contribute to learner success, particularly if it examines pedagogical aspects necessary for the development of learning in the online classroom (Du et al., 2016; Tinto, 2017; Xu & Jaggars, 2013). Despite its importance, theoretical elements of cognitive and affective course design as pedagogy have not been examined as predictors of persistence in online community college learners, specifically in accelerated course offerings. If this problem and research gap persist, it may lead to questions about the viability of online learning to meet the needs of all learners within higher education settings.

Pedagogy includes the cognitive and affective aspects of course design effects in online learning environments (Akyol & Garrison, 2019; Nilson & Goodson, 2021b, 2021a), but studies often focus on one or the other. Cognitive learning outcomes are often associated with grades (GPA), academic ability, and what the learner will gain from the learning event (Guerrero-
Roldán & Noguera, 2018; Han et al., 2020; Martin et al., 2020), which are also markers of persistence (Bean & Metzner, 1985; Rovai, 2003; Tinto, 1975). Affective learning, namely motivation, is essential in online course design and can affect multiple aspects of the learner experience, including engagement with course materials, academic success, and outcomes achievement (Clark & Mayer, 2016; Lucey, 2018; Nilson & Goodson, 2021b), which also factor into persistence decisions. Few studies have investigated the association between cognitive and affective outcomes in online courses (e.g., Cane et al., 2017; Chen & Wu, 2012; Costley & Lange, 2018). Furthermore, a current gap exists in the research examining the possibility of a predictive relationship between course design pedagogical factors, including cognitive and affective domains, and persistence. Specifically, these cognitive and affective elements can be examined through learner perceptions of cognitive load (cognitive) and motivation (affective).

There are multiple ways to understand cognitive and affective learning goals. In terms of the former, Cognitive Load Theory (Sweller et al., 2019) can be used as a basis for understanding cognitive elements of online course design and learner experience in learning events (Bradford, 2011; Burkes, 2007; L. Nilson & Goodson, 2021a). Specifically, Cognitive Load Theory includes three categories of cognitive load: intrinsic, germane, and extraneous. The categories of Cognitive Load Theory will operate as predictor variables in this study. As for affective learning outcomes, Self Determination Theory (R. Ryan & Deci, 2017) can be used as a basis for understanding the socio-emotional elements of online course design and learner experience (Hartnett, 2019; L. Nilson & Goodson, 2021b; Tinto, 2017). Self Determination Theory includes three categories of motivation on a continuum of intrinsic, extrinsic, and amotivation. The categories of motivation will operate as predictor variables in this study.
By understanding this relationship between learner perceptions of cognitive load and motivation and persistence, course designers and instructors can execute pedagogical course design strategies that could directly affect factors leading to community college learners’ persistence in accelerated online asynchronous courses.

**Purpose Statement**

The purpose of this quantitative, predictive correlational study is to examine to what extent, if any, community college learners’ perceived online course cognitive load, including extraneous, intrinsic, and germane loads, and online course motivation, including extrinsic, intrinsic, and amotivation, predict persistence in an accelerated online course. However, due to the nature of persistence, other variables must also be considered, including course subject and the number of online courses taken by the learner.

The criterion variable in this study is defined by course persistence as measured by course completion or withdrawal (Rovai, 2003; Tinto, 1975). As noted earlier, the predictor variables include cognitive load (extraneous, intrinsic, and germane) and motivation (intrinsic, extrinsic, and amotivation). The control variables include course subjects and the number of online courses taken by the learner (Hart et al., 2018; Ocana et al., 2020; Owston & York, 2018).

For this study, extraneous cognitive load is defined as the presentation of information and the learner's requirements to participate in the learning procedure (Sweller et al., 2019). Alternatively, intrinsic cognitive load is defined as the content and information learned through the learning procedure (Sweller et al., 2019). Finally, germane cognitive load is defined as the amount of memory required to process the learning environment to learn the expected content (Sweller et al., 2019). All three variables will be measured using the validated instrument
developed by Klepsch et al. (2017) to measure cognitive load in a differentiated way, referred to as the Cognitive Load Questionnaire. This instrument is included in Appendix A.

Intrinsic motivation (IM) can be defined as activities completed for the “inherent interest and enjoyment” (Ryan & Deci, 2020, p. 2). In terms of external factors, extrinsic motivation (EM) can be defined as activities conducted “for reasons other than their inherent satisfaction” (Ryan & Deci, 2020, p. 2). Due to the breadth of variations within motivations, self-determination theory provides four subtypes of extrinsic motivation: external regulation, introjected regulation, identified regulation, and integrated regulation. The unifying theme of these subtypes is that these activities are completed not because of interest or enjoyment but of the sense of value associated with the activity. Lastly, amotivation (AM) is defined as activities completed with a lack of intentionality (Ryan & Deci, 2020). Two instruments will be utilized to measure these constructs. The validated Work Preference Inventory will be used (Amabile et al., 1994) to measure the online course's intrinsic and extrinsic course motivation. This instrument is included in Appendix B. Amotivation will be measured using the validated Academic Amotivation Inventory (Legault et al., 2006). This instrument is included in Appendix C.

Persistence factors, including course withdrawal or completion, course subject, and the number of previous online courses taken, will be collected through the institution’s learner information system and learning management system. Persistence will be measured by the learner’s continuation in the course past the institutional withdrawal date. Research has found that course subjects and the number of online courses taken can affect course performance (Hart et al., 2018). Learners at the research site have two options for withdrawal: administrative, due to lack of attendance or lack of proctored test completion requirement, or learner-initiated. The college instituted a new withdrawal policy in 2020 where if the learners withdrew prior to
completing fifty percent of the course term, the learner would receive an “F” for the course rather than a “W” for withdrawal. Learner withdrawals are coded in the Learner Information System according to the type of withdrawal in the following ways: AW, or administrative withdrawal, SW, or learner withdrawal, CF, or cut out with F, and CW, or cut out with withdrawal. An administrative withdrawal refers to a learner who attends class but must withdraw due to extenuating circumstances. A learner withdrawal is a learner who attends class but requests withdrawal during the allowed withdrawal period, which is the fifty percent to seventy-five percent part of the term. A cut out with F is a learner who is removed due to absences prior to the withdrawal period. Finally, a cut out with W is a learner who is removed due to absences during the withdrawal period. Thus, if a learner either withdraws administratively or by request, the learner will be considered as not persisting, whereas a learner who does not withdraw will be considered as persisting. The subject of the course will be defined by the three-letter signifier as part of the course name, e.g., ENG for English. These signifiers will be used to show relationships between course subjects, cognitive load, motivation, and persistence. This information will be both identified by the learner when completing the instrument and through the information from the Learner Information System. The number of previous online courses taken will be identified through the Learner Information System and coded by ranges: 0, 1-2, 3-4, 5 or more.

The convenience sample will be learners taking an accelerated online course, defined as an eight-week fully asynchronous online course, at a mid-sized community college in the southeastern United States. Learners will complete the three instruments to measure their perceived cognitive load and their perceived motivation in their online courses. These instruments will be given during the second week of the online course.
Theoretical Framework

The theories guiding this study are Rovai’s synthesized model of persistence (Rovai, 2003), Cognitive Load Theory (Sweller et al., 2019), and Self-Determination Theory (Ryan & Deci, 2020). These theories explain cognitive and affective factors related to a learner’s experience in an online asynchronous course.

Rovai’s Model of Persistence

Rovai’s (2003) model of persistence is built upon the models of Tinto (1975) and Bean and Metzner (1985). In this persistence model, Rovai separates the process into a pre- and post-admission framework specifically for online learners. Pre-admission factors include learner characteristics and learner skills, both of which are internal factors. During post-admission, there are external and internal factors that ultimately culminate in a persistence decision. These external factors that come from the Bean and Metzner (1985) model include finances, employment, family responsibility, and life crises. The internal factors are combined from Tinto (1975) and Bean and Metzner (1985) and include the factors associated with the individual learner’s commitment, affective nature, and needs, as well as the specific pedagogical styles related to the course. While there are multiple factors associated with course persistence, the inclusion of learning styles and teaching styles in Rovai’s model highlights pedagogical decisions, like course design, that could play a role in course persistence. Rovai’s model is relatively untested, particularly for individual factors. This study will focus on the institutional factor of pedagogy as seen in course design through learner perceptions of pedagogical factors in accelerated online asynchronous courses.
Cognitive Load Theory

Cognitive Load Theory was initially developed by John Sweller and given its first full description in 1988 (Sweller, 1988). This theory was further investigated over a decade, leading to an updated article in 1998 (Sweller et al., 1998), which was further updated twenty years later (Sweller et al., 2019). This theory, highly influenced by evolutionary psychology, theorizes that the relationship between working memory and long-term memory is the basis for how people learn, think, and work. With the influx of evolutionary psychology, Cognitive Load Theory was updated to include biologically primary and secondary knowledge. Primary knowledge concerns information passed through evolutionary history that makes up the generic cognitive skills that happen almost automatically and unconsciously. Secondary knowledge, then, is knowledge deemed essential by culture or domain-specific knowledge. While these knowledge bases are the spring from which knowledge is stored, the process of accumulating knowledge and gaining the use of that knowledge is the function of cognitive load.

Cognitive Load Theory highlights three categories of cognitive load: extraneous, intrinsic, and germane. These categories contribute to the learner’s achievement of the specified learning objectives as they dictate the learner's experience through the course design. Extraneous cognitive load, defined above, highlights the reduced ability of a learner to understand complex course content due to poorly designed and difficult to navigate course experiences (Sweller et al., 2019). With a higher extraneous load, learners have a reduced capacity to process the intrinsic load of the course, contributing to a reduced ability to achieve the course’s learning objectives (Bradford, 2011; Sweller et al., 2019). Then, the mediating ability of germane cognitive load would be focused on reallocating working memory to overcome the extraneous load rather than processing the intrinsic load (Costley, 2020). Thus, understanding a learner’s perceived cognitive
load can help identify areas where a more effective design can contribute to achieving cognitive learning objectives.

Current research in Cognitive Load Theory has specifically discussed the effects of emotions, stress, and uncertainty on cognitive load (Evans & Stecker, 2004; Moran, 2016; Sweller et al., 2019). With such an emphasis on effective course design through the cognitive load to achieve cognitive learning outcomes, the question remains whether the cognitive load has a relationship with the affective domain, the social and emotional constructs, within the learning context.

**Self-Determination Theory**

Self-Determination Theory, developed by Richard Ryan and Edward Deci, is a general psychological theory of human development and wellness that began as research into intrinsic and extrinsic motivation around 2000 (Ryan & Deci, 2020). The theory itself is much broader, as it “examines how biological, social, and cultural conditions either enhance or undermine the inherent human capacities for psychological growth, engagement, and wellness, both in general and in specific domains and endeavors” (Ryan & Deci, 2017, p. 3). Self-Determination Theory functions as an organismic theory, much like Cognitive Load Theory, in that it relates specifically to a living organism and its evolution, particularly humanity. Peoples’ inclination to intrinsically explore, learn, and master the world around them is a central focus of the theory, leading to intrinsic motivation. Intrinsic motivation, defined above, does not fully explain the breadth of human motivation, leading to the understanding of extrinsic motivation. Extrinsic motivation and the four related sub-types, defined above, were long seen as the opposite end of the spectrum from intrinsic motivation (Harter, 1981). However, recent research has examined extrinsic motivation as a separate construct from intrinsic motivation rather than opposite ends of
a continuum. (Amabile et al., 1994; Lepper et al., 2005). The opposite of intrinsic motivation would be amotivation, defined above, which explains a loss of motivation within the learning event.

Applying Self-Determination Theory to academic settings has long been an area of research, as the questions around motivation in learning environments are essential to examine for improving and understanding the implementation of effective online course design (Amabile et al., 1994; Cook et al., 2017; 18ours et al., 2018; Francis et al., 2019; Legault et al., 2006; Ryan & Deci, 2020). In some research, the interplay between cognitive learning and motivation has also been examined (Cane et al., 2017; Feldon et al., 2019; S. Schneider et al., 2018). One study specifically examined how motivation influences learning outcomes in online learning, moving from the affective to the cognitive (Chen & Wu, 2012). However, exploring how using cognitive and affective principles for online learning environments as a method of course design to predict persistence has not been a focus of study. By understanding if a predictive relationship exists between effective course design, including learner perceptions of cognitive load and motivation, and persistence, course designers and instructors can more adequately develop online learning environments that contribute to online learners’ persistence.

**Research Questions**

The research question for this study is:

**Research Question 1.** To what extent, if any, do community college learners’ cognitive loads, extraneous, intrinsic, and germane loads, and motivation, intrinsic, extrinsic, and amotivation, predict persistence in an accelerated online course?
**Research Question 1a.** To what extent, if any, do community college learners’ course subject and the number of online courses completed predict persistence in an accelerated online course?

**Research Question 1b.** To what extent, if any, do community college learners’ extraneous cognitive load predict persistence in an accelerated online course?

**Research Question 1c.** To what extent, if any, do community college learners’ intrinsic cognitive load predict persistence in an accelerated online course?

**Research Question 1d.** To what extent, if any, do community college learners’ germane cognitive load predict persistence in an accelerated online course?

**Research Question 1e.** To what extent, if any, do community college learners’ intrinsic motivation predict persistence in an accelerated online course?

**Research Question 1f.** To what extent, if any, do community college learners’ extrinsic motivation predict persistence in an accelerated online course?

**Research Question 1g.** To what extent, if any, do community college learners’ amotivation predict persistence in an accelerated online course?

**Null Hypotheses**

The null hypothesis for this study is:

**H₀₁.** There is no statistically significant predictive relationship among community college learners’ cognitive load, extraneous, intrinsic, and germane loads, and motivation, intrinsic, extrinsic, and amotivation, predict persistence in an accelerated online course.

**H₀₁a.** There is no statistically significant predictive relationship among community college learners’ course subject and the number of online courses completed.
**H₀₁b.** There is no statistically significant predictive relationship between community college learners’ extraneous cognitive load and persistence.

**H₀₁c.** There is no statistically significant predictive relationship among community college learners’ intrinsic cognitive load and persistence.

**H₀₁d.** There is no statistically significant predictive relationship among community college learners’ germane cognitive load and persistence.

**H₀₁e.** There is no statistically significant predictive relationship among community college learners’ intrinsic motivation and persistence.

**H₀₁f.** There is no statistically significant predictive relationship among community college learners’ extrinsic motivation and persistence.

**H₀₁g.** There is no statistically significant predictive relationship among community college learners’ amotivation and persistence.

**Definitions**

**Intrinsic Cognitive Load.** Intrinsic cognitive load refers to the complexity of the information processed for learning (Sweller et al., 2019).

**Extraneous Cognitive Load.** Extraneous cognitive load refers to the increased complexity of learning derived from the learning environment, the information presented, and the procedures required for learning the material (Sweller et al., 2019).

**Germane Cognitive Load.** Germane cognitive load refers to the mediating redistribution of processing resources from extraneous learning activities to the actual learning task (Sweller et al., 2019).

**Intrinsic Motivation.** Intrinsic motivation refers to the inherent desire to complete a task due to its enjoyment or perceived value of the task (Ryan & Deci, 2017).
**Extrinsic Motivation.** Extrinsic motivation refers to the desire to complete a task due to the perceived reward or avoid the perceived punishment if not completed (Ryan & Deci, 2017).

**Amotivation.** Amotivation refers to the perceived lack of motivation or intentionality to complete a task (Ryan & Deci, 2017).

**Persistence.** Persistence refers to the ability of an individual learner to complete a course without withdrawal or dropping out (Rovai, 2003; Tinto, 1975).

**Accelerated online course.** An online course offered during a term or session shorter than a traditional, semester-length course, shortening the amount of time needed to complete the course (Trekles & Sims, 2013; Wlodkowski & Ginsberg, 2010).
CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

Research shows that persistence in online courses occurs at a lower rate, particularly when compared to persistence in traditional face-to-face opportunities (Allen & Seaman, 2017; Meneses & Marlon, 2020; Seaman et al., 2018). Many factors are associated with persistence on both an individual and institutional level (Bean & Metzner, 1985; Rovai, 2003; Tinto, 1975, 1988). While individual factors, like age, ethnicity, gender, socioeconomic status, and others contribute to persistence decisions (Bean & Metzner, 1985), understanding the role of factors within the institution’s control can benefit course designers and instructors, particularly in an online course setting. Among these institutional factors, the role of pedagogy, mainly through online course design as seen through learner perceptions of cognitive load and motivation, is of specific interest as it directly relates to the learner experience as they progress through the course (Bradford, 2011; Kalyuga et al., 2001). The role of learner perceptions of cognitive load and motivation as predictors of course persistence has not been collectively considered. Using cognitive load theory to assess cognitive learning and self-determination theory and its associated constructs of motivation to assess affective learning, this study examines the extent, if any, of a predictive relationship between learner perceptions of cognitive load and motivation with persistence.

The following literature review outlines persistence in higher education and community college settings, particularly with online courses. The manuscript focuses on persistence in accelerated online courses, demonstrating how accelerated online courses are subject to the same considerations as traditional length courses. The review focuses in on the concept of pedagogy and course design as a predictor of persistence, using learner perceptions of cognitive load and
motivation as cognitive and affective domains of course design. Then, the manuscript profiles
cognitive load theory and its related empirical literacy, specifically highlighting how the
reduction of extraneous cognitive load increases germane load and how course design promotes
this interaction. Moving into the affective domain, the review focuses on self-determination
theory and the constructs of intrinsic and extrinsic motivation, as well as amotivation, and how
motivation is affected by course design. The review finishes by highlighting the need to examine
the predictive relationship of course design, as seen in learner perceptions of cognitive load and
motivation, and persistence in accelerated online asynchronous community college courses.

Theoretical Context

Persistence in Higher Education and Community Colleges

Persistence is a long-studied and discussed issue in higher education (Bean & Metzner, 1985; Rovai, 2003; Schneider & Preckel, 2017; Tinto, 1988, 2007). Furthermore, the increased
enrollments and poor persistence in online learning have led to even higher scrutiny of learner
experience and their ability to persist (Aragon & Johnson, 2008; National Learner Clearinghouse
Research Center, 2021; Tinto, 2007). According to Seaman, Allen, and Seaman (2018), there
was a total drop in college enrollments of -3.8% between 2012-2016, with private for-profit 4-
year, private for-profit 2-year, and public 2-year institutions showing the most significant decline
in enrollments. With these declining numbers, one might argue that institutions should increase
course persistence as online learning continues to be a viable part of higher education. Suppose
issues of persistence are not addressed in online learning. In that case, questions regarding the
sustainability of online programs and the viability of online courses to provide effective
educational experiences could arise and prove issues of persistence to be detrimental to online
learner success.
The idea of persistence extends beyond the ability to overcome obstacles in education. Persistence specifically refers to the ability of learners to complete a course or how long a learner remains in the course (Bean & Metzner, 1985; Rovai, 2003; Tinto, 1975, 1988). According to Tinto (1975), multiple factors lead to persistence, both external and internal. These factors include family background, individual characteristics, past educational experiences, and goal commitment. Of the institutional factors that most impact learner persistence, academic involvement has proven the most important (Tinto, 1998). Bean and Metzner (1985) build on Tinto by specifically addressing non-traditional learners in community college settings in their persistence model, focusing on background, academic, social interaction, and environmental variables related to academic and psychological outcomes. Rovai (2003) synthesizes the Tinto and Bean and Metzner models, separating the process into a pre- and post-admission framework specifically for online learners. Pre-admission factors include learner characteristics and learner skills, both of which are internal factors. During post-admission, there are external and internal factors that ultimately culminate in a persistence decision. These external factors that come from the Bean and Metzner (1985) model include finances, employment, family responsibility, and life crises. The internal factors are combined from Tinto (1975) and Bean and Metzner (1985) and include the factors associated with the individual learner’s commitment, affective nature, and needs and the specific pedagogy related to the course. While there are multiple factors associated with course persistence, the inclusion of learning styles and teaching styles in Rovai’s model highlights pedagogical decisions, like course design, that could play a role in course persistence. Rovai’s model is replicated in Figure 1 for clarity.
Karp, Hughes, and O’Gara (2010) apply Tinto’s model of course persistence to community college learners and confirm Tinto’s model with an emphasis on integration, as “integration is related to community college learners’ persistence” (p. 17). This integration, occurring both from an academic and social standpoint, is necessary as the development of information networks produces the integration needed for learner persistence. These information networks, according to Karp et al. (2010), are developed both inside the learning environment and in the social experience of the individual learner, including both cognitive (course design) and affective (motivational) elements of pedagogy. This validation of the course persistence model shows that community college learners face the same external and internal factors as other...
college learners, particularly in residential settings. However, other factors must be examined when examining online course persistence, as seen in Rovai’s synthesized model (Rovai, 2003). Specifically, pedagogical factors of both cognitive (course design) and affective (motivation) domains should be examined as they contribute to overall learner success (Bradford, 2011; Feldon et al., 2019). These issues are highlighted further when considering factors of persistence in accelerated online courses.

**Persistence in Accelerated Online Courses**

Accelerated online courses can be defined as courses where the traditional full semester content is compressed into a shortened time frame, either during the academic term or between academic terms (Holzweiss et al., 2019). Traditional semester-long course lengths vary by institution but can be 16-week, 15-week, or 12-week. Accelerated online courses are typically offered in an 8-week, 7-week, 5-week, or 4-week format, depending on the institution.

The examination of accelerated online courses is not robust from a research perspective, particularly in terms of persistence. Of the empirical literature that exists, studies have shown that there has been no statistical difference in persistence between accelerated online courses and traditional semester-long courses (Doggrell & Schaffer, 2016; Guillory, 2018; Pearse, 2019). Thus, it can be assumed that accelerated online courses will follow the same constraints and expectations as traditional courses in terms of course experience, which may lead to persistence issues. One of the main concerns regarding accelerated online courses is the depth of learning experienced by the learners (Trekles & Sims, 2013). In a meta-analysis, Caskurlu et al. (2020) found that course length can serve as a moderating factor between learners’ perceived learning and satisfaction, both of which contribute to persistence. This strong correlation provides a basis for further review within accelerated online courses, mainly focusing on pedagogical factors of
persistence and how these practices and structures affect learner learning (Holzweiss et al., 2019).

**Online Course Design and Persistence**

Online course design is, inherently, an institutional factor of persistence, bridging the factors of pedagogy, academic integration, and learning community. According to Rovai’s (2003) model above, institutional factors of persistence are internal factors of persistence, contributing to the persistence decision after the learner has been admitted to the institution and somewhat within the control and direction of the institution. Specifically, pedagogy can be defined as “any strategy that enhances the learning experience… and emphasizes the context and interactions of the teaching and learning dynamic” (Steele et al., 2019, p. 5). Course design fits into this definition as online classes are dependent on course design as a strategy for developing the overall learning experience. While course design is a broad topic to consider in terms of persistence, focusing on learner perceptions of cognitive load and motivation provides a lens to examine online course design that can highlight specific components as predictors for persistence.

**Cognitive Element – Cognitive Load**

Cognitive load theory begins with the idea of cognitive architecture and working memory (Chandler & Sweller, 1991; Paas et al., 2003; Sweller & Chandler, 1991; Sweller, van Merriënboer, & Paas, 2019; Sweller, van Merrienboer, & Paas, 1998). This memory has a limited capacity for information that it can process at any given time, which can lead to cognitive overload. Cognitive overload occurs when inputs outstrip capacity (Bradford, 2011; Cooper et al., 2001). Over time, however, information in the working memory is transferred to the long-term memory and stored in the form of schema (Sweller et al., 2019, 1998). Long-term memory
Cognitive load theory identifies three major types of loads: extraneous, intrinsic, and germane (Sweller et al., 2019, 1998). Each of these loads is a part of the learning process, though the effect of instructional design (e.g. online courses) varies depending on the type of load addressed. Intrinsic load refers to the difficulty of the information inherent to the domain or content (Sweller et al., 2019, 1998). Germane load refers to the cognitive processing necessary to learn and develop the relative schema essential to learning the material (Sweller et al., 2019, 1998). Extraneous load refers specifically to the learning environment elements: the structure of the content, the interface, and the process for actively engaging with the content (Sweller & Chandler, 1991; Sweller et al., 1998). These three types of loads and their effect on the learning process are essential to learning and online course design, as managing these loads is the focus of cognitive load theory.

This process of cognitive learning, then, becomes inherently difficult to measure (Cook et al., 2017; Klepsch et al., 2017). However, the research completed on measuring cognitive load has provided a foundational aspect to examining the interaction of instruction and cognitive load (Paas, Tuovinen, Tabbers, & Van Gerven, 2003). These measurements often have focused on items of instructional effects like mental efficiency (Paas & van Merrienboer, 1993), the worked
example and completion problem effects (Paas & van Merrienboer, 1994; Renkl, 2014; Van Merrienboer & Krammer, 1987), and split-attention and modality effects (Arslan, 2012; Cerpa et al., 1996; Ginns, 2005). As cognitive load theory continues to be studied, more instructional and learning effects have been measured, including element interactivity (Chen et al., 2015), transient information (Spanjers et al., 2011), and imagination (Chandler & Sweller, 1991), to name a few. The study of these effects and furthering cognitive load have led to an expansion of the knowledge of human cognitive architecture, testable theories and hypotheses regarding human cognition, and data that can be used to inform effective instructional practices without regard to the setting or content (Sweller et al., 2019).

Using cognitive load as a course design method may reduce learners’ barriers to meaningful learning experiences (Çakiroglu & Aksoy, 2017). As mentioned earlier, this process is done through managing the three cognitive loads: extraneous, intrinsic, and germane. Thus, course design, particularly in online learning, plays a role in developing the pedagogy, or learning experiences, that mitigate the effects of cognitive load by managing the three loads present in learning environments. Learner perceptions of cognitive load, then, can demonstrate which categories of cognitive load are contributing to their learning experiences and ability to persist in online courses where learners are tasked with navigating the learning environment, as the design elements reduce the points of cognitive overload and help learners better manage their learning, developing complex schema related to the topic so that meaningful learning takes place. If learners are learning the material through well-designed learning environments, there is a greater chance they will continue to persist and increase in academic performance (Oyserman & Dawson, 2021). While multiple factors contribute and detract from course persistence outside the realm of online course design, by addressing the factors that are affected through the lens of
learner perceptions of cognitive load, instructors and course designers can actively engage learners to promote course persistence.

One example of managing extraneous cognitive load was examined by Costley (2020), who theorized that the use of cognitive strategies could moderate the relationships between the intrinsic load and germane load. Participants (N=428) from online learners at the Open Cyber University of Korea completed an online survey derived from research into motivation and self-regulation to measure cognitive strategies. This survey was posted on the learner message board of the Open Cyber University for one month; only current online learners had access to it. The study was not focused on a particular class or subject but was applicable to all online learners. The study found that employing cognitive strategies had a positive relationship with germane load and that extraneous load had a negative relationship with germane load. Furthermore, the use of cognitive strategies moderates the negative relationship of extraneous and germane load to some degree, meaning that the use of these strategies could mitigate some of the effects of poor design on learner learning. Thus, from a theoretical perspective, an increased extraneous load, or poorly designed online learning environment, reduces the ability of the learner to process the content of the learning environment cognitively. However, utilizing cognitive strategies can provide some benefits in overcoming these poor designs. While this study provides a continued understanding of the relationship between loads, it opens the door for further research into how cognitive load is associated with a learner’s outcomes and if a relationship exists between more effectively designed online courses and persistence.

From the same series of studies as Costley (2020), Lange et al. (2017) examined the relationship between extraneous load, germane load, and self-regulated effort. Participants (N=1575) from online courses within the Open Cyber University of Korea completed a survey
consisting of questions measuring cognitive load and the *Motivated Strategies for Learning Questionnaire*. Whereas the Costley (2020) study employed surveys, this study included qualitative interviews to determine survey questions focused on video lectures; the survey was then posted on the main information board of the Online Cyber University for one month for participants to respond without regard to specific online course subjects. This study revealed a negative relationship between extraneous load and both germane load and self-regulated effort. Thus, if extraneous load increases, the relationship between self-regulated effort and germane load is weakened, meaning effort becomes less effective to learn the material if there is an increase in extraneous cognitive load. Practically, this relates to the course design; if the course design is low in extraneous load, then effort can help the learner understand the content to a higher degree. If poorly designed courses have an increased extraneous load, then learner effort is spent overcoming inherent design issues rather than learning the course material. This study aligns with Costley (2020) and other seminal works of cognitive load research (Sweller et al., 1998) regarding the importance of reducing the extraneous load to improve learner outcomes.

Reducing extraneous load, however, is not the only lens to examine cognitive load design decisions. Bradford (2011) examined the relationship between motivation and cognitive load through the lens of learner satisfaction. To do this, learners in asynchronous, online courses were recruited via a request through the learning management system which included a link to the survey instrument. Participants (*N*=1401) completed a researcher-created survey instrument that measured cognitive load and learner satisfaction. Bradford found three significant factors that contributed to this model: awareness, challenge, and engagement. These three factors highlight areas that the participants determined had the greatest effect on their learning, which Bradford uses to offer practical applications for course design in an online context. For example, the item
with the greatest effect in awareness was “be able to track progress.” This effect led to a recommendation of including opportunities to track their progress in a course through either a schedule or through grading feedback. The item with the greatest effect in challenge was “more satisfied when more challenged.” This effect led to a recommendation that instructors should include relevant and appropriate challenges into the course with a focus on overcoming the challenge through clear communication of performance details. Finally, the item with the greatest effect in engagement was “being able to communicate with others in course,” which led to a recommendation of incorporating communication into the course design itself. This study highlights the importance of how course design, particularly through cognitive load and motivation, can lead to learner satisfaction in online courses, contributing to a better understanding of cognitive load by demonstrating how cognitive load can be managed to create learner satisfaction within a course. Bradford (2011) suggests that future research should consider how cognitive load and academic performance are related. This study continues that vein of research by considering how cognitive load is related to persistence.

As this study is focusing on learner perceptions of cognitive load, it is important to note that many studies have focused on cognitive load after a learning task rather than examining cognitive load prior to the learning experience (Bradford, 2011; Costley, 2020; Lange et al., 2017). By examining cognitive load at the beginning of the course, particularly through the learners’ perceptions of the cognitive elements of the course design, this study further highlights a gap in current research regarding how cognitive load can be a predictor of persistence in online courses as to how perception of the cognitive load of the online course can contribute to a persistence decision.
Research highlighted above shows that decreasing extraneous load can cause an increase in germane load and other factors, like self-directed learning (Costley, 2020; Lange et al., 2017; van Merrienboer & Sluijsmans, 2009). In an overview of the literature, the extraneous load of an online course is of utmost concern in most online instructional experiences, as the added technology can increase the extraneous load (Çakiroğlu & Aksoy, 2017). As described further below, these design decisions can also promote the affective component of the learning experience, which research also shows as a contributor to course satisfaction (Bradford, 2011), a marker for course persistence (Hart, 2012). Cognitive load, then, has a direct relationship with well-designed courses, contributing to the pedagogy of the online course. However, the literature does not show a current understanding of any relationship between cognitive load and persistence, providing a foundation for this study. Thus, further research is needed to examine the relationship between cognitive load and motivation, particularly in online courses.

*Affective Element – Motivation*

Motivation as a construct can be defined as “what moves people to action” (Ryan & Deci, 2017, p. 13). As an underlying theory of human development, Self-Determination Theory defines motivation with three categories: intrinsic, extrinsic, and amotivation. These three constructs form a continuum of motivation, from amotivation, or lacking any intention, to intrinsic motivation, motivated purely by the enjoyment of the activity and its interest. Then, the movement from amotivation to intrinsic motivation progresses through varying degrees of extrinsic motivation: external regulation, introjected regulation, identified regulation, and integrated regulation. External regulation refers to motivation in response to punishment or reward (Hartnett et al., 2011). Introjection refers to motivation based on perceived expectations (Hartnett et al., 2011). Identified regulation refers to motivation from a perceived value or utility
by completing the task rather than the inherent enjoyment (Hartnett et al., 2011). Integration, then, refers to a motivation due to a perceived significance of the task’s significance to the individual’s sense of self (Hartnett et al., 2011). Thus, a learner moving from amotivation to intrinsic motivation would pass through varying stages of motivation of entirely external punishment/reward to a more autonomous extrinsic motivation before a task becomes fully intrinsic. Figure 2 visualizes this concept from Cook and Artino (2016).

Motivation, then, becomes an essential component of an education environment, particularly in online courses. Multiple studies have examined motivation in online courses from various theoretical frameworks. Hobson and Puruhito (2018) used future time perspective theory and expectancy-value theory to examine online courses. They reinforced the fact that no single variable can be used to predict motivation or success in online courses. Hartnett (2019) further examined motivation in online learning environments, proposing further inquiry models into motivation to understand the role motivation plays in the online learner experience. Feldon et al.
(2019) empirically tested the link between cognitive load and motivation, using expectancy-value theory and theorizing cognitive load as motivational cost. Collectively, the theories and related empirical research suggest that motivation is a multifaceted concept built on multiple internal and external factors, both inherent to the learner and evident in the course (Hartnett et al., 2011). Thus, examining the levels of intrinsic, extrinsic, and amotivation in online courses can better determine the relationship motivation has with other external course factors.

The research underscores how motivation, as a noncognitive factor, is associated with the overall success of learners in collegiate environments. Han et al. (2020) examined this idea, in conjunction with other noncognitive factors such as self-efficacy, sense of belonging, and academic goal achievement, in high school learners and their academic performance at college. By examining noncognitive factors as a factor of learner success, this study furthers research in understanding the role of motivation in academic performance, a factor to consider in persistence (Bean & Metzner, 1985; Rovai, 2003; Tinto, 1988). Participants ($N=2279$) from a large public university completed multiple surveys to determine their sense of belonging in high school, perceived academic self-efficacy, academic motivation, and academic goal achievement. Combined with other demographic and success factors, the authors examined two different models of explaining academic performance and success as either a measure of cognitive factors or cognitive and noncognitive factors together. Although the results of this study showed that the best fit model included noncognitive factors as an association for academic performance, this study did not show a relationship between motivation and academic performance, which could be contributed to a variety of factors. Hence, from a theory perspective, the authors concluded that noncognitive factors, like self-efficacy, goal engagement, and sense of belonging, impact educational outcomes, but the role of motivation is still unclear. The authors do note that “more
research is needed to understand the importance of motivation for college success” demonstrating a need to continue to examine the role of motivation in terms of academic performance and persistence (Han et al., 2020, p. 11). As such, the research acknowledges the role of the affective element, like motivation, in learning, although the extent of the role of motivation is still unclear.

While Han et al. (2020) shows that motivation is not a clear and direct concept in learning, other research has examined the role of motivation in the online course and how it can be affected by course design related to academic performance. For example, Ferrer et al. (2020) suggest a need for engaging design and carefully curated resources to support learner motivation in the online course. Participants (N=574) in online courses completed an email questionnaire including multiple measures of motivation, learner experience, and attitude to online learning. In this cross-sectional quantitative study, positive attitudes towards online learning were shown to have a positive mediating relationship for both intrinsic and extrinsic motivation. A negative attitude toward online learning had a negative mediating relationship with amotivation. From a theoretical perspective, this finding shows that attitude formation in online learning environments is essential to designing for engagement and increasing intrinsic and extrinsic motivation in the online learning environment. Thus, course design can impact learner motivation in online learning, both positively and negatively, impacting persistence decisions in online courses. However, further research is needed to understand the relationship of course design as a contributor to motivation.

Whereas Ferrer et al. (2020) demonstrate the importance of course design in the context of motivation, Gustiani (2020) completed a qualitative study of learner motivation in online learning during COVID-19 and suggested that while internal factors of motivation are present in
online learners, designers and instructors should also focus on external factors, like the learning environment, learning time, and support, in an effort for these factors to be integrated into the learners’ self-determination in the online course. Using a case study design, the authors investigated the motivation of online English Department learners, focusing on eight in-depth interviews and fourteen participants in focus group interviews. While these interviews revealed that the majority of learners were driven by intrinsic motivation in online learning, the recommendation to focus on external factors highlights a similarity with the findings of cognitive load: managing external factors of the learning environment can directly impact the learner experience within online courses.

Baber's (2020) study continues in the same vein of Gustiani (2020) with the role of motivation and course design in supporting learner learning and success, mainly situated after the COVID-19 pandemic. Participants (N=100), undergraduate learners from South Korea and India in online courses, completed a survey regarding interaction, learner motivation, course structure, and instructor facilitation as predictors for learner perceived learning and satisfaction. The findings support that increased learner motivation and satisfaction in online courses decrease learner attrition, which can be partly influenced by course structure or design. This aligns with previous research in reinforcing that course design can affect motivation (Bovermann & Bastiaens, 2020; Ferrer et al., 2020). Thus, additional research is needed to determine the extent of the relationship of learners’ perceptions of motivation as an affective element of course design and persistence in online learning.

While research shows how motivation is multifaceted (Han et al., 2020) and how online course design contributes to the motivation of the learners, (Baber, 2020; Ferrer et al., 2020; Gustiani, 2020), other researchers focused on the role of motivation in the context of persistence.
Hobson and Puruhito (2018) examined the role of motivation in persistence in college learners taking online classes. Participants ($N=409$), online college learners in seven-week courses, in this quantitative correlational study completed multiple surveys to examine motivation, self-efficacy, knowledge building, future time perspective, task importance, and extrinsic motivation. The findings show a strong correlation between final course grades and extrinsic instrumentality, or the importance of a task in its everyday usefulness. Extrinsic instrumentality can be a factor in learner success and persistence in an online course and can be directly affected by course design, further strengthening the understanding of how motivation and course design are related to course persistence. However, the authors note that “no single variable can be used as a predictor for optimal motivation or academic success” (Hobson & Puruhito, 2018, p. 136). Thus, continuing research should examine how motivation operates as one contributing factor in a model of academic success or persistence.

The aforementioned studies above underscore how motivational factors contribute to multiple components of the online course experience, including learner satisfaction and learner academic success (Baber, 2020; Han et al., 2020; Hobson & Puruhito, 2018). Furthermore, learner perceptions of motivation as an aspect of online course design demonstrates how pedagogical decisions can impact motivation (Baber, 2020; Ferrer et al., 2020; Gustiani, 2020). Yet, motivation is a multifaceted concept that is both individual to the learner and impacted by course experiences (Cook & Artino, 2016; Feldon et al., 2018; Hartnett et al., 2011; Hobson & Puruhito, 2018). While the research literature continues to examine motivation from different angles, seeing motivation as a piece of a predictive pedagogical model of persistence has not yet been discussed. Focusing on the level of intrinsic, extrinsic, and amotivation the learner
experiences in the online course can provide further research in how motivation can be understood in conjunction with the cognitive load as a predictor for persistence.

**Summary**

In summary, persistence in online courses is affected by multiple factors (Aragon & Johnson, 2008; Huntington-Klein et al., 2017; Rovai, 2003). While researchers have focused on various aspects of cognitive load, motivation, and persistence, a gap still exists in determining how cognitive (cognitive load) and affective (motivation) elements of online courses are related to persistence. By focusing on factors of cognitive load and motivation in the online course as predictors for persistence, researchers can guide practitioners on how to design courses to encourage persistence in online courses. Understanding the relationship between cognitive load and motivation in online courses and persistence addresses a current gap in the literature regarding how institutional factors of persistence are related to pedagogy, specifically course design and learner experience through learner perceptions of cognitive load and motivation.
CHAPTER THREE: METHODOLOGY

Introduction

The purpose of this quantitative, predictive correlational study is to examine to what extent, if any, community college learners’ perceived online course cognitive load, including extraneous, intrinsic, and germane loads, and online course motivation, including extrinsic, intrinsic, and amotivation, predict persistence in an accelerated online course. Thus, the results of the study provide a better understanding of institutional factors that contribute to course persistence and can illuminate how learners’ perceptions of cognitive load and motivation play a role in online course persistence.

More specifically, the research questions include:

Research Question 1. To what extent, if any, does community college learners’ cognitive load (extraneous, intrinsic, and germane loads) and motivation (intrinsic, extrinsic, and amotivation) predict persistence in an accelerated online course?

Research Question 1a. To what extent, if any, does community college learners’ course subject and the number of online courses completed predict persistence in an accelerated online course?

Research Question 1b. To what extent, if any, does community college learners’ extraneous cognitive load predict persistence in an accelerated online course?

Research Question 1c. To what extent, if any, does community college learners’ intrinsic cognitive load predict persistence in an accelerated online course?

Research Question 1d. To what extent, if any, does community college learners’ germane cognitive load predict persistence in an accelerated online course?
Research Question 1e. To what extent, if any, does community college learners’ intrinsic motivation predict persistence in an accelerated online course?

Research Question 1f. To what extent, if any, does community college learners’ extrinsic motivation predict persistence in an accelerated online course?

Research Question 1g. To what extent, if any, does community college learners’ amotivation predict persistence in an accelerated online course?

The Investigation Plan

Appropriate Design for this Study

The study aims to identify the association among predictor variables – cognitive load and motivation – as they exist in an accelerated asynchronous online course and persistence. As this study includes three instruments to measure the predictor variables (cognitive load and motivation) and a nominal criterion variable (persistence) choosing a quantitative, predictive correlational research design was appropriate for the study (Creswell & Gutterman, 2019; Stoltzfus, 2011). In this study, learners will complete an online survey in week two of an online course, measuring the predictor variables at one point in time. Registrar data regarding their completion of the course will be gathered at the completion of the course. The variable will then be analyzed using a predictive correlation analysis. No variable is being manipulated, and no intervention was studied. Thus, according to (Creswell & Gutterman, 2019), the predictive correlational research design is most appropriate to “identify variables that will predict an outcome or criterion” (p. 346). According to Tuckman and Harper (2012), correlational studies focus on “two or more sets of data from a group of subjects that attempt to determine the relationship between them” (p. 183). Moreover, the predictive correlational research design has
been utilized in previous studies to examine factors associated with persistence (Fischer et al., 2020; Rockinson-Szapkiw et al., 2016).

**Learner Characteristics**

The population of this study is new and transfer learners who choose to enroll in online courses during the second eight-week term of the Fall 2021 academic term at a public community college within the southeastern United States. A nonprobability, convenience sampling method will be used to identify study participants. The sample will be drawn from this population and is considered a convenience sample as the learners are conveniently available for me to access (Creswell, 2019).

Participants will be drawn from the fifty-nine courses offered. The courses are entirely online, asynchronous, and eight weeks long; Canvas is the learning management system. The size of each class varies but may slightly exceed what Taft, Kesten, and El-Banna (2019) recommend for online class size, which for these types of online courses is under 40 learners. All courses are each taught by a single instructor. While the design of each class may vary according to instructor preference, each course does include an institutionally mandated orientation, two proctored exams, and an “Important Course Information Module.” Each course is evaluated using an institutional course evaluation rubric to ensure consistency in design, which is included in Appendix E. A complete list of the courses selected for this study can be found in Appendix D.

The learners enrolled in these courses will include first-year undergraduate learners, second-year undergraduate learners, and dual-enrolled high school learners. The age of learners is typically between 17 years to 35 years old. Learners are a mix of traditional and non-traditional learners. Traditional learners, for this study, are learners within a traditional age range
(18-20) who entered college directly after high school (Chung et al., 2014). Non-traditional learners have been defined in many ways; however, most of these definitions center on demographic and educational background factors (Chung et al., 2014). For this study, a non-traditional learner will be considered a learner outside of the traditional age range of post-high school learners enrolled, or at least twenty-one years old or above. Both traditional and non-traditional learners will be included as part of the study. Participant information will be collected and categorized, including gender, ethnicity, age, classification, marital status, and employment status. Learners are enrolled in classes with varying sizes. College policy states that courses of over forty-five enrolled learners are considered two courses, so individual courses would have between ten and forty-five learners.

According to Fowler’s Sample Size Table (2009), a sample size of at least 500 learners is necessary as the participants have a 50/50 chance of registering for the accelerated course offering. Using 500 learners will reduce the possibility of sampling error to four percent, setting a rigorous standard for this study to determine statistical significance. This study will use a four percent rigorous error percentage, determining the need for a sample of at least 500 participants. This larger sample size will also provide a great deal of correlation as the larger samples “contribute to less error variance and better claims of representativeness (Creswell & Gutterman, 2019, p. 364).

Setting

Credit-bearing, 100% online, asynchronous courses offered during the first and second eight-week terms of the Fall 2021 semester at a public degree-granting community college in the southeast region of the United States will be the setting of this study. The Carnegie Classification of Higher Education categorizes the college as an Associate’s College, an exclusively two-year,
medium-sized school that offers associate degrees in Academic and Career-Technical
designations. The college sees an annual enrollment of 4,507 with 2,978 learners in online
courses, and 573 of these typically enroll in an eight-week online course. The courses in question
will be entirely online, asynchronous eight-week courses from multiple academic disciplines.

Online courses at the research site typically make up fifty percent of the institution’s
courses. In general, around 376 online courses are offered each semester in multiple terms,
including fifteen-week, eight-week, and four-week sections. However, the focus of this study
will be the eight-week courses offered during the second eight-week term. The institution self-
classifies these courses as accelerated courses since they are completed in a shorter time than the
traditional semester-length course. These courses are evaluated using an internal rubric designed
by the eLearning Office to assist faculty with course design and preparation for instruction. A
link to a required Online Orientation course is included in each course, which covers elements of
the learning management system, other educational technologies available to online learners, and
best practices for success in the online environment.

The courses for this study were housed in the Canvas Learning Management System.
Canvas was developed in Utah by two graduate learners for a class project. The learning
management ecosystem was built as an open-source cloud that offered various services and
third-party integrations. Canvas by Instructure has grown in use and popularity into the most
widely used provider in the United States and Canada (Marachi & Quill, 2020). In this system,
instructors and instructional designers design online courses from a template with consistent
course navigation using a home page and content curated into modules. Each online course
begins with a required “Online Orientation Module,” where learners must complete orientation
materials before progressing into the learning material. After this point, each online course must
include an Important Course Information module, where the individual instructor can provide critical information for how the course will progress, including a syllabus and course schedule. After this point, course materials are separated into modules either by a week or by unit, depending on the type of course. An example of this setup is seen in Figure 3, a screenshot of the beginning of an online public speaking course.

![Figure 3](image)

**Figure 3.** A screenshot of a public speaking course in the Canvas learning management system.

**Instrumentation**

An online survey, embedded in all online courses within the second eight-week term hosted via the learning management system (LMS), will be used to measure this study’s predictor and control variables. These variables will be measured via validated instruments and researcher-created questions within an online survey.
**Cognitive Load Variables.** The instrument used to measure the three constructs of cognitive load is the second version of the differentiated cognitive load instrument developed by Klepsch, Schmitz, and Seufert (2017). While not officially given a name, it has been called the Cognitive Load Questionnaire in related literature (D. A. Cook et al., 2017; Klepsch & Seufert, 2020). This measures, via a self-report, aspects of cognitive load, including extraneous cognitive load, intrinsic cognitive load, and germane cognitive load (Klepsch et al., 2017). Through a confirmatory factor analysis with multiple groups, it was found that the instrument measured three different factors of cognitive load and included the subscales for the extraneous cognitive load (ECL), intrinsic cognitive load (ICL), and germane cognitive load (ICL) (Cook et al., 2017; Klepsch et al., 2017; Klepsch & Seufert, 2020). Each subscale is matched to a question on the instrument: items one and two correspond to intrinsic cognitive load, items three, four, and five correspond to germane cognitive load, and items six, seven, and eight correspond to extraneous cognitive load. The reliability of the three subscales was calculated using Cronbach’s alpha: \( \alpha = 0.81 \) for the ICL scale, \( \alpha = 0.86 \) for the ECL scale and \( \alpha = 0.67 \) for the GCL scale. An aggregated \( \alpha \) of 0.85 was found for the entire survey.

To explicate the role of design in online learning, the wording of the instrument was altered slightly from referring to a “task” to referring to “the design of this course.” Example items include “For the design of this course, many things need to be kept in mind simultaneously,” and “For this course design, it was exhausting to find the important information.” Each item is measured on a seven-point Likert-type scale ranging from “absolutely wrong” (1) to “absolutely right” (7) (Klepsch et al., 2017). Scores for the ICL subscale could range from two to fourteen, with a lower score indicating a lower intrinsic cognitive load. Scores for the GCL and ECL subscales could range from three to twenty-one, with a lower score
indicating a lower germane cognitive load. The items are presented in the instrument as statements and are included in Appendix B. In a study of the instrument’s validation, researchers reported internal reliabilities using Cronbach’s a for each of the subscales of 0.81 and higher with an alpha level of .05 or .001 (Klepsch et al., 2017). In the current study, Cronbach’s alpha will also be measured to determine sample reliability.

**Motivation Variables.** The instrument used to measure extrinsic and intrinsic motivation variables is the Work Preference Inventory (Amabile et al., 1994). This inventory was developed to provide a “direct, explicit assessment of individual differences in the degree to which adults perceive themselves to be intrinsically and extrinsically motivated toward what they do” (Amabile et al., 1994, p. 952). The thirty-item instrument includes the significant elements of intrinsic and extrinsic motivation: self-determination, competence, task involvement, curiosity, interest, evaluation concerns, recognition concerns, competition concerns, a focus on money or other tangible incentives, and a focus on the dictates of others. Fifteen items specifically refer to intrinsic motivation, and fifteen items refer to extrinsic motivation. Items are scored on a four-point scale, from one (never or seldom true) to four (always or almost always true). The range of scores can be fifteen to sixty for each subscale, with a lower score indicating a lower level of either intrinsic or extrinsic motivation. Respondents are asked to respond to items such as “I enjoy tackling problems that are completely new to me” and “I’m less concerned with what work I do than what I get for it.” Cronbach’s a was .79 for the intrinsic motivation subscale and .78 for the extrinsic motivation subscale. The scale’s construct validity was confirmed through the correlations between the different measures of motivation and the instrument’s scales (Amabile et al., 1994). The scales showed high test-retest reliability (.89 for intrinsic motivation, .80 for
extrinsic motivation). The items are presented in the instrument as statements and are included in Appendix C.

The instrument used to measure the variable of amotivation is the Academic Amotivation Inventory (Legault et al., 2006). This sixteen-item instrument measures four dimensions of academic amotivation with four items for each factor: ability beliefs, effort beliefs, characteristics of the academic task, and the value placed on the task. Each item is measured on a seven-point Likert-type scale. Scores can range from seven to twenty-eight for each factor, with lower scores indicating a lower possibility of that factor representing the academic amotivation of the respondent. Respondents were asked to answer the question “Why do you not want to study” and by rating their answers to items such as “Because studying is not valuable to me” and “Because I’m not good at school.” Construct validity was determined by assessing correlations among the academic amotivation dimensions and behavioral and psychological constructs. Internal consistency of the scale ranged from .74 to .85 (Legault et al., 2006). The items are presented in the instrument as statements and are included in Appendix D.

**Demographic and Persistence Information.** Demographic data will be collected for all participants using their college-issued identification numbers, such as gender, ethnicity, age, classification, marital status, and employment status. Course information will also be included, including the subject of the online course and the number of online courses the learner has completed. An initial chi square analysis will be completed with demographic data to identify any significant differences between groups including gender, age, ethnicity, and factors associated with traditional and nontraditional learners.

Course persistence data will also be collected, including course completion and withdrawal information. The criterion variable of persistence was measured as a binary variable.
by the learners’ completion of the course. The registrar provided the enrollment and completion
data for each participant. Each participant who enrolled in an online course during the Fall 2021
second eight-week term and completed the online course was coded as 1. Participants who had
not completed the online course during the Fall 2021 second eight-week term, either due to
administrative withdrawal or learner requested withdrawal, and received a W or F were coded
with a 0. This data will be used to control pre-existing factors if significant differences between
groups are found and included in Table 5.

Procedures

IRB approval was secured at the institution where the study occurred and where I am
completing my doctoral studies. Online faculty were informed of the study during the Fall 2021
faculty meeting and asked to encourage their learners to complete the survey. Faculty were told
that the research was taking place across multiple courses and disciplines and that the survey
would be uploaded to their course shells. Before the start of the course, the survey was uploaded
into the learning management system as an “Assignment.” Instructors were given a choice to
offer extra credit for the assignment or not, as their instructional practice would dictate. The
survey was moved into the module associated with Weeks One and Two of the course. Weeks
One and Two were chosen to capture the initial perception of cognitive load and motivation
within the course. Potential participants in the study were notified via the instructor in the
learning management system. The instructions in the assignment noted that the completion did
not affect their course progress or have any bearing on their status at the college. At the
beginning of the survey, learners were informed of the study and invited to participate, with the
option to opt-in or opt-out. The learners were instructed that participation in the study would not
affect their grades in the course, and if they wished not to participate, their data would not be
included in the study. Learners were also asked to provide their college-issued identification number to match the survey data and demographic and persistence data collected. The following table provides a summary of the procedures.

**Table 1**

*Summary of Study Procedures*

<table>
<thead>
<tr>
<th>Week</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two weeks before semester</td>
<td>Instructors informed of study during faculty meeting.</td>
</tr>
<tr>
<td>Two weeks before Course begins</td>
<td>Survey inserted into course shell as assignment</td>
</tr>
<tr>
<td>Week Eight of Course and following</td>
<td>Survey data tabulated using Qualtrics and SPSS</td>
</tr>
</tbody>
</table>

**Implementation of Design for this Study**

As this study examines the predictive relationship of learner perceptions of cognitive load and motivation of community college learners in accelerated online asynchronous courses and persistence, faculty of these online courses were informed of the study during the faculty meeting before the start of the semester. Faculty were informed that participation in the study was optional for learners; faculty were asked and encouraged to place the link to the study instrument in their courses. Due to institutional policy for online courses, the survey link was added before the course began. However, the survey link was only available during the period of weeks one and two of the course. Any surveys submitted after the second week of the course were not accepted for part of this study.

The implementation of this study requires the completion of three validated instruments by all participants: the Cognitive Load Questionnaire (Klepsch et al., 2017), the Work Preference Inventory (Amabile et al., 1994), and the Academic Amotivation Scale (Legault et al., 2006).
These instruments were combined into one survey and inserted into a learning module in every eight-week asynchronous fully online course at a mid-sized community college in the southeastern United States. Learners were informed of the survey by their instructors and an announcement in the Learning Management System, Canvas. Learners had an opportunity to choose to participate or deny participation in the study. After all surveys were submitted, and access to the survey was removed, analyses were conducted using correlations and logistical regression analysis through SPSS.

Analysis

Descriptive statistics were used for demographic data, including gender, ethnicity, age, classification, marital status, and employment status. By including these descriptive statistics, a complete picture of the learner can be incorporated into the study. Descriptive statistics were calculated for each instrument and included in the results. Correlation analyses were used to measure the pairwise associations between variables. Descriptive statistics for predictor variables, disaggregated by learners who persisted and those who did not persist, are reported in Table 2.

A binary logistical regression analysis was used to examine the association between a set of predictor variables, perceptions of cognitive load and motivation, and a categorical criterion variable, learners’ persistence. A significance level of $p = .05$ was used to determine significance.

Before conducting the analysis, assumption testing was completed. First, linearity of the continuous variables was ascertained concerning the criterion variable’s logit. Any significance values over 0.05 indicated that the assumption of linearity had been met (Field, 2018). Multicollinearity was tested by examining predictors that have high proportions on the same
eigenvalues to determine if variance in the model is associated with a dependency between predictive variables (Field, 2018). Results of bivariate correlation analyses will demonstrate if a significant association exists between each predictor variable as well as among the pairs of predictor variables. Additional assumption testing was completed to determine the presence of outliers in the data. Residuals will be tested to determine if a variance of ±3 exists to determine if cases need to be removed from the data (Pardoe, 2020).

The logistic regression analysis will demonstrate whether the entire model containing all the variables significantly predicted whether or not online learners persisted. Variation in online persistence will be reported according to the model. The significant contribution of each variable will also be examined. A table will be included to demonstrate which variables make significant individual contributions to the model explaining persistence. Inspection of the B coefficients and odds ratios for each significant contributor will demonstrate which variable made individual significant contributions.

**Role of the Researcher**

During this study, the role of the researcher was minimized as much as possible. I was not enrolled, nor did I possess any official association as an instructor with any of the courses used for this study. The only contact I had with the courses was to inform the faculty regarding the study and to copy the survey into the course as an assignment for the faculty to place in the appropriate module.

**Summary**

Chapter Two noted an established research gap regarding the combined relationship of pedagogy and course design, as defined by learner perceptions of cognitive load and motivation, and persistence in accelerated online community college courses. To address this gap, this study
proposes a predictive logistic regression that examines the role of pedagogy and course design as a predictor of persistence in this environment. The results of this study are presented in Chapter Four.
CHAPTER FOUR: RESULTS

Introduction

The purpose of this quantitative, predictive correlational design study was to examine to what extent, if any, community college learners’ perceived online course cognitive load, including extraneous, intrinsic, and germane loads, and online course motivation, including extrinsic, intrinsic, and amotivation, predicted persistence in accelerated online courses. A binomial logistic regression analysis was conducted. The predictor variables were measured using the scores from the Cognitive Load Questionnaire (Klepsch et al., 2017), Work Preference Inventory (Amabile et al., 1994), and Academic Amotivation Scale (Legault et al., 2006). The criterion variable was dichotomized into whether the learner completed the course (1) or did not persist (0). Demographic Data were collected from 438 participants using an online survey embedded in sixty-one courses with a potential sample of 1737 learners. The response rate was 25%. Out of the 438 survey responses, thirteen did not give consent. An additional sixty-four responses were unusable for analysis due to incomplete surveys, incorrect learner ID numbers, or an inability to match the survey response with course and persistence data. A total of 361 responses were used for data analysis.

Descriptive Statistics

Demographics

Demographic information was collected from the survey respondents. Demographic information included gender, race, marital status, employment status, and highest education received. These demographics were dummy coded for analysis as shown in Table 2. There were more female \( n=288, 80\% \) learners than male \( N=68, 19\% \) that completed the survey. There were more minority respondents \( n=195, 46\% \) than majority white respondents \( n=166, 45\% \).
These differences are expected due to typical demographics of online learners at the research site. According to the National Center for Education Statistics, 70.3% of community college learners took an online course at their institution (National Center for Education Statistics, 2021). Of the total enrollments in public community colleges in Fall 2020, 47.9% were white and 59.5% were female (National Center for Education Statistics, 2021). Most of the respondents were not married (n=268, 74%), employed (n=285, 79%), and had taken some college courses towards an Associate’s degree (n=201, 56%). All data related to participant characteristics can be found below in Table 2.

### Table 2

**Participant Characteristics (N=361)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female (0)</td>
<td>288</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Male (1)</td>
<td>68</td>
<td>19</td>
</tr>
<tr>
<td>Race</td>
<td>Minority (0)</td>
<td>195</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Majority White (1)</td>
<td>166</td>
<td>45</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Married (1)</td>
<td>61</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Not Married (0)</td>
<td>268</td>
<td>74</td>
</tr>
<tr>
<td>Employment Status</td>
<td>Working (1)</td>
<td>285</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>Not working (0)</td>
<td>76</td>
<td>21</td>
</tr>
<tr>
<td>Highest Education Attained</td>
<td>High school or less (1)</td>
<td>97</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Associate degree or some college (2)</td>
<td>201</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Bachelor’s Degree or higher (3)</td>
<td>48</td>
<td>13</td>
</tr>
</tbody>
</table>

Data about survey respondents subject of the online course and how many online courses the respondents had completed prior to their completion of the survey. The 361 respondents were spread over 61 online sections of 34 different courses. Of the 34 courses, 20 courses were from non-STEM subjects and 14 courses were from STEM subjects. The list of online courses...
included are included in Appendix D. Respondents had completed anywhere from zero to forty online courses prior to their participation in this study ($M=6.03$, $SD=5.79$).

**Predictor Variables**

The predictor variables of this study are the levels of perceived cognitive load and motivation, as measured by the Cognitive Load Questionnaire (Klepsch et al., 2017), Work Preference Inventory (Amabile et al., 1994), and Academic Amotivation Scale (Legault et al., 2006). Each variable was measured using their respective subscales. The Cognitive Load Questionnaire measured intrinsic cognitive load, extraneous cognitive load, and germane cognitive load. The Work Preference Inventory measured intrinsic motivation and extrinsic motivation. The Academic Amotivation Scale measured four components of amotivation: value, ability, task and effort. Each subscale, except for intrinsic cognitive load, had a Cronbach’s alpha value greater than .70, indicating good reliability in this study (Cohen, 1988). Due to the low reliability from the intrinsic cognitive load scale (.575), results related to this measure should be interpreted and applied with caution due. Table 3 presents the reliability of each instrument subscale.

**Table 3**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Range</th>
<th>Subscale</th>
<th>Number of Items</th>
<th>M</th>
<th>SD</th>
<th>alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Load Questionnaire</td>
<td>1 - 7</td>
<td>Intrinsic Cognitive Load</td>
<td>2</td>
<td>4.64</td>
<td>2.59</td>
<td>.575</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Germane Cognitive Load</td>
<td>3</td>
<td>5.75</td>
<td>3.64</td>
<td>.906</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extraneous Cognitive Load</td>
<td>3</td>
<td>3.09</td>
<td>5.24</td>
<td>.917</td>
</tr>
<tr>
<td>Work Preference Inventory</td>
<td>1 - 4</td>
<td>Intrinsic Motivation</td>
<td>15</td>
<td>2.95</td>
<td>7.11</td>
<td>.849</td>
</tr>
</tbody>
</table>
Criterion Variable

The criterion variable of this study is persistence and is measured by either completion of the course or non-completion. Non-completion of courses could occur through learner-requested withdrawal, administrative withdrawal due to absences, or administrative withdrawal due to other learner-related issues. Of the 361 respondents, 314 (87%) persisted in their online course while 47 (13%) did not. Table 4 includes the descriptive statistics for each subscale based on the persisting group.

Table 4

Descriptive Statistics for Predictor Variables with Criterion

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ICL</td>
<td>4.64</td>
<td>1.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. GCL</td>
<td>5.73</td>
<td>1.21</td>
<td>-.536</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. ECL</td>
<td>3.10</td>
<td>1.75</td>
<td>-.389</td>
<td>.129</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. IM</td>
<td>2.93</td>
<td>.472</td>
<td>-.107</td>
<td>.146</td>
<td>-.017</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. EM</td>
<td>2.67</td>
<td>.430</td>
<td>-.050</td>
<td>-.283</td>
<td>-.121</td>
<td>-.697</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. AM - Value</td>
<td>2.01</td>
<td>1.40</td>
<td>-.006</td>
<td>.106</td>
<td>-.159</td>
<td>.134</td>
<td>-.051</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. AM - Ability</td>
<td>2.09</td>
<td>1.52</td>
<td>.046</td>
<td>.004</td>
<td>-.078</td>
<td>.008</td>
<td>.008</td>
<td>-.490</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. AM - Task</td>
<td>2.67</td>
<td>1.69</td>
<td>.072</td>
<td>-.033</td>
<td>.120</td>
<td>-.134</td>
<td>-.005</td>
<td>-.386</td>
<td>-.024</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. AM - Effort</td>
<td>2.75</td>
<td>1.75</td>
<td>-.103</td>
<td>.068</td>
<td>-.046</td>
<td>.189</td>
<td>-.075</td>
<td>.146</td>
<td>-.247</td>
<td>-.639</td>
<td></td>
</tr>
</tbody>
</table>

Control Variables

A series of chi-square tests of independence were conducted to determine if learner persistence differed based on each of the participants’ characteristics. These analyses were run to
determine if the variables were of concern and needed to be controlled. The chi-square tests of
independence indicated that there was no difference in the proportion of participant
characteristics across the persisting and non-persisting groups using the Yates Continuity
Correction to indicate significance. Significance values of the chi-square test are included in
Table 5.

The chi-square test of independence with the Yates Continuity Correction indicated that
there was no difference in the proportion of ethnicities across the persisting and non-persisting
groups, $\chi^2 (1, .95) = 1.489, p = .222, \phi = -.072$. These results suggest that ethnicity need not be controlled. Another chi-square test for independence with the Yates Continuity Correction indicated that there was no difference in the proportion of males and females across the persisting and non-persisting groups, $\chi^2 (1, .95) = .368, p = .544, \phi = -.043$. Based on these results, gender was not included as a covariate in this study. A chi-square test of independence was completed for marital status and indicated no difference in the proportion of marital status across the persisting and non-persisting groups, $\chi^2 (2, .95) = .472, p = .790, \phi = .036$. These results suggest that marital status did not need to be controlled. A further chi-square test of independence was completed with the Yates Continuity Correction for employment status, indicating no significance across persisting and non-persisting groups, $\chi^2 (1, .95) = .054, p = .816, \phi = .022$. Based on these results, employment status did not need to be included as a covariate in the study. A chi-square test for independence was run for highest education completed, indicating no significance across the persisting and non-persisting groups, $\chi^2 (3, .95) = 1.058, p = .787, \phi = .054$. These results suggest that education did not need to be controlled. A final chi-square test for independence was completed for the online course subject. Online course subjects were not grouped, e.g., based on STEM or non-STEM, to show if any significance occurred
across courses. No significance was indicated across persisting and non-persisting groups, $\chi^2(23, .95) = 17.986, p = .758$, phi. = .244. These scores are included in Table 5.

### Table 5

**Chi-square Analysis of Demographic Groups**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Persist</th>
<th>Not Persist</th>
<th>Pearson Chi-Square</th>
<th>$p$ value</th>
<th>phi value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>252</td>
<td>36</td>
<td>.368$^a$</td>
<td>.544</td>
<td>-.043</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>57</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>Minority</td>
<td>174</td>
<td>21</td>
<td>1.489$^a$</td>
<td>.222</td>
<td>-.072</td>
</tr>
<tr>
<td></td>
<td>Majority White</td>
<td>26</td>
<td>140</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td>Married</td>
<td>52</td>
<td>9</td>
<td>.472</td>
<td>.790</td>
<td>.036</td>
</tr>
<tr>
<td></td>
<td>Not Married</td>
<td>235</td>
<td>33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment Status</td>
<td>Working</td>
<td>249</td>
<td>36</td>
<td>.054$^a$</td>
<td>.672</td>
<td>.022</td>
</tr>
<tr>
<td></td>
<td>Not working</td>
<td>65</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest Education Attained</td>
<td>High school or less</td>
<td>82</td>
<td>15</td>
<td>1.058</td>
<td>.787</td>
<td>.054</td>
</tr>
<tr>
<td></td>
<td>Associate’s Degree</td>
<td>178</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bachelor’s Degree</td>
<td>41</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Degree or higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online Course Subject</td>
<td></td>
<td>40</td>
<td>261</td>
<td>17.986</td>
<td>.758</td>
<td>.244</td>
</tr>
</tbody>
</table>

Note: $p < .05$

$^a \chi^2$ uses Yates Continuity Correction.

An independent samples t-test was run separately for the number of online courses previously completed. The average number of online courses taken by the respondents was five courses. The 314 participants of the persisting group ($M=5.01$, $SD=5.87$) and the 47 participants
of the non-persisting group ($M=5.15$, $SD=4.90$) had similar scores but showed no statistical significance $t(359) = .151, p=.880$.

**Statistical Analysis**

**Assumption Testing**

Prior to conducting the binary logistic regression, assumption testing was conducted. The Box-Tidwell (1962) test was run to test for linearity between the continuous variables of intrinsic cognitive load, germane cognitive load, extraneous cognitive load, intrinsic motivation, extrinsic motivation, and the four subscales of academic amotivation, and the criterion variable, persistence. A statistical significance level was set at $p < .002$ adjusting for with to the Bonferroni correction. Using this test, no logits violated the assumption of linearity; therefore, the assumption of linearity was tenable.

Learnerized residual values were assessed to identify extreme outliers. There were twenty-four cases (Case 14, 32, 33, 43, 84, 87, 96, 107, 110, 147, 157, 201, 207, 223, 236, 249, 257, 266, 278, 281, 284, 286, 306, 349) with standardized residual values above 2.0 standard deviations. As the presence of these outliers influenced the results, the cases were removed prior to conducting the analysis. Once the outliers were removed 337 cases were analyzed.

**Logistic Regression without Outliers**

The model, consisting of intrinsic cognitive load, germane cognitive load, extrinsic cognitive load, intrinsic motivation, extrinsic motivation, and the four subscales of academic amotivation (value, ability, task, and effort), was statically significant $\chi^2(9) = 41.390, p=.000$, indicating that the combination of these variables adequately predict whether or not learners’
persist. The Hosmer and Lemeshow Test did not have significance (\(p=.822\)) supporting the results that the model was adequate for predicting the categorical outcome of persistence. significant. The model (e.g., intrinsic cognitive load, germane cognitive load, extrinsic cognitive load, intrinsic motivation, extrinsic motivation, and the four subscales of academic amotivation (value, ability, task, and effort)) explained between 11.6% (Cox and Snell R2) and 29.5% (Nagelkere R2) of the variance in persistence and correctly classified 93.2% of cases. Sensitivity was 99.4% and specificity was 8.7%. Positive predictive value was 96.89% and negative predictive value was 16.67%.

The evidence from the logistic regression analysis supports the rejection of null hypotheses \(H_{01d}, H_{01e},\) and \(H_{01f}\) as a statistically significant predictive relationship was found. All other null hypotheses failed to be rejected due to the lack of individual significance. While the combination of the variables predicted whether learners’ persistence, three variables, germane cognitive load, intrinsic motivation, and extrinsic motivation, made an individual significant contribution in explaining persistence (see Table 6). Due to the number of variables, a Bonferroni correction (.005), was used to determine significance. Increasing germane cognitive load and intrinsic motivation was associated with an increased likelihood of persisting in the course, but increasing extrinsic motivation was associated with a reduction in the likelihood of persisting. The evidence from the logistic regression analysis supports the rejection of null hypotheses \(H_{01d}, H_{01e},\) and \(H_{01f}\) as statistically significant predictive relationships were found. All other null hypotheses failed to be rejected due to the lack of individual significance.

Table 6
Results of the Logistic Regression Analysis for Each Variable (\(N=337\))

<table>
<thead>
<tr>
<th>Variable</th>
<th>Exp(B)/Odd</th>
</tr>
</thead>
</table>

61
In summary, 361 community college learners participated in this predictive correlational study that examined the predictive relationship between persistence in accelerated online asynchronous courses and factors associated with course design, namely intrinsic cognitive load, germane cognitive load, extraneous cognitive load, intrinsic motivation, extrinsic motivation, and the four associated subscales of academic amotivation, value, ability, task, and effort. Participant characteristics were examined via chi tests of independence and no statistically significant difference was found among persisting and non-persisting groups. Assumptions for linear regression were tested and no violations were found. The binary logistic regression analysis indicated a good model fit using the predictor variables as a prediction for persistence, with statistical significance found in the germane cognitive load, intrinsic motivation, and extrinsic motivation subscales. Overall, the model used for the binary logistic regression shows statistical significance. Chapter 5 will discuss these findings in conjunction with associated literature, discuss implications for practice, highlight limitations of this study, and suggest recommendations for future research.

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>p</th>
<th>ratio</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICL</td>
<td>-.358</td>
<td>.263</td>
<td>1.858</td>
<td>1</td>
<td>.173</td>
<td>.699</td>
<td>.417</td>
<td>1.170</td>
</tr>
<tr>
<td>GCL</td>
<td>.683</td>
<td>.242</td>
<td>7.990</td>
<td>1</td>
<td>.005*</td>
<td>1.979</td>
<td>1.233</td>
<td>3.177</td>
</tr>
<tr>
<td>ECL</td>
<td>-.111</td>
<td>.172</td>
<td>.414</td>
<td>1</td>
<td>.520</td>
<td>.895</td>
<td>.638</td>
<td>1.255</td>
</tr>
<tr>
<td>IM</td>
<td>3.398</td>
<td>.818</td>
<td>17.258</td>
<td>1</td>
<td>.000*</td>
<td>29.907</td>
<td>6.019</td>
<td>148.609</td>
</tr>
<tr>
<td>EM</td>
<td>-2.835</td>
<td>.842</td>
<td>11.341</td>
<td>1</td>
<td>.001*</td>
<td>.059</td>
<td>.011</td>
<td>.306</td>
</tr>
<tr>
<td>AM - Value</td>
<td>.635</td>
<td>.327</td>
<td>3.762</td>
<td>1</td>
<td>.052</td>
<td>1.885</td>
<td>.993</td>
<td>3.579</td>
</tr>
<tr>
<td>AM - Ability</td>
<td>.035</td>
<td>.274</td>
<td>.017</td>
<td>1</td>
<td>.897</td>
<td>1.036</td>
<td>.606</td>
<td>1.772</td>
</tr>
<tr>
<td>AM - Task</td>
<td>-.605</td>
<td>.254</td>
<td>5.692</td>
<td>1</td>
<td>.017</td>
<td>.546</td>
<td>.332</td>
<td>.898</td>
</tr>
<tr>
<td>AM - Effort</td>
<td>.558</td>
<td>.254</td>
<td>4.837</td>
<td>1</td>
<td>.028</td>
<td>1.747</td>
<td>1.063</td>
<td>2.873</td>
</tr>
</tbody>
</table>

Note. *p < .005
CHAPTER FIVE: DISCUSSION AND CONCLUSIONS

Introduction

The purpose of this quantitative, predictive correlational design study was to examine to what extent, if any, community college learners’ perceived online course cognitive load, including extraneous, intrinsic, and germane loads, and online course motivation, including extrinsic, intrinsic, and amotivation, predicted persistence in accelerated online courses. This study utilized a quantitative, predictive correlational research design with a binary logistic regression to analyze the data, including chi-square tests of independence to determine if learner persistence differed based on participant characteristics. The previous chapter details the data and findings from the research questions and hypotheses. In this chapter, I will discuss the results, implications, and limitations of the study, as well as considerations for future research.

Discussion of Results

The results of this study revealed a statistically significant model of persistence. This conclusion was based on the binary logistic regression analysis (see Chapter 4, Table 6). Given that the nature of the data included multiple predictor variables and a categorical criterion variable, a binary logistic regression analysis allowed analysis of the entire model and significant contribution of each variable (Field, 2018; Stoltzfus, 2011). The predictor variables were identified using constructs of Cognitive Load Theory (intrinsic cognitive load, germane cognitive load, extraneous cognitive load) (Sweller et al., 1998, 2019) and Self-Determination Theory (intrinsic motivation, extrinsic motivation, and the four subscales of academic amotivation—value, ability, task, and effort) (Ryan & Deci, 2017; 2020). The model of persistence was identified from Rovai’s (2003) synthesis of Tinto (1975) and Bean and Metzner (1985). The findings of this research confirm Rovai’s inclusion of pedagogy, learning and teaching styles, as
an internal factor in leading to a persistence decision in accelerated online asynchronous courses.

This confirmation is found through the statistically significant model fit of the nine predictor variables as a predictor of persistence. A visual representation of this model can be found in Figure 4. Within the model, these results show that germane cognitive load, intrinsic motivation, and extrinsic motivation held individual statistical significance. These results showing significance in the interplay of germane cognitive load, intrinsic motivation, and extrinsic motivation allow for a potential reinterpretation of these respective constructs in light of course persistence.

Research Question 1a: To what extent, if any, does community college learners’ course subject and the number of online courses completed predict persistence in an accelerated online course?
In line with the first research question (RQ1a), the online course subject and number of online courses completed by the participant were included in the analysis. The online course subjects associated with the study were analyzed using a chi-squared test of independence. No statistical significance was found showing any relationship between the online course subject and learner persistence. While other research has found course subject to be significant in persistence (Higashi et al., 2017; Soffer & Cohen, 2019), these findings suggest that course subject is not significant in terms of cognitive load and motivation as predictive factors of persistence in the model that explores this context. As this model of persistence specifically focuses on the predictive nature of cognitive load and motivation in online classes, the influence of course subject may be negligible in relation to these other factors. There may be multiple interpretations for this finding. One is that cognitive load can be generally considered as more task-based rather than content based, so course subject may not be as relevant and important a role in this predictive model (Cook et al., 2017; Klepsch & Seufert, 2020; Sweller et al., 2019). The same could be said for motivation. While intrinsic motivation towards a course subject has found to be a predictive feature in persistence (Soffer & Cohen, 2019), this study focuses on the predictive relationship among both cognitive load and motivation on persistence. Thus, the predictive relevance of the individual course subject taken by the respondent may be accounted for within the intrinsic motivation scores as opposed to a separate construct to consider within this model. While this is an area of future research, as this study considered cognitive load and motivation in conjunction with one another across course subjects, this study suggests that course subject is not as predictive as other factors considered.

Furthermore, an independent samples t-test was used to analyze the number of online courses completed by the participant. No statistical significance was found showing any
relationship between the number of online courses completed and learner persistence. While some research suggests that prior online course experience has significance in online course persistence (Hachey et al., 2014), this study suggests that in light of the other factors considered (cognitive load and persistence), it is not a statistically significant variable. In the study site context, this could be due to the inclusion of an online course orientation, which learners are required to complete each semester prior to accessing the online course. Thus, if learners had taken online courses at this site prior to this semester, they would have already been familiar with the processes of an online learner at this site and the information the orientation contains. Within the current term, it is possible that this orientation could provide the needed information for each learner that removes the favorability of having completed prior online courses in relation to persistence in the course. This research could suggest that prior online course experience becomes less of a factor leading to persistence when all learners are exposed to consistent orientation information for online learners, but future research would need to confirm this possibility.

**Research Question 1b: To what extent, if any, does community college learners’ extraneous cognitive load predict persistence in an accelerated online course?**

In line with research question 1b (RQ1b), extraneous cognitive load was examined as part of the binary logistic regression. While extraneous load fit within the overall model of persistence, it was not found to be statistically significant individually. That is, while extraneous cognitive load was included holistically as part of a model including cognitive elements of course design, extraneous load did not hold individual significance in predicting a learner’s persistence in the course. This data is seemingly inconsistent with previous research which has shown that decreasing extraneous cognitive load can cause an increase in germane load and
should be paramount in most online instructional experiences (Çakiroglu & Aksoy, 2017; Costley, 2020; Lange et al., 2017; van Merrienboer & Sluijsmans, 2009). However, the findings of this study suggest that germane cognitive load (RQ1d), is most significant in predicting persistence. Thus, the reduction of extraneous cognitive load cannot be an isolated element to improve learning outcomes in a longer course, as opposed to a singular task.

The intersection of cognitive load and course persistence is interesting in light of prior studies. For example, one study found that germane cognitive load is most effective when “learners are motivated and extraneous load is low” (Noetel et al., 2021). From this consideration, it is possible that the courses included in this study were already designed to reduce extraneous cognitive load through an institutional template and robust evaluation rubric (see Appendix E.) The institutional template may preemptively reduce extraneous cognitive load as it forces a consistent course navigation and online orientation module in all online classes. The robust evaluation rubric reinforces this template as criteria to be evaluated to ensure it remains consistent. Instead, the rubric does provide a set of guidelines for a consistent course navigation, modular course structure, and learner course experience through the inclusion of weekly announcements, a required online orientation, and expectations for faculty presence in the course. Thus, the reduction of extraneous load through a robust and consistent course evaluation process that requires consistent design (e.g., – navigation, course structure) could leave room for more cognitive processing in the learner to be utilized for developing schemata and content automation, leading to a learner’s ability to persist in the course. While reducing extraneous load can be a place to start when examining persistence, this reduction needs to be a steppingstone to increasing germane load across the course to increase the likelihood of learner persistence.
Research Question 1c: To what extent, if any, does community college learners’ *intrinsic* cognitive load predict persistence in an accelerated online course?

In line with research question 1c (RQ1c), intrinsic cognitive load was examined as part of the binary logistic regression. While intrinsic load fit within the overall model of persistence, it was not found to be statistically significant individually. Similar to extraneous cognitive load, intrinsic cognitive load, or the learner’s perception of the general complexity of the content, fit within the overall model including cognitive factors of course design, but it did not contribute individually to a learner’s persistence decision. Furthermore, the scores of the intrinsic cognitive load scale indicated a low reliability, so these scores should be interpreted with caution. This lower reliability score may speak more to the nature of this study as a holistic approach to examining cognitive load rather than examining load in terms of a particular task. Cognitive Load Theory suggests that element interactivity and prior knowledge are two major components of determining the amount of intrinsic load within a learning event (Klepsch & Seufert, 2020; Sweller, 2010; Sweller et al., 1998). As this study viewed perceptions of cognitive load at the beginning of a course, during weeks one and two, it is possible that content-rich learning that is critical for intrinsic cognitive load had not yet been activated and considered by the learner, particularly across the entire course experience rather than a specific learning event.

The findings from this study regarding intrinsic cognitive load warrant further examination in light of the prior literature. While previous studies suggest that intrinsic load be of specific consideration to instructional designers in terms of content presentation and managing course structure (Costley, 2020; Klepsch & Seufert, 2020; Sentz et al., 2019; Sweller et al., 2019), as intrinsic load scores were found to have low reliability and low statistical significance, the data suggests that it would be beneficial to examine further the nature of intrinsic cognitive
load across a full course experience. This low reliability could come from the focus of this study as perceptions of cognitive load across the entire course rather than in a specific learning moment, which could make this aspect of cognitive load difficult to assess. However, in terms of predicting learner persistence, intrinsic cognitive load, or the general complexity of the content, was not found to be a significant factor.

**Research Question 1d: To what extent, if any, does community college learners’ *germane* cognitive load predict persistence in an accelerated online course?**

In line with research question 1d (RQ1d), germane cognitive load was examined as part of the binary logistic regression. The germane cognitive load, or the general difficulty of understanding the content and connecting it to prior learning, fit within the overall model of persistence, and it was found to be statistically significant individually. This finding differs from the aforementioned extraneous and intrinsic cognitive load, as germane load both fits within the larger model of cognitive factors of course design and contributing individual significance to predict whether a learner persisted in the asynchronous online course. This data is especially noteworthy as this study suggests that the development of germane cognitive load over the time frame of the course has a predictive relationship with learner persistence. That is, there was a temporal aspect in terms of design and persistence. Specifically, as germane load increases, the likelihood of learner persistence increases. This finding extends the research on cognitive load as germane cognitive load has not been a major focus of study. In a systematic review of the literature, Mutlu-Bayraktar et al. (2019) found that in the 90 studies they reviewed, germane cognitive load was investigated in only three studies where the majority of studies focused on extraneous cognitive load. In a similar meta-analysis, Noetel et al. (2021) found only one study that included germane cognitive load as a factor. While some studies have remarked on the
difficulty of measuring germane cognitive load or of including it with intrinsic cognitive load (Kalyuga et al., 2001; Noetel et al., 2021; Orru & Longo, 2019; Sweller, 2010), this study aligns with Klepsch & Seufert (2020) as defining germane cognitive load as “the load imposed on working memory that can have a positive impact on learning” (p. 48). Further, this load can be seen in how “learners invest increased effort into cognitive processes” (p. 48), especially in terms of schema formation. Thus, we can potentially conclude that this cognitive investment may have a relationship with persistence. These schemata form as learners are able to understand the overall learning goals and objectives within the course content (intrinsic load) and overcome any barriers to their access and understanding of that content (extraneous load). Thus, the positive impact on learning found in germane load is only possible with a reduced extraneous load in the learning environment and a manageable intrinsic load within the content. Viewing germane cognitive load as having a significant predictive relationship with persistence provides instructional designers and educators needed clarification on the development of course materials and course design to assist learners in building schemata and mental models for automation of content.

As this study examines learner perception of cognitive load across a course, it is important to note that most studies of cognitive load often occur for a specific task. For example, these tasks may be connected with completing in-class study-recall tests (Chen et al., 2015; Paas & van Merrienboer, 1994), completing variable tasks within a lab scenario (Klepsch et al., 2017; Klepsch & Seufert, 2020), or associated with a specific type of effect produced by cognitive load, like the worked example effect or modality effect (Chen et al., 2015; Sweller et al., 2019). However, examining cognitive load across a learning environment and over time allows for further consideration of the constructs of cognitive load and their importance in the overall
structure of course design. This type of examination is confirmed by Klepsch and Seufert (2020) for using differentiated measures of cognitive load to examine cognitive load across different environments, particularly less artificial environments than in a laboratory, and employed by Bradford (2011) to develop a deeper understanding of the relationship between cognitive load and other constructs related to the learning environment. Bradford (2011) mentions that studies of cognitive load and learning need to include discussions of academic performance and results, such as persistence. Specifically, by highlighting and understanding the role of germane cognitive load in the context of course design, instructional designers and course instructors can include practices that could benefit learner persistence in accelerated online asynchronous courses.

**Research Question 1e: To what extent, if any, does community college learners’ *intrinsic* motivation predict persistence in an accelerated online course?**

In line with research question 1e (RQ1e), intrinsic motivation was examined as part of the binary logistic regression. Intrinsic motivation both fits within the overall model of persistence and was found to be statistically significant individually. Similar to germane cognitive load, intrinsic motivation was found to both contribute to an overall model of affective factors of course design and hold individual significance towards predicting learner persistence. This work extends prior work in that motivational factors have been included in past research regarding learner experiences in online courses (Baber, 2020; Ferrer et al., 2020; Gustiani, 2020; Han et al., 2020; Hobson & Puruhito, 2018). However, motivation is multifaceted and impacted both by the individual learner and the learner’s course experience (Cook & Artino, 2016; Feldon et al., 2018; Hartnett et al., 2011; Hobson & Puruhito, 2018). Thus, this examination of
motivation within the online course can only demonstrate a snapshot of learner motivational factors as learners engage in a class over time.

These findings suggest that as learners engage with material that increases their enjoyment and interest, their likelihood of persisting to the end of the course increases. While intrinsic motivational factors are different for each learner, the data in this study suggests inherent desire to learn content due to its intrinsic enjoyment for the learner is what leads to this increased likelihood of persisting. This finding is in line with other studies (Baber, 2020; Ferrer et al., 2020; Gustiani, 2020). As Ferrer et al. (2020) found, intrinsic motivation in online learning is tied directly to engagement, particularly with intrinsic motivation to know rather than intrinsic motivation to accomplish. With this understanding of intrinsic motivation, instructional designers and online course instructors can focus on developing opportunities to increase learner enjoyment of course materials and engagement in online courses as a way to increase the likelihood of learner persistence throughout the course.

Research Question 1f: To what extent, if any, does community college learners’ extrinsic motivation predict persistence in an accelerated online course?

In line with research question 1f (RQ1f), extrinsic motivation was examined as part of the binary logistic regression. Extrinsic motivation both fit within the overall model of persistence and was found to be statistically significant individually. Similar to both germane cognitive load and intrinsic motivation, extrinsic motivation contributed to the overall model as an affective component of course design and held individual significance in predicting learner persistence. The data suggests as intrinsic motivation increases and extrinsic motivation decreases, the likelihood of learner persistence increases. By decreasing extrinsic motivation, it is possible that learners can transition from avoiding punishment or earning a reward into finding enjoyment in
the content and engaging in the course, promoting intrinsic motivation to persist. In the context of this study, extrinsic motivators were often present in the attendance policy, which did not allow learners to withdraw until halfway through the course, various grade structures, and extra credit opportunities. Decreasing extrinsic motivational factors includes a shift in pedagogical thinking, as most courses include these types of extrinsic motivation: extra credit, grades, digital badging, attendance policies, etc. (Chamberlin et al., 2018; Foster, 2021; Morris et al., 2019; Sloan et al., 2020). In this study, both intrinsic and extrinsic motivation were found to have a statistically significant predictive relationship with persistence.

The present findings are noteworthy considering other studies. Other research has suggested that intrinsic and extrinsic motivation should be considered as part of the larger spectrum of motivational categories as reflected in Self Determination Theory. In a meta-analysis including 344 samples, Howard et al. (2021) found that different aspects of motivation, specifically introjected regulation and identified regulation, are most closely related with persistence decisions and learner academic outcomes. Introjected regulation refers to extrinsic motivation that is somewhat external, including compulsion or guilt (Cook & Artino, 2016). Identified regulation is slightly more intrinsically motivated, as it most closely aligns with the conscious goals of the individual (Cook & Artino, 2016). Specifically, Howard et al. (2021) found that extrinsic motivation was found to have a negative correlation with an increase in maladaptive behaviors, including increased anxiety, in learners. The current study confirms these results as a decrease in extrinsic motivation was found to have a predictive relationship with persistence. This behavior could occur due to decreased external pressure on the learner, allowing for more opportunities to develop intrinsic interest and enjoyment in the content. As noted earlier, external pressure, from an extrinsic motivational standpoint, may be in the form of
grades, attendance policies, required extra credit, and other course policies or procedures that attempt to reward or punish the learner for learning (Chamberlin et al., 2018; Foster, 2021; Morris et al., 2019; Sloan et al., 2020). Van den Broeck et al. (2021) also demonstrates this finding, though in a work setting rather than academic. Their meta-analysis of 124 samples found that every type of motivation “holds incremental validity in predicting employee well-being, attitudes, and behavior” (p. 26). While this current study focuses only on intrinsic motivation, extrinsic motivation, and amotivation, it is important to note that both Howard et al. (2021) and Van den Broeck et al. (2021) suggest that increased extrinsic motivation can be detrimental to affective outcomes while increased intrinsic motivation can be beneficial.

**Research Question 1g: To what extent, if any, does community college learners’ amotivation predict persistence in an accelerated online course?**

In line with research question 1g (RQ1g), amotivation was examined as part of the binary logistic regression. The constructs of amotivation fit within the overall model of persistence, but it was not found to be statistically significant individually. While amotivation plays a role in the holistic model of persistence, its lack of individual significance suggests that a learner’s amotivation did not contribute to the decision to persist in the online asynchronous course. Ferrer et al. (2020) found that learner attitudes to online learning had a partial and negative effect on learner engagement, showing that if learners have negative attitudes towards online learning, they are likely to lose engagement in the course. However, Breva and Galindo (2020) found that amotivation predicted performance and served as a predictor of dropping out. Breva and Galindo (2020) also found that amotivation held low predictive power towards academic achievement. The findings from this study seem to align with Ferrer et al. (2020) and Howard et al. (2021) and
specifically note that amotivation plays a role in learner engagement and academic performance as a barrier to learner success, specifically for the learning outcome of persistence.

While amotivation, or the lack of motivation either internally or externally, was not found to be significant in this study, it is important to note that amotivation does fit within the larger model of persistence. This suggests that while learners intrinsic and extrinsic motivations play a more significant role in determining their likelihood of persistence, amotivation, as the lack of either intrinsic or extrinsic motivation, may be overshadowed by those constructs. Thus, the significant role of amotivation is reduced due to the importance of increasing intrinsic motivation and decreasing extrinsic motivation in the online course. By focusing on what encourages learners to engage and develop interest in the content, while removing extrinsic pressure to perform, instructional designers and course instructors can overcome amotivational factors and increase the likelihood of persistence. Future research may be needed to examine the singular role of amotivation in predicting learner persistence in online courses.

Summary

This study both confirms that intrinsic and extrinsic motivation are essential components of learner persistence (Ferrer et al., 2020; Howard et al., 2021; Van den Broeck et al., 2021) and adds additional insights into previous findings regarding the role of germane cognitive load in persistence (Klepsch & Seufert, 2020; Mutlu-Bayraktar et al., 2019). However, it is important to note that both extrinsic and intrinsic motivation were found to have significance within the model in conjunction with germane cognitive load. Thus, it is not one element of increase intrinsic motivation or decreasing extrinsic motivation that produces a predictive relationship with learner persistence, but it is the interplay between schemata formation and motivation that may play a role as learners persist in a course. This interplay, then, becomes the paramount
consideration of instructional designers and course instructors. Discovering ways to develop
germane cognitive load and intrinsic motivation while decreasing inherent extrinsic motivation
can then provide avenues for practical shifts in course design and development.

**Implications for Practice**

The findings of this study do lead to practical implications for overall course design,
especially when viewed holistically. Based on these findings of the importance of germane
cognitive load, intrinsic motivation, and extrinsic motivation, the following design and
development considerations and recommendations should be considered.

**Implications for Professional Development Opportunities**

Providing faculty professional development regarding course alignment and structure to
allow for learner production of content-related schemata and automation could allow for the
development of online courses that promote learner persistence. By focusing on this type of
schema-producing course alignment during training, instructional designers and instructors can
foster course structure that enhances germane cognitive load. These professional development
sessions can include information on overall course design and alignment, learning management
system-specific strategies for course structure, development of course materials to increase
learner engagement and interest, and decreasing rewards/punishment-based policies within the
online classroom. Furthermore, professional development in metacognitive strategies, such as
cognitive prompts or desirable difficulties (Klepsch & Seufert, 2020) provides opportunities to
enhance germane cognitive load in courses. Rather than primarily focusing on single class
activities, focusing on development of faculty and instructional designers to adopt a more holistic
perspective with germane load in mind can provide more opportunities to harness this element of
persistence.
Faculty development programs like those discussed by Miller et al. (2019) could be beneficial in promoting courses that produce persistence. Miller et al. (2019) created a faculty developing program based on scholarship that extended over a longer time period to engage faculty around the concept of persistence. By including information regarding cognitive load theory, specifically germane cognitive load, these types of workshops could promote opportunities for faculty to develop a deeper understanding of actionable tasks they can include to increase the likelihood of learner persistence.

Professional development opportunities should also include information on how to increase intrinsic motivation, e.g., learner enjoyment of the material, and decrease extrinsically focused motivation, e.g., grade boosts and extra credit. Increasing intrinsic motivation may come from through expanding course materials outside of the textbook to include other relevant options for reaching course objectives. Decreasing extrinsic motivational factors may prove to be more challenging, as grades-based rewards are inherent in the academic system. However, by decreasing the reliance on grades as a motivator and viewing them as an academic marker of progress may help develop further intrinsic motivation, increasing the likelihood of learner persistence in the course. One example to consider in increasing intrinsic motivation is digital badging in the course. Professional development around the use of badges could provide faculty resources to consider the intrinsically motivating factors of badging that produce enjoyment and are related to skill achievement rather than as one more extrinsic motivator that learners feel forced to participate in for course credit. This approach would need to be considered carefully, along with other professional development on decreasing extrinsic motivators in the course structure.

Implications for Course Templating
Developing consistent course templates across an institution that reduce extraneous cognitive load and allow for more processing to increase germane load could allow for the development of online courses that promote learner persistence. The development of a consistent course template reinforced through a systematic course evaluation that reduced extraneous load in the online courses of this study possibly provided the opportunity for learners to enhance their germane cognitive load in their online courses. The difficulty of course templating across disciplines is the unique needs and structural components of different instructors and course disciplines. A viable course template, then, needs to be generalizable in structure (e.g., modules) and include a consistent course navigation and introduction (Martin et al., 2019). The goal of the course template would be to reduce extraneous cognitive load across the learning environment to increase possibility for learners to develop overall understanding of course content. Utilizing a course template helps provide a consistent course organization, which learners believe contributes to their eventual success in the online course.

A further element to course templating is the creation of course maps. Utilizing course mapping strategies that allow instructional designers and course instructors to develop an overall understanding of course materials that promote schemata formation and automation could allow for the development of online courses that promote learner persistence. Utilizing a course map as a blueprint for course sequence creates opportunities to develop an awareness of the learning journey and metacognitive opportunities within the course (Nilson & Goodson, 2021). The goal of course alignment, course templates, and course maps is to provide opportunities for instructional designers, instructors, and ultimately learners to see connections across a course, understand course objectives, and develop metacognitive strategies to enhance the formation of content-related schemata and the development of germane cognitive load.
Implications for Course Experience and Learning Materials

The data above suggests that the overall course experience of the learner develops into an opportunity to develop germane load and affect motivation. One implication is that educators should consider that the development of overall course materials, particularly when curating from multiple sources, as it relates to schemata building could allow for the development of online courses that promote learner persistence. This point is particularly important when curating courses from open educational resources as well as traditional textbook materials. The formal definition of open educational resources includes materials that are in the public domain and that are able to be retained, reused, revised, remixed, and redistributed (Wiley, 2021). On the surface, the use of open educational resources suggests a major benefit to the learner as it reduces the costs of learning materials drastically. However, these resources must be curated and/or created by faculty in terms of the overall course objectives. Practically, all learning materials, whether open or paid, should be considered in light of the development of content-based schemata that support the overall learning objectives of the course. Instructional designers and instructors should be aware and purposeful in the inclusion of course materials as it relates to the overall course objectives, alignment, and development of related schema. One point to consider is the inclusion of materials that produce desirable difficulties that lead to an increase in subjective difficulty to produce a deeper learning environment (Klepsch & Seufert, 2020). Desirable difficulties includes the idea that the “difficultly level should be ‘just enough’ to engage learners as well as not too much cognitive load so as not to frustrate learners” (Nihalani & Robinson, 2021, p. 17). Thus, by reducing extraneous load of the learning management system and including course materials that are difficult enough to encourage engagement, instructional designers and course instructors can promote both motivation and schema-formation within the
course. By creating opportunities for course materials to increase content learning without increasing extraneous load, learners can develop a deeper sense of the content and build better connections across learning objectives.

One way to develop this course experience is through utilizing components from the Learning Management System. For example, the courses included in this study are housed within the Canvas Learning Management System. Thus, instructors can use grouping structures, like modules, to organize course content by topic, assessment, or week. This function allows instructors to develop student pathways through the content that allow the course experience and exposure to build course content connections. Also, using a consistent course navigation across courses, either through course templating from the institution or another method, students can build knowledge between courses that reduce extraneous cognitive load and provide more opportunity to focus on course content.

Furthermore, the affective component of motivation can be examined in terms of decreasing extrinsic motivational requirements in online courses. Decreasing reward- and punishment-based course policies could allow for the development of online courses that promote learner persistence. By lowering these elements of extrinsic motivation, such as grades, digital badging, extra credit, etc., learners can develop a greater sense of motivation towards learning the material rather than achieving the reward or avoiding the punishment. Specifically, the inclusion of such extrinsic rewards have been associated with limited performance and increased stress and anxiety (Chamberlin et al., 2018; Van den Broeck et al., 2021). Thus, focusing on course policies that promote intrinsic motivation rather than extrinsic motivation can develop learning environments that contribute to persistence.
Limitations and Considerations for Future Research

This study was limited by various factors. First, persistence is a multifaceted concept that includes a variety of internal and external factors (Bean & Metzner, 1985; Rovai, 2003; Tinto, 1975, 1988). This study focused solely on institutional factors of pedagogy as seen through the element of cognitive and affective factors of course design. Not including learner-based factors contributing to persistence limits the scope of this study and its findings. For example, researchers note that examining the cognitive load or motivational scores of specific ethnic groups, genders, age groups, or other individual factors contributing to persistence could provide further insight into these groups and the relative flexibility of this model to encompass all learners (Barbera et al., 2020). Alternatively, one could suggest that examining more individual factors, like how many credit hours the learner is currently enrolled in, could provide more insight into the overall persistence model (Shea & Bidjerano, 2018).

Another limitation may relate to the timing in terms of the length of courses and when the data was collected. This study focused on a narrow scope of courses, looking specifically at one eight-week term of online courses. By not including multiple terms, the findings of this study are limited to these courses. For example, it could be more difficult to sustain germane cognitive load in a full-term (15-week) course as the content is more diffused across the multiple weeks. Conversely, examining even shorter terms (4-week) courses could provide insight into how decreased time to complete may affect motivation or cognitive load within the course. Alternatively, empirical literature suggests that longer courses provide more opportunities to examine persistence, as learners have more opportunities to make persistence decisions. Thus, using full-term courses as a basis of study could provide more insight into the role of cognitive load and motivation as a predictor variable for persistence within those settings as other research
has examined the role of course length in terms of persistence (Austin & Gustafson, 2006; Griffith et al., 2021). Finally, this study examined learner perceptions of cognitive load and motivation at one point in time during the course experience. Further study may be needed to show how perceptions of cognitive load and motivation change throughout the course as more course materials are experienced by the learner.

Further limitations of this study are found in the predictor variables chosen for this model. One example was this study focused specifically on intrinsic motivation, extrinsic motivation, and amotivation as factors to consider. By limiting motivational factors to Self-Determination Theory and these three aspects of that theory, one could argue that the breadth of learner motivation was not fully encapsulated as part of the persistence model. For example, when discussing motivation, others have discussed the importance of external regulation, introjected regulation, and integrated regulation (D. Cook & Artino, 2016; Van den Broeck et al., 2021, 2021). However, in this study, these categories were not examined as separate constructs. Including these aspects of motivation in future research could provide a more nuanced view of how these categories of motivation are situated within the persistence model suggested by this study. This more nuanced view could provide more information as to which of these various types of extrinsic motivation may be individually significant when examining persistence in online courses.

Another limitation and opportunity for future research includes the temporal aspect of the study. This study was also limited in that it examined motivation and cognitive load at one point in the course, during the first two weeks of the learners’ course experience. This limitation provides a snapshot of the learners’ perceptions of motivation and cognitive load but does not provide insight into how cognitive load and/or motivation may change or shift due to exposure to
course materials. Future research may include a multiple measures examination of cognitive load
and motivation throughout a course experience (Anmarkrud et al., 2019; Chenu et al., 2018).

This study provides multiple opportunities for future research into how cognitive and
affective aspects of course design are related to learner experiences in online asynchronous
courses. First, as this study had a limited number within the non-persisting group, further
research into a larger sample size can further this model of persistence in including both
cognitive and affective factors of course design. Second, further research in motivation has
revealed a more nuanced view of self-determination theory in learner course outcomes. Future
research should include a more nuanced view of motivation to include external regulation,
introjected regulation, identified regulation, and integrated regulation as part of the motivation
consideration (Howard et al., 2021).

Finally, this study examined courses indiscriminately across subjects and instructors,
which include a variety of course design models and learning experiences. Narrowing the study
to specific online courses across multiple terms could provide a richer examination of course
design and develop opportunities to develop this model of persistence through multiple
iterations. For example, it could be that STEM courses induce a higher intrinsic load, which
mitigates the effect of germane load within those courses, leading to different persistence
decisions. Or humanities courses may have lower germane cognitive load, suggesting that it is
more difficult to see higher level connections in the content and reduce the likelihood of
persistence. As a majority of cognitive load research uses STEM subjects (Mutlu-Bayraktar et
al., 2019), examining differences between STEM and non-STEM courses could further this
research. This limitation also applies to motivational factors, as some STEM courses may lead to
a certificate within the degree program, creating extrinsic rewards for the course. Examining
types of extrinsic reward as a predictor for persistence may further clarify this model. Further research, both quantitative survey and qualitative interview, may provide more answers to the aspects of course design that are directly related to persistence across multiple online course settings.

Future research may also benefit from a variety of settings. While this study considered online learners at a mid-sized community college in the southeastern United States, future research may benefit from examining community colleges in other areas, as well as online university or high school learners. This type of research could provide further generalizability of these findings, particularly considering the limited numbers in the non-persisting group. Utilizing other research sites may also be beneficial in highlighting how various research sites organize course materials or utilize other course evaluation methods and/or templates to design their online courses. By examining a variety of course experiences, the role of cognitive load and motivation be considered more broadly in determining their predictive value in persistence.

Finally, future research may benefit from examining other aspects of the learner experience within online courses to predict persistence. For example, future research could consider self-efficacy in learners and/or instructors as a component of pedagogical factors that lead to persistence. Other aspects of Rovai's (2003) persistence model can be examined in isolation, including academic integration, course availability, clarity of programs, and further pedagogical factors included within the online course experience. Further research could also examine the relative differences in perceived cognitive load across different course subjects in an effort to quantify which courses may need further instructional design assistance in an effort to produce courses that lead online learners to persistence.
Conclusion

In summary, this study found statistical significance using this model of persistence focused on the pedagogical aspects of course design, both cognitive and affective, as a predictor in the community college context of accelerated asynchronous online courses. The predictor variables of germane cognitive load, intrinsic motivation, and extrinsic motivation were found to have statistical significance in the model as key predictors in the relationship. More research is needed to understand the full scope of the predictive relationship among these factors of cognitive load and motivation as a predictor in persistence. These findings also serve to further the understanding of persistence factors outside of the individual learner to how instructional designers and course instructors can play a pivotal role in the development of courses that have the capability to produce environments conducive to learner persistence in online courses.
REFERENCES


https://doi.org/10.2307/1170245


https://doi.org/10.1016/j.iheduc.2011.05.001


Burkes, K. M. E. (2007). *Applying cognitive load theory to the design of online learning* [Ph.D., University of North Texas].

http://search.proquest.com/pqdtglobal/docview/304814884/abstract/5A5E82747BA34463PQ/1


https://doi.org/10.1080/0144929X.2016.1276964


Ferrer, J., Ringer, A., Saville, K., Parris, M., & Kashi, K. (2020). Students’ motivation and engagement in higher education: The importance of attitude to online learning. *HIGHER EDUCATION.*

https://doi.org/10.1007/s10734-020-00657-5


community college students. *Journal of College Student Retention: Research, Theory and
Practice, 12*(1), 69–86. https://doi.org/10.2190/CS.12.1.e

intrinsic, extraneous, and germane cognitive load. *Frontiers in Psychology, 8.*
https://doi.org/10.3389/fpsyg.2017.01997

Klepsch, M., & Seufert, T. (2020). Understanding instructional design effects by differentiated
measurement of intrinsic, extraneous, and germane cognitive load. *Instructional Science, 48*(1),

Lange, C., Costley, J., & Han, S. (2017). The effects of extraneous load on the relationship between self-
regulated effort and germane load within an e-learning environment. *International Review of
Research in Open & Distance Learning, 18*(5), 64–83. https://doi.org/10.19173/irrodl.v18i5.3028

Legault, L., Green-Demers, I., & Pelletier, L. (2006). Why do high school students lack motivation in the
classroom? Toward an understanding of academic amotivation and the role of social support.
*Journal of Educational Psychology, 98*(3), 567–582.

Marachi, R., & Quill, L. (2020). The case of Canvas: Longitudinal datafication through learning
https://doi.org/10.1080/13562517.2020.1739641

Martin, F., Ritzhaupt, A., Kumar, S., & Budhrani, K. (2019). Award-winning faculty online teaching
practices: Course design, assessment and evaluation, and facilitation. *The Internet and Higher


http://www.proquest.com/pqdtglobal/docview/2384881466/abstract/32B1593E12EC4F73PQ/1


Appendix A

The following instrument is adapted from the Cognitive Load Questionnaire (Klepsch et al., 2017). The following statements were measured on a Likert-type scale of one to seven, one being classified as “absolutely wrong” and seven as “absolutely right.” The scale was adapted to included language related to course design rather than specific task as this study focuses on the course as a whole. The edits to the original scale are included in italics below.

1. For the design of this course, many things need to be kept in mind simultaneously.
2. The design of this course is very complex.
3. I made an effort, not only to understand several details, but to understand the overall context.
4. My point while dealing with the design of this course was to understand everything correctly.
5. The learning tasks within this course design consisted of elements supporting my comprehension of the course.
6. For this course design, it was exhausting to find the important information.
7. The design of this course was very inconvenient for learning.
8. For the learning tasks within this course design, it was difficult to recognize and link the crucial information.
Appendix B

The following instrument is Work Preference Inventory (Amabile et al., 1994). The following statements were measured on a Likert-type scale of one to four, one being classified as “never or almost never true of me” and seven as “always or almost always true of me.” The instrument items used reflected the academic questions included in the instrument rather than the industry questions.

1. I am not that concerned about what other people think of my work.
2. I prefer having someone set clear goals for me in my work.
3. The more difficult the problem, the more I enjoy trying to solve it.
4. I am keenly aware of the goals I have for getting good grades.
5. I want my work to provide me with opportunities for increasing my knowledge and skills.
6. To me, success means doing better than other people.
7. I prefer to figure things out for myself.
8. No matter what the outcome of a project, I am satisfied if I feel I gained a new experience.
9. I enjoy relatively simple, straightforward tasks.
10. I am keenly aware of the GPA (grade point average) goals I have for myself.
11. Curiosity is the driving force behind much of what I do.
12. I’m less concerned with what work I do than what I get for it.
13. I enjoy tackling problems that are completely new to me.
14. I prefer work I know I can do well over work that stretches my abilities.
15. I’m concerned about how other people are going to react to my ideas.
16. I seldom think about grades and awards.

17. I’m more comfortable when I can set my own goals.

18. I believe that there is no point in doing a good job if nobody else knows about it.

19. I am strongly motivated by the grades I can earn.

20. It is important for me to be able to do what I most enjoy.

21. I prefer working on projects with clearly specified procedures.

22. As long as I can do what I enjoy, I’m not that concerned about exactly what grades or awards I can earn.

23. I enjoy doing work that is so absorbing that I forget about everything else.

24. I am strongly motivated by the recognition I can earn from other people.

25. I have to feel that I’m earning something for what I do.

26. I enjoy trying to solve complex problems.

27. It is important for me to have an outlet for self-expression.

28. I want to find out how good I really can be at my work.

29. I want other people to find out how good I really can be at my work.

30. What matters most to me is enjoying what I do.
Appendix C

The following instrument is the Academic Amotivation Scale (Legault et al., 2006). The following statements were measured on a Likert-type scale of one to seven, one being classified as “does not correspond” and seven as “corresponds exactly” to answer the question “Why do you not want to study?” No edits were made to this instrument for use in this study.

1. Because, for me, school holds no interest.
2. Because studying is not valuable to me.
3. Because I have no good reason to study.
4. Because studying is not important to me.
5. Because I don’t have what it takes to do well in school.
6. Because I don’t have the knowledge required to succeed in school.
7. Because I’m not good at school.
8. Because the tasks demanded of me surpass my abilities.
9. Because I find that studying is boring.
10. I don’t like studying.
11. Because I have the impression that it’s always the same thing everyday.
12. Because my school work is not stimulating.
13. Because I’m a bit lazy.
14. Because I’m not energetic enough.
15. Because I can’t seem to invest the effort that is required.
16. Because I don’t have the energy to study.
Appendix D

The following is a list of the sixty-one courses included in the second-eight week term at the research site. Institutional course codes were removed from the list.

Art Appreciation
Intro to Business
Legal Environment of Business
Business Communications
Principles of Biology I
Principles of Biology II
General Biology I
General Biology II
Nutrition
Anatomy & Physiology I
Anatomy & Physiology II
Microbiology
Introduction to Keyboarding
Social Media Management
Human Resource Management
General Chemistry Lab I
General Chemistry I
Police Operations
Survey of Criminalistics
Computer Applications I
Beginning English & Reading
Intermediate English & Reading
English Composition I
English Composition II
Creative Writing I
American Literature I
World Literature I
Child Psychology
Human Growth & Development
World Geography
Western Civilization I
Western Civilization II
American History I
American History II
Personal & Community Health
PE for Elementary School
Baseball Theory
Softball Theory
Prevention & Care of Athletic Injuries
News Write and Report I
Orientation
Enhancement of Study
Beginning Algebra
Intermediate Algebra
College Algebra
Geometry Measurement Probability
Spanish II
Music Appreciation
New Testament Survey
Intro World Religion
General Psychology
Adolescent Psychology
Applied Behavior Analysis
Intro to Sociology
Social Problems
Marriage and Family
Public Speaking
Appendix E

The following rubric is used by the study site as part of the online course evaluation process.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The site uses a 1-5 scale for each category, with 5 being the highest possible score.
<table>
<thead>
<tr>
<th>Learning Module: E-Learning to Provide Video Resources to Address the Needs of Students with Diverse Learning Styles, Along with Homework Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed Syllabus - Course Description (42 pages)</td>
</tr>
<tr>
<td>HG 120C Academic Honesty Policies (Handout)</td>
</tr>
<tr>
<td>Course Syllabus - My Homes Curriculum</td>
</tr>
<tr>
<td>Course Syllabus - My Homes Curriculum - student modules, and policies</td>
</tr>
<tr>
<td>Pledge included for reference, including error (even for <strong>AND LAB POLICIES</strong> <strong>AND LAB POLICIES</strong>) Included in the Module</td>
</tr>
</tbody>
</table>

**This is the one-stop-shop for course information**

<table>
<thead>
<tr>
<th>Important Course Information: Module ** 1** NOT mandatory to a student's success in the class - the details presented policy grading rubrics if needed be here</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module #1 - Course Material ( \text{COM} ) is complete</td>
</tr>
<tr>
<td>Module #1 - Course Material ( \text{COM} ) is complete</td>
</tr>
<tr>
<td>Module #1 - Course Material ( \text{COM} ) is complete</td>
</tr>
<tr>
<td>Module #1 - Course Material ( \text{COM} ) is complete</td>
</tr>
<tr>
<td>Module #1 - Course Material ( \text{COM} ) is complete</td>
</tr>
</tbody>
</table>

**Online Curriculum Module **

<table>
<thead>
<tr>
<th>Announcements - Weekly Assignments along with daily class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcements - Weekly Assignments along with daily class</td>
</tr>
<tr>
<td>Announcements - Weekly Assignments along with daily class</td>
</tr>
<tr>
<td>Announcements - Weekly Assignments along with daily class</td>
</tr>
<tr>
<td>Announcements - Weekly Assignments along with daily class</td>
</tr>
</tbody>
</table>

**Announcements - Weekly Assignments along with daily class**

<table>
<thead>
<tr>
<th>Syllabus - Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DO NOT</strong> (completions) who I'm using</td>
</tr>
<tr>
<td>Syllabus - Policies</td>
</tr>
<tr>
<td>State Board of Education - Arizona College</td>
</tr>
<tr>
<td>State Board of Education - Arizona College</td>
</tr>
<tr>
<td>State Board of Education - Arizona College</td>
</tr>
<tr>
<td>State Board of Education - Arizona College</td>
</tr>
</tbody>
</table>

**Students* arcs**: Student 

<table>
<thead>
<tr>
<th>Course Course Navigation Menu: Organize your menu for student convenience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Course Navigation Menu: Organize your menu for student convenience</td>
</tr>
</tbody>
</table>
| Grades: All students are required to discuss the current week's readings and to participate in the discussion. The discussion is held in the seminar.

| Discussions: It is important for all students to participate in the discussions. The discussions help students understand the material.

| Goals: All students are expected to read and analyze the assigned readings.

| Activities: The activities include reading assignments, discussion questions, and problem sets.

| Products of the seminar: The seminar includes reading assignments, discussion questions, and problem sets.

| Process: The process includes reading assignments, discussion questions, and problem sets.

| Exam schedule: The exam schedule is as follows:

| Final Exam: All exams are scheduled for the same time.
<table>
<thead>
<tr>
<th>Total Points</th>
</tr>
</thead>
</table>

- **Spelling and grammar are correct.**
- All hypenations are acknowledged (space one word per line). (0 points)
- Code may be indented until needed. Indent 2 spaces per line. (0 points)
- Final Grade Column must be 6 digits. (0 points)
- Proctored Exam (must count at least 25% of the final average). (0 points)
- Course assignment (weight, total points, etc.)

**Assignments: (websites, total points, etc.)**

Generated reports are clearly stated in *Problems* and matches what is in
Appendix F

The following includes IRB approval.

**IRB #:** PRO-FY2022-13  
**Title:** Motivation and Cognitive Load: Examining the Relationship of Cognitive and Affective Outcomes in Online Courses  
**Creation Date:** 7-9-2021  
**Status:** Approved  
**Principal Investigator:** Alan Kinsey  
**Review Board:** University of Memphis  
**Sponsor:**

---

**Study History**

<table>
<thead>
<tr>
<th>Submission Type</th>
<th>Initial</th>
<th>Review Type</th>
<th>Expedited</th>
<th>Decision</th>
<th>Approved</th>
</tr>
</thead>
</table>

**Key Study Contacts**

<table>
<thead>
<tr>
<th>Member</th>
<th>Role</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew Tawfik</td>
<td>Co-Principal Investigator</td>
<td><a href="mailto:aatawfik@memphis.edu">aatawfik@memphis.edu</a></td>
</tr>
<tr>
<td>Alan Kinsey</td>
<td>Principal Investigator</td>
<td><a href="mailto:awkinsey@memphis.edu">awkinsey@memphis.edu</a></td>
</tr>
<tr>
<td>Alan Kinsey</td>
<td>Primary Contact</td>
<td><a href="mailto:awkinsey@memphis.edu">awkinsey@memphis.edu</a></td>
</tr>
</tbody>
</table>