THE RELATIONSHIP OF STUDENT-TEACHER TRANSACTIONAL DISTANCE AND STUDENT SELF-REGULATION, COMMUNITY PRESENCE, AND SATISFACTION IN ONLINE COURSES

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ABSTRACT

This study explored the relationship between student perceptions of transactional distance between themselves and their teachers and their sense of community presence as measured by the Community of Inquiry Questionnaire (Arbaugh et al., 2008), use of self-regulated learning skills as measured by the Online Student Learning Questionnaire (OSLQ) (Barnard-Brak et al., 2010), and satisfaction with online courses using one section of the TDSRECH questionnaire (Weidlich & Bastiaens, 2018). The study used a mixed methods converging approach and consisted of a five-point Likert style survey and semi-structured interviews. The population of interest was undergraduate college students in three community colleges and one 4-year college in a university system in the pacific. A link to the survey was sent to teachers with at least one online course requesting that they share the survey with their students, resulting in a sample size of 203. Participants who provided emails for follow up interviews were contacted, and 12 semi structured interviews followed. Exploratory factor analysis and thematic analysis of interview transcripts showed that Learner-Teacher Transactional Distance was part of a larger construct labeled Learner-Teacher Engagement, and that Satisfaction was related to both Learner Teacher Engagement and Cognitive Engagement. No significant correlation was found between Learner-Teacher Transactional Distance and student self-regulation of learning , however self-regulation skills and engagement with the community of learners is critical for cognitive engagement.

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CHAPTER 1. INTRODUCTION

Online courses offer benefits to students by collapsing barriers of distance and time, allowing college attendance while working, parenting, or living thousands of miles from the school. However, with the benefits come challenges related to transactional distance (TD) between the student and teacher, course content, and other students that are not present in face-to-face (F2F) courses. With COVID-19 restrictions on campus-based F2F class meetings, students who traditionally would have enrolled in F2F classes now find themselves online coping with unexpected challenges, as do teachers who were used to face-to-face classrooms.

Statement of the Research Problem

Barriers exist in any educational environment regardless of the venue or mode in which it is conducted. For example, in a F2F classroom, students' metacognitive skillsets will vary depending on experience in classrooms and prior knowledge of study skills, and teaching methods and experience vary among instructors which either support or hinder student success.

However, online courses offer distinct challenges to learners not encountered in a F2F classroom. For example, asynchronous discussion forums with organized teams or groups are often the sole formal method for learners to interact with peers and the instructor in online courses, a very different process from how learners interact in the F2F classroom (Dixon et al., 2006; Gunawardena & Zittle, 1997; Rogers & Lea, 2005). Taking courses online can impact student engagement by increasing learner-teacher transactional distance (Chen, 2001; Falloon, 2011; Giossos et al., 2009; M. Moore, 1973), decreasing sense of community (Garrison,

Anderson, & Archer, 2001; Garrison & Cleveland-Innes, 2005; Garrison, Cleveland-Innes, & Fung, 2010), and satisfaction (Dixson et al., 2017; Gunawardena & Zittle, 1997).

The challenge of teaching and learning at a distance led to the development of a Theory of Transactional distance (TTD)(Moore, 1973; Moore, 1989). TTD proposes that as dialog (direct engagement) with the teacher decreases, the student's autonomy, or ability to self-direct their learning, becomes more necessary to success and satisfaction in online courses. Self-regulated learning (SRL) involves developing a plan for learning that includes acquiring information prioritizing, and integrating information according its relative importance (Barnard-Brak et al., 2010). This often requires some level of interaction and co-learning with peers enrolled in the course (Garrison, 2018). Self-regulated Learning (SRL) is a learned metacognitive skillset (Garrison & Akyol, 2015). Learning and the development of metacognitive skills thus occurs, or fails to occur, through a process of interaction with teachers and peers in the classroom with students ostensibly acquiring the skills required for learning validation, fact checking, and collaboration (Barnard-Brak et al., 2010; Garrison & Akyol, 2015).

Socioeconomic issues, mental and physical health, access to learning materials, time, and many other factors constitute barriers which in effect increase the psychological distance the online student must overcome. In addition to unmodifiable barriers, online learning adds further barriers and potentially greater transactional distance by narrowing the bandwidth of teacher-learner interactions even as it eliminates geographic barriers. In any classroom, the instructor is both a source of information and a facilitator in removing or mitigating barriers by reducing the perception of distance and empowering students to learn and utilize metacognitive skills. In each online course, a student with metacognitive skills, a strong sense of community with peers and the instructor and a good internet connection may experience little or no TD related barriers to

successful learning and satisfaction, while another student lacking any one of these components may experience a very high level of TD and find themselves having difficulty succeeding or even completing a course. Because part of the teacher's role is as a facilitator, it is important to understand the relationship between TD, SRL, community presence, and satisfaction to empower teachers to effectively support student success.

Research Questions

The research questions for this study focus on the relationship of transactional distance between the student and instructor and the student's use of self-regulatory skills, sense of community, and satisfaction with online courses. TTD includes learner-teacher, learner -content and learner-learner TD. This study focuses on learner-teacher TD (LTTD) and defines it as the distance of understanding between the teacher and student. Community Presence is defined through the CoI framework as teaching presence, social presence, and cognitive presence, and learner self-regulation is defined though the SRL model (Barnard-Brak et al., 2010; Zimmerman, 1989).

The research questions for reflect the phase 1 quantitative part of the study:

1. What is the relationship between LTTD and student use of SRL skills in online courses?
2. What is the relationship between LTTD and student sense of CP in online courses?
3. What is the relationship between LTTD and student Satisfaction in online courses?

Phase two research questions are qualitative and form the explanatory part of the study:

4. How do student perceptions of learner-teacher transactional distance influence decisions on the use of self-regulated learning skills?

5. How do student perceptions of learner-teacher transactional distance influence participation in the online course community?
6. How do students describe satisfaction in the context of online learning, and how do perceptions of learner-teacher transactional distance influence satisfaction in online courses?

Purpose of the Study

The purpose of this study was to investigate the relationship between LTTD, SRL, CP, and Satisfaction in the context of online community college courses using a sequential thematic mixed methods approach. The study explored how LTTD may influence student acquisition and use of self-regulation skills in online courses. Because of the central role the instructor plays in online learning design, management, and interaction, it is also important to explore the relationship between LTTD and the learner's sense of community in online learning. Finally, the relationship between LTTD and satisfaction will be explored because satisfaction has a well-known connection to persistence in online learning (Tinto, 1975; Shin & Chun, 2003).

Significance of the Study

While many studies have explored transactional distance, learner self-regulation, satisfaction, and learning communities separately, few have specifically studied the relationship between the student's perceptions of the psychological distance, or distance in understanding between learner and instructor and the learner's use of self-regulation skills, satisfaction with online learning, and sense of community in the online learning environment. This study is important because literature supporting the constructivist paradigm underpinning course design

and facilitation stresses the critical role of discussion, peer collaboration to construct knowledge, yet does not address the student use of metacognitive skills needed for collaborative learning (Barnard-Brak et al., 2010; Cho, 2004; Rovai, 2002, 2007; Schrire, 2004). Indeed, some researchers have argued that there is not abundant evidence of meaningful collaboration leading to deep learning in collaborative learning communities (Annand, 2011; Rourke & Kanuka, 2009). This leads to the question of whether deep learning in collaborative online courses is not being captured in the study data because of the questions being asked, because of elusive variables, or because it is not happening (Annand, 2011; Rourke & Kanuka, 2009). This study will attempt to address these unknowns by focusing on the relationship of LTTD, student use of SRL, satisfaction, and the student's sense of community presence in online courses.

Theoretical Framework

Transactional Distance Theory, Zimmerman's model of learner self-regulation, and the CoI model formed the initial theoretical framework for this study (Garrison, 2018; Moore, 1993; Zimmerman, 1989). LTTD is a subset of The Theory of Transactional Distance (TTD) and represented the student experience of the distance of understanding, or the psychological distance, between the student and the instructor (Giossos et al., 2009). This study focused on LTTD as a distance in understanding between the learner and instructor, as this was the definition operationalized for LTTD in prior research leading to the development of a validated survey instrument exploring LTTD (Giossos et al., 2009, 2016).

The CoI Model provided a framework for exploring community presence for this study, with dimensions of Social Presence, Teaching Presence, and Cognitive presence (Garrison et al., 2010). Together the three dimensions create a model of a virtual learning community that is well

established in research literature. In this study the CoI framework is defined as Community Presence (CP) Finally, SRL was represented with Zimmerman's (1989) SRL model composed of dimensions of Forethought, Performance Control, and Self-reflection using the online student learning questionnaire (OSLQ) (Barnard-Brak et al., 2010; Zimmerman, 1989).

Participants and site

IRB approval was obtained prior to recruitment of participants for the study. Ethical treatment of participants physically, emotionally, and psychologically was paramount. Strict adherence to COVID-19 protocols as instituted by the IRB was followed, with all data collection completed with an online questionnaire and interviews completed through a video conferencing application. Participants were all college students currently enrolled in online courses within three community and one 4-year college, all part of a major public university system in the Pacific.

Instrumentation

The instrumentation for this study was a Likert style survey tool for phase 1 of the study, and a semi-structured interview script and the Zoom video conferencing application (55 Almaden Blvd, San Jose, CA 95113). For the phase 1 questionnaire three previously validated questionnaires were utilized with permission from the authors. The LTTD Questionnaire collects data on LTTD, defined as the distance of understanding between the teacher and the learner in an online course. LTTD captures one aspect of TD, but it does not address the construct of autonomy in TTD. Therefore autonomy is operationalized as Self-regulated learning (SRL) in this study and so data was collected using all items from the OSLQ (Barnard-Brak et al., 2010;

Zimmerman, 1989). For student perceptions of CP, the CoI questionnaire is well known and validated (Arbaugh et al., 2008).

Data collection

A sequential process of quantitative data collection using an online questionnaire deployed through online community college teachers to students was followed by semi-structured interviews of selected participants who agreed to participate in recorded interviews. Online surveys have the advantage of ease of sending electronic survey tools to participants, somewhat automated data collection, and the widespread acceptance of online survey tools and techniques by both researchers and participants (Evans & Mathur, 2018). Online surveys on average have a lower response rate than paper or face-to-face surveys (Fan & Yan, 2010). However, ease of use and the ability to send surveys electonically across the world compensates for this somewhat (Chang & Vowles, 2013). Also, steps can be taken to increase response rate. While online surveys can collect quantitative information, qualitative semi-structured interviews will collect richer data with greater depth to better understand the experience of online students with transactional distance, community, self-regulation strategies and skills, and satisfaction.10

Data Analysis

Quantitative data analysis included descriptive statistics followed by correlation studies. Thematic analysis methods with coding and thematic clustering led to an overarching theory to explain the student experience of the main concepts of LTTD, CoI, and Satisfaction with online course(s). A relationship between LTTD and SRL was not supported directly. This iterative process of quantitative analysis was followed by recursive qualitative analysis of 12 interviews.

Limitations

While this study indicated correlation between LTTD, Teaching Presence, and Satisfaction, it does not establish causality. This study is also limitedd by a lack of data on the impact of socioeconomic stressors outside of the course environment on learners and instructors, which can have a significant impact on learner perceptions. The sample of the population that chooses to complete the questionnaire will mean that there is a chance of sampling error through participant self-selection. Finally, while conclusions based on data analysis may appear to "fit" reality, other conclusions from a different analysis of the same data may also fit as well.

CHAPTER 2. REVIEW OF LITERATURE

One of the greatest challenges of teaching and learning in virtual learning environments is the limitation placed on the learner's sense of presence and immediacy due to the learner's perception of disconnection from the instructor and learning environment (Falloon, 2011; Garrison, 2000a; M. Moore, 1973). In turn this impacts the creation and maintenance of communities of learners (Traver et al., 2014) and intent to persist in college (J. Kim et al., 2011; Shin & Chan, 2004; Tinto, 1975). Virtual learning environments are separate from real world embodiment, even though within context virtual worlds are self-consistent environments (Bronack et al., 2008; Wang, 2011). That is, the participants within a virtual world interact with each other using media that embodies a consistent reality (Childs et al., 2012; Uzun & Aydin, 2012). However, even with high fidelity virtual environments there is a barrier to communication caused by limited bandwidth and a lack of real-world embodiment in the form physical presence in the environment with other participants (Beaumont et al., 2014; Chen & Willits, 1998; Gunawardena & Zittle, 1997; Hung et al., 2014). The distance that learners and instructors experience in virtual learning environments was first described by Moore (1993) as a psychological distance and pedagogical distance rather than a geographical or temporal distance. In virtual learning environments, fidelity is a term used to describe how accurately or seamlessly the virtual environment emulates the real world. Participants in both high and low fidelity virtual environments experience transactional distance, a psychological distance between the learner, the instructor, and the environment (Chen, 2001; Falloon, 2011b; Giossos, Koutsouba, & Lionarakis, 2009; Moore, 1993; Moore, 1989) and attempt to overcome this distance in order to communicate effectively (Driscoll, Jicha, Hunt, Tichavsky, & Thompson, 2012; Gunawardena &

Zittle, 1997; Y. Kim & Thayne, 2015; Kuo, Walker, Schroder, & Belland, 2014; Moore, 1993). It is important to understand how learners and instructors perceive and adapt to transactional distance in virtual learning communities. Hence, this study explores learner perceptions of transactional distance on communication, study processes, and sense of presence socially, cognitively, and with the instructor. A community of inquiry (CoI) model was implemented to represent community presence, as the learning environment in which to operationalize the concept of transactional distance. The advantage of the CoI model is that the CoI model is well defined and studied (Arbaugh et al., 2008; Garrison et al., 2004, 2010; Garrison & Cleveland-Innes, 2005); and best reflects the college-level virtual learning environment experienced by learners.

Transactional Distance

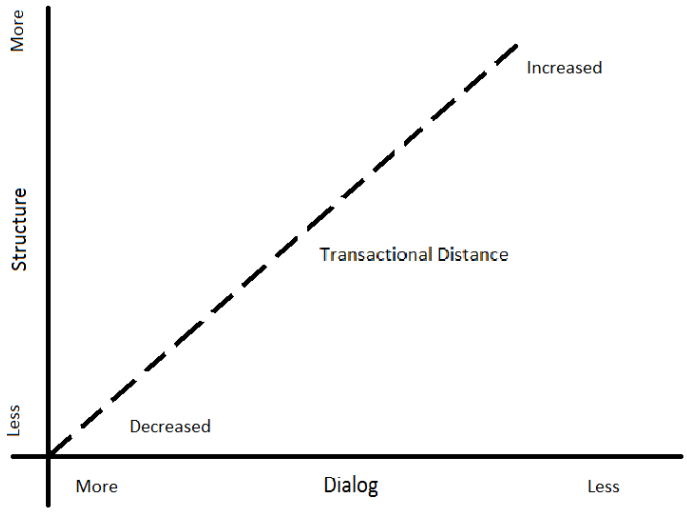
The Theory of Transactional distance (TTD) is a pedagogical model to explain the "distance" in distance education (Moore, 1993). In virtual learning environments, geographic distance is not a critical factor. Instead, psychological distance, or a distance in understanding, is the criterion for assessing the distance between instructor and learner, learners from each other, and learners from the content to be learned (Chen & Willits, 1998; Giossos et al., 2009; M. G. Moore, 1989). Transactional distance was operationalized originally as instructor-learner dialog and course structure. TD theory holds that the more structure is built into a course, the less dialog occurs, and transactional distance increases. Conversely, the greater the dialog between learner and instructor, the less TD is experienced by the learner. Later, learner autonomy was added to account for independent learning. Moore (1993) did not qualify TD as either good or bad, but rather as a condition to manage for optimal learning.

Origins of Transactional Distance Theory

According the Garrison (2000) “Theory can provide a perspective that reduces complexity while suggesting generalizability”(p. 3) . The conceptual framework for a post-modern TTD in online education was introduced as part of a paper on independent learning in non-traditional educational models (Moore, 1973). At the time, this included any coursework learners participated in outside of the traditional university system. However, the term *transactional distance* did not occur until later (Moore, 1993). Moore (1989) proposed terms for learner-content, learner-learner, and learner-instructor interactions, reflecting the growth of computer mediated distance learning. By the mid 1990’s the TTD had become identified as a foundational distance education theory (Benson & Samarawickrema, 2009; Benton et al., 2013; Biocca, 2000; Falloon, 2011; Garrison, 2000a; Saba, 2003, 2011). Later researchers elaborated on the sub concepts of autonomy, structure, and dialog, adding important dimensions such as learner self-efficacy, perceived instructor presence, and sense of social belonging (Benton, Li, Gross, Pallett, & Webster, 2013; Huang, Chandra, Depaolo, Cribbs, & Simmons, 2015).

Moore’s (1973) theory of transactional distance is perhaps best illustrated by the earliest depiction of the theory as a simple graph as shown in figure 1.

Figure 1. The relationship of dialog and structure (Moore, 1991)



Dialog and Structure in Transactional Distance Theory

Moore described what Saba (2003) termed a cybernetic, or auto regulatory relationship between the learner and the instructor. Dialog in TTD is key to instructor-learner communication, allowing personal communication and feedback and requiring very little structure in the course. Defining dialog in terms of pedagogical or psychological distance rather than physical distance represented a paradigm shift in thinking about the "distance" in distance education by redefining distance as the ability of the student and instructor to interact effectively and affectively. A course composed of only dialog, for example via synchronous communication would have minimal TD. Conversely, as dialog decreases, structure is required to provide direction and content to the learner. This was the core of how TD was operationalized at the time; as dialog decreased, autonomy and dependence on structure automatically increased. Hence, transactional distance described a pedagogical or psychological rather than geographic or temporal distance, with inter-related elements working in a constant and dynamic balance.

Autonomy in Transactional Distance Theory

While dialog and structure move in opposite directions in TD theory, autonomy moves in the same direction as structure. That is, as structure increases (and dialog decreases), autonomy will be required to increase. This made sense in the context of comparing correspondence held completely via paper mail and live television courses which allowed synchronous communication between instructor and student; however, videoconferencing added a much more dynamic level of interaction, and blurred the distinction between structure and dialog. For example, in a study of classroom use of remote videoconferencing, the instructor alternated between classroom sites for face-to-face instruction while the rest of the students at remote sites participated through videoconferencing (Chen & Willits, 1998). The researchers found that the face-to-face students consistently felt lower TD than the remote students, but that autonomy and structure were irrelevant in either group. Remote students complained of having a difficult time following discussion and getting their input into discussions. Because the structure of the class was the same for all students whether in-person or online, the ability to participate in dialog was uneven. Also, since the structure of the class depended on synchronous discussion alone students did not use significant metacognitive skills because there was no opportunity to demonstrate autonomy. Research into synchronous videoconferencing and chat sessions as well as asynchronous discussion boards have revealed that dialog, structure, and autonomy are fluid constructs that shift constantly even during a single interaction in (Chen, 2001; Saba & Shearer, 1994; Stein et al., 2005) More recently, online students have had access to more interactive learning spaces and more tools for both synchronous and asynchronous communication. This has made the use of metacognitive skills more important and obvious to researchers. Key to autonomy are a student's metacognitive abilities, which are a learned skillset and widely held to

be indispensable to success in online learning (Barnard-Brak et al., 2010; C.-Y. Lee, 2015; M. Moore, 1973). Metacognition can be broken down into regulatory skills typically associated with autonomous learning, and co-regulatory skills, which are skills used specifically when interacting with others (Barnard-Brak et al., 2010; Garrison & Akyol, 2015). This study uses the term Self-regulated Learning (SRL) to reflect the over-arching construct of learner autonomy, to include those aspects of metacognition involved in co-regulation.

Learner-Instructor, Learner-Learner, and Learner-Content Interaction

Within the paradigm of dialog, structure, and autonomy are three types of interaction. These are (a) learner-instructor; (b) learner-learner; and (c) learner-content interaction. Learner-interface has been proposed as another significant type of interaction in virtual earning environments (Weidlich & Bastiaens, 2018). While each type of interaction influences the learner experience and each is important to the design and execution of a successful course, most studies of transactional distance have focused on learner-instructor interaction as the most significant indicator of learner satisfaction (Giossos et al., 2009; Kuo et al., 2013; Weidlich & Bastiaens, 2018)

Critiques of Transactional Distance Theory

Despite the widespread acceptance of TTD as a core concept of distance education, there are concerns and disagreements with both the scope and the validity of the theory (Falloon, 2011; Garrison, 2000a; Gorsky & Caspi, 2005; Saba, 2003). TTD has been criticized for being too imprecise (Gorsky & Caspi, 2005) , too narrow (Kang & Gyorke, 2008), and mis-interpreted (Garrison, 2000b; Saba, 2003). Each criticism has merit, and points to the need for further research. Nonetheless, TD as a pedagogical phenomenon underpins social presence and

collaborative learning models in online learning environments in ways that have not been adequately operationalized or modeled in other ways (Dron, 2005; Gorsky & Caspi, 2005; Saba & Shearer, 1994).

Theoretical Validity. Perhaps the strongest criticism of TTD is that it is not really a theory at all, but a tautology (Gorsky & Caspi, 2005). From a purely reductionist perspective TD could be defined as the ease or difficulty of interaction, which plausibly be translates as meaning the better the communication, the better the communication (Gorsky & Caspi, 2005). This is a challenge with trying to model a complex theory in strictly empirical, reductionist terms. Kang and Gyorke (2008) recognized that operationalizing TD only through dimensions of dialog, structure, and SRL with fixed relationships to each other limited the application of the theory. The researchers compared TTD with cultural-historical activity theory to extend and redefine TTD to better measure social interaction.

Other researchers have disagreed with the way dialog, structure and autonomy in the original theory were operationalized, based on studies finding that dialog and structure can vary independently of each other and result in either high or low TD (Benson & Samarawickrema, 2009; Benton et al., 2013; Dron, 2005). For example, Benson & Samarawickrema (2009) found that high structure and high dialog together led to low TD for some students. And Dron (2005) argued that stigmergic signs and signals in the learning environment can blur the line between structure and dialog, further confounding the separation of variables.

Self-regulation of learning in autonomy is a third dimension of transactional distance theory that is not well defined. Associating autonomy with structure infers that only students with high levels of autonomy and perseverance (or grit) can function effectively in low dialog, high structure learning environments (Anderson et al., 2016). Terms defining intrinsic qualities

of learners such as self-efficacy and grit are social concepts and have been challenged as referring unjustly to personal traits rather than underlying socioeconomic and psychosocial impacts on the individual of the learning environment (Anderson et al., 2016). Autonomy in this context indicates that autonomy is a metacognitive skillset that some learners mysteriously possess, and others, equally mysteriously, do not. Though it seems intuitive that TD is relevant to these issues, operationalizing it rigidly as dialog, structure, and autonomy is unlikely to detect subtle social factors such as alienation, connectedness, and presence. TTD does not clearly demonstrate how the dimensions of autonomy, structure, and dialog relate to human factors, technology factors, and cultural factors, all of which affect transactional distance (Chen & Willits, 1998; Gorsky & Caspi, 2005). Forcing TTD into a narrow definition of dialog vs. structure, with autonomy as a vaguely related learner self-regulation coping mechanism is problematic because it limits TD as a useful measure of cognitive and psychological distance in online learning environments (Shea et al., 2006; Shea & Bidjerano, 2010).

Relationship of autonomy, dialog, and structure. Another critique of transactional distance theory concerns the way the dimensions of autonomy (or self-regulation), structure, and dialog interact (Garrison, 2000). Are they inversely related, or do they overlap and interact independently of the direction of the other dimensions? However, even with these published critiques, TTD is a comprehensive and still evolving framework that allows for the investigation of learner perceptions of psychological distance and is therefore appropriate for a study of this scope.

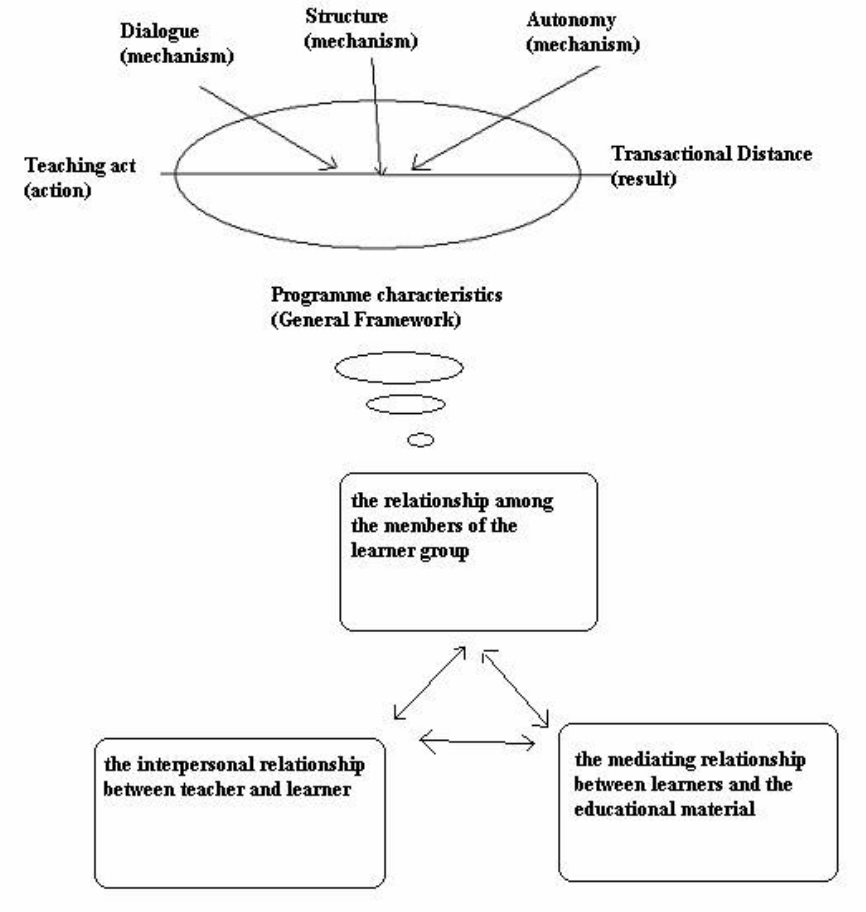
Operationalizing Transactional Distance

Operationalizing transactional distance is challenging because of the dynamic interaction of learner-instructor, learner-learner, learner-content, and learner-interface dimensions (Chen, 2001; Giossos et al., 2009; Saba & Shearer, 1994). Further, it is a challenge from a positivist perspective because of the inability of researchers to isolate variables in complex social environments (Giossos et al., 2009). This has led some researchers to move away from dialog, structure, and autonomy as the variables of interest in operationalizing transactional distance. Giossos, Koutsouba, and Lionarakis (2009) chose a critical realist approach, arguing that "The world of humans, and consequently, that of education, is an open system in which input and output cannot at any given time be controlled for. In other words, the effort to show a steady relationship between the variables of transactional distance and structure cannot lead to any concrete result" (Giossos et al., 2009, p.3). A critical realist approach looks at actions, mechanisms, and results within a specific context, recognizing that categories are provisional and subject to modification as new evidence is discovered (Bryman, 2016) .

Transactional Distance as a Theoretical Framework

Garrison (2000) stated that "A theoretical framework represents a broad paradigmatic set of assumptions that provides the elements of the theory but without the detail and completeness (nuances) of a comprehensive theory" (p.3).

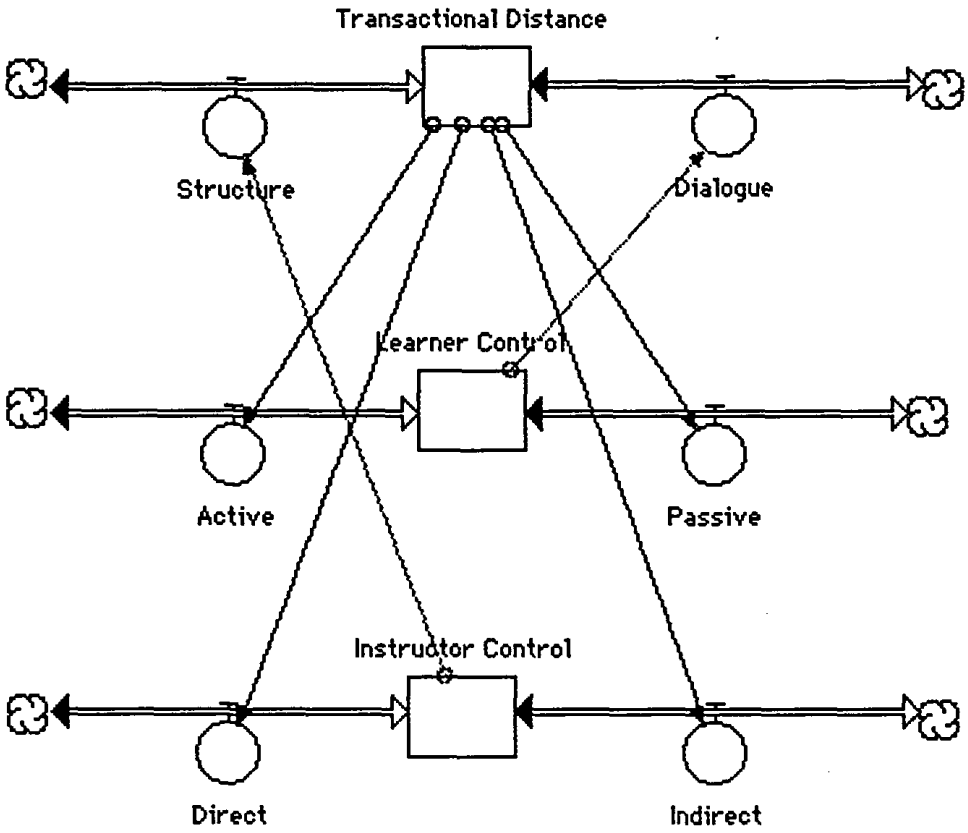
Figure 2. Model of transactional distance based on critical realism (Giossos et al., 2009)



This reflects a dynamic model of interaction which allows dialog and structure to vary independently rather than in a rigidly inverse manner, and led to a definition of TD as a distance of understanding rather than a psychological distance or communication space (Giossos et al., 2009). This addresses somewhat the issue described above of defining dialog, structure, and autonomy in overly narrow terms. A model of TD from a critical realist perspective illustrates three inter-related themes that bear a resemblance to the three dimensions of social, cognitive, and Teaching Presence in the CoI model (Garrison, 1991). Social interaction, cognitive interaction, and instructor interaction are all operational in communities of inquiry, as is autonomy though it is not explicitly addressed in the CoI model.

Saba and Shearer (1994) also recognized the complexity of transactional distance theory due to the dynamic interaction of social context and environment with the three main dimensions of SRL, structure, and dialog in virtual learning environments. The researchers developed a system dynamics model using a computer program called STELLA (DataONE, MSC04 2815, 1 University of New Mexico, Albuquerque, NM 87131) to analyze data from student interactions in real time in a synchronous online course using both audio and visual interfaces.

Figure 3. A flow diagram of transactional distance (Saba & Shearer, 1994).



STELLA was developed for use on the Macintosh desktop computer as a low cost way to model simulation data without complicated programming knowledge (Parigi & Bergemann,

2011). This study represented a relatively cutting-edge use of computer modeling to study the interaction of dialog, structure, and TD as well as learner-learner, instructor learner, and learner interface relationship to transactional distance. Findings supported key hypotheses of TTD, finding an inverse correlation between dialog and structure and a direct correlation between autonomy and structure. However, the authors noted that the interaction was dynamic model of the flow of instructor and learner interactions and did not always follow expected patterns. The flow model explored by Saba and Shearer (1994) is powerful because it shows this dynamic interaction and also assigns different aspects of interaction impacted by transactional distance to either the learner or the instructor. This study supported the premise of locus of control, or self-regulation, as an important part of learner perception of TD (Hsia, 2015; Joo et al., 2013; Rovai, 2000). In this model the learner controls actions such as being a passive or active participant and engaging in dialog, while the instructor controls course structure and whether to interact directly or indirectly with learners.

Chen (2001) performed a factor analysis of four dimensions of TD. Learner- learner, learner- instructor, learner-content, and learner-interface dimensions were factored onto a questionnaire in which learners rated 23 Likert style items with ratings from “very distant” to “very close”. Participants were instructed to rate each of the 23 types of interaction represented by the questionnaire items, and each item was associated with one of the four dimensions of transactional distance. For example, “access to classmates” was associated with the dimension “learner-learner”, while “contact instructor via course web page” was associated with the dimension “learner-interface”. Using these variables to operationalize TD, the findings validated the variables; however, the researcher did not attempt to link the variables with the dimensions of structure, dialog, or autonomy.

Modeling TD as a psychological distance or distance in understanding requires a context in which to be operationalized. Outside of a specific context, the concept of transactional distance has no meaning (Giossos et al., 2009). Within the constructivist research models are several models of learning that can provide a well-grounded context in which to study the impact of transactional distance. Two models based on collaborative distributed learning include communities of practice (CoP) and communities of inquiry (CoI). Of these two models, the CoI model most authentically represents the type of learning community found in academic courses, while the CoP model most closely represents longer term professional communities or organizations (Annand, 2011; Lindkvist, 2003). For example, within academia a CoI may encompass a single course within an academic program, while a CoP might well better model an academic department over a span of years. This makes sense, as the CoP model was originally developed to describe workers in professional trades, while the CoI model was developed to describe learning communities within formal academic courses (Annand, 2011; Li et al., 2009).

Communities of Inquiry

A CoI is defined as a community of learners working in a purposeful and meaningful way to foster deep learning through collaboration (Garrison et al., 2010). The CoI framework developed out of research into collaborative learning in virtual learning environments (Akyol & Garrison, 2011; Arbaugh et al., 2008; Rourke et al., 1999). Collaborative learning is defined as learning among equals in the construction of new knowledge (Dron & Anderson, 2014; Kawachi, 2003; Lindkvist, 2003; Vygotsky, 1978). This definition places collaborative learning squarely in the constructivist paradigm of learning theory (Dron & Anderson, 2014). Like CoP and knowledge communities, CoI are a type of knowledge collective (Lindkvist, 2003), though structured in a

way that models the learning environment with separate instructor and learner roles. The CoI model has three overlapping dimensions of social presence, cognitive presence, and instructor or teaching presence (Garrison et al., 2010; Rourke et al., 1999). Presence is defined here as the perception of being engaged in the moment with other people in a shared environment (Picciano, 2002). The CoI model posits that the three presences together form the online collaborative experience of learners. Social presence is defined as the ability to interact in a community of learners, communicate purposefully in a safe and trustworthy environment, and to develop personal connections with others in the community (Arbaugh et al., 2008; Garrison et al., 2010; Rourke et al., 1999). In general, positive social presence correlates to increased learner satisfaction, self-efficacy, and persistence (Shea & Bidjerano, 2010, 2012). Teaching Presence is a facilitator for both cognitive and social presence, forming a nexus of connections for the learner in the community. Teaching Presence is the organizing, Teaching, and facilitating force within a CoI (Arbaugh et al., 2008). Cognitive presence is defined by the four-phase Practical Inquiry Model (PIM) (Arbaugh et al., 2008). The phases of the PIM are triggering event, exploration, integration and resolution or application, (Arbaugh et al., 2008). Each phase is part of a collaborative construction of knowledge by and for the community of learners, medicated by social and Teaching Presence. Garrison (2018) is critical of online courses that do not demonstrate significant interactive collaboration among learners, arguing that these are not true CoI.

Social Presence in CoI

Social presence in computer mediated communication was originally defined as a one-dimensional "quality of the medium" (Short et al., 1976, p. 65). That is, it was the medium used

for communicating that determined the extent and quality of social presence experienced by the user. Subsequent studies supported a unidimensional model, for example the Cuelessness model, SIDE model, and Transactional Presence model (J. Kim et al., 2011; Rogers & Lea, 2005; Rourke et al., 1999; Rutter, 1987; Shen & Khalifa, 2008; Shin, 2003).

Common to most definitions of social presence is the sense that one is communicating with a real person or group of people with a perception of immediacy and connection to other human beings (Dixson et al., 2017; Rogers & Lea, 2005) or a "feeling of being together" (Shen & Khalifa, 2008). Research on social presence in virtual learning environments often compared communication in a face to face classroom with computer-mediated communications in synchronous and asynchronous discussion forums (Dixson et al., 2017; Rogers & Lea, 2005), with physical presence considered the standard (Rogers & Lea, 2005; Shen & Khalifa, 2008; Short et al., 1976). To compensate for a perceived lack of the sense of physical presence, some researchers recommend that Teaching designers simulate conditions to replicate face to face interaction (Dixson et al., 2017; Scollins-Mantha, 2008). However, physical presence and social presence are separate phenomena (Rogers & Lea, 2005). That is, the presence of one does not necessarily imply the presence of the other (Caspi & Blau, 2008; Shen & Khalifa, 2008; Spears & Lea, 1992) In the past, much of the criticism related to social presence in asynchronous computer-mediated communication related to the lack of nonverbal cues available to communicators (Gunawardena & Zittle, 1997; Rogers & Lea, 2005; Rutter, 1987; Spears & Lea, 1992). This lead to the conclusion that increasing the ability to communicate affectively, for example by the use of emoticons, should increase perceived social presence and learner satisfaction (Dixson et al., 2017; Gunawardena & Zittle, 1997). However, while increasing individuals ability to display affective communications did increase perceived social presence,

satisfaction did not necessarily follow (J. Kim et al., 2011). Likewise, increased interaction among learners also increased perceptions of social presence, but not necessarily learner satisfaction, improved collaboration, or deep learning (Annand, 2011; Dubuclet et al., 2015; Gunawardena & Zittle, 1997; J. Kim et al., 2011; Rogers & Lea, 2005)..

Social Presence Model

As initially hypothesized in the Social Presence Model, social presence was completely dependent on the type and quality of the media used to communicate (Short et al., 1976). Social presence was realized according to a continuum of communications media, from low bandwidth communication such as with a speakerphone, to high bandwidth media such as video conferencing (Rutter, 1987; Short et al., 1976). In this conceptual framework no communication media could meet or exceed the bandwidth and quality of social presence of face-to-face communications (Caspi & Blau, 2008; Short et al., 1976). Thus, social presence was a unidimensional problem entirely dependent on the quality and quantity of available media bandwidth, and always inferior to fact-to-face communication (Short et al., 1976). The role of media was to emulate as closely as necessary a face-to-face encounter to accommodate the type of communication needed. For example, a one-to-one business meeting for basic information exchange or updates might be best done by telephone, while a large meeting might require that videoconferencing be utilized to accommodate much higher bandwidth needs (Rutter, 1987; Short et al., 1976).

Despite noting that users of communication media modify their communication style by substituting visual cues with verbal ones in audio only communication , the Social Presence Model did not explain other dimensions of learner perception of social presence (Rogers & Lea, 2005). Indeed, recent research has found that communication with limited bandwidth does not

reduce intimacy or reciprocity but instead attenuates it in the absence of non-verbal cues (Dixson et al., 2017; Jiang et al., 2013).

Cuelessness Model

The Cuelessness Model, following the Social Presence conceptual framework, added the perception of immediacy (Rutter, 1987). Immediacy is "…the necessarily covert denial of mediation that occurs in the formal properties of institutions and social interactions that aspire to give access to an authentic experience and truth" (Allen, 2009, p. 162). It is the sense that another person is authentically present in the same moment (Brunner, 2012; Rourke et al., 1999; Rutter, 1987), if not the same room. The Cuelessness Model predicted a hierarchy of social presence based on communication intimacy and immediacy, with face-to-face communication at the top and business letters at the bottom (Rutter, 1987). Below face-to-face communication was live videoconferencing, audio only teleconferencing, asynchronous messaging, and finally written documents toward the bottom (Rutter, 1987). The model predicted that social presence in business transactions should decrease as immediacy decreased. However, immediacy was found to be important only for communication of personality and intimacy, not communication of information in general. The studies found that negotiators who stressed the supporting data in their arguments were more successful in low social presence, low immediacy and environments, but negotiators who stressed personal persuasiveness performed better in the high social presence environments (Rogers & Lea, 2005; Rutter, 1987). The Cuelessness Model is interesting for the finding that limiting bandwidth may favor one type of communication over another, without decreasing the overall effectiveness of the communication if the medium used is a good match for the type of communication desired. This result is accounted for in the Social Identity Model of De-individuation Effects (SIDE) model (Rogers & Lea, 2005).

SIDE Model

The SIDE model holds that social presence changes depending on the social context of the computer-medicated environment and that individuals may deploy any of several social identities depending on the perceived context (Rogers & Lea, 2005). Based on this model, communication skills in one social context and media type may not translate into another equally as well. The SIDE model may help to explain how some learners thrive in high dialog, loosely structured discussion forums while others participate in a superficial and peripheral way or drop out of the dialog completely (Rogers & Lea, 2005).

According to the SIDE model, individuals have multiple social identities that develop over time while interacting within different social settings, so social identity most salient for a setting or environment will define the individual's behaviors within a given group (Rogers & Lea, 2005). For example, in a virtual asynchronous discussion board, the environment may be informal and encourage personal interaction, or it may be formal, with specifically assigned topics and format for presenting arguments. Therefore, the social identity chosen for a specific social environment should be sensitive to the requirements of the environment, using a communication mode and style salient to the group members. If the communication is not salient or relevant it may be that the individual does not have a social identity with the group and alienation, disenfranchisement, and attrition from the group is likely to occur unless the learner can develop the required identity. Non-verbal signs in the virtual learning environment may create support for social presence following the SIDE model where individuals adopt social identities based on understood group norms (Dixson et al., 2017; Rogers & Lea, 2005).

Transactional Presence Model

Despite its name, the Transactional Presence Model has more similarities to the social presence models discussed so far than TTD. The model has three main dimensions; a) instructor-student presence; b) student-student presence; and c) student-institutional presence (Shin, 2003; Shin & Chan, 2004). Shin (2003) argued that social presence was not enough to ensure a sense of connectedness and engagement within a virtual distance educational setting, and that connectedness included feeling that the instructor, peers, and institutional support were all accessible. Still, the importance of feeling a strong social connection was stressed. The Transactional Presence Model acknowledges the importance of multiple modes of presence to provide a supportive learning environment, moving toward a collaborative learning framework or model.

Cognitive Presence in CoI

Researchers in the constructivist philosophy of knowledge creation have long argued that the creation of new knowledge is collaborative and grounded in context (Dron & Anderson, 2014; Garrison, 1991; Nonaka & Takeuchi, 1995; Núñez, Edwards, Laurie D., & Matos, 1999; Vygotsky, 1978). The CoI cognitive presence dimension was operationalized with the Practical Inquiry Model (PIM) (Akyol & Garrison, 2011; Garrison, 1991), and grounded in context as the place where cognitive presence is operationalized. However, the PIM lacked a collaborative dimension, and so alternative models that focus on collaboration in cognitive work are also discussed below to provide perspective.

Practical Inquiry Model

In line with constructivist thought, cognitive presence dimension of CoI was operationalized through the Practical Inquiry model (PIM) (Akyol & Garrison, 2011; Garrison, Anderson, & Archer, 2001). The PIM is composed of four iterative phases that together describe the process of knowledge creation in a virtual learning environment. It includes (a) a triggering event; (b) exploration of the problem; (c) integration of participant knowledge; and (d) resolution of the problem (Garrison, 1991; Schrire, 2004). Generally, the first two elements (triggering and exploration) of the PIM involve shallower knowledge development such as answering questions that do not require reflection or locating resources without applying knowledge to research questions deeply (Sadaf & Olesova, 2017; Schrire, 2004). The second two elements reflect deeper learning such as developing solutions to real word problems, arguing a point of view, or reflecting on the comments of other participants. (Sadaf & Olesova, 2017; Shea & Bidjerano, 2009). Deep learning as demonstrated by integration and resolution are difficult to achieve in academic settings (Garrison & Cleveland-Innes, 2005; Ramón Tirado Morueta et al., 2016; Sadaf & Olesova, 2017; Schrire, 2004). Schrire (2004) found that increasing the cognitive level of questions as measured by Bloom's Taxonomy led to higher level thinking in asynchronous discussions. Sadaf and Olesova (2017) found that the CoI model provided a helpful framework for Teaching design to elicit higher levels of cognitive presence through integrating information and resolving problems in case studies.

Critiques of the PIM: Alternative Models

While supporting the CoI model constructs, some researchers argued that instructor-learner interaction and direct instruction played a larger role in achieving higher cognitive levels in discussion forums (Annand, 2011; Shea & Bidjerano, 2009). Shea and Bidjerano argued that a

fourth dimension termed Learner Presence be added to the CoI model to better reflect learner self-efficacy and self-regulation within a CoI because of the significant influence of direct instruction and learner-instructor dialog on learning and learner satisfaction. There are models of knowledge creation that expressly include collaboration as an integral dimension, which is lacking in the PIM such as the socialization, externalization, internalization (SECI) model, and the cognitive learning model (CLM) (Nonaka et al., 2000; Pepin et al., 2011; Sweller et al., 1998). These models are discussed below.

SECI Model. Building on the basic process of collaborative group formation, the Socialization, Externalization, Combination, Internalization (SECI) model builds on the dynamics of group processes by describing the process of knowledge creation within collaborative groups (Brunet & New, 2003; Nonaka et al., 2000; Nonaka & Takeuchi, 1995). The SECI model of knowledge creation is composed of ; (a) socialization, the tacit to tacit sharing of knowledge; (b) externalization, when that knowledge is made explicit, for example through presentations or a book; (c) combination, when the knowledge is synthesized with or replaces what is already known; and (d) internalization, when the knowledge becomes tacit knowledge within members of the group (Nonaka et al., 2000). The SECI model agrees with Vygotsky (1978) that knowledge creation occurs as a collaborative effort among a group of individuals (Nonaka et al., 2000). The original SECI model describes how organizational teams meeting face to face create new knowledge. However, the concepts of socialization, externalization, combination, and internalization also explain collaborative knowledge creation in virtual communities. For example, the SECI model does not contradict the CoI model of knowledge creation in learning communities, and it does explain the group process within the communication medium of a CoI. The SECI model accommodates non-verbal cues or norms

that may also play a role in conveying tacit knowledge between group members (Bolici et al., 2016; Dixson et al., 2017; Heylighen, 2016; Susi, 2016).

CLM Model. The Cognitive Learning Model (CLM), developed by nurse educators, attempted to describe the process of learning leadership skills among baccalaureate nursing students (Pepin et al., 2011). The learning stages in the CLM were somewhat like the PIM with the exception that collaboration was specifically described in the advanced stages. The stages were described in the first person as "1) 'I am aware of clinical leadership in nursing'; 2) 'I integrate clinical leadership in my actions'; 3) 'I have active leadership with patient/family, and sometimes with colleagues'; 4) 'I have active leadership with the team'; and 5) 'I have embedded clinical leadership that is extended to organizational level and beyond'." (Pepin et al., 2011, p. 270). The integration of collaboration in the CLM model was an important contribution to cognitive learning theory, later also integrated into an updated CoI framework (Garrison, 2018).

Teaching Presence in CoI

Teaching Presence in the CoI framework is operationalized as (a) design and organization; (b) moderating discourse; and (c) direct instruction (Budhai & Williams, 2016; Garrison, 1991; Rourke et al., 1999). Originally, Teaching Presence in the CoI model was operationalized by just the first two elements of design and organization and management of discourse in the form of asynchronous discussion (Garrison et al., 2001). The researchers argued that "the element of teaching presence is a means to an end – to support and enhance social and cognitive presence for the purpose of realizing educational outcomes (Garrison et al., 2001, p. 5). The purpose of Teaching Presence was therefore to support and promote the cognitive and social presence

dimensions, not to function independently. However, the element of direct instruction was later added to the model to include learning as the result of direct interaction between individual learners and the instructor (Arbaugh et al., 2008). The addition of direct instruction moved the CoI model away from being a pure constructivist model of learning in that it does not absolutely require collaboration with peers for learning to occur (Annand, 2011). Also, some studies indicated that learners could not distinguish between direct Teaching interventions and instructors supporting discourse (Shea et al., 2006), suggesting the two variables be collapsed into a single variable labeled "directed facilitation". However, in research on CoI the focus remains on a constructivist view of Teaching Presence as a supportive rather than direct Teaching function (Huahui Zhao & Sullivan, 2017; Miller et al., 2014), and the three-factor model remains intact. For example, Miller, Hahs-Vaughn, and Zygouris-Coe (2014) found through confirmatory factor analysis that Teaching Presence could be most effectively modeled using all three factors. Design and organization, moderating discourse, and direct instruction were all significant factors, though learners did have difficulty distinguishing between direct instruction and facilitating discourse (Miller et al., 2014). However, Zhao and Sullivan (2017) found that supporting discourse rather than direct instruction was more effective in pushing learner discussions from exploration to the higher level of integration and resolution, strongly influencing the quality of learner discourse in discussion boards.

The CoI model is a framework developed from three distinct but related sub-concepts of social presence, cognitive presence, and Teaching Presence. Several studies found that social presence generally acts as an enabler of Teaching and/or cognitive presence (Joksimovic et al., 2014; Kozan, 2016). Correlation between social and cognitive presence and social and Teaching Presence are not always strong, however (Annand, 2011). Annand (2011) argued that few studies

of cognitive presence within the CoI model have reported significant correlation to social presence but to individual, one-on-one peer and Teaching interactions (Annand, 2011; Shea & Bidjerano, 2010). Schrire (2004) found evidence of deep learning through collaborative student discussions indicating social presence, supported through long discussion threads moderated by the instructor and built into the course structure (Schrire, 2004). It is clear that within a CoI social presence supports cognitive and Teaching Presence (Joksimovic et al., 2014; Kozan, 2016; Shea & Bidjerano, 2010), but studies have not consistently supported the strength of the relationship.

The cognitive presence dimension of the CoI model was operationalized in this using the PIM, however as discussed above the PIM does not require collaboration or particularly support collaborative learning in a CoI (Annand, 2011). Yet we know that collaboration is fundamental to CoI (Akyol & Garrison, 2011; Garrison et al., 2001; Garrison & Cleveland-Innes, 2005). Recognizing this, it is important to be aware of alternate models of cognition and knowledge creation that do specifically include collaboration as part of the knowledge creation process. Garrison (2018) argued that failures to find collaboration and deep learning in studies of online courses indicated the courses were not true CoI, not a flaw in the model. The PIM is a well-established and researched model with known strengths and weaknesses. Therefore, for this study the PIM was used to operationalize cognitive presence to explore how transactional distance mediates cognitive presence, with the caveat that this model may miss some of the influence of collaboration

Within the CoI model Teaching Presence is operationalized as design and organization, moderating discourse, and direct instruction. Design and organization are associated with learner content interaction. Moderating discourse clearly relates to learner-learner interaction. Finally,

direct instruction relates directly to instructor-learner interaction. Hence, all three components of Teaching Presence within a CoI correlate to dimensions of transactional distance.

The Teaching Presence dimension of the CoI model includes instructor-learner and learner-content aspects of transactional distance. This correlates to the learner-teacher transactional distance (LTTD) construct (Giossos et al., 2009) used to operationalize the learner-instructor relationship in transactional distance theory above. Missing from the CoI model and LTTD construct is the role of leaner Self-regulation. It seems clear that learner Self-regulation plays a significant role in learning communities as a moderating factor in learner-instructor transactional distance.

Self-Regulated Learning

Self-regulated learning is an outcome of metacognition and is defined as "those active and volitional behaviors on the part of individuals to achieve in their learning" (Barnard-Brak et al., 2010, p. 62) . Students are "self-regulated to the degree that they are metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 1989, p. 329). Research on Self-regulated learning (SRL) consistently points to learner SRL as a critical element of collaborative learning in online courses (Artino & Stephens, 2009; Garrison & Baynton, 1987; Kuo et al., 2014; Kwon et al., 2014; Martinez-Lopez et al., 2017). To account for self-regulation in learning, researchers have argued for including "learning presence" as an additional element of the well-known community of inquiry (COI) model (Annand, 2011; Shea & Bidjerano, 2010). However, the original CoI questionnaire instruments for measuring social, cognitive, and Teaching Presence within a CoI had no way to measure learner self regulation as part of the model (Annand, 2011; Kilis & Yıldırım, 2018),

leading Annand (2011) to argue that a learner with good SRL skill had no real need of a CoI. Kilis and Yildirim (2018) argued for the inclusion of regulatory presence, to include both self-regulation and co-regulation. Indeeed, in further development of the CoI model, Garrison and Akyol created a meta-cognition questionnaire to be used as a measure of self-regulation. The authors stressed that in an authentic CoI metacognition should be primarily manifest as co-regulation between learners (Akyol & Garrison, 2015). It is clear that self-regulation is an important component of a CoI, and that some level of metacognition is critical for self-regulation. However, how the online student develops those skills is not clearly described, a significant gap in understanding since online students also have high levels of attrition in undergraduate courses. It is apparent that simply being in a collaborative learning environment does not teach the student SRL skills. For example, Artino and Stephens (2009) compared undergraduate and graduate student motivation and self-regulation. While graduate students demonstrated more critical thinking and use of SRL behaviors, undergraduates demonstrated greater task value and commitment to persevere. The researchers suggested that instructors could foster SRL behaviors by teaching proximal (small, incremental, and achievable) goal setting and scaffolding discussions skills in the online classroom rather than expecting the student to come with established SRL skills. This study and others indicate that SRL is understood to be important in online courses, but is not often explicitly taught (Artino & Stephens, 2009). SRL can also be described in terms of an iterative process with three main phases of forethought, performance control, and self-reflection (Barnard-Brak et al., 2010; Zimmerman, 1989). Forethought is associated with those behaviors that establish goals and a mindset of self-efficacy and intrinsic motivation (Barnard-Brak et al., 2010). While motivation and self-efficacy are hallmarks of the forethought phase, performance control represents the use knowledge

acquisition skills such as focus, attention, time management, seeking (and giving) help and information, and in-action monitoring of the learning process. This is the flow part of SRL, where a skilled learner will interact with and engage in content acquisition and processing (Joo et al., 2014) . Finally, the self-reflection phase is an evaluation of learning outcomes through self-validation and, crucially, external validation through social interaction. It is a reality check on the accuracy and validity of the information as it is processed into knowledge (Barnard-Brak et al., 2010; Zimmerman, 1989). SRL can also be described as a set of cognitive, self-regulatory, and resource management strategies that students invoke to enhance learning (Garcia & Pintrich, 1995; Pintrich, 1999).

SRL as defined above is both a mindset of the learner and a learned set of behaviors and tools the learner applies to problems. It is composed of practical, observable behaviors, but also latent dimensions with psychosocial as well as environmental components such as task value, locus of control, emotional intelligence, and self-efficacy (Anderson et al., 2016; Beauvais et al., 2011; Joo et al., 2013; C.-Y. Lee, 2015; E. Lee et al., 2015).

SRL (Self-regulated Learning) in Transactional distance Theory

The implication within the original structure of transactional distance theory was that as structure increased, so too did autonomy (M. Moore, 1972, 1993; Saba & Shearer, 1994). Perhaps because it is hard to define as a variable, the role and definition of autonomy has undergone constant revision. In this study, the concept of SRL is considered synonymous with learner autonomy. The advantage of SRL over autonomy as a construct is that it is more precise, implying purposive self-regulation by the learner (Barnard-Brak et al., 2010; Kramarski & Gutman, 2005; Kuo et al., 2014; Martinez-Lopez et al., 2017; Steffens, 2006; Usta, 2011). SRL

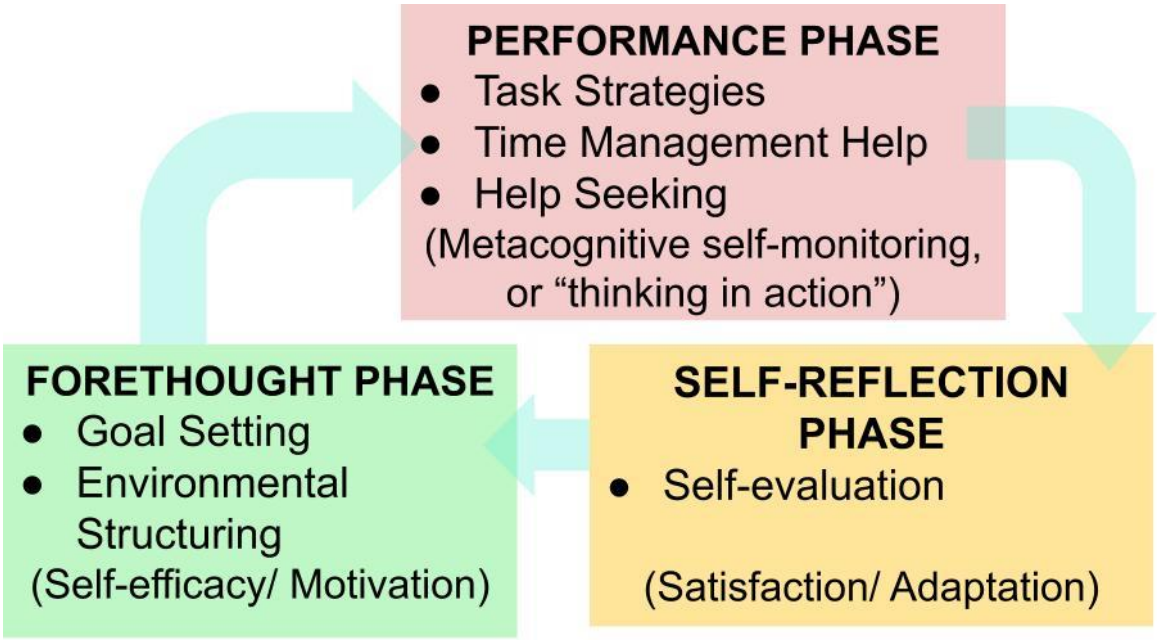
is important as a distinct construct within the virtual learning environment, as it can move independently of either structure or dialog (Dron, 2004; Dron & Anderson, 2014; M. Moore, 1972; Saba & Shearer, 1994). For example, Rovai (2000) argued that dialog could be categorized as that which is under learner control, while structure is under instructor control. However, SRL is under learner control, yet is not necessarily dialog with the instructor or peers (Rovai, 2000). Dron (2004) argued that the concepts of SRL and structure are fluid within a learning community, the learner moving along a continuum between dialog and structure, with SRL possibly driving as well as responding to that movement, a concept thar Saba and Shearer (1994) also hypothesized. This engages with the concept of locus of control as a construct of learner SRL. In transactional distance theory the instructor controls structure, SRL is positively connected to structure; when If the instructor controls structure, it implies control also of learner SRL to some degree, and the development of metacognitve skills.

Operationalizing SRL

SRL is an important skillset that online learners need to master, however unlike the structure of the learning environment, instructor presence, engagement, or social support in the classroom, SRL lies almost entirely within the individual learner. Unfortunately, this may lead educators to assume that SRL skills are solely the learner's responsibility to acquire (Barnard-Brak et al., 2010). However, SRL is composed of several dimensions, all of which are manifest as teachable skills (Lee et al., 2015). SRL skills are the operational application of the learner's level of metacognition, enabling the learner to organize their learning, to communicate their learning needs to instructors, collaborate with other students, and verify their learning. However, students vary in their ability to implement metacognitive skills in the online classroom.

Barnard-Brak, Lan, and Paton (2010) developed five profiles of SRL based on Zimmerman's (1989) three phases of learner self-regulation. The Online Student Learning Questionnaire (OSLQ) with sub-concepts of goal setting, environmental structuring, task strategies, time management help, help seeking, and self-evaluation was then used to create profiles of student self-regulation (Barnard-Brak et al., 2010; Martinez-Lopez et al., 2017).

Figure 4. The Three Phases of Self-regulation with Operationalized Subconstructs from OSLQ (Barnard-Brak et al., 2010).



The five profiles were (a) super self-regulators; (b) competent self-regulators; (c) forethought-endorsing self-regulators; performance/reflection self-regulators; and (d) non- or minimal self-regulators (Barnard-Brak et al., 2010). Super self-regulators and competent self-regulators tended to be far more proactive in preparing and planning for study and more likely to seek help than the other three profiles. Conversely, performance/reflection and non- or minimal self-regulators tended to be disorganized in their study practices, and to either fail to reach out or modify their behavior, or to do so too late to improve performance. It is important to note that

learning was not measured in this study, only G.P.A. performance, which may more accurately measure knowledge, including prior knowledge, than the actual learning of new information. Learning is difficult to assess, and students with lower G.P.A results may learn as much or more than students with high G.P.A.s. However, results indicated that the SRL behaviors and skills measured in the study are teachable skills (Kramarski & Gutman, 2005) and depended on instructor-learner interaction and learner beliefs about learning (Barnard-Brak et al., 2010; Braten & Stromso, 2005; Fotiadou et al., 2017) . Goal setting, environmental structuring, task strategies, time management help, help seeking, and self-evaluation are all basic and teachable social and behavioral skills in a range of virtual learning situations (Barnard-Brak et al., 2010; Martinez-Lopez et al., 2017). This has implications for instructional design and teacher education (Artino & Stephens, 2009; Cho, 2004; Kramarski & Gutman, 2005). Devolder, van Braak and Tondeur (2012) argued that scaffolding lessons within a virtual learning environment supported self-regulated learning. The authors noted that different types of contextual scaffolding were needed to support learners cognitively, metacognitively, and affectively. Learners also needed different levels of scaffolding over time (Devolder et al., 2012). This is consistent with Vygotsky's (1978) zone of proximal development, and research on SRL (Barnard-Brak et al., 2010; Bodrova et al., 2014; Kramarski & Gutman, 2005). Barnard-Brak, Yan, and Patons's six constructs of SRL are a particularly powerful way to operationalize learner self-regulation as a concept within learning communities and transactional distance. The impact of learner-instructor transactional distance on learner metacognition and self-regulation is not well researched. However, studies suggest that transactional distance does impact how learners perceive, integrate, and process information about their learning and impacts both the teaching of self-regulation skills and the learner's implementation of SRL.

Satisfaction

A student is generally considered to be satisfied with an educational course or program when personal learning, cognitive, and social needs are met(Levy, 2007; Tello, 2007; Tinto, 1975). Satisfaction is closely linked to student persistence in the research literature and is often used as a measure of the success of online courses (Tinto, 2012). This is not always true, however. For example, a student may drop out of college not because of dissatisfaction but because the student's personal, cognitive, social, or economic goals have been met, or because of personal or socioeconomic events or conditions unrelated to formal education (Tinto, 1975, 1993, 2012). In professional programs an offer of employment in the industry may be proffered prior to the completion of a defined program, or opportunities may arise that obviate the need to continue, at least in the short term. Mark Zuckerberg, co-founder of Facebook, and Bill Gates, co-founder of Microsoft, are two examples, having dropped out of university at Harvard during their undergraduate studies to pursue ultimately rewarding careers.

Satisfaction vs. Persistence

Student persistence in enrolling in online courses is closely linked with satisfaction (Bolliger & Wasilik, 2012; Joo et al., 2014; Tinto, 2012). Tinto (1993, 2012) notes that colleges often link satisfaction with persistence, however the author cautions that this may be a false connection when evaluating online courses because being satisfied with an online course may not mean a student prefers them. In one study correlated more s The current COVID-19 pandemic is an example of many studenton factors influencing persistence, students ranked situational factors, primarily work, followed by family, higher than academic or course related issues (Levy, 2007). Other environmental factors such as the COVID-19 pandemic have forced

students online who will likely as soon as possible return to F2F classrooms. This does not neccesarily imply dissatisfaction with the online course, but might instead indicate a preference for the traditional classroom or campus setting. For many if not most college students, social factors such as campus life and activities are an important part of college, which are difficult to replicate online (Tinto, 2012). However, for those students who do not have access to a physical campus for one reason or another, satisfaction with online courses may determine whether the student persists in college at all, not merely a choice between online or F2F attendance.

The subjective nature of student satisfaction makes it difficult to define in a way to satisfy every manifestation. However, the sections following attempt to present the concept of Satisfaction in relation to LTTD, SRL, and CP.

Satisfaction and Learner-Teacher Transactional Distance

Instructor communication, respect, connectedness, and engagement are described as prerequisites to satisfaction (Gray & DiLoreto, 2016). Interaction with the instructor serves as a driver for student peer interaction and the student perception of learner-teacher transactional distance (Giossos et al., 2009; Mbwesa, 2014). A direct correlation between student satisfaction and perceived LTTD is supported by research, seemingly regardless of the level of autonomy or self-regulation of the student (Baxter, 2012; Mbwesa, 2014), which implies that here is a complex relationship between LTTD, Satisfaction, and its influence on self-regulation and community presence. The instructor is more than a provider of syllabi, course content and grades, but also as a role-model and mentor, facilitating the development of academic identity (Baxter, 2012). With an investment of time and effort into establishing an identity within the context of college, the student develops a sense of validity as a member of the learning

community, which reinforces satisfaction and persistence (Baxter, 2012; Farr-Wharton et al., 2018).

Satisfaction and Community Presence

There are mixed research findings related to the importance of peer interaction in online courses. Boliger and Wasilik (2012) found that undergraduate students reported high satisfaction with high enrolled non-interactive courses. However, the courses were in fact hybrid; a F2F large auditorium lecture combined with asynchronous online labs via the college LMS. It is likely that students interacted informally in the F2F setting, possibly even with the instructor. In a study of the relationship between student satisfaction and self-efficacy with online learning technology, peer collaboration and instruction, Weidlich and Bastiaens (2018, p. 232) found that "In the present student population, it seems that being able to meaningfully engage with the learning content and to feel a certain psychological closeness to the instructor are essential for a satisfying experience, the psychological closeness to ones' peers is not.". The implication for collaborative learning is that it is not a spontaneous process initiated by students in pursuit of a satisfying learning experience but is instead a process deliberately integrated into the course by the instructor. It also implies that students engaged in online collaborative work primarily derive satisfaction from interacting (perhaps as a group) with the instructor and content assigned.

Satisfaction and Learner Self-Regulation

When a student decides to enroll in online courses there is certainly a confluence of instrinsic (student) and extrinsic (environmental) factors that influence the decsion. Satisfaction with previous online courses is only one of those factors. Zimmerman (1989) argued that student self-regulation level (as measured by self-reported questionnaire studies) influenced student

ability to positively affect learning outcomes, and therefore satisfaction. Other studies focused on satisfaction did not consistently find a direct link to level of satisfaction and learner self-regulation. The exception is a finding that flow, a concept linked to self-regulation and motivation, correlated strongly with satisfaction among online students (Joo et al., 2014; Leong, 2011). Also, students with higher scores on the OSLQ self-regulation scale did report higher levels of success in terms of self-reported Grade Point Averages (G.P.A.) (Barnard-Brak et al., 2010). A higher G.P.A. may imply higher satisfaction as well (Webber et al., 2013).

Operationalizing Satisfaction

In this study student satisfaction is framed as the student's perception that they benefited from the course, their expectations were met, they learned new and interesting things, and they would likely persist in taking online courses, given a choice. Six items from the Satisfaction subscale of Weidlich & Bastiaen's (2018) TDSTECH Questionnaire were used, with permission from the questionnaire developers, to collect data on student satisfaction.

CHAPTER 3. METHODOLOGY

This study will use a sequential explanatory mixed methods methodology composed of an initial Likert style survey followed by semi-structured interviews about the relationship of LTTD, SRL, CE and Satisfaction in online community college courses. Survey tools are a popular and well tested method for collecting data on participant perceptions in research on transactional distance and communities of inquiry. Online surveys can be highly useful and valid for data collection for online courses (Andrews et al., 2003; Evans & Mathur, 2018; Nulty, 2008). Survey based research has several limitations, however with careful design and testing of question items, internal and external sources of error can be minimized (Collins, 2003; Evans & Mathur, 2018; Theuri & Turner, 2002). Procedures for testing and refining survey items are discussed below in the sections on instrumentation and data collection.

Research Questions

The research questions reflect the phase 1 quantitative part of the study:

1. What is the relationship between LTTD and student use of self- regulation skills in online courses?
2. What is the relationship between LTTD and student sense of community in online courses?
3. What is the relationship between LTTD and student satisfaction in online courses?

Phase two research questions are qualitative and form the explanatory part of the study:

4. How do student perceptions of learner-teacher transactional distance influence decisions on the use of self-regulated learning skills?
5. How do student perceptions of learner-teacher transactional distance influence participation in the online course community?
6. How do students describe satisfaction in the context of online learning, and how do perceptions of learner-teacher transactional distance influence satisfaction in online courses?

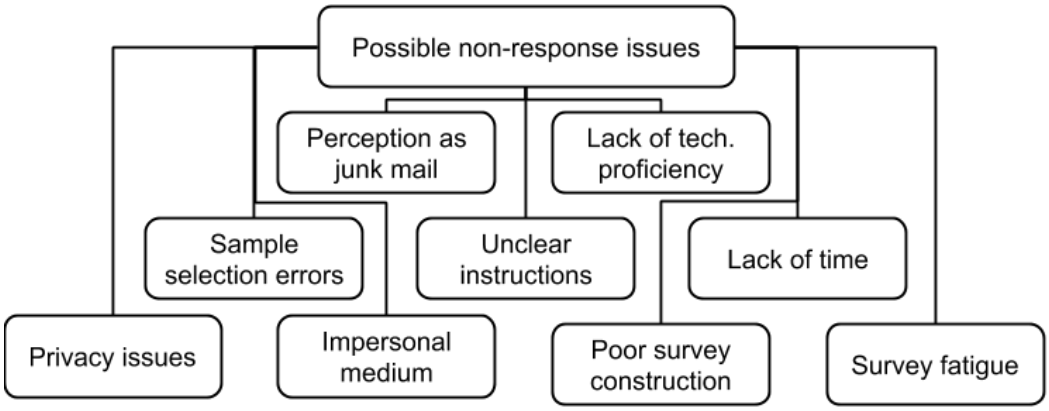
Research Design

This study will use a mixed methods sequential explanatory methodology consisting of an initial survey phase, followed with a second phase of semi-structured interviews with selected participants.

Phase 1 (Survey)

Surveys have several advantages and disadvantages for collecting interpreting data. Some potential disadvantages of online questionnaires are potential data collection errors such as the unintentional exclusion in the sample of a portion of the target population, participant self-selection, misinterpretation of the survey items, and non-response of a significant number of participants for various reasons (Figure 5).

Figure 5. Possible Non-response Issues. Adapted from Evans and Mathur (2018)



Survey data also cannot explain why participants answer items as they do. Another issue with surveys is context and how context affects memory processing and recall. Typically, a survey respondent interprets question items, reflects upon the interpretation, and retrieves required information to answer the item. Memory retrieval is highly context dependent (Collins, 2003), and experiences in class may be difficult to recall accurately in the very different context of survey completion outside of the class. In order to complete a survey the respondent needs to (a) understand the question item; (b) judge what type of response is required, ; (c) retrieve information pertinent to answering the question item, and (d) respond to the item (Collins, 2003). All of this processing centers on retrieval of stored schema in long term memory which is highly context-based (Sweller, 2008; Sweller et al., 1998). That is, it is ready for retrieval when the context for retrieval is similar to that under which the original memory was stored in long term memory (Collins, 2003; Sweller, 2008). However, the memory of an experience may be altered by previous recall, altering the perception each time. Events that have routinely occurred over time become more difficult to separate into individual events, whereas rare but significant events

are more likely to be recalled in detail and stand out (Collins, 2003). In addition to data collection, the methods used to analyze survey data are limited by the type of data collected. This study uses Likert type items with a five-point numerical scale representing a range of response for each item including Strongly Disagree (1), Somewhat Disagree (2), Neutral (3), and Strongly Agree (5). Because the scale includes numerical values, Likert data is often treated as interval and sometimes as ratio level data, and this can be controversial (Carifio & Perla, 2007; Jamieson , 2004). Jamieson (2004) argued that even though the scale is composed of consecutive integers, the integers themselves represent attitudes, not mathematical quantities, and therefore cannot be considered interval data or analyzed using parametric methods. However, other authors, including Likert, found that in practice, parametric methods are consistently reliable when applied appropriately (Carifio & Perla, 2007; Likert, 1932). Carifio and Perla (2007) countered Jamieson's (2004) critique by partly by agreeing that any one Likert scale item might be inadequate for parametric analysis, but that typically variables are represented by several items, which increases the reliability of the data as a whole. In this study each latent variable is represented by a minimum of six questionnaire items as recommended (Carifio & Perla, 2007). As with any method of analysis, context and purpose inform the methods used. Despite potential issues with online surveys , there are several advantages that make surveys a valuable tool for collecting useful data if the survey is well-designed and the researcher develops and follows a plan for survey deployment, reminder emails, data collection and storage (Evans & Mathur, 2018). Given a sufficient sample of the study population, valid information on participant attitudes, perceptions and behaviors can be collected and analyzed using quantitative analysis tools (Andrews et al., 2003; Chang & Vowles, 2013). Self-report by participants in a well-constructed survey instrument produces data on participant perception, attitude, feelings, and

intention that cannot be collected through direct observation (Bryman, 2012; Evans & Mathur, 2018).

Phase 2 (Interview)

Augmenting quantitative survey data with follow-up interviews to clarify and explain findings can retrieve rich and thick data related to individual experience. (Creswell et al., 2007; Ivankova et al., 2006). Semi-structured interviews provide rich, thick information and context, allowing the participant to share thoughts or feelings the researcher did not anticipate (Yin, 2018, p. 236). This study will include follow-up semi-structured interviews to collect rich, thick data on student experiences in online courses. This will help to clarify (or perhaps contradict) findings from the survey phase. Because of the highly context driven nature of memory and recall, it will be important to establish the context for survey items to minimize possible errors of memory and interpretation. Partnering the survey phase with semi-structured interviews will help to establish context, clarify ambiguous findings, and provide for more reliable and trustworthy interpretation of findings. The interview will consist of five main questions, with possible follow-up questions depending on the respondent answers and the flow of the interview. The interview protocol can be found in Appendix C. Coding of interview transcripts followed an iterative process. Initial coding was based on established sub-concepts of each of the main concepts of LTTC, SRL and CoI. Satisfaction did not have sub-concepts associated with in the survey. Free coding followed, allowing further code development. Themes that emerged from the initial coding round led to collapsing some codes into others, and ultimately eliminating extraneous codes.

Theoretical Framework

The initial theoretical framework combined four research areas: LTTD, CoI, and SRL, and Satisfaction. Based on the literature on transactional distance, the expected theoretical framework indicated that low transactional distance would correlate to high community presence, high satisfaction, and low use of self-regulation skills, while high transactional distance would correlate to lower community presence, lower satisfaction, but higher use of self-regulation skills. This relationship is shown in figure 6 below.

Figure 6. Initial Theoretical Framework for LTTD, SRL, CP, and Satisfaction.

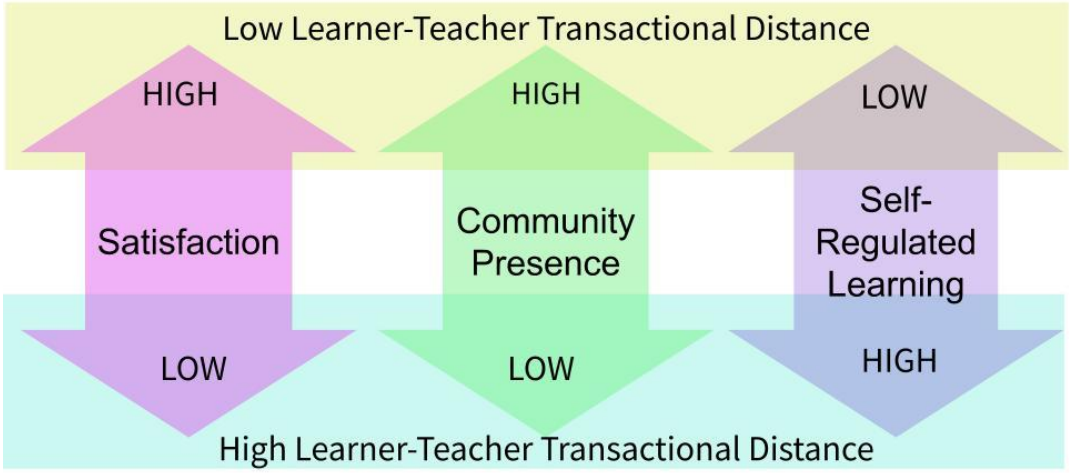
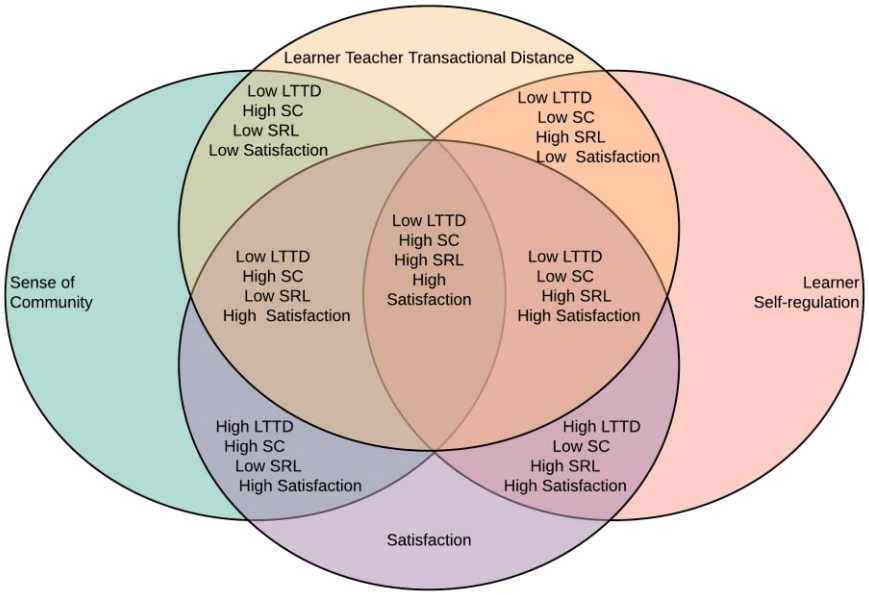


Figure 6 above illustrates the expected relationship of LTTD, SRL, CP, and satisfaction a given student may experience based on transactional distance theory. Low LTTD, meaning a low distance of understanding between instructor and student will correlate with high student satisfaction, lower use of SRL skills, and a higher sense of CP. While low LTTD, high sense of community presence, high use of SRL skills and satisfaction is often the goal of teachers, there is a paradox here. The Venn diagram (figure 7) indicates that high student satisfaction may not be tied exclusively to low LTTD, and that students may find high satisfaction with high LTTD, if

compensating levels of CP and/or SLR exist. Because of these possibilities, it will be important to validate the student experience through interviews and careful application of thematic analysis to develop a theoretical framework that reflects the lived experience of students. It is likely that the student experience of the relationship between LTTD, SRL, CP, and

Figure 7. Venn diagram of the possible Relationships Between LTTD, SRL, Community, and Satisfaction.



Satisfaction is more complicated than the theoretical framework in figure 6. Using a mixed methods approach to describe and explain the complexity of the student experience may yield a theoretical framework that more closely reflects the student experience.

Participants and Context

IRB approval from all institutions involved in the study was obtained prior to recruitment of participants at that institution for the study. Ethical treatment of participants physically, emotionally, and psychologically was paramount. Participants were college students enrolled in

one or more online courses in baccalaureate or community college courses. All participants were at least 18 years old, with no upper age limit. The colleges represent a diverse population of students, and each are described below.

Institution A

Table 1 shows the variety of distance online course offerings in the undergraduate colleges as of August 29, 2019.

Table 1. Number of Students by Major at Study Colleges Fall 2021

Major	**College A**	**College B**	**College C**	**College D**
General and Pre-Professional Education Total	2630	432	2744	1042
Liberal Arts	*2127*	*396*	*2414*	*953*
Natural Sciences	*422*	*36*	*330*	*89*
Career and Technical Education Total	1455	385	1295	873
Unclassified	837	387	681	135
***Total Student Enrollment**	**6413**	**1343**	**6100**	**2724**

Source: IRAO Institutional Research & Analysis Office, March 2022.
* Total enrollment exceeds listed majors in table because not all majors are listed, available data contained redundancies, and some students have multiple majors.

Demographic items on the survey asked about the student's year in college, the number of pervious online courses they have taken, the mode of the course, and the reason the student is taking the course online. Table 2 shows student year in college. While approximately 50% of students were in year one or two, a significant number were in year five or more (21.7%). This may reflect that many students attend college part time at the community college level, or that certain technical programs such as nursing require a year or more of prerequisite courses before

the student qualifies for the formal two-year program. Indeed, labeling community colleges as "two-year colleges" may be misleading.

Table 2. Year in College.

Student Response	n	%
1	46	22.7
2	55	27.1
3	42	20.7
4	16	7.9
5+	44	21.7
Total	**203**	100.0

Table 3 shows the number of online courses previously taken by the student. Almost half of respondents had taken six or more online courses before the current semester. This might reflect one of the effects of COVID-19 on college attendance and online course enrollment, because in the pilot study for this project, done in 2018, few students had taken more than one or two online courses.

Table 3. Number of Prior Online Courses.

Student Response	n	%
1-2 courses	21	10.2
3-5 courses	62	30.2
6 or more courses	98	47.8
This is my first online college course	24	11.7
Total	**205**	100.0

Several students added their own specific description of their online course as opposed to selecting one of the pre- defined responses, as shown in Table 4 below.

The item *"The online course I am currently taking is:"* was coded as a single answer item with an "other" option allowing the student to type in a response. Responses revealed that while the majority (51.2%) of courses taken were asynchronous, the next most common was a blended asynchronous and synchronous mode at 19.5%. In this mode students might meet weekly or a few times using a videoconferencing application, but also used an LMS for asynchronous learning. Hybrid courses, with some face-to-face and some online work, comprised 11.2% (n=23) of courses. Other modes represented included online classes with in-person testing (0.5%, n=1) and a course with an online textbook only (0.5%, n=1). One student responded that they had one hybrid and one blended course, which would make the blended category 20% (n=41) and hybrid category 11.7% (n=24) approximately.

Table 4. Course Mode.

Student Response	n	%
All class is online but tests are in person	1	0.5
Asynchronous online (the class does not meet together at the same time, but uses online apps like discussion boards)	105	51.2
Blended online (some of the class is synchronous online and the rest is asynchronous online)	40	19.5
Hybrid of in person face-to-face and online (the class meets in person but also online)	23	11.2
One hybrid and one blended	1	0.5
Online textbook	1	0.5
Synchronous online (the class primarily meets together online at the same time)	34	16.6
Total	**205**	**100.0**

Reasons for taking a course online were very diverse, as shown in Table 5. The item *"I am taking this course online mainly because:"* was coded so that a student could choose multiple reasons for taking a course online. An "other" option was also provided to allow unique answers. The researcher was surprised that several students opted to enter very specific reasons manually rather than simply choosing one or more of the provided options as shown in table 5 below.

Table 5. Reason for Taking Course Online.

Item: I am taking this course online mainly because…	*n*	*%*
"all of the above"	1	0.5
"Arthritis hinders my walking and sitting for an extended period of time"	1	0.5
"Because of Covid-19 and also because I'm a full time employee so the flexibility is nice."	1	0.5
"Course is outside my major, but am interested in it as I want to become a programmer. Class is only available online async."	1	0.5
COVID-19 pandemic campus restrictions prevent me from taking in person classes.	1	0.5
COVID-19 pandemic campus restrictions prevent me from taking in person classes., I prefer to take courses online when possible., My program or degree requires a course that is only available online.	1	0.5
COVID-19 pandemic campus restrictions prevent me from taking in-person classes.	83	40.5
"Distance Learning. I live on [redacted] and there are no ICS program opportunities for me here."	1	0.5
"I need flexibility for athletics"	1	0.5
I prefer to take courses online when possible.	46	22.4
"I wanted to take this course and online is the only option."	1	0.5
"It was only available online"	1	0.5
My program or degree requires a course that is only available online.	21	10.2
"Stay at home mother with limited childcare"	1	0.5
"This course is one of the prerequisites for the Nursing program in [redacted] and it's being provided online."	1	0.5
Work or other commitments prevent me from taking courses in person	43	21.0
Total	**205**	100.0

While 40.5% of students listed COVID-19 as the only reason, three additional students (1.5%) included it as a primary or secondary reason. Work and other commitments was the reason for 21% (n=43) of students, but other related but more specific reasons were manually entered by several students such as “I need flexibility for athletics” (0.5%, n=1), and “Stay at home mom with limited childcare” (0.5%, n=1). Twenty-three students (11.2%) were taking an online course because it was required as part of a program. Only one student specifically stated geography (“Distance Learning. I live on [redacted] and there are no ICS program opportunities for me here.”) as a reason. Among the 205 respondents, 22.4% (n=46) students chose “I prefer to take courses online when possible”.

Study Setting

The study setting was the online learning environments at three Community and one 4-year college of higher education based on three islands in the Pacific. Students completed surveys using the same technology available for accessing online courses. Interviews were done using a researcher created Zoom videoconferencing. The Zoom conference room was secured from intrusion with a passcode and a waiting room feature activated. The setting of interest for the study was the online course students were currently enrolled in at the time they completed the survey, however based on later interviews it became clear that many students responded in general to their online learning experience.

Many of these settings were asynchronous, however synchronous learning environments such as videoconferencing were also common. Institution A uses a proprietary instance of the Sakai learning management system (LMS), hence most asynchronous courses are based in Sakai. The LMS includes two discussion platforms, a chat room tool, as well as email and messaging. All

course content can be presented in the LMS as either uploaded files for learners to retrieve, or embedded content the learner accesses directly in the LMS. The LMS also includes a synchronous conferencing tool (Big Blue Button) which is not commonly utilized by instructors. Instead, third party conferencing applications such as Zoom (http://www.zoom.us), Adobe Connect (https://www.adobe.com/products/adobeconnect.html), or GoToMeeting (http://www.gotomeeting.com) are commonly used by instructors and learners, though Zoom appeared to be the platform of choice during the pandemic years 2019-2022.

Institution B utilizes a licensed version of Canvas for the common LMS. Unlike institution A, instructors at institution B are required to use the same LMS for a consistent student experience. Canvas also offers a discussion board, gradebook, email, calendar, student homepage and a dashboard of courses. However, institution B, as a completely online college, also utilizes instructional designers heavily in the design of courses. Institution B also utilizes the Zoom videoconferencing application, though Canvas also includes Big Blue Button.

Instrumentation and Procedures

Instrumentation included a survey tool, an interview script, a videoconferencing system with recording capability, and laptop computer. Participants accessed their own personal computers or handheld devices for the survey phase, and videoconferencing capable device for the interview. The researcher provided links to connect with the survey tool, and a videoconferencing link for participants in the interview phase.

Phase 1 (Survey)

The survey instrument was a Likert style questionnaire composed of three validated questionnaires; The Learner-Teacher Transactional Distance (LT-TD) questionnaire, the Online

Student Learning Questionnaire (OSLQ), the Community of Inquiry (CoI) questionnaire, and one section of the Transactional Distance between Students and Technology (TDSTECH) questionnaire related to satisfaction with online courses (Arbaugh et al., 2008; Barnard-Brak et al., 2010; Giossos et al., 2016; Weidlich & Bastiaens, 2018).

Demographic questions on the survey questionnaire differed slightly between the survey deployed in the researcher's home university system, and the survey deployed within the U.S. mainland online college. In both versions of the survey, demographic items established (a) the participant's year in college; (b) relative experience with online courses; and (c) whether the course is synchronous, asynchronous, or a hybrid of the two. An additional item will ask whether the student is willing to be contacted for a follow-up interview, and if so, an email address will be requested to send further information. Two items related to the student's experience with COVID-19 pandemic restrictions and online learning were added as the pandemic affected online enrollment. In addition, the U.S. mainland online college survey includes an item asking about the state or territory where the student resides. In all other respects the survey questionnaires are identical. Table 6 below shows how each research question was linked to the survey instrument and question item.

Table 6. Research Questions and related Questionnaire Items.

Research Question	Instrument	Question Items
RQ1 What is the relationship between LTTD and student use of self-regulation skills in online courses?	LT-TD Questionnaire OSLQ	1-25 60-83
RQ2 What is the relationship between LTTD and student community engagement in online courses?	LT-TD Questionnaire CoI Questionnaire	1-25 26-59
RQ3 What is the relationship between LTTD and student satisfaction in online courses?	LT-TD Questionnaire TDSTECH Questionnaire (six items)	1-25 84-89

All four instruments used a 5-pont Likert scale which was also used in the instrument for this study. Permission to use the survey tools can be found in Appendix B. Likert style survey design was originally based on a five point scale with the options (a) strongly disapprove; (b) disapprove; (c) undecided; (d) approve; (e) strongly approve (Chyung et al., 2017; Likert, 1932). The purpose for developing the scale was to find an effective and efficient method for measuring a population's attitudes as latent variables that could be easily quantified and render the data into numbers which could be mathematically quantified for analysis of large populations (Chyung et al., 2017). Variations on the wording developed over time, with the words "approve" and "disapprove" commonly replaced with "agree" and "disagree" respectively (Chyung et al., 2017). This study used the terms "strongly agree" and "strongly disagree" at the extreme ends of the scale. The survey was be deployed electronically to participants, who were recruited through instructors at the college in the university system undergraduate colleges, and through the operations and surveys office at the mainland U.S. online college. A link was provided in an

email directing participants to the survey, which was only accessible through the link. Data collection occurred during the Spring 2021 and Spring 2022 semesters at the university colleges, and Spring 2022 at the U.S. mainland online college. and Data was secured on a secure computer in an encrypted file. The process for Phase 1 (Survey) at the traditional university colleges is shown below.

1. Identify online distance courses the in the target College
2. Contact course instructors describing the study and asking for permission to send email invitations to students
3. Send email/announcement to distance course participants with Informed Consent Form TMP 443 and link to survey with access triggered by providing consent.
4. Potential participants who consent will be directed to the survey
5. Potential participants who do not consent will be directed to a page thanking them for their time and consideration.
6. Data collection period.
7. Data cleaned and stored on secure computer for analysis.
8. Preliminary analysis and potential phase 2 participants identified.

For the mainland U.S. college steps included:

1. Contact IRB office for permission to conduct research.
2. Modify Research plan as required with home IRB office.
3. Upon approval, contact the Analytics and Decision Support Office at the target college.
4. The office of Analytics and Decision Support then distributed the survey according to college policy.
5. Steps 5-8 were identical in both processes.

Phase 2 (Interview)

Semi-structured interviews occurred during data collection as students provided emails, as a follow-up after initial analysis of the student data. Participants who opted in for follow-up interviews were to be selected based on responses to the survey questionnaire to provide as wide a variety of cases for interviews as possible, however in practice the rate of response to emailed invitations to participate in interviews was low. Fortunately, the students who were contacted in the end did represent participants who ranked LTTD as low and high. Interview questions were open-ended and based on the sub-concepts explored initially via the quantitative phase with the survey tool.

The process for Phase 2 (Interview) is shown below.

1. Potential interview participants contacted.
2. Initial interviews conducted via teleconferencing app.
3. Transcript creation.
4. Initial coding of transcripts by researcher.
5. Second coder checks initial coding, recodes as needed.
6. Inter-coder discussion and consensus.
7. Member checking.
8. Follow-up interviews as needed for data saturation.

The interview protocol in Appendix C includes a script for the researcher to greet, obtain consent, clarify procedures, and initiate questions. Follow-up questions were included as a guide, however since the interviews were semi-structured and student experiences varied, the flow of the conversation ultimately directed the exact questions used for follow-up and clarification. A

follow-up email to each interviewee included a transcript of the interview and asked for clarification on any comments if needed.

University email addresses for instructors currently teaching online courses were obtained by manual review of the web pages with course availability postings for each college. For every course specifically described as an online course, the instructor's email address was copied to a spreadsheet, and then used to compile a mailing list for each college. Emails with information about the survey, and PDF files of informed consent, approval letter from the IRB, and the survey questions were sent to 566 instructors at three community colleges in the university system in Spring 2021using the "bcc" (blind carbon copy) function to protect instructor identity. The email list was used to send online instructors the same information and invitation in Spring 2022, with the addition of 94 instructors teaching online courses from an additional 4-year college in the same university system at the semester mid-point, to achieve a greater sample size. A reminder email was sent to instructors three weeks following the initial email.

Data Collection

Phase 1 (Survey)

Data were collected from four colleges within the university system as described above on google sheets, then compiled into one data file. 221 students responded, with 14 declining to progress to the survey after reviewing the informed consent. Responses were then reviewed for indications of response bias, for example extreme response bias. The benchmark for this was at least some variation in the rankings chosen. Though likely present, no clear response bias patterns emerged from a visual scan of responses. Having several items address topics in the

survey may also have helped smooth out errors caused by response bias. The rule for retaining survey responses was that one or two missing responses overall was acceptable, however consecutive response gaps, for example involving most or all any sub concept, was unacceptable. After removing incomplete surveys with incomplete responses (n=2) following this rule a total sample size of 203 remained.

An adequate sample size is critical when using a quantitative survey methodology to provide valid results (Andrews et al., 2003; Bryman, 2016; Evans & Mathur, 2018) and statistical power (Wolf et al., 2013). In general, simpler studies with larger samples have less risk from internal and external threats to validity (Beaujean, 2014; Muthén & Muthén, 2002; Wolf et al., 2013) because a larger sample tends to smooth out outliers, which are responses falling well outside of the mean. These responses are valid, however in a small sample they may gain outsized weight and distort findings. (Wolf et al., 2013).

The sample sizes used to develop the original LTTD, OSLQ, CoI, and TDSTECH instruments are shown in Table 4.

Table 4. Sample Sizes for Study Survey Instruments.

Survey Instrument	Authors	Sample Size
LTTD	(Giossos et al., 2016)	287
OSLQ	(Barnard-Brak et al., 2010)	279
CoI	(Arbaugh et al., 2008)	287
TDSTECH	(Weidlich & Bastiaens, 2018)	141

Jackson (2001) proposed the *q:N* rule for determining sample size. The *q* is the number of parameters in the model and *N* equals the sample size. A recommended ratio of 1 parameter

(*q*) for 20 participants (*N*) indicates an adequate sample according to this rule. The number of parameters considered essential is shown in Table 5. Using the q:N rule, this study, parameters of Co-Understanding, Awareness, Teaching presence, Social Presence, Cognitive Presence, , SRL, and Satisfaction, would need a minimum of 140 participants for the survey phase (7 parameters X 20 = 140). The sample size of 205 for this study fell well above that goal, however short of the sample size of 377 based on an N of 16,500 online students as recommended by Krejcie and Morgan (1970) in the *Table for Determining Sample Size from a Given population*. Using a mixed methods methodology with follow-up interviews helped to correct for a smaller than ideal sample size and explain findings.

Sample Size for Phase 2 (Interview)

For the interview phase 12 participants were interviewed over the course of two consecutive Spring semesters. The plan was to have participants who ranked LTTD high and who ranked LTTD as low on the survey instrument. Data saturation, the point where no significant new information surfaces, was achieved by the final interview in March 2022. Recruitment for interviews was continuous once respondents who wanted to participate in Phase 2 submitted emails at the end of the survey.

Data Analysis

Quantitative analysis from a questionnaire was combined with a Qualitative analysis of interview transcripts in a sequential mixed methods approach. This allowed a deeper understanding of the relationships between the key variables of LTTD and SRL, CP and Satisfaction, as well as insights into specific correlations. However, the description of the methodology as “sequential” may be misleading. Initial quantitative analysis was followed by

interviews with students, and data from the interviews then triggered a review of the data methods used for the analysis of questionnaire items, and further checking the results with interview transcripts and both formal and informal member checking and inter-rater reviews. So, while the initial process was sequential, this was repeated in several iterations to clarify and better understand the data.

Quantitative Analysis

Initial quantitative analysis involved descriptive statistics for variables and pivot tables for demographic items. Correlation studies of the main concepts and sub concepts followed to explore the relationships. In this study, individual item analysis was done using non-parametric methods, while subscale data was analyzed using parametric methods. Because Likert scales are visually numerical, correlation analysis is often done using Pearson's *r* , with the assumption that the intervals between numbered level of agreement or disagreement are equal. (Gardner & Martin, 2007; Jamieson, 2004). However, Likert scales are technically ordinal, with no guarantee that the intervals between rankings are equal in the respondent's mind (Gardner & Martin, 2007; Jamieson, 2004). Spearman's ρ is therefore considered a more appropriate statistical method to apply to *individual items*, as opposed to *subscales* of items representing study variables (Bryman, 2016; Carifio & Perla, 2007; Jamieson , 2004; Likert, 1932). For subscale data composed of at least six to eight items, parametric methods such as Pearson's *r* are appropriate (Carifio & Perla, 2007; Likert, 1932), therefore Pearson's *r* was used for correlation studies of variable represented as subscales of six or more items. This is in line with findings that data from Likert type questionnaires, when latent variables are manifest by multiple (preferably at least six to eight) items, are robust when analyzed with parametric methods (Carifio & Perla, 2007).

Exploratory Factor Analysis (EFA) using R statistical software helped to clarify the relationships between LTTD and SRL, CoI, and Satisfaction. For analysis, the means of subscale rankings for each variable were used. For LTTD, the mean of items 1-25 for each observation was used as a datapoint. For CoI, the subscales of Teaching Presence, Social Presence, and Cognitive Presence were analyzed as separate variables initially.

A review of the main concepts and their subscales revealed that the LT-TD and CoI questionnaire items were organized in subscales with sufficient items for parametric analysis. LTTD sub concepts of Co-Understanding and Awareness correlated highly and were collapsed into a single variable, LTTD for this study, composed of 25 items. Within the CoI Questionnaire the three subscales of Teaching Presence, Social Presence, and Cognitive Presence were each composed of sufficient items for reliable parametric testing. Correlation studies and t-tests also validated their treatment in this study as separate variables. However, the OSLQ questionnaire was composed of six subscales with a maximum of 5 items and a minimum of three, and so subscales were collapsed according to the Zimmerman (1989) SRL Model for analysis. A more detailed analysis of LTTD, CoI, SRL, and Satisfaction question items and subscales follows.

LTTD

The original Giosso et al. (2016) LT-TD Questionnaire had four subscales: Co-Understanding of Skills, Co-Understanding of Needs, Awareness of Skills, and Awareness of Needs. For this stud Co-Understanding Skills and Needs items were combined as Co-Understanding, and Awareness Skills and Needs items were likewise combined as Awareness. This allowed for sufficient items to reliably proceed with parametric analysis.

Table 7. Descriptive statistics for LTTD Subscales.

	Co-Understanding	Awareness
Mean	3.31	3.35
Standard Error	0.07	0.08
Median	3.30	3.27
Mode	5.00	5.00
Standard Deviation	1.03	1.08
Sample Variance	1.05	1.16
Kurtosis	-0.52	-0.43
Skewness	-0.18	-0.34
Range	4.00	4.00
Minimum	1.00	1.00
Maximum	5.00	5.00
Sum	679	686
Count	205	205
95% Confidence Level ($\alpha = 0.05$)	0.14	0.15

Items related to co-understanding typically began with “My teacher knows…” while items related to awareness began with “My teacher takes into consideration…”. Twenty of the 25 items related to LTTD are paired by similar wording as shown in Table 9 below.

Table 8. Instructor Co-Understanding and Instructor Awareness Item Pairing.

Item	Co-Understanding	Item	Awareness
1	My teacher knows what I know about the course module he/she teaches.	11	My teacher takes into consideration the knowledge I have on the course module he/she teaches.
2	My teacher knows my abilities on the course module he/she teaches.	12	My teacher takes into consideration the abilities I have on the course module he/she teaches.
3	My teacher knows the way I learn better.	13	My teacher takes into consideration the way I learn better.
4	My teacher knows the gaps I have on the course module he/she teaches.	15	My teacher takes into consideration the gaps I have on the course module he/she teaches.
5	My teacher knows that the time I have available for study is limited.	17	My teacher takes into consideration that the time I have available for study is limited.
6	My teacher knows that, apart from my studies, I have to cope with many other things in my life.	18	My teacher takes into consideration that, apart from my studies, I have to cope with many other things in my life.
7	My teacher knows that I need help in my studies.	19	My teacher takes into consideration the need I have for guidance and help in my studies.
8	My teacher knows that I need to communicate with the other students regularly.	22	My teacher takes into consideration that I need to communicate with the other students regularly.
9	My teacher knows that I need encouragement.	23	My teacher takes into consideration that I need encouragement.
10	My teacher knows the difficulties I face in coping with the course module.	24	My teacher takes into consideration the difficulties I face in coping with the course module.

A paired t test showed similar means and variances, with a high Pearson correlation of 0.85 between Co-Understanding and Awareness, as shown in Table 9 below. The t-test results indicated that Co-understanding and Awareness were nearly identical with a correlation of .90,

leading to the failure to reject the null hypothesis that there was no significant difference between the variables.

Table 9. *t*-Test Paired Two Sample for Means, Co-understanding and Awareness.

	Co-Understanding	*Awareness*
Mean	3.31	3.35
Variance	1.05	1.16
Observations	205	205
Pearson Correlation	0.90	
Hypothesized Mean Difference	0.00	
Degrees of Freedom	204.00	
t Stat	-1.06	
P(T<=t) one-tail	0.14	
t Critical one-tail	1.65	
P(T<=t) two-tail	0.29	
t Critical two-tail	1.97	

LT-TD questionnaire items formed a single variable of LTTD as an independent variable in this study, unlike the CoI questionnaire and OSLQ, which contained subscales of items clearly belonging to separate variables.

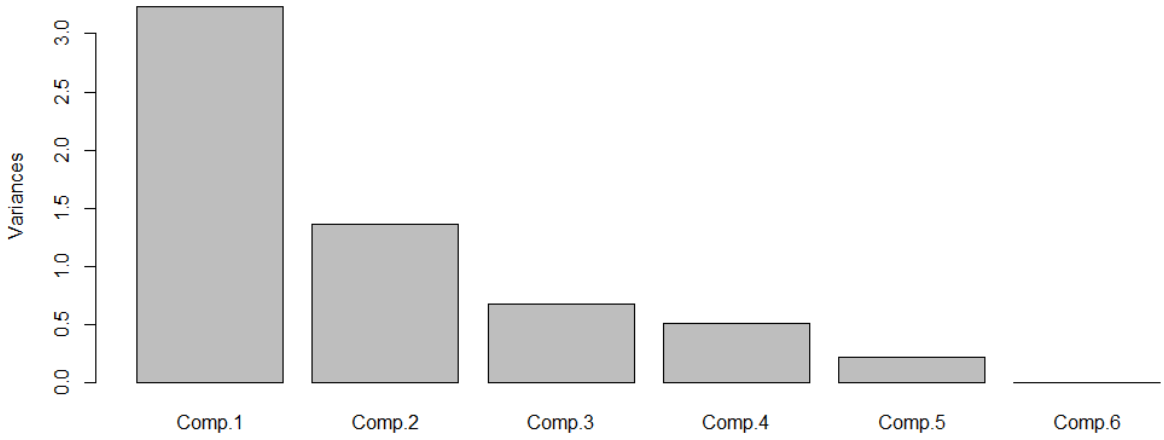
CoI

The CoI framework is composed of the three dimensions of Teaching Presence, Social Presence, and Cognitive Presence (Arbaugh et al., 2008). The relationship of LTTD with each of the CoI dimensions was analyzed using correlation studies and EFA since each CoI subscale contained more than enough items to allow analysis as a dependent variable.

SRL

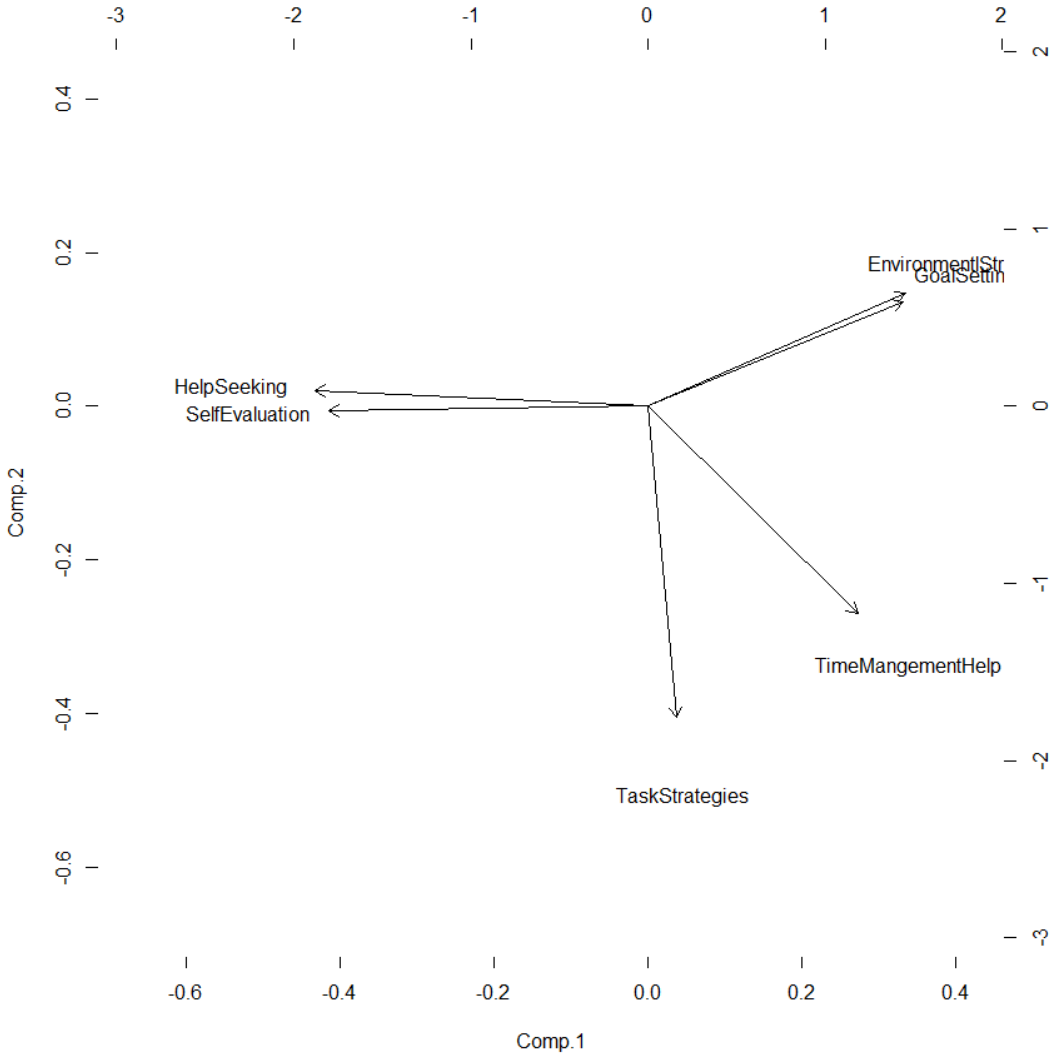
For analyzing SRL, a problem arose, because the subscales used by Barnard-Brak et al. (2010) did not contain a minimum of six items, the lower limit for reliable analysis established for this study based on Carifio and Perla (2007). However, the original Zimmerman (1989) SRL model was based on three sub concepts of Forethought, Performance, and Self-Reflection. Correlation studies and EFA of the OSLQ indicated that Help Seeking correlated strongly with Self-Evaluation,

Figure 8. PCA of SRL Subscales



A biplot of SRL subscales showed that SRL subscales mostly fit into the Zimmerman three phase SRL model, with the exception of Help Seeking, which instead paired with Self-Evaluation, a component of the Self-Reflection phase. Time Management Help did not closely pair with Task Strategies as expected but fell between Task Strategies and the group Goal Setting and Environmental Structuring.

Figure 9. Biplot of SRL PCA.



An EFA. Shown in Table 10 below, also supported a three-factor model, again mostly following the SRL model except for Help Seeking. Also, time Management cross-loaded on factors 2 and 3, indicating that it was not strongly linked to one factor. However, Time Management was represented by only three items in the OSLQ instrument.

Table 10. EFA of SRL Subscales.

	Factor 1 Self-Reflection	Factor 2 Forethought	Factor 3 Performance	h2	u2	com
Goal Setting	0.17	0.7	0.22	0.58	0.42	1.4
Environmental Structuring	0.16	0.65	0.24	0.51	0.49	1.5
Task Strategies	0.35	0.35	0.63	0.66	0.34	2.3
Time Management Help	0.2	0.51	0.58	0.66	0.34	2.3
Help Seeking	0.8	0.13	0.18	0.7	0.3	1.2
Self-Evaluation	0.82	0.22	0.21	0.79	0.21	1.3
SS loadings	1.53	1.37	0.92			
Proportion of Variance	0.26	0.23	0.15			
Cumulative Variance	0.26	0.48	0.64			
Proportion Explained	0.39	0.35	0.24			
Cumulative Proportion	0.39	0.74	0.98			

For this study, since the purpose of performing factor analysis on SRL subscales was to determine whether a smaller number of variables with more items for each was reasonable, Time Management Help was retained as part of factor 3 since it loaded highest there. For this study, SRL subscales were divided as shown below in Table 11.

Table 11. Original and Revised SRL Subscales.

OSLQ Subscales	**Items**	**Revised Subscales**	**Items**
Goal Setting	60-64 (5)	Forethought	60-68 (9)
Environmental Structuring	65-68 (4)		
Task Strategies	69-72 (4)	Performance	69-75 (7)
Time Management Help	73-75 (3)		
Help Seeking	76-79 (4)	Self-Reflection	76-83 (8)
Self-Evaluation	80-83 (4)		
Total Items	24		24

Qualitative Analysis

Following initial quantitative analysis of the survey data, Interviews with students were analyzed. Thematic analysis is a flexible and robust method for analyzing qualitative data (Braun & Clarke, 2006). Initial categories for main variables of LTTD, SRL, CP, and Satisfaction (Table 1). Participants were sent transcripts of our interviews and given the opportunity to add to or clarify information, or to opt out of having their interview included in the analysis. No modifications, additions, or opting out were requested. Data from semi-structured interviews was analyzed systematically using coding and thematic clustering to develop an overarching theory to explain the student experience of the main concepts of student-teacher distance of understanding, student strategies and use of SRL skills, sense of community presence and satisfaction with the online course(s). A coding book with initial categories following the concepts and sub-concepts of LTTD, SRL, and CoI as operationalized in the respective questionnaires (Arbaugh et al., 2008; Barnard-Brak et al., 2010; Giossos et al., 2009, 2016) was developed, shown in Table 7 below.

Table 12. Initial Categories from LTTD, SRL, CoI, and Satisfaction Questionnaires.

Concept	Sub-concepts	Coding
Learner-Teacher Transactional Distance (LTTD)	Co-Understanding	Co-Understanding Skills
		Co-Understanding of Needs
	Awareness	Awareness of Skills
		Awareness of Needs
Self-regulated Learning (SRL)	Forethought	Goals Setting
		Environmental Structuring
	Performance	Task Strategies
		Time Management Help
	Self-Reflection	Help Seeking
		Self-Evaluation
Community of Inquiry (CoI)	Teaching Presence	Design and Organization
		Facilitating Discourse
		Direct Instruction
	Social Presence	Social Presence
	Cognitive Presence	Cognitive Presence
Satisfaction		Self-Efficacy
		Cognitive Engagement

Following initial coding two professional educators with experience in online teaching reviewed the codes for congruence and did not suggest additional categories. Member checking was done throughout the analysis to clarify and enlarge on interviews, and at the end of the process to verify findings. After coding and summarizing interviews, further quantitative analysis of survey data necessitated additional iterations of coding and inter-rater review to help

confirm quantitative findings. The researcher met with the same two individuals who performed the inter-rater role to discuss and clarify findings.

Validity

This study utilized a five-point Likert style survey tool for data collection in Phase 1, and follow-up semi-structured interviews in Phase 2. Triangulation helped to overcome limitations inherent in survey research with a less-than-optimal survey sample as well as providing a qualitative context to responses (Creswell, 2015; Ivankova et al., 2006). Measures to ensure internal and external validity are discussed below.

Internal Validity

A pilot survey using all items except demographic data was tested on a small representative sample of online students attending the researcher's home college in the same university system as the target colleges. A Cronbach's α test using the sample of 41 online students (with 39 retained results after data cleaning) indicated good internal consistency among sub concepts. For example, four question items, or indicators, measured the sub-construct Co-understanding of Skills. Since the Cronbach's α value for those four indicators was 0.886, good internal consistency was indicated for the sub-construct. Cronbach's α values for all items on the survey tool, for each of the four main concepts of LTTD, CoI, SRL, and satisfaction, and the supporting sub-concepts underlying main concepts indicate good internal consistency as shown in Table 5.

Table 13. Cronbach's α and Number of Items per Variable.

Concept	# items	Cronbach's α
LTTD	**25**	**0.979**
Co-understanding	10	0.942
Awareness	15	0.973
CoI	**34**	**0.966**
Teaching Presence	13	0.96
Social Presence	9	0.878
Cognitive Presence	12	0.948
SRL	**24**	**0.909**
Forethought	9	0.898
Performance	7	0.827
Self-Reflection	8	0.833
Satisfaction	**6**	**0.845**
Total Items	**89**	**0.981**

Other challenges to internal validity involve the structure of the questionnaire and the participant/questionnaire interface. Though the survey will be online, traditional obstacles to paper survey completion and return will also need to be considered. For example, measurement error, when the respondent's answer does not accurately reflect perceptions is just as likely in an online survey as on a paper survey (Umbach, 2005). Basic wording and survey construction errors are possible internal errors. Careful survey construction and piloting will be used to avoid or minimize these errors (Bryman, 2012; Evans & Mathur, 2018; Umbach, 2005). The survey instruments used slightly different wording, and this was adjusted to provide a consistent voice

throughout the study survey instrument, and then tested as described above. For example, the present tense was used in one instrument, while the past tense was used in another. For the study instrument the present tense is used, since the survey will be deployed during the semester while students are actively engaged in online courses.

External Validity

External validity depends on those things that are outside of the structure of the data gathering tool and include areas such as researcher bias in the form of sampling bias or confirmation bias (whether intentional or not), response errors, sampling errors, confirmation bias, and errors in statistical analysis of results.

Response error. Social desirability, extreme response, acquiescence and neutral response bias impact external validity and will need to be anticipated and consistently dealt with in data collection and cleaning (Bryman, 2012; Draugalis & Plaza, 2009). Complications related to survey completion by learners involve the online competence of the participant, perceptions of the survey as junk mail, possible skewedness of the online population, and connectivity issues. (Evans & Mathur, 2018; Fan & Yan, 2010). Though technology may not be a major barrier to the participants in this online survey because participants will be online students enrolled in web-based classes, it cannot be discounted. Also, learners may encounter survey fatigue or repetition bias from repeated questionnaires such as class surveys and end of term course and instructor evaluations (Bryman, 2012; Umbach, 2005). To counter response errors, the survey was designed with a Likert style scale with only five possible ratings, allowing ease of response . Short, concise questions using commonly used English and avoiding jargon were used . It was also presented in an easy-to-use electronic format using an easy to access app. To encourage

engagement rather than simply deleting the recruiting email, instructors at the college were recruited to announce the survey, and where possible include a link to the survey web page with informed consent information and survey link. Also, the survey was deployed well before the end of semester, when students are typically exposed to multiple end-of-term surveys while preparing for final exams. Finally, reminders were sent at the two-week and three-week marks to encourage participation.

Sampling error. The most common sampling error is having too small a sample size for the complexity of the study. The number of variables in a study generally increases the necessary sample size for statistical validity (Privitera, 2019). Another important sampling error is the failure to draw a sample that truly represents the population. For this study, the researcher worked to recruit online students from a wide variety of online courses and programs, such as career technical education and also from STEM and liberal arts courses. A limitation here may be the under-representation of science-with-lab courses available online at the target college (Table 1). To obtain an adequate sample the survey was deployed in the middle of the Spring 2021 semester, the Fall 2021 semester, and then deployed again following the same process in Spring 2022. The survey was deployed at Institution B in Spring 2022 as well. For Institution A, forty-eight responses were received in Spring 2021, two responses in the Fall 2022 semester, and 160 in Spring 2022. The extremely low response in Fall 2021 remains difficult to explain, however it may have been simply a result of overload on both instructor and students. The researcher did receive anecdotal feedback from some instructors that they were overwhelmed or felt that it was an unacceptable extra workload for their students, who therefore never had an opportunity to decide whether to participate. This highlighted another challenge to validity and demonstrated the pivotal role instructors have in relation to students. By working through

instructors, the researcher enabled the instructor to control access to the survey, possibly skewing the sample.

Confirmation bias. Confirmation bias is a frequent issue, and occurs when the researcher fails to consider alternate explanations that might equally well explain a correlation between variables (Kline, 2011). Exploring other possible explanations such as reverse causality (a phenomenon is actually the outcome rather than the cause of a change), being aware of the risk of overemphasizing data that supports the hypothesis while deemphasizing confounding data, and verifying results with other researchers or study participants are methods to counter confirmation errors (Bryman, 2016). The researcher triangulated survey findings in this mixed methods study by cross-checking interviews with statistical data to help detect researcher confirmation error. Triangulating findings and member checking also helped to detect and then explicate risks of confirmation error.

Trustworthiness

Internal validity in quantitative methods is not directly applicable to qualitative methods of research. Instead tests of trustworthiness are applied to qualitative methods (Lincoln & Guba, 1985; Shenton, 2004; Whittemore et al., 2001). Instead, supporting the trustworthiness of findings is the goal. Trustworthiness is defined for this study as trustworthiness as credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). Though other terms are also used under the umbrella of trustworthiness (Whittemore et al., 2001), this study framed trustworthiness using the Lincoln and Guba (1985) terms.

Credibility. Credibility is established when alternate perspectives are considered. For this study, credibility in the interview phase was supported using methodological rigor in data

collection and analysis, including reflective review of codes, categories, and themes, using secondary coders, and member checking to provide triangulation to ensure results reflect participant's experiences.

Transferability. While statistical methods can be applied to quantitative data to ensure external validity, qualitative data requires a robust process of data collection providing thick, rich descriptions. This allows other researchers to evaluate whether the findings can be transferred to other contexts. This study supported transferability through an iterative interview and analysis process, continuing until data saturation occurred. The initial plan was to recruit six to ten participants who represent the widest variety of responses on the LTTD portion of the survey instrument. However, among the approximately 30 respondents who provided email addresses, only seven students replied to invitations to participate in interviews. Fortunately, the seven students did present a wide range of perceptions of LTTD, which became even more obvious as the interviews unfolded.

Dependability. Roughly corresponding to (but not the same as) reliability, dependability refers to the ability of other researchers to follow the researcher's process of data collection, analysis, and development of conclusions or theories to explain findings. This is often done by inviting other researchers to audit the process through review of an audit trail, or complete set of records of the research program. An audit trail of recruitment, transcripts, and researcher journaling of the process will provide materials for transparent auditing of the interview phase of this study.

Confirmability. In addition to supporting the dependability of a study, an audit trail and auditors help to support the confirmability of the study. Though qualitative studies are generally

not replicable, the process through which conclusions are arrived at can at least be traced through the research process if a comprehensive audit trail is created during the study.

Trustworthiness is achieved through rigorously applying the proper methods for the type of data one is collecting and analyzing (Shenton, 2004). This study is a sequential mixed methods study utilizing both quantitative and qualitative methods, which are integrated into the findings through comparison and triangulation of survey data proving a broad but relatively shallow view and interviews providing a more narrow but deep view into the experiences of individual students in online courses.

Role of the Researcher

It is important that the researcher clearly identify assumptions and be willing to question them in the light of new evidence (Lincoln & Guba, 1985). To that end the researcher discusses assumptions related to this study and online learning below as well as personal biases which may influence the findings.

The researcher is a doctoral student in a Learning Technologies (LTEC) program at a major U.S. university in the Pacific. The researcher is also an associate professor of nursing in a small community college within the same university system, and an online instructor. A big concern leading to the interest in conducting this study was that, while in the past students usually self-selected to enroll an online course, increasingly (and especially since the beginning of the COvID-19 pandemic) students have had little choice but to participate in online classes in order to continue their education. That is certainly the way the researcher went through graduate school for nursing education. And though for this researcher it was “Oh, great, it's online, perfect”, clearly that is not a universal feeling among students. The researcher’s assumptions are

informed by this predisposition to view online courses in a positive light. But for a lot of people, learning through online coursework is not a great thing, or necessarily a positive experience. It is not an experience they love, nor one they may be well prepared for. This was confirmed by this researcher's experience in teaching introductory and advanced health sciences courses in synchronous and asynchronous modes online. More and more students were going online because the course they needed was not offered on their home campus, or in the case of high demand courses, filled already. Students often lacked the requisite skills and technology to function effectively in the course. And that was interesting to me, because it meant that as educators, we needed to become better teachers. We needed to be better at supporting those students for whom this is not their preferred modality. This required more care in designing the online environment. For example, providing redundant pathways and links to resources and interactive tools, making easy pathways to follow online, so students don't have to go look for arcane files in a cryptic and confusing directory tree. What may have been tolerable to students in the past became a serious barrier to success for many students who were pushed into online courses. This became obvious to the researcher when COVID-19 essentially shut down F2F courses, forcing nearly all students online, right where most of them did not want to be. Making the current environment even more difficult, teachers who preferred, and may only have taught F2F courses themselves were not prepared to teach online. They were using whatever videoconferencing application was supported by the school as if it were a F2F classroom, ignoring that fact that a different mode of instruction required a different approach to teaching because the bandwidth is reduced severely from the F2F mode to whatever the internet connection will support. Or students were expected to suddenly know how to collaborate online asynchronously. The researcher was a community college nursing instructor and experienced the

profound change in instructional mode personally. A hybrid approach replaced the previous F2F mode of instruction, with online synchronous (but still three hour) lectures. Labs were conducted in small groups, with mandatory separation of students, facemasks, and extremely limited access to clinical sites. The workload of faculty and students increased significantly, while transactional distance also increased. The researcher's assumptions about the pivotal role of the teacher in empowering students to develop the self-regulation and collaborative skills needed for students to succeed in nursing was reinforced by this experience, and the critical importance of learner-teacher engagement for fostering cognitive and community engagement became clear. My previous research in online courses led to the topic of learner-teacher transactional distance and its relationship to student self-regulation, community presence in online courses, and student satisfaction. That bias toward the assumed importance of the teacher role is a potential challenge to trustworthiness, however it is also a significant motivation for research into learner-teacher engagement.

Another point of possible bias besides an affinity for online courses is this researcher's history of being a "problem student" throughout my K-12 education. My interest in learner-teacher engagement stemmed from failure. However, eventually the researcher was fortunate enough to enroll in a vocational education program at the local community college, where non-traditional instructors took the time to engage with students like me who had internalized the lesson from school that we were not very bright. Since then, the researcher has been a non-traditional student; older than the average college age student, and usually working full-time. As such this researcher has often felt as an outsider to the traditional campus-based full time student culture and more attuned to commuter and vocational students. This has perhaps sensitized the researcher to the challenges of enculturating into and feeling part of the academic community as

a student. Those teachers who consciously reached out and provided guidance were especially important to overcoming feelings of being an imposter and persisting to earn a degree, which Tinto (2012) describes well. Challenges such as the COVID-19 pandemic show that fostering resilience, self-efficacy, and engagement in students is as important as imparting facts and modeling life-long learning.

CHAPTER 4. FINDINGS

The research questions for this study focus on the relationship of LTTD, community presence as represented by the CoI framework, student SRL, and satisfaction with online courses. The research questions were:

1. What is the relationship between LTTD and student use of SRL skills in online courses?
2. What is the relationship between LTTD and student sense of CP in online courses?
3. What is the relationship between LTTD and student Satisfaction in online courses?
4. How do student perceptions of LTTD influence decisions on the use of self-regulated learning skills?
5. How do student perceptions of LTTD influence participation in the online course community?
6. How do students describe satisfaction in the context of online learning, and how do perceptions of LTTD influence satisfaction in online courses?

The first three RQs explored the relationship between LTTD, CoI, SRL, and Satisfaction, while the last three explored more closely the individual student experience of LTTD in relation to CoI, SRL, and Satisfaction.

This chapter is divided into two main sections. The first section will review the findings from the survey, Phase 1, of the study , and the scond section will review findings from Phase 2, semi-structured interviews. The seven semi-structured interviews are described with accompanying data, where available from the interviewee's survey responses.

Phase 1 Survey Findings

Main variables included LTTD, CoI, SRL, and Satisfaction. CoI, SRL, and Satisfaction were primarily analyzed in relation to LTTD.

Table 14. Descriptive Statistics, LTTD, CoI, SRL, and Satisfaction.

	LTTD	*CoI*	*SRL*	*Satisfaction*
Number of Questionnaire Items	25	34	24	6
Mean	3.34	3.85	3.66	3.90
Standard Error	0.07	0.05	0.05	0.06
Median	3.24	3.85	3.67	4.00
Mode	5.00	5.00	4.17	5.00
Standard Deviation	1.03	0.76	0.67	0.89
Minimum	1.00	1.41	1.67	1.00
Maximum	5.00	5.00	5.00	5.00
Count	203.00	203.00	203.00	203.00
*Confidence Level (95%)	0.14	0.10	0.09	0.12

*Indicates the possible range of the mean +/- the value shown for each variable.

Descriptive statistics for the main variables included the means of questionnaire item rankings by students. Table 9 shows standard descriptive statistics and the number of items for each main variable. LTTD had the lowest mean ranking at 3.34 (*SD* = 0.07), while the mean Satisfaction was highest at 3.90 (*SD* = 0.06), with CoI, encompassing teaching, social, and cognitive presence, just behind Satisfaction and SRL third at 3.66 (*SD* = 0.05). This was also true for median scores, with Satisfaction reaching a median ranking of 4 among students and LTTD at 3.24, however, the range for both LTTD and Satisfaction was 4 with a high of 5 and a low of 1. Later analysis confirmed a closer relationship between CoI and Satisfaction than between Satisfaction and either LTTD or SRL. The sample variance of 1.06 for LTTD and 0.78 for Satisfaction indicates significant variability between individual student mean rankings for

LTTD and Satisfaction and slightly less variation for CoI and SRL, however all except LTTD were less than 1 standard deviation from the mean. Table 15

Table 15. *t*-Test: High and low LTTD Ranking Groups.

	LTTD		CP		SRL		Satisfaction	
α = 0.05	*Group A*	*Group B*	*Group A*	*Group B*	*Group A*	*Group B*	*Group A*	*Group B*
Mean	2.30	3.93	3.32	4.15	3.34	3.85	3.42	4.17
Variance	.44	.44	.52	.36	.36	.42	.94	.48
Observations	75.00	130.00	75.00	130.00	75.00	130.00	75.00	130.00
Pooled Variance	0.44		0.42		0.40		0.65	
Hypothesized Mean Difference	0.00		0.00		0.00		0.00	
Degrees of Freedom	203.00		203.00		203.00		203.00	
t Stat	-16.94		-8.79		-5.54		-6.45	
P(T<=t) one-tail	<.001		<.001		<.001		<.001	
t Critical one-tail	1.65		1.65		1.65		1.65	

*Group A = Mean of LTTD Rankings =< 3, Group B = Mean of LTTD Rankings > 3 on Likert 1-5 scale.

shows the differences between students who ranked LTTD as relatively low (greater than 3on the Likert scale) in Group A, and students who ranked LTTD as high (at or less than 3on the Likert scale) in Group B on the 1-5 Likert scale. For LTTD, the Likert scale moved in the opposite direction from the student's perception of LTTD because of the way the questionnaire was constructed with low LTTD receiving a higher score and high LTTD receiving a lower score. Mean rankings for CoI, SRL, and Satisfaction were lower for students for whom the mean ranking for LTTD was at 3 or lower, and higher for students who ranked LTTD higher. Based on a null hypothesis that no difference in means existed, the *t*- test (1.65) for significant variation between students who ranked LTTD at greater than a 3 (taken as a mean of 25 item rankings) and students who ranked LTTD at 3 or lower showed that the difference in mean scores was significant (alpha = 0.05) for CoI, SRL, and Satisfaction, leading to the rejection of the null

hypothesis. Lower mean LTTD score, meaning a smaller distance of understanding or psychological distance between the teacher and student, was associated with higher sense of community as measured by the CoI mean score, and a higher score for self-regulation and satisfaction. Pearson's r correlation studies followed.

The main variables of LTTD, CoI, SRL, and Satisfaction were first compared. Subscale variables were then studied to explore possible underlying correlations between sub concepts of LTTD, CoI, and SRL. Satisfaction, composed of six items from the TDSTECH questionnaire, was not subdivided into sub concepts in the TDSTECH questionnaire. For this study, correlations with values of 0.7 or higher were considered strong, between 0.6 and 0.69 were considered moderate, and below between 0.5 and 0.59 were considered weak.

Table 16. Pearson's r , LTTD, CoI, SRL, and Satisfaction.

	LTTD	CoI	SRL	Satisfaction
LTTD	1			
CoI	.75	1		$\alpha = 0.05$
SRL	.51	.63	1	
Satisfaction	.59	.78	.44	1

Light Green = Correlation >= .50, Medium Green = Correlation >= .50 Dark Green = Correlation >= .70

As shown in Table 16, the correlation between LTTD and CoI from was strong $r(201) = .75$, $p < .01$. There was very weak correlation, $r(201) = 0.51$, $p < .01$, found between LTTD and SRL. LTTD and Satisfaction were moderately correlated, $r(201) = 0.59$, $p < .01$. Also of note is a strong $r(201) = 0.78$, $p < .01$ correlation between CoI and Satisfaction and a moderate $r(201) = 0.63$, $p < .01$ correlation between CoI and SRL.

Table 17. Pearson's *r*, LTTD and CoI, SRL, Satisfaction Sub Constructs.

	LTTD	*Teaching Presence*	*Social Presence*	*Cognitive Presence*	*Forethought*	*Performance*	*Self-Reflection*	*Satisfaction*
LTTD	1.00							
Teaching Presence	.81	1.00					α= 0.05	
Social Presence	.58	.63	1.00					
Cognitive Presence	.62	.72	.73	1.00				
Forethought	.32	.43	.48	.59	1.00			
Performance	.50	.43	.52	.48	.56	1.00		
Self-Reflection	.68	.75	.64	.77	.51	.59	1.00	
Satisfaction	.60	.75	.52	.74	.44	.35	.88	1.00

Lt. green = >= 0.5, Med. Green = >= 0.6, Dk. Green = >= 0.7

The following provides a more detailed analysis of correlation studies between LTTD and CoI, SRL, and Satisfaction, focusing on sub concepts where appropriate.

LTTD and CoI

Overall, LTTD correlated strongly with CoI subscales using Pearson's r , however most of the strength of the correlation was between LTTD and the CoI sub concept of Teaching Presence ss shown in Table 18. Of note also is that Social Presence correlated only weakly with Teaching Presence, and moderately strongly with Cognitive Presence.

Table 18. Pearson's *r*, LTTD and CoI Sub Concepts.

	LTTD	Teaching Presence	Social Presence	Cognitive Presence
LTTD	1			
Teaching Presence	0.78	1		α = 0.05
Social Presence	0.54	0.55	1	
Cognitive Presence	0.61	0.73	0.68	1

Light Green = Correlation >= 0.50, Medium Green = Correlation >= 0.50 Dark Green = Correlation >= 0.70

A more detailed analysis of item correlations using Spearman's ρ follows,

LTTD and Teaching Presence

Teaching Presence is defined as being composed of (a) design and organization; (b) moderating discourse; and (c) direct instruction (Budhai & Williams, 2016; Garrison, 1991; Rourke et al., 1999). For the students interviews the design and structure and direct instruction components of Teaching Presence seemed to be the strongest determinants of satisfaction with the course. These components linked to survey items in the CoI Questionnaire, as shown in Table 19 below.

Table 19. CoI Questionnaire Teaching Presence Items and Sub-Components.

CoI Questionnaire Teaching Presence Item	Sub-Component
The instructor clearly communicates important course topics.	Design and Organization
The instructor clearly communicates important course goals.	Design and Organization
The instructor provides clear instructions on how to participate in course learning activities.	Design and Organization
The instructor clearly communicates important due dates/time frames for learning activities.	Design and Organization
The instructor is helpful in identifying areas of agreement and disagreement on course topics that help me to learn.	Facilitating Discourse
The instructor is helpful in guiding the class towards understanding course topics in a way that help me clarify my thinking.	Facilitating Discourse
The instructor helps to keep course participants engaged and participating in productive dialogue.	Facilitating Discourse
The instructor helps keep the course participants on task in a way that helps me to learn.	Facilitating Discourse
The instructor encourages course participants to explore new concepts in this course.	Facilitating Discourse
Instructor actions reinforces the development of a sense of community among course participants.	Facilitating Discourse
The instructor helps to focus discussion on relevant issues in a way that helps me to learn.	Facilitating Discourse
The instructor provides feedback that helps me understand my strengths and weaknesses relative to the course's goals and objectives.	Direct Instruction
The instructor provides feedback in a timely fashion.	Direct Instruction

The survey did not ask participants about the relative value they placed on each component, only to rank how much they agreed that the teacher was providing it. The interviews revealed a clear concensus that how the teacher set up and organized the course, moderated discussions, and reponded to individual communications from students, were critical for their satisfaction with the course. Table 20 below shows the descriptive statistics for these sub concepts. Design and Organization concerns actions such as syllabus development and posting, instructional design, and online course site maintenance. Facilitating Discourse is associated with

moderating discussion boards, or breakout rooms in a synchronous online setting. Direct instruction relates to direct 1:1 email, virtual office hours, and mentoring 1:1 with a student.

Table 20. Descriptive Statistics for Teaching Presence Sub Concepts.

	Design & Organization	*Facilitating Discourse*	*Direct Instruction*
Mean	4.21	3.74	3.84
Standard Error	0.06	0.08	0.07
Median	4.50	4.00	4.00
Mode	5.00	5.00	5.00
Standard Deviation	0.91	1.12	1.07
Minimum	1.00	1.00	1.00
Maximum	5.00	5.00	5.00
Sum	863.25	766.79	787.50
Count	203.00	203.00	203.00

A correlation study of LTTD and subcomponents of Teaching Presence revealed strong correlation between LTTD, Facilitating Discourse, and Direct Instruction, and LTTD and Design and Organization had a moderate correlation. The strongest correlation was between LTTD and Facilitating Discourse. This indicates that students somewhat more strongly correlated Teaching Presence and Learner-Teacher engagement in their role as facilitator and in direct interaction with individual students than in their role as instructional designer and organizer.

Table 21. Pearson's *r* correlation between LTTD and Teaching Presence Sub Concepts.

	LTTD	*Design & Organization*	*Facilitating Discourse*	*Direct Instruction*
LTTD	1.00			
Design & Organization	.60	1.00		
Facilitating Discourse	.79	.75	1.00	
Direct Instruction	.70	.73	.81	1.00

Light Green = Correlation >= .60, Dark Green = Correlation >= .70

A Spearman's ρ correlation study of all items revealed a strong correlation between LTTD and Teaching Presence subscale items, except for items related to the Design and Organization component of Teaching Presence. Design and Organization items, as shown in table 22 below, relate to the basic framework of the course such as information normally included in a course syllabus. It is not too surprising that these items would not correlate well with LTTD items, which are concerned the student's perception of the teacher's understanding of their specific needs and skills in the course rather than whether the teacher carried out general instructional duties.

Table 22. Design and Organization Items for Teaching Presence Subscale.

	Design and Organization Items
Q26	The instructor clearly communicates important course topics.
Q27	The instructor clearly communicates important course goals.
Q28	The instructor provides clear instructions on how to participate in course learning activities.
Q29	The instructor clearly communicates important due dates/time frames for learning activities.

Table 23. LTTD and Teaching Presence Spearman's ρ Correlation.

LTTD Items	Teaching Presence Subscale Items											
	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q34	Q35	Q36	Q37	Q38
Q1	0.46	0.48	0.46	0.43	0.52	0.5	0.47	0.48	0.52	0.55	0.49	0.42
Q2	0.48	0.47	0.37	0.37	0.52	0.6	0.55	0.58	0.65	0.58	0.53	0.43
Q3	0.41	0.42	0.38	0.29	0.56	0.58	0.53	0.55	0.63	0.54	0.58	0.45
Q4	0.4	0.44	0.46	0.32	0.5	0.54	0.56	0.58	0.58	0.57	0.53	0.45
Q5	0.39	0.38	0.4	0.32	0.46	0.48	0.44	0.5	0.51	0.52	0.46	0.39
Q6	0.38	0.39	0.43	0.36	0.54	0.55	0.52	0.54	0.53	0.58	0.54	0.42
Q7	0.36	0.33	0.3	0.19	0.48	0.5	0.43	0.47	0.52	0.48	0.59	0.39
Q8	0.3	0.37	0.32	0.26	0.43	0.49	0.47	0.48	0.54	0.5	0.48	0.36
Q9	0.32	0.36	0.3	0.32	0.46	0.5	0.47	0.5	0.52	0.44	0.48	0.34
Q10	0.38	0.41	0.36	0.32	0.55	0.57	0.5	0.55	0.6	0.58	0.55	0.42
Q11	0.52	0.54	0.47	0.43	0.62	0.66	0.61	0.62	0.68	0.63	0.62	0.46
Q12	0.56	0.58	0.52	0.46	0.65	0.72	0.7	0.69	0.74	0.69	0.64	0.51
Q13	0.51	0.52	0.46	0.39	0.65	0.68	0.63	0.65	0.68	0.6	0.64	0.48
Q14	0.45	0.47	0.4	0.35	0.61	0.62	0.52	0.56	0.66	0.57	0.6	0.49
Q15	0.56	0.55	0.49	0.42	0.64	0.66	0.59	0.62	0.66	0.57	0.6	0.53
Q16	0.45	0.44	0.48	0.44	0.59	0.58	0.54	0.56	0.62	0.6	0.56	0.46
Q17	0.46	0.43	0.46	0.39	0.56	0.59	0.52	0.56	0.61	0.6	0.56	0.43
Q18	0.48	0.46	0.47	0.36	0.59	0.61	0.56	0.59	0.65	0.6	0.6	0.5
Q19	0.53	0.55	0.52	0.45	0.59	0.59	0.59	0.6	0.67	0.6	0.55	0.49
Q20	0.45	0.44	0.38	0.33	0.52	0.58	0.54	0.56	0.62	0.6	0.57	0.4
Q21	0.55	0.56	0.53	0.45	0.57	0.63	0.58	0.58	0.66	0.6	0.57	0.48
Q22	0.46	0.49	0.43	0.35	0.52	0.58	0.53	0.55	0.64	0.6	0.52	0.41
Q23	0.45	0.49	0.45	0.38	0.58	0.65	0.59	0.62	0.64	0.57	0.63	0.45
Q24	0.52	0.53	0.48	0.41	0.61	0.64	0.58	0.61	0.69	0.65	0.64	0.45
Q25	0.48	0.45	0.34	0.31	0.52	0.57	0.53	0.55	0.61	0.55	0.56	0.42

Dark Green = ρ >=0.7, Medium Green = ρ between 0.6 and 0.7, Light Green = ρ between 0.5 and 0.6

LTTD and Social Presence

Social Presence subscale items did not correlate with LTTD items except for Q 40 and Q46, which showed a moderate correlation to Q2 and Q15 respectively.

Table 24. LTTD and Social Presence Spearman's ρ Correlation.

		Social Presence Subscale Items								
		Q39	Q40	Q41	Q42	Q43	Q44	Q45	Q46	Q47
Learner-Teacher Transactional Distance Items	Q1	0.3	0.34	0.26	0.26	0.3	0.25	0.22	0.37	0.33
	Q2	0.33	0.52	0.31	0.34	0.35	0.26	0.22	0.43	0.34
	Q3	0.37	0.48	0.37	0.33	0.3	0.25	0.26	0.42	0.38
	Q4	0.33	0.43	0.3	0.29	0.34	0.25	0.27	0.43	0.35
	Q5	0.31	0.33	0.17	0.33	0.28	0.25	0.26	0.34	0.27
	Q6	0.33	0.35	0.2	0.28	0.29	0.2	0.28	0.4	0.35
	Q7	0.35	0.36	0.25	0.25	0.26	0.24	0.27	0.43	0.36
	Q8	0.48	0.48	0.26	0.25	0.31	0.28	0.33	0.44	0.4
	Q9	0.33	0.36	0.19	0.16	0.2	0.18	0.22	0.38	0.35
	Q10	0.4	0.45	0.25	0.22	0.23	0.22	0.27	0.43	0.33
	Q11	0.38	0.44	0.28	0.27	0.31	0.23	0.3	0.46	0.38
	Q12	0.36	0.45	0.3	0.29	0.33	0.25	0.29	0.48	0.4
	Q13	0.35	0.42	0.31	0.27	0.27	0.21	0.25	0.42	0.35
	Q14	0.36	0.42	0.32	0.24	0.27	0.18	0.28	0.47	0.37
	Q15	0.33	0.4	0.32	0.37	0.36	0.29	0.3	0.53	0.39
	Q16	0.34	0.33	0.23	0.28	0.27	0.2	0.32	0.45	0.36
	Q17	0.34	0.34	0.24	0.26	0.27	0.2	0.3	0.42	0.34
	Q18	0.35	0.41	0.29	0.28	0.3	0.21	0.31	0.48	0.4
	Q19	0.33	0.36	0.29	0.25	0.3	0.23	0.26	0.49	0.37
	Q20	0.36	0.46	0.3	0.21	0.2	0.11	0.23	0.37	0.32
	Q21	0.37	0.35	0.31	0.2	0.3	0.24	0.26	0.47	0.37
	Q22	0.41	0.44	0.3	0.22	0.31	0.27	0.3	0.43	0.36
	Q23	0.38	0.38	0.28	0.19	0.26	0.21	0.28	0.44	0.4
	Q24	0.41	0.39	0.29	0.25	0.3	0.2	0.31	0.49	0.4
	Q25	0.39	0.39	0.33	0.25	0.24	0.19	0.23	0.39	0.33

Dark Green = ρ >=0.7, Medium Green = ρ between 0.6 and 0.7, Light Green = ρ between 0.5 and 0.6.

In general, Social Presence Subscale items did not correlate well with items composing other main or sub concepts, and specifically not with LTTD items. This pattern remained true for factor analysis as well.

LTTD and Cognitive Presence

While LTTD correlated moderately well with Cognitive Presence using Pearson's r at 0.61 (Table 17), LTTD and Cognitive Presence items correlated poorly using Spearman's ρ, with weak correlations highlited in light green on Table 24 below.

Table 25. LTTD and Cognitive Presence Spearman's ρ Correlation.

	Cognitive Presence Subscale Items											
Learner-Teacher Transactional Distance Items	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56	Q57	Q58	Q59
Q1	0.31	0.36	0.33	0.27	0.35	0.44	0.42	0.41	0.38	0.46	0.44	0.46
Q2	0.36	0.4	0.41	0.26	0.34	0.44	0.39	0.45	0.46	0.46	0.43	0.41
Q3	0.38	0.4	0.41	0.24	0.34	0.47	0.39	0.39	0.43	0.47	0.37	0.39
Q4	0.35	0.44	0.42	0.25	0.32	0.41	0.39	0.39	0.4	0.42	0.38	0.41
Q5	0.36	0.42	0.46	0.32	0.37	0.33	0.35	0.37	0.38	0.42	0.4	0.43
Q6	0.36	0.42	0.43	0.25	0.34	0.44	0.37	0.34	0.38	0.43	0.43	0.52
Q7	0.31	0.34	0.43	0.3	0.31	0.4	0.33	0.3	0.33	0.38	0.36	0.44
Q8	0.33	0.34	0.39	0.24	0.33	0.41	0.37	0.31	0.32	0.33	0.31	0.32
Q9	0.33	0.36	0.37	0.24	0.31	0.41	0.3	0.26	0.29	0.35	0.3	0.35
Q10	0.34	0.39	0.44	0.28	0.33	0.49	0.36	0.31	0.41	0.46	0.37	0.42
Q11	0.37	0.4	0.43	0.24	0.32	0.52	0.41	0.44	0.44	0.47	0.44	0.46
Q12	0.4	0.42	0.47	0.27	0.35	0.57	0.43	0.46	0.44	0.47	0.45	0.45
Q13	0.35	0.39	0.44	0.24	0.33	0.48	0.36	0.37	0.38	0.45	0.41	0.43
Q14	0.38	0.38	0.43	0.21	0.36	0.55	0.39	0.37	0.39	0.48	0.4	0.42
Q15	0.37	0.42	0.45	0.34	0.38	0.52	0.44	0.46	0.45	0.5	0.47	0.46
Q16	0.44	0.48	0.45	0.26	0.35	0.46	0.38	0.42	0.43	0.44	0.44	0.43
Q17	0.4	0.47	0.45	0.27	0.37	0.45	0.4	0.4	0.45	0.43	0.44	0.46
Q18	0.39	0.39	0.48	0.28	0.33	0.48	0.38	0.37	0.41	0.39	0.44	0.46
Q19	0.38	0.43	0.41	0.27	0.33	0.48	0.38	0.37	0.38	0.43	0.44	0.41
Q20	0.42	0.4	0.44	0.22	0.31	0.42	0.34	0.31	0.37	0.4	0.42	0.44
Q21	0.37	0.43	0.42	0.25	0.34	0.45	0.39	0.42	0.45	0.44	0.37	0.42
Q22	0.34	0.37	0.4	0.21	0.29	0.44	0.32	0.33	0.35	0.41	0.36	0.4
Q23	0.44	0.42	0.43	0.2	0.3	0.43	0.33	0.34	0.38	0.38	0.36	0.4
Q24	0.46	0.47	0.46	0.2	0.32	0.49	0.39	0.42	0.42	0.44	0.4	0.43
Q25	0.41	0.37	0.39	0.21	0.28	0.42	0.29	0.29	0.32	0.34	0.34	0.39

Dark Green = ρ >=0.7, Medium Green = ρ between 0.6 and 0.7, Light Green = ρ between 0.5 and 0.6.

This indicates that, while individual items within a subscale representing a variable may not correlate with items in another group of items forming a subscale, it may not rule out a correlation between the subscales as a whole with each other.

Based on Pearson's *r* and Spearman's ρ analysis, LTTD correlated strongly with CoI overall, however this was mainly due to a strong correlation between LTTD and the Teaching Presence sub concept, and secondarily with Cognitive Presence. Factor analysis helped to clarify the relationship between LTTD, and Cognitive Presence as discussed in the section on factor analysis below.

LTTD and SRL

The Zimmerman (1989) SRL model was composed of three phases; Forethought, Performance, and Self-Reflection. In the OSLQ, Forethought was represented by subscales of Goal Setting and Environmental Structuring with four items each. Performance was represented by Task Strategies, Time Management Help, and Help Seeking with 11 items combined. Finally, Self-Reflection was represented only by the subscale Self-evaluation with 4 items.

To verify that the subscales were accurately aligned with their variables, a Pearson's r correlation study and an exploratory factor analysis (EFA) of the original subscales was done. This was followed by further exploration of the subscales of the OSLQ, based on the outcomes from the correlation study. The EFA grouped the OSLQ subscales in the factor analysis almost exactly as the Zimmerman model suggests, except for Help Seeking, which loaded with Self-Evaluation instead of with Performance as predicted. The revised ordering of subscales is shown below in Table 26.

Table 26. Comparison of OSLQ Subscales and Zimmermen SRL Model Subconcepts.

OSLQ Subscale	Items	SRL Sub Concepts	Items
Goal Setting	5	Forethought	9
Environmental Structuring	4		
Task Strategies	4	Performance	7
Time Management Help	3		
Help Seeking	4	Self-Reflection	8
Self-Evaluation	4		
Total Items	**24**	**Total Items**	**24**

Combining the items in the Help Seeking and Self-Self-Evaluation subscales under Self-Reflection created an eight-item variable, meeting the Carifio and Perla (2007) criteria for quantitative analysis using subscales composed of Likert scaled items.

The mean Likert ranking or score overall for SRL was 3.66 (*SD* = 0.67), and sub concept mean rankings varied from 3.42 (SD = 0.78) for Performance, representing task strategies and time management, to 4.20 (SD = 0.76) for Forethought, representing goals setting and environmental structuring. Overall, students felt that they were most competent at establishing a study environment, setting goals, and managing time, while seeking help from the teacher and peers, and self-evaluation and performance relatedareas such as developing strategies for learning were areas of progressively lower self-rated competence. However, individual ranking varied considerably within each sub concept, ranging from 1 to 5 on the Likert scale.

Table 27. Descriptive Statistics for SRL and Sub Concepts.

	SRL	Forethought	Performance	Self-Reflection
Mean	3.66	4.20	3.42	3.58
Standard Error	0.05	0.05	0.05	0.05
Median	3.67	4.33	3.27	3.70
Mode	4.17	5.00	3.27	4.00
Standard Deviation	0.67	0.76	0.78	0.74
Minimum	1.67	1.56	1.00	1.00
Maximum	5.00	5.00	5.00	4.80
Count	203.00	203.00	203.00	203.00

The OSLQ instrument was originally used to create a profile of student (self-reported) SRL skills resulting in a set of five levels of SRL composed of super self-regulators, competent self-regulators, forethought-endorsing self-regulators, performance/reflection self-regulators, and (d) non- or minimal self-regulators (Barnard-Brak et al., 2010). The table below shows the breakdown of SRL profiles from the survey data. A lower SRL profile score was associated with lower G.P.A. scores in the original study while higher G.P.A scores and greater success in courses was associated with Class 4 and 5 profile scores (Barnard-Brak et al., 2010).

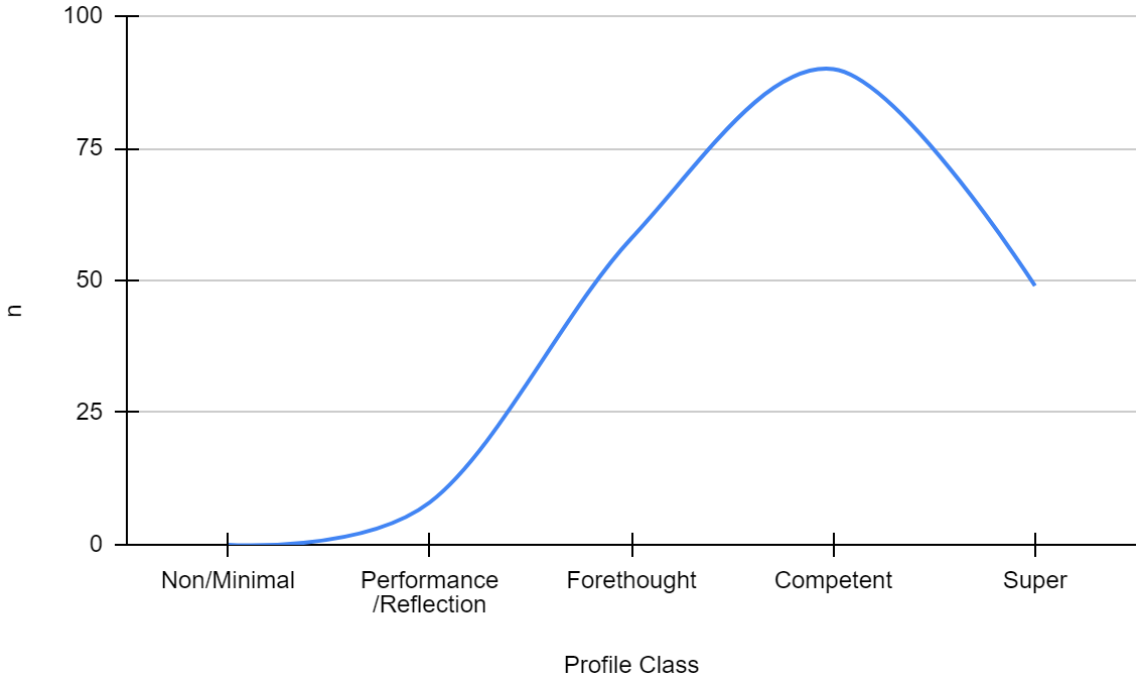
Table 28. SRL Profiles.

SRL Profile	n	%	Range (Mean Scores)
Class 1 (Non/Minimal SRL)	0	0	0-1.66
Class 2 (Performance /Reflection SRL)	8	4	1.67-2.49
Class 3 (Forethought SRL)	58	28	2.50-3.33
Class 4 (Competent SRL)	90	44	3.34-4.17
Class 5 (Super SRL)	49	24	4.18-5.00
Total	205	100	

Exact limits for each class are not described for the OSLQ instrument, and the original OSLQ developers had access to student G.P.A. data to validate their data, which was not possible for

this study. However, an approximate scale based on student mean scores for the OSLQ section of the survey allows a general idea of how students rate themselves in terms of their self-regulation. The line graph in Figure 8 below shows a slight negative skew, indicating student self-rating of SRL skills may be somewhat optimistic, however Barnard Brak et al. (2010) found that Competent and Super level profiles were equally successful based on G.P.A., and that is exactly where the peak of the curve rests as shown in Figure 10 below.

Figure 10. Curve of SRL Scores.



Despite the importance of developing self-regulation skills to success in college and perhaps especially in online courses, there did not seem to be a significant correlation between LTTD and SRL sub concepts, as shown below in table 29. This was explored further using EFA.

Table 29. LTTD and SRL Revised Subscale Pearson's r Correlation.

	LTTD	Forethought	Performance	Self-Reflection
LTTD	1			
Forethought	0.32	1		
Performance	0.43	0.6	1	
Self-Reflection	0.5	0.36	0.51	1

Light Green = Correlation >= 0.60, Dark Green = Correlation >= 0.70

LTTD and Satisfaction

Satisfaction was represented by six Likert style items as shown in Table 30, with one reverse phrased as a negative statement. For analysis the rankings were inverted so that a "5" became a "1", a "4" became a "2", and a "2" became a four, and a "3" remained unchanged.

Table 30. Satisfaction Items

Item	Statement
Q85	I benefited from this course.
Q86	This course met my expectations.
Q87	I experienced and learned new things in this course.
Q88	The content covered in this course was not interesting.*
Q89	I would like to take more courses like this one.
Q90	I wish other course were more like this one.

*Reverse coded item.

As shown in Table 31, student mean Likert rankings agreed that they benefited from the online course (4.13, *SD* = 1.02), that the course met their expectations (3.92, *SD* = 1.17) and that they learned new things (4.34, *SD* = 0.88). Students were a bit less in agreement about whether the course was interesting, whether they would like to take another similar course, or wishing other courses were "more like this one". This finding is similar to the findings from Phase 2 interviews, discussed in the next section.

Table 31. Descriptive Statisistics for Satisfaction Items.

	Q85	*Q86*	*Q87*	*Q88*	*Q89*	*Q90*
*Mean	4.13	3.92	4.34	3.87	3.63	3.48
Standard Error	0.07	0.08	0.06	0.09	0.09	0.09
Median	4.00	4.00	5.00	4.00	4.00	4.00
Mode	5.00	5.00	5.00	5.00	5.00	5.00
Standard Deviation	1.02	1.17	0.88	1.32	1.27	1.35
Minimum	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00
Sum	846.00	799.00	889.00	794.00	741.00	714.00
Count	205.00	204.00	205.00	205.00	204.00	205.00

*Mean Likert scale ranking on a scale of 1 (strongly disagree) to 5 (strongly agree).

Satisfaction items correlated weakly with LTTD items using Spearman's ρ Overall, satisfaction was more highly correlated with CoI and SRL. The researcher hypothesized that LTTD and Satisfaction would be closley related, however the data indicate a more complex relationship. This is further examined in the factor anlysis section.

Table 32. LTTD and Satisfaction Spearman's ρ Correlation.

		Satisfaction Items					
		Q84	Q85	Q86	Q87	Q88	Q89
Learner-Teacher Transactional Distance Items	Q1	0.5	0.51	0.48	0.13	0.43	0.46
	Q2	0.48	0.53	0.35	0.09	0.44	0.47
	Q3	0.43	0.5	0.31	0.08	0.45	0.48
	Q4	0.44	0.48	0.37	0.04	0.44	0.43
	Q5	0.4	0.41	0.33	0.14	0.42	0.43
	Q6	0.45	0.45	0.34	0.05	0.39	0.41
	Q7	0.39	0.46	0.4	0.04	0.36	0.34
	Q8	0.34	0.34	0.28	0	0.29	0.27
	Q9	0.39	0.43	0.32	0.06	0.37	0.3
	Q10	0.41	0.48	0.4	0.1	0.4	0.37
	Q11	0.53	0.54	0.47	0.07	0.46	0.46
	Q12	0.57	0.57	0.48	0.1	0.49	0.49
	Q13	0.51	0.57	0.4	0.13	0.45	0.5
	Q14	0.48	0.5	0.35	0.05	0.45	0.48
	Q15	0.53	0.59	0.53	0.2	0.48	0.5
	Q16	0.46	0.5	0.39	0.08	0.51	0.56
	Q17	0.48	0.52	0.42	0.1	0.45	0.5
	Q18	0.47	0.53	0.48	0.08	0.44	0.48
	Q19	0.55	0.56	0.48	0.08	0.48	0.53
	Q20	0.45	0.49	0.36	0.04	0.43	0.45
	Q21	0.5	0.53	0.48	0.12	0.4	0.43
	Q22	0.41	0.43	0.35	0.04	0.34	0.36
	Q23	0.46	0.5	0.41	0.07	0.45	0.43
	Q24	0.49	0.54	0.43	0.07	0.51	0.52
	Q25	0.4	0.41	0.28	0.01	0.41	0.44

Dark Green = ρ >=0.7, Medium Green = ρ between 0.6 and 0.7, Light Green = ρ between 0.5 and 0.6.

Factor Analysis

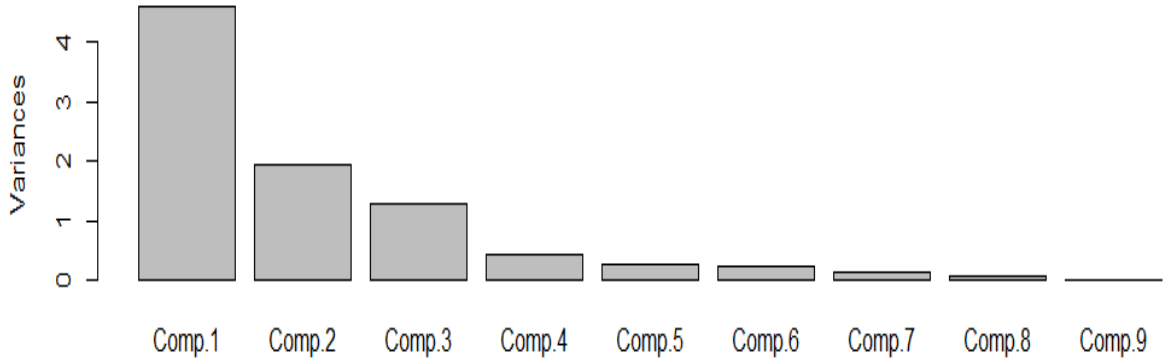
Factor analysis helped to clarify the relationships between the main concepts and more specifically between the sub concepts underlying them. First, principal components analysis

(PCA) indicated how many factors were needed to parsimoniously describe the relationships. This was done for two possible models. The first model included the six SRL subscales as used in the OSLQ questionnaire (Goal Setting, Environmental Structuring, Time Management Help, Help Seeking, and Self-Evaluation). The second PCA was done using a modified version with sub concepts of Forethought, Performance, and Self-Reflection as shown above in Table 9.

Principle Components Analysis

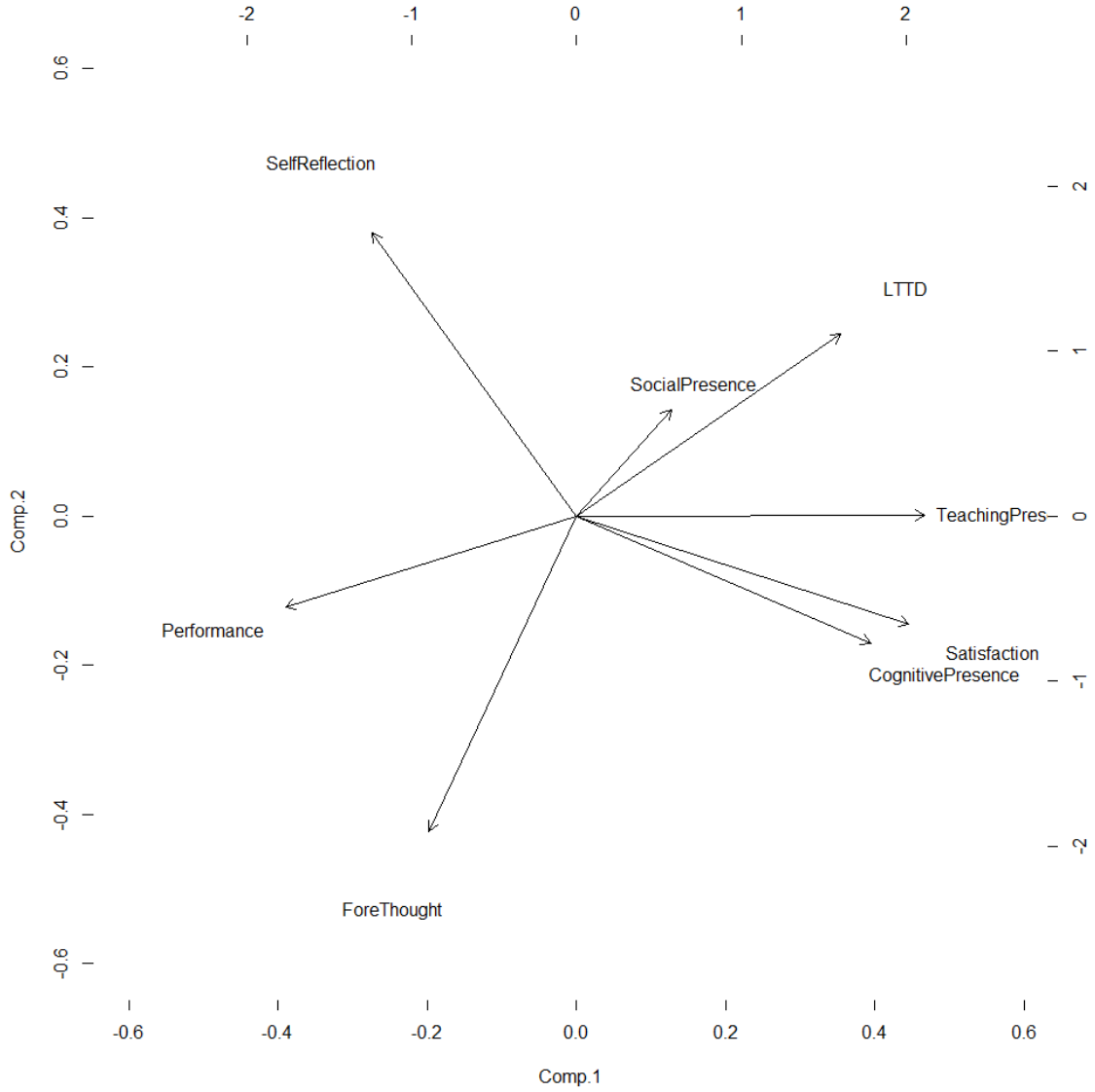
PCA of LTTD, CoI, SRL sub concepts and Satisfaction revealed that three factors would be sufficient based on an eigenvalue cutoff of 1 as shown in figure 11.

Figure 11. Principal Components Scree Plot.



A biplot of components (Figure 12showed that Forethought, Performance, and Self-Reflection formed distinct components with a wide angle and diverging from other components, while LTTD and, weakly, Social Presence formed a binary as did Cognitive Presence and Satisfaction. Teaching Presence and LTTD remained distinct from each other, however vectors headed in the same direction, indicating some relationship to each other.

Figure 12. Principle Components Biplot.



EFA allowed a closer look at the relationships between variables as shown in Table 34 below.

Exploratory Factor Analysis

Table 33. Exploratory Factor Analysis.

	Factor 1	Factor 2	Factor 3	Factor 4	h2	u2	com
LTTD	0.79	0.09	0.17	0.42	0.85	0.152	1.7
Teaching Presence	0.8	0.38	0.16	0.2	0.85	0.15	1.7
Social Presence	0.28	0.47	0.15	0.6	0.68	0.321	2.5
Cognitive Presence	0.48	0.71	0.18	0.3	0.86	0.143	2.3
Forethought	0.14	0.51	0.49	0.19	0.57	0.435	2.4
Performance	0.18	0.15	0.91	0.27	0.95	0.052	1.3
Self-Reflection	0.21	0.11	0.31	0.64	0.56	0.438	1.8
Satisfaction	0.64	0.53	0.15	0.07	0.72	0.283	2.1
SS loadings	2.08	1.46	1.3	1.19			
Proportion Var	0.26	0.18	0.16	0.15			
Cumulative Var	0.26	0.44	0.6	0.75			
Proportion Explained	0.35	0.24	0.22	0.2			
Cumulative Proportion	0.35	0.59	0.8	1			

Shading indicates Loading >= 0.50. Tucker Lewis Index of factoring reliability = 0.945.

The EFA results revealed that four factors loaded significantly, however according to the PCA three factors explained 87% of the variation. This is consistent with the correlation of regression scores for the four factors as well as the multiple R square of scores and minimum correlation. In all three of these measures of reliability, factor 4 is well below factors 1-3, as shown in Table 33. The Tucker-Lewis Index (TLI) of 0.969 also indicates that the model has good reliability. However, because this study attempts to identify the relationships between LTTD, CoI, SRL and Satisfaction as fully as possible, Factor 4 was retained for this analysis. EFA is often used to identify latent factors with the purpose of eliminating cross-loaded items for questionnaire construction (Yong & Pearce, 2013). However, in this case the goal is to explore relationships, so cross-loadings were allowed . Setting an eigenvalue too low allows too much factor cross-loading, while setting it too high results in the loss of information that may be important to a

study (Yong & Pearce, 2013). A common eigenvalue for the cutoff is 0.32 (Yong & Pearce, 2013).

An eigenvalue of 0.32 resulted in multiple factor cross-loadings in this study, possibly due to the response rate being low at n=203 rather than n=280, making identification of the most significant relationships difficult. For this study the eigenvalue was set at 0.5 to eliminate some cross-loading without losing any of the concepts under study. A future research project with a more robust dataset would allow a deeper dive into individual item cross-loadings between factors.

Table 34. Measures of EFA Model Reliability.

	Factor 1	Factor 2	Factor 3	Factor 4
Correlation of (regression) scores with factors	0.91	0.87	.95	0.79
Multiple R square of scores with factors	0.83	0.76	0.91	0.63
Minimum correlation of possible factor scores	0.65	0.52	0.82	0.25

A cutoff value of .5 was used to help ensure minimal cross-loading, and most of the variables loaded on just one factor with a cutoff for significance set at 0.5, except for Satisfaction, which cross-loaded on Factor 1 and Factor 2 even with a relatively high cutoff value. In a true exploratory analysis, cross loaded variables are usually eliminated, however for this study Satisfaction was retained because it was an important component the research.

LTTD, Teaching Presence, and Satisfaction loaded on Factor 1. These variables are related to learner and teacher engagement; the teacher's co-understanding and awareness of the student's skills and needs, the teacher's presence as reflected by specific actions such as communicating important course information and providing facilitation and direct instruction, and the students engagement as reflected in satisfaction with the course.

The CoI sub concept of Cognitive Presence, the SRL sub concepts of Goal Setting and Environmental Structuring which compose the Forethought phase of the SRL model, and Satisfaction (again) loaded on Factor 2. Items linked to these sub concepts were related to the student's interest in the course content, being stimulated to think and evaluate concepts critically, being able to apply new knowledge, and the course's value to the student. Factor 2 was thus most closely associated with the student's cognitive engagement.

The SRL phase of Performance, composed in this study of sub concepts of Task Strategies and Time Management Help loaded on Factor 3. These sub concepts are the most closely associated with individual self-regulation through task management. Finally, the CoI sub concept of Social Presence and the SRL phase of Self-Reflection loaded on Factor 4. Self-Reflection is composed of sub concepts of Help Seeking and Self-Evaluation. Again, while Help Seeking was associated with the SRL phase of Performance in the Zimmerman (1978) model, in this study Help Seeking highly correlated with Self-Evaluation, and loaded on the same factor as well. A review of the questionnaire items associated with these variables revealed that the items related to communicating with classmates, reaching out to classmates to confirm or compare learning, and getting to know classmates Factor 4 is thus related to engagement with the learning community of other students rather than between the teacher and student.

Summary of Phase 1 Survey Findings

For Phase 1 the RQs were

1. What is the relationship between LTTD and student use of SRL skills in online courses?
2. What is the relationship between LTTD and student sense of CP in online courses?

3. What is the relationship between LTTD and student Satisfaction in online courses?

Correlations studies of the main concepts of LTTD, CoI, SRL, and Satisfaction showed a strong relationship between LTTD and the CoI framework as a whole, a very weak correlation between LTTD and SRL, and a moderate correlation between LTTD and Satisfaction.

A more detailed analysis of sub concepts using Pearson's r correlation revealed a strong correlation between Teaching Presence and LTTD. CoI sub concepts of Teaching Presence and Cognitive Presence were also strongly correlated, while there was a moderate correlation between Cognitive Presence and Social Presence, and a weak correlation between Teaching Presence and Social Presence. EFA supported combining LTTD and Teaching Presence as a single factor, labeled Learner-Teacher Engagement.

Surprisingly, LTTD did not correlate significantly with any sub concepts of SRL, indicating either that the survey failed to capture relevant data, or that in the sample, no significant relationship existed between the distance of understanding between teacher and student and a student's self-regulation in learning. SRL sub-concepts were distinct from each other with little correlation and loaded on separate factors from each other. Satisfaction correlated highly with LTTD and Cognitive Presence, and cross-loaded with them in EFA.

Semi-Structured Interviews

Twelve interviews were conducted via Zoom, a videoconferencing application chosen because the student interviewees were familiar with it's ubiquity in online courses during the COVID-19 pandemic. The interviews were semi-structured in that the researcher followed a loose script covering student perceptions in four main areas; a) transactional distance between the teacher and student; b) the students sense of community in the course; c) self-regulation of

learning in the online environment; and d) satisfaction with the course in terms of meeting learning needs. The length of interviews ranged from approximately 24 minutes to 45 minutes based on the flow of the interview and time constraints of the interviewees. Demographically, five of the interviewees were returning to college after a long absence, three were first time college students in their first year, two were first- time students in pre-nursing pursuing their first degree, one was completing the final semester of a 4-year program, and one was a retired military veteran utilizing education benefits to learn new things for personal interest, with no plans to return to the workplace. The inital plan for selectig interviwees was to choose three who percieved transactional distance as high in their online course and three who percieved transactioal distance as low. In practice, this proved impossible due to a low number of responses. However, during the interviews it became apparent that the students interviewed had experienced example of both high and low transactional distance, and what became interesting was the response of the student to that in terms of community engagement, self-directed learning, and satisfaction. Initially the researcher asked interviewees to focus on one online course, but it became apparent in this first interview that most of the students interviewed have two or more courses online, and that experiences varied greatly between each course. Student names were replaced with random letters bearing no relation to the name in the following sections. Pronouns “they”, “them”, and “there” are used to avoid identifying participant’s gender, not because of participant’s stated pronoun preferences.

Interview Participants

Student interviews were conducted after the Spring 2021 and Spring 2022 semesters. A wide range of ages, college experience, and online course experience were represented, including

traditional recent high school graduates, returning non-traditional students with and without employment outside of school, and first-time non-traditional students pursuing career paths. Some students were only enrolled in online courses because of COVID-19 restrictions on face-to-face classes, while others preferred them, and a few were able to attend college only because the COVID-19 pandemic forced courses previously only available face-to-face online. For example, English and Math courses, required for most programs, were not often offered online prior to the pandemic. A brief profile of the students interviewed follows. Neutral pronouns are used throughout to maintain maximum anonymity of interviewees.

Student J

J was taking their first online college course and is a non-traditional returning student. J describes themself as a former worker in the hospitality industry who first attended college many years ago to revieve an associate degree in hospitality. Layed off during the first year of the COVID-19 pandemic from the hospitality job, J is still employed with the county part-time. J decided to return to school for accounting, On the phase one survey, J indicated that they only enrolled in online courses because of work and family obligations, which J confirmed in the interview. So, the opportunity to return to school occurred because of COVID-19 , but their choice to enroll online was not. J would have enrolled online even if face to face courses were offered, however, they were not

J was enrolled in two courses, one asynchronous using only the college LMS, and the other synchronous using videoconferencing as well as the college's LMS. On the survey, J indicated her course was synchronous online, and data collection is based on that course. However, J also discussed her asynchronous course during the interview which made a comparison of their experiences in each course possible. J said "I was told by my counselor,

when I started to think about going back to school that I only needed eight more courses. Because I have my associates degree in the hospitality industry." But they were looking for a more stable job outside of hospitality, stating "So I decided to go back to school for accounting. And then I found that accounting is not me."

Student C

C had taken six or more online college courses prior to the current semester; however, this is their first year of college. C was a retired career military non-commissioned officer (NCO) with extensive experience as an aircraft systems trainer. C enrolled in college to take advantage of their veteran's benefits. C was taking a range of courses as a full-time student to explore opportunities and areas of interest particularly agriculture. C said "I'm 58 years old. I'm not looking for another career. Um, but self-improvement, self-enrichment, and the benefit from the government here to go to school. You'd be a fool not to take advantage of them.

As a non-traditional student, C felt somewhat separate from student peers, which is not uncommon among veterans, even when they are relatively young: "I have a whole different perspective on this than I think a lot of students, other students do, because I'm part of that military family" (Student C).

Student L

L had taken one or two online courses before and had five-plus years of college experience. L was enrolled in a community college nursing program, which awards an associate of Science in Nursing degree and is the minimum required to be a registered nurse in the U.S. L was one of the researcher's students in the program, and of the interviewees was the only one with whom the instructor has interacted as a teacher. L was an ESL student and described their

home country as less developed technologically. Also, L was out of the educational system for 18 years after graduating from high school in their native country. Because of this L experienced a paradigm shift moving to the U.S. educational system. L stated “I guess I'm a little bit skeptical about the, like, completely online classes, because I didn't have much, much of the experience. And since I came from country where technologies are like, literally, like, very low progressing”.

Student E

E was in their second year of college and has taken six or more online courses, due to the COVID-19 pandemic. E was a full-time student pursuing a STEM degree. They fit closely into the traditional student profile, having gone directly from high school to college. E had only attended college online and seems quite comfortable with both asynchronous and synchronous courses. They also participated somewhat in a social aspect of college via social networking apps. E said, “So I've had a wide range of people are with the, the instructors, being very well, being very willing and approachable to reach out, reach out to us and allow us to reach out to other experiences where it was the complete opposite”.

Student M

M was in their first year of college and was enrolled in at least three online courses. M was attending fully online courses to complete the pre-nursing program required courses. M valued the ability to attend school online. M appeared to be highly motivated and did not seem to expect that there would be a significant social dimension to her interactions with either the teacher or classmates. They valued the ability to do their work and study online and from home and preferred online courses, because it allowed them to attend college. In M’s case the pandemic presented the opportunity to pursue their career goal because the program was forced

to offer courses online that normally would only be offered face-to-face. M stated, “Yeah, the pandemic was the reason I was able to go back to school. So, you know, it worked out great”.

Student K

Student K was a returning college student with four years of previous college experience and is taking their first online courses due to the COVID-19 pandemic. K previously attended the flagship university of the college system but left before graduating on being hired by a major corporation, where they worked for several years. With the COVID-19 pandemic, however, the company offered early retirement incentives, and K decided to take advantage of the opportunity to finish their degree with the intention of starting a new career. K returned to one of the community colleges to ease back into college with the plan of finishing their degree. K stated that they would have preferred to attend face-to-face courses but were unable to because of pandemic restrictions. However, K enrolled in several courses that met entirely online. One course K enrolled in was a synchronous online accounting course with Zoom lectures, while the other was an asynchronous philosophy course with mandatory discussion boards. Overall K rated themself as very dissatisfied with their online course experience.

Student N

N was a recent high school graduate in their second semester of college. N was currently taking four online courses and is attending online because of COVID-19 restrictions. N has never attended a face-to-face college class. Despite the pressures and sometimes stress of attending online, N enjoys their online college experience. “ I graduated high school in 2020. So that's when COVID hit. So, I've been online ever since I've actually never gotten in person yet. This semester, I have four classes [and] 12 credits. And, um, I honestly really like it online though.” (Student N).

Student O

Student O is a non-traditional returning college student after twenty years in the workforce who started online due to COVID-19 but prefers it anyway since they work full time. O said, "I actually went to school for education I went to one year. So, I'm originally from Big Island. So, I actually wanted to be a special ed teacher. And on [redacted] Island, there wasn't a lot about special ed". O has managed to adapt to online coursework and feels they are even benefiting from the experience even though it is new to them. O said "So yeah, I haven't had I was a little leery. I'm ah, I prefer to be in person face to face. You know, I am not right out of High School".

Student R

R was a traditional student who graduated high school and then attended community college before transferring to the university. "… I just did it because it was like it was way cheaper to go it's like [community college] and then just go [to the university] after like, like nothing like change like it didn't really affect my, like the chances of getting into [university] (Student R). R was planning to graduate at the end of the semester with a 4-year college degree.

Student Q

Q was a returning college student who dropped out because of difficulties, perhaps with an instructor or administrator, and was returning to college. Q was concerned about coming back, stating that "And, you know, and people make a lasting impression on how you learn and what you do. And if, if you like it, they're gonna make it better for you. And not worse. And that's not what happened."

Student S

S was an older non-traditional student who was working toward an Early Childhood Education degree, having taken some courses in the late 1990's. At the time of the interview S worked as a site coordinator for an Early Childhood Education Center. "I started in 1998. And then I had a big family that had to take care of my kids. And so, we didn't have money. I didn't have the time to do it. So now I just went back last year, this spring. Yeah. "(Student S).

Student T

T was a pre-nursing student and had previously only taken online college courses, none face-to-face. However, one of T's classes had a face-to-face lab component during the semester of the interview. "I'm very happy with online I'm extremely, like, almost surprised. And like that we're having this opportunity to learn online and learn home at home or at wherever and not be locked into going to a class in because now I'm a new mom." (Student T)

Interview Findings: Themes

Initial coding of interviews utilized pre-set codes representing the main concepts and sub concepts as represented by subscales of the survey tool. After reviewing codes and discussion between the researcher and colleagues who also rated samples of transcripts, the coding was again reviewed for themes. LTTD and Teaching Presence seemed to collapse into one theme of engagement between the teacher and student, and this was supported with re-analysis using EFA. Cognitive Engagement emerged as a second theme from students' narratives on how they organize their physical study space and manage time while developing a cognitive presence and in the online course space. A third theme, Community Engagement emerged from Social Presence and Self-Reflection, which had a strong influence on the student's success with both

Cognitive Engagement and Satisfaction. Themes, Categories and Sub-categories that emerged from interviews are shown in Table 36. The emergent themes were supported by reanalysis of survey data and inter-rater discussions.

Table 35. Main Themes and Categories for Qualitative Analysis.

Theme	Categories	Subcategories
Learner-Teacher Engagement	Learner-Teacher Transactional Distance	Co-Understanding, Awareness
	Teaching Presence	Design & Organization, Facilitating Discourse, Direct Instruction
	Satisfaction	
Cognitive Engagement	Cognitive Presence	
	Social Presence	
	Satisfaction	
Task Performance	Performance	Task Strategies, Time Management
	Forethought	Goal Setting, Environmental Structuring
Community Engagement	Social Presence	
	Self-Reflection	Self-Evaluation, Help Seeking

Learner-Teacher Engagement emerged as the underlying foundational theme, supporting Cognitive Engagement through both elements related to Teaching Presence and LTTD. Satisfaction bridged Learner-Teacher and Cognitive Engagement, and Cognitive Engagement was enabled by the student's ability to also engage with the community. SRL skills were

important skills that the student seemed to bring with them to the course. A detailed discussion of findings follows. Brief quotations from interview transcripts are presented in the narrative, however, longer excerpts from which the quotes were taken can be found in Appendix E.

Learner-Teacher Engagement

A common theme through interviews was the level of involvement of the teacher in the course, from course design (how easy or difficult it was to navigate the course and find information) to the teacher's role in moderating course discussions in asynchronous courses or breakout rooms in synchronous videoconferencing classrooms. Learner-Teacher Engagement emerged as the teacher's specific interaction with the student regarding the student's needs and challenges, whether by email or one to one online meeting, and the impact that had on the student's performance in the class and overall self-efficacy. This was especially apparent with the non-traditional, older students new to online courses or returning after a long absence, who often felt somewhat alienated from other students in the course, and felt it was difficult to engage with the teacher. Non-traditional students who did successfully engage with the teacher expressed higher satisfaction and engagement in other aspects of their courses.

For Q, engagement with the teacher emerged as an important part of success in the course because they felt the teacher took their needs into account. Q felt the teacher noticed that something was not working and adapted to their needs as a student, stating " I feel like the teacher kind of adapted to that. The teacher said, 'Okay, I have a student. That means more than just me saying, Here's a piece of paper, read it'". This was an example of how low LTTD made a significant difference to Q being able to learn more effectively. L, however, described feeling overwhelmed by the information in an online course they took at another university system, with little support or recognition by the instructor of their learning needs and skills. This left them

feeling unable to keep up with the course. L stated, “Before I even got to the point where I started submitting those papers and assignments, I was like, oh, I cannot handle it's just, it's too much. It's too much.”. In this case, L felt overwhelmed by the amount of work, represented by the Planning and Organization component of Teaching Presence. L also felt a large transactional distance from the Teacher on a personal level and so was not effective in reaching out for dialog with the teacher. Learner-teacher engagement was missing here. However, in the interview L also discussed a different, completely online microbiology course they took. In the completely online course L connected with the teacher, stating, “But then she made it like, she related the information from microbiology to real life, that it'll be easier for us to understand. And that's what sticks to my, to my head.”. For L, connection with the teacher was important for them to feel engaged with and supported in learning new information, and this was a strong component of satisfaction with the course. They said, “I have to see that the instructors are willing to actually, you know, be there for students. It's not like just throwing this information and you learn on your own…”.

J rated LTTD as relatively low overall for her synchronous course on her survey and validated that during her interview, stating, “On this other class that I'm taking, we need to be on Tuesdays and Thursdays. And she teaches via zoom. So, everybody's online. And we're able to ask questions. She's even had extra, like, class time available…”.

In this course LTTD and strong Teaching Presence led to high Learner-Teacher Engagement. However, J had a very different experience with the asynchronous course taken at the same time. In that course the instructor J perceived a much higher LTTD, even though it seemed that there was at least some Teaching Presence in the form of a syllabus, assignments, and teacher availability for meetings in the form of direct instruction; “On the test, you have any questions

let him know, he's available. But I missed that interaction". J expressed reluctance to contact the instructor, and yet doing so would seem logical for a student missing interaction and struggling with course material. According to the theory of tranasctional distance, J would be most comfortable in a high dialog. Low structure and autonomy course environment, while a learner with high autonomy such as C would be expected to prefer high LTTD with little dialog and more structure and autonomy. However, in the interview student M stated that they valued the teacher's availability and guidance, stating that, "I mean, the teacher has everything to do with, with the content that they make available and the resources they make available". At the same time M liked the space provided by distance learning; "I can access them [YouTube videos] from anywhere, and they have a transcript. So, I can edit that transcript into coherence, which creates a kind of a kinetic working/learning experience for me".

M stated that she did not feel the teacher particularly understands her own skills and needs as a student, although her mean rating for LTTD was 4.44, compared to 3.44 for the Sample. M felt that the teacher made an effort to reach out to students, and was flexible in adapting her own learning. Notably, M also seemed to have very high SRL skills, perhaps allowing more adaptability in online coursework than Student J possessed.

K uniformly rated LTTD Sub-Concepts at "1" (strongly disagree). This was reflected in the interview as well, where L expressed conisderable anger related to the distance of some of her teachers, stating, "I do have one professor, we don't even I don't even know how I did on a test that we took a month ago, or papers that [we] have written so we haven't received anything back".

However, K expressed satisfaction with other teachers who they felt were more engaged, stating, "And then I have professors who they are there every week, they post themselves lecturing, or

they have slideshows, you know, a lot of videos are just to be interactive with the student because you have to keep our attention …".

N as well, with two semesters of experience, described engagement as depending very much on the particular instructor, stating, "I feel like it depends on the teacher though, because the teacher, one of my teachers this semester, I feel like he's not very empathetic. And if you try to, like reach out to him, he won't really explain, like, explain the, the question you have and like a very descriptive way and honestly make me more confused. But then there's other teachers where they really do understand like, personal situations, too, that come up". N had experienced a family emergency during the previous semester and found that some instructors were very accommodating when she reached out.

Q felt their teacher expressly worked to narrow the transactional distance through deliberately reaching out to students and encouraging 1:1 interaction; "…And she actually kind of not forced me but encouraged me to meet with her at least twice every month", while S found that the teacher understood their skills and needs, and forced them to work outside of their own comfort zone, stating, "And I was so proud of myself, at the end of that English class, I really grew to admire him, because if he didn't do it, that way, I wouldn't have forced myself into going on and pursuing the rest of my classes that I have to get…". This was an example of how the level and type of learner-teacher engagement varies by student and over time. S said that" …you felt like he was not far away from you, like, not understanding you or that he was just being tough. It's been, he was being tough".

E stated that interaction with the teacher is a significant requirement for her satisfaction and learning in an online class and mentioned teacher interaction several times in the interview, stating that "I'd say that that makes it that kind of sets up the environment for me to be a lot

easier to answer those questions that challenged my thinking, and in a way answer my questions and how that relates to studying is that if I'm able to ask questions in the class and really engage my understanding". This exchange seemed like an example of Teaching Presence providing a framework for or scaffolding for Cognitive Engagement to emerge in the class.

A lack of Learner-Techer Engagement affected student Cognitive Engagement, especially among students struggling with a course. K expressed dismay that the two instructors with whom she experienced hight transactional distance also did not manage the classroom discussion or projects well enough to foster collaboration among students. K had challenges with collaboration and did not seem to be able engage with the learning community, stating, "So now you want six people from all over to get together at a certain time to work on a project. And our grade depends on the other five people. Which I believe is not realistic. I mean, I don't think that it's realistic for them to... it's not acceptable, honestly". Although several students mentioned collaborative assignments as challenging, those who did engage in them tended to have higher satisfaction. However, K's experience shows the importance of Learner-Teacher Engagement in fostering collaboration.

Cognitive Engagement

L rated Community of Inquiry items related to cognitive and social presence higher than teaching presence on the survey, and this is supported by their comments during our interview; "And for the hybrid class, since it's a nursing student, and we work as a group, it's definitely like, it's, it's a, as of right now, it's my support system as well, because that's the people that can understand what I'm going through and what is happening" (Student L). It was clear that for L, Cognitive Engagement and Community Engagement were critical elements for her satisfaction and success in the course. This is likely because L was in a hybrid program run in cohorts of students who

have been together for at least two years. However, only in the hybrid course did social presence play a role for L, stating that, for their fully online microbiology course , “the instructor was from [another island], and most of the students [are] from [that island], and I haven't engaged with even one student’.

C indicated that their teachers spent significant time and energy working with students he believed were much less prepared and focused on completing their schoolwork. However, C did not feel that he needed that, preferring to work on his own more. “Hey, I would rather just read the material, watch the videos, learn it myself, I don't need to hear lectures. A lot of the videos are lectures from the professor's because they make their own videos”. C did, however, seem to especially enjoy their agriculture course, a hybrid course involving a face-to-face hands-on lab. C rated Teaching Presence the highest, but also rated Social Presence and Cognitive Presence relatively high. This may be due to the hands-on component of C’s farming class, where they had to interact with other students. In the military C would have worked as a trainer for other service members, and it is not surprising that they might miss that contact; “…You have to get hands on experience with certain things”.

Student N noted that collaborations tended to be structured, at least initially, by the teacher, stating “I would think that with online, like, there's no way that you could do group projects, but they kind of force it's like, no, you guys have to get like their email or their phone number. And it was kind of cool”.

Task Performance

Task Performance included sub concepts of Time Management and Task Strategies. Like other students interviewed. K started the semester feeling that they had a good plan for structuring her learning, beginning with goal “Because I'm doing you know, distance learning. I,

in the beginning, I made a schedule for myself that I was actually going to commit from this hour to whatever time to do this class, on this day, to make sure that I was on a schedule as if I was actually attending school, in person". However, they soon found that their initial plan was not working, as they stated, "But what I've found early on within the first month, for example, like my philosophy course, that one hour of time, three days a week was not enough". This was where students with more adaptive self-regulation skills typically would reach out to either the teacher or peers. For K, it instead became a barrier to their goals that seemed make them less, rather than more, likely to engage with the teacher and community. However, K soon realized the schedule she made would not work. "I mean, this whole semester, I feel like I had to kind of put certain courses on the backburner just to focus on a certain course". This caused K to fall behind in other courses as well, leading to a spiral of dissatisfaction with their online college experience. While K felt that they did good quality work and was focused on getting good grades, they had difficulty revising their original time management and task strategies "For me, I'm over, I'm trying to get all As in my courses. That's why I'm trying to prove to myself that I can get a 4.0"

K also felt that the expectations for student work in the courses was too high, which they found frustrating; "So if that's the expectation, I think maybe it's a little too high. And that's why I say, I'm at a... This was a 200 level course, you know, I'm not even at 300, 400 level. So, it's I say it's a little bit discouraging that if at this point, no this is actually 100 level course!".

K rated their self-regulation skills relatively high, with the exception of Help Seeking, a component of Self-Reflection. Based on their comments during our interview, seeking help may have been a useful strategy. However, once they felt their schedule slipping out of control, it became difficult to regain momentum.

O was meticulous in their time management because time was limited due to family and work responsibilities. “So, Sunday's is my only day off. So, what I do in the afternoon, I go ahead and I make sure that I log in my phone, and also my calendar on my desk, all of the due dates throughout the whole week for each class, and I have a timer for my online phone”.

J, with similar work and family responsibilities, tended to put schoolwork at the end of the day. “Mostly in the evening, when I have done good work, checking with family, you know, getting dinner done. And then when I have my me time, is when I'm able to actually try to catch up”. For J, then schoolwork came after other higher priorities had been satisfied. This was a challenge for several of the non-traditional students interviewed, except for C, who did not seem to have outside obligations. C felt that prioritizing was key to managing their workload. “…if I get ahead in a certain subject, then I'll just let it sit for a few. And then I'll go concentrate on something that that I need to concentrate on. So, it's, it's a matter of prioritizing, you know”. Notably, C did not appear to have family or work responsibilities to balance with their school workload.

Where for some students interviewed, the shift to online classes due to COVID was described as a burden, for E the shift seemed to free her to develop her learning strategies more independently. “So, it has its drawbacks. via online, definitely, especially the limitations it would take to study with other people if I wanted to. But in terms of studying on my own, it has really, it it's kind of a blessing in disguise, because it gave me a means of learning how to build those study strategies on my own without the influence of anyone else”.

It seemed a little paradoxical that E, while valuing the interaction and presence of instructor and peers in her online courses, also values the ability to separate herself from it. However, it is a good example of having adaptive self-regulation skills.

Community Engagement

For C, the learning community was an integral part of their online experience. "…sometimes you have to work with the other students for projects. And you generally work together in forums or, you know, sometimes you'll have to do email stuff back and forth to get a project put together. And I always take the lead because I am good at giving direction". "And, and, and I lose patience. But I, but I control that. I know that, you know, I give everybody the proper respect. And I just take a step back, and I say, hey, these, these younger folks, they just don't have the work ethic, and maybe they don't have the understanding". While C stated that they did not like working with the much younger students in their class, they engaged with the community because it was required. "So, I have to be patient. But, you know, you just do your best to work with them. It can be frustrating". Though frustrating at times, community engagement seemed to help C cognitively engage more fully in the course. For some non-traditional students, collaboration with perhaps younger students was a persistent challenge that made adapting to online coursework more difficult. However, for some non-traditional student's community engagement was critical to their ability to engage.

L, in a cohorted nursing program, felt a strong connection to her classmates. However, that is only true for the hybrid course. The social presence of classmates in that course helped her to overcome challenges such as language and adapting to an online community, as well as the normal stressors of the nursing program. L was not at all hesitant to reach out to classmates and teachers for clarification and support. "And for the hybrid class, since it's a nursing student, and we work as a group, it's definitely like, it's, it's a, as of right now, it's my support system as well, because that's the people that can understand what I'm going through". For L, the course community is a large part of their life. "I probably I have more friends right now than I, I had I

like, I got from the I like living four years on Island, you know, like it from those two semesters, this group of people became like a second family for me, right?".

Being in a formal cohorted program or an informal cohort of students working toward similar goals seemed to increase the value placed on social interaction. For non-cohorted student this seemed to be less common especially with non-traditional students. However, if the teacher fostered social interaction in the class, it seemed to encourage students

J rated questions related to seeking help from or comparing her own understanding with other students at a "3". These items were under Help Seeking and Self-evaluation and reflect J' own statements that she has limited time to spend online, and that she feels somewhat separated from other students because of her perception of an age difference. Age can be a barrier culturally to seeking information because of a sense that elders are knowledge keepers and younger people are knowledge seekers, so it may be uncomfortable for J to reach out to students she feels are , as she says, "my children's age" (Student J).

Satisfaction

Satisfaction coded under both Learner-Teacher Engagement and Cognitive Engagement and was a major determinant of whether the student intended to enroll in courses the following semester. Satisfaction depended not on how often the student made actual contact with the teacher, but on the availability of contact when it was needed, for example to clarify an assignment or find out how the student was doing in the course. The amount of satisfaction varied by student and seemed to track positively with the student's cognitive and community engagement. Even among students who disliked having to collaborate with other students, those who did collaborate consistently stated satisfaction with the course.

Overall J was satisfied with her synchronous course, which more closely followed the format of a face-to-face classroom, but she struggled with the higher transactional distance of her online course, and this was compounded by a sense of the age gap between her and her peers and her sense that she could not reach out. While the presence of the instructor and other students in the synchronous course may have helped to compensate for that, the asynchronous course may have exacerbated a sense of separateness for J as an older returning student. Unfortunately, J's experience with her asynchronous course has led her to question her decision to return to school, even though she would like to enhance her job skills and possibly a career in accounting. One notable exception to J's ratings for Satisfaction items was the "5" (strongly agree) she put for the item "The content covered in this course is not interesting". This was likely an error caused by the reverse coding of this item, which J inadvertently misread. In a follow-up email, J verified that she indended to put a "1" (stongly disagree). J also wrote that she did not enroll in the following semester (Fall 2021), and at this time has no new plan for continuing her studies (personal communication, August 17, 2021).

For L, peer interaction and support were a significant factor in Satisfaction with online courses, with the hybrid model providing opportunities for face-to-face meetings and collaboration the most satisfying. In L's rely to the emailed follow-up questions sh wrote that she is enrolled in the Fall 2021 semester and id still in the Nursing Program at the community college. L is in the final year of the program for an Associate of Science in Nursing degree.

C rated Satisfaction on all items very positively, and overall expressed satisfaction with his online experience. C seemed very self-assured about their ability to regulate their learning, however, despite stating in our interview that they preferred to work on their own, the course they most enjoyed was one with a collaborative hands-on component. "…the agriculture though,

is, of course, the reason why I'm there. And it's really, really good. I like the hands-on stuff. I like the plant biology stuff is really good".

C replied to an email with the follow-up questions confirming that he is enrolled in the same college and program (Agriculture) and is taking all online courses in the Fall. C is following the same study plan, as COVID-19 restrictions continue to prevent most face-to-face classes (personal communication, August 19, 2021).

Q thought engagement between teacher and student was most important." I feel like it's the interaction between teacher and student, in class and out of class". Active engagement by the teacher and student was equally important to Q. "But also keeping that communication with the student is to keep them engaged in the class so that they're not falling behind or getting bored of what they're doing to. So, I think that's, it's the interaction in class and out of us. Keeping them engaged".

Summary of Phase 2 Interview Findings

The RQs for Phase 2 were

4. How do student perceptions of learner-teacher transactional distance influence decisions on the use of self-regulated learning skills?
5. How do student perceptions of learner-teacher transactional distance influence participation in the online course community?
6. How do students describe satisfaction in the context of online learning, and how do perceptions of learner-teacher transactional distance influence satisfaction in online courses?

Being able to engage with the teacher was important to all 12 of the students interviewed, though the form that engagement took varied. For all students interviewed, LTTD and Teaching Presence merged to a theme of Learner-Teacher Engagement (LTE).

For RQ 4, their did not seem to be a direct relationship between the student use of SRL skills and LTTD Student interviewees were very consistent in being able to describe their goal setting and environmental structuring plans, which formed the category of Forethought in the Zimmerman (1989) SRL model, however this varied widely among students. Performance components of SRL, time management and task strategies, seemed to be internal knowledge that the student brought with them to the course and not dependent on LTTD. However, those students who were more able to adapt their SRL skillset reported more satisfaction and success with their courses.

RQ 5, how student perceptions of LTTD influenced community presence was directly related to the student's Cognitive Engagement, a second theme that emerged. LTE and Community Engagement, a third theme, seemed essential to Cognitive Engagement, in that students who reported a stronger and more satisfying cognitive engagement also were able to engage with the learner community to the extent needed for success in the course.

RQ 6 addressed how the student's perception of LTTD influenced satisfaction with the course. Satisfaction did not emerge as a separate theme but was instead an important part of the themes of LTE and Cognitive engagement. Even among those students who were not satisfied with their course, low LTTD (and Cognitive Engagement) were consistently described as important for satisfaction with a course.

Of the 12 interviewees, all but two were planning to continue the next semester, and all were in the same program or major as in their Spring 2021 semester. J and reported that she will

not attend college in the Fall 2021 semester, and K was not at this time planning to return at the time of our interview. This was significant because J and K also experienced high LTTD, meaning a larger psychological distance or disconnect between their understanding and the teacher about their learning needs and skills, and both seemed to lack the self-regulation skills needed to succeed independent of teacher or peer support. Neither student reported being persistent in reaching out to their instructors. Peer support might have made a difference for them as it did for other students interviewed, for example L found significant support by collaborating informally (without specific instructions from the teacher) with other students in the course and E in fact found significant support both academically and socially through her online course. Significantly, L was part of a cohort program, so had a group of peers moving together through several courses.

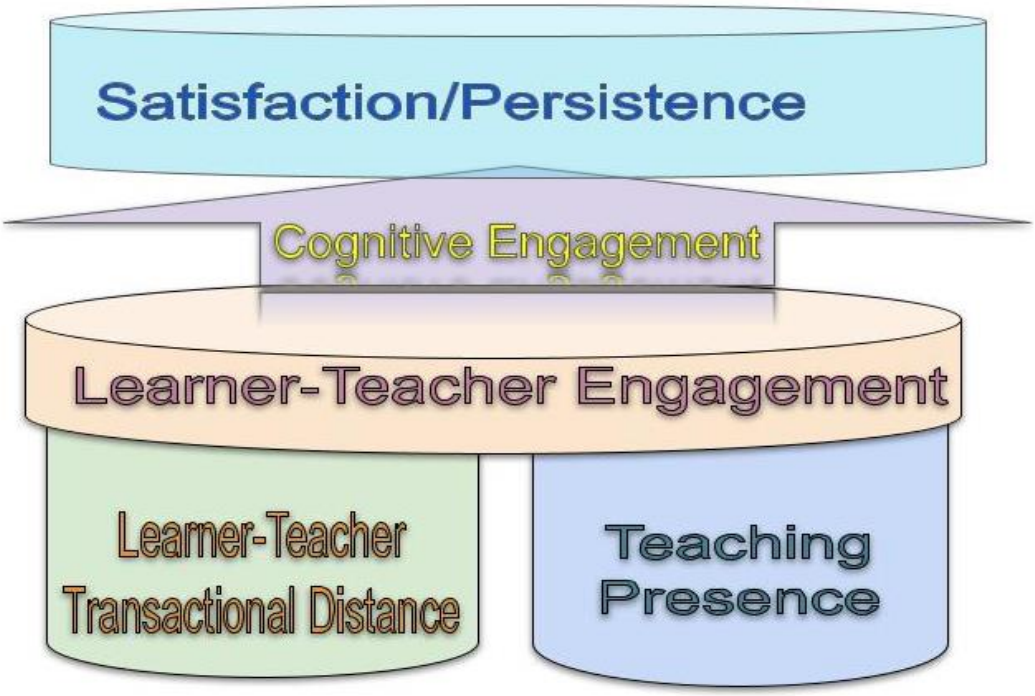
CHAPTER 5. DISCUSSION AND CONCLUSIONS

In this chapter the major findings and conclusions based on analysis of data from the Phase 1survey and Phase 2 interviews will be discussed. Synthesis of Phase 1 Survey and Phase 2 semi-structured interviews helped to explain survey findings as well as to clarify the student experience of LTTD in relation to community presence, self-regulation of learning and satisfaction in online courses.

Phase 1 and Phase 2 Synthesis

This research was structured as a sequential mixed methods study followed by a synthesis of findings. While the relationship between LTTD, community presence, self-regulation and satisfaction was complex, a mixed methods approach helped to overcome some of the limitations of the study, such as sample size. Figure 13 below shows a conceptual framework illustrating how LTTD and Teaching Presence form a single concept of Learner-Teacher Engagement. Learner -Teacher Engagement supports Cognitive Engagement, and both are necessary for student satisfaction. This finding is similar to Transactional Presence (Shin, 2003). However, it provides a clear indication of the critical role of the teacher in fostering cognitive engagement in online courses through supporting community engagement. A detailed discussion of the conceptual framework follows.

Figure 13. Conceptual Framework.



Learner-Teacher Engagement

The Community of Inquiry dimension of Teaching Presence was clearly linked with LTTD, combining to form the over-arching concept of Learner-Teacher Engagement. In interviews, students reflected on their personal relationship to the teacher in terms of the LTTD model, while describing the operation of the course itself in terms related to Teaching Presence. This reflects the nature of the question items on the survey, where LTTD items are phrased as "My teacher knows…" or "My teacher takes into consideration…" while Teaching Presence Items are phrased as "The teacher…" , focusing on tasks and organization, such as returning assignments on time and providing course information. Teaching Presence and LTTD emerged as an integrated concept of Learner-Teacher Engagement, both strongly correlated and forming a

unified factor as the teacher's understanding and consideration of student skills and needs, operationalized through Teaching Presence which includes actions such as course design and organization, moderating discussions, and topics, and directly instructing the student (Arbaugh et al., 2008). Teaching Presence is one leg of a structure described here as learner-teacher engagement, with the other leg being LTTD This is described well by Student E, who valued how the course design itself helped reduce LTTD, the psychological distance from the teacher. "It's required for each student to go to at least one module, but this is one that actually breaks us up into smaller groups. And the learning assistants are the ones that facilitate it, and that'll give us ways to review or study for the material" (Student E).

For some students Teaching Presence manifest mainly in the Design and Organization of the course, while for others sit was also important that the teacher engaged in Facilitating Discourse by moderating discussion boards or breakout rooms was the most apparent teaching role. Students were very diverse in the exact mix of these three aspects of Teaching Presence needed for Satisfaction with the course, and the level of transactional distance needed to sustain learner-teacher engagement changed depending on other factors in the student's lives. Student N valued a well-designed asynchronous course leaning more toward autonomy, while still engaging through email with the teacher, stating "I don't know why but I personally like asynchronous classes better. I'm not sure, I don't, I guess it's because like, I get to just learn on my own piece, and I like to be independent".

Q preferred a much more synchronous interactive classroom, with higher dialog, stating "…I feel like it was probably a more advanced way of experiencing it. Because I was taught by the teacher. And then the teacher taught me how to make it better" .

For most of the students, email was the main channel for direct instruction, and the sense that the teacher was engaged, understood, and took consideration of them personally as students was transmitted by timely and student-specific email communication. One-to-one videoconferencing, or virtual office hours, were also important, especially for students who placed more value in Social Presence as important in their online learning such as Student Q. The flexibility and engagement of the teacher in meeting student needs was important Q said, "… and then we would ask her for like, more emails, like a day before, or like, prior to the deadline. So, she would send out more emails in the back half of the class, because we asked her".

Cognitive Engagement

Cognitive Presence was correlated with Teaching Presence, however it clearly loaded in EFA as part of a separate factor of Cognitive Engagement. It is also moderately loaded with Learner-Teacher Engagement in EFA and Satisfaction cross-loaded on both Learner-Teacher Engagement and Cognitive Engagement. Cognitive Engagement is the process by which students construct knowledge through cognitive presence phases of triggering, exploration, integration, and resolution (Arbaugh et al., 2008), however Cognitive Engagement requires more than Cognitive Presence. It also requires some aspects of self-regulation and the ability to form some social connection in the course community. This was supported by student interview narratives as well as moderate cross loading of social presence in EFA. Students who reported engaging with others in their class were also more likely to be satisfied with their course, " ... I guess in a way, not only does it help us build a community, but it also helps us to understand the material a lot better" (Student E).

This did not imply that the student necessarily enjoyed the social aspect of the class, but that they were able to engage to the extent needed for success in the course, as C stated, “I have to be patient. But, you know, you just do your best to work with them. It can be frustrating”.

Task Performance

All of the students interviewed rated their self-regulation skills relatively highly, and this appeared to have no relationship to their perception of Learner Teacher Engagement or LTTD specifically. SRL was composed of three phases of Forethought, Performance, and Self-Reflection. Forethought cross loaded on factor 2, Cognitive Engagement, and Factor 3, Task Performance (along with the Performance subscales of Task Strategies and Time Management). None of the SRL subscales loaded with Factor 1, Learner-Teacher Engagement. Though clearly important for student learning and success, it was apparent from the phase two interviews that some student perceptions of their actual self-regulation skills may not have been objectively accurate. The two interviewees who did not have successful semesters tended to place the responsibility for their dissatisfaction with the teacher’s engagement, rather than on their own SRL skillset or engagement in the course. Student Q, however, seemed to have the SRL skill of Self-Reflection, and so engaged in Help Seeking: “I was always jumping at the opportunity to get the teacher involved with my teaching to learn how I learned” (Student Q).

This was a common theme among those students who demonstrated strong SRL skill; the ability to self-reflect and then seek help. Self-Reflection was composed of subscales of self-evaluation and help-seeking. Those students who did not bring strong self-reflection skills to the course tended to have difficulty engaging with the teacher, the course, and the community, and to be

dissatisfied with the course. Nonaka , Tonama, and Kono (2000) describe knowledge as intrinsic or extrinsic. Intrinsic knowledge is knowing that the individual previously incorporated and brings with them, while extrinsic knowledge is imparted by others, and is incorporated as new knowledge, becoming intrinsic. In this sense, SRL was intrinsic knowledge that the student possessed on enrolling in the course, or it was absent. No student described learning-how-to-learn in their online course or in their college experience, leaving the researcher to wonder where students learn metacognitive skills.

Community Engagement

The teacher as course organizer, discussion facilitator, and communicator seemed to be key to fostering cognitive engagement among students, however community engagement performed an essential supporting role in Cognitive Engagement through social presence. Collaborative hands-on labs or small group projects online, typically assigned by the teacher, encouraged students to engage in the community. Notably, among the older non-traditional students, none felt comfortable engaging directly with other students, who were typically much younger. Yet students who did engage were both more successful and satisfied with their classes.

Satisfaction

Correlation studies clearly showed a strong positive correlation between Satisfaction and LTTD Teaching Presence, Cognitive Presence, and the Self-Reflection phase of SRL. In EFA, Satisfaction did not form a distinct factor, instead cross loading on Factor 1, Learner-Teacher Engagement, and Factor 2, Cognitive Engagement. Satisfaction is closely linked to the student‘s success, or percieved success, in a course (Tinto, 1975). Two of the student‘ interviewed found themselves overwhelmed by unexpected workloads and a percieved lack of support as they

grappled with new concepts in courses such as accounting, “Like, I'm to the point where I'm technically failing that class”(Student J, or Philosophy, “I would not recommend taking online classes. I have told other friends of mine who are like, well, I should go back to school too. And I was like, don't do it. If it's online” (Student K).

It is tempting to simply decide that the student was unprepared, however J and K were both previously enolled in college, while two students who were first-time college students (C and M) were both very satisfied with their online course experiences, but also had different teachers than J and K and perhaps different expectations. So it is not always previous experience with college or initial self-efficacy entering the course that determines satisfaction. It seems to depend more upon learner-teacher engagement and cognitive engagement along with the supporting roles of student Task Performance skills and Community Engagement.

Contribution to Theory

This study focused on the learner-teacher dimension of TD theory (LTTD) and explored the relationship between it and cognitive and community presence as defined by the CoI framework (Arbaugh et al., 2008), student self-regulated learning (SRL) as measured by the OSLQ (Barnard-Brak et al., 2010), and student satisfaction with online learning from the TDSTECH (Weidlich & Bastiaens, 2018). A convergent mixed methods approach using a Likert type survey and semi-structured interviews helped to validate the findings. This study indicated that at college level, the two concepts of Teaching Presence, as defined by course design and organization, facilitation of discourse, and direct instruction, and LTTD, the distance of understanding between the teacher and student, form an overarching concept of Learner-Teacher Engagement. This study has demonstrated that transactional distance theory and the community

of inquiry framework are complimentary constructs for explaining student engagement in online courses.

Implications for Practice

Fostering Learner-Teacher Engagement in online courses is partly a design problem, and partly a problem of perceptions. The student perception of psychological distance from the teacher (and the teacher from the student) is an important component of learner-teacher engagement in online courses, along with teaching presence as defined in the CoI framework. The teacher may feel that they are readily available to any student who reaches out, unaware of the technical and social barriers students may face in doing so. Creating an environment that mitigates these barriers requires that transactional distance be minimized, and that teaching presence is apparent in the course design and execution. Teaching presence is the design and organization of the course, facilitation of discourse (discussion boards and online chat), and direct instruction. The design of the course should positively facilitate interaction between the teacher and student individually and as a group or class, fostering learner-teacher engagement. Four suggestions to foster learner-teacher engagement follow.

1. Teach students explicitly how to reach you by email using the course management software, and how to ensure they get your emails. Ask them to email you on the first day.
2. Teach students explicitly with in-class exercises how to find information in your online class, and make it easy to find information (e.g., the “three click” rule).
3. Require community engagement and collaboration through discussion boards, class breakout rooms. Dedicate some class time to this each week.

4. Embed teaching of self-regulation skills in course content, do not assume students know how to self-evaluate and seek help in an online environment.

Instructional designers will be familiar with these suggestions; however, it is important to be consistent in applying them, and to adapt them carefully to every course individually based on the student's needs, and the teacher's as well. No two teachers or students are alike, so it is a mistake to apply a single online course design template to every course regardless of the unique perceptions, skills, and abilities of the people who will have to use it. For example, although three of the students interviewed were first-year college students, and two non-traditional returning students ultimately dropped out of college (did not register for Fall 2021), all rated their SRL skillset as relatively high. This may indicate that novice students are not adept at evaluating their own self-regulation skills, or that returning students may need a process for evaluating their self-regulation skillset.

Based on this study, metacognitive and self-regulation skills should be progressively acquired through deliberate training as part of advancing coursework as the student progresses rather than leaving the acquisition of these critical skills to chance. It is important to note that teaching presence and low transactional distance can be manifest in asynchronous courses through careful course design and ready access to direct instruction via email or other means when needed. Setting a specific amount of office time to answer emails allows the teacher to aggregate common threads. For example, if several students are confused about part of an assignment or schedule, it is a flag that the information was not clear or was not easy to find. Similarly, instead of answering the same questions repeatedly in individual emails, send out an announcement answering the question through the course LMS, and push it to all student email

accounts. It is likely that students who didn't email also have the same questions. This also sends a message that the teacher is engaged in the community of learners.

Limitations

This study is limited by several factors in the Phase 1 survey and the Phase 2 interviews. Phase 1 limitations including the recruitment method for deploying the survey, limited response rate, and the associated limitations on quantitative analysis. Phase 2 limitations include the researchers relative lack of experience with coding and analyzing participant statements, the researcher bias as a teacher and academic, and the unique perspectives of individual participants. While the researcher anticipated a pool of possible candidates for interviews, the low response rate meant that the 12 students interviewed were the drawn from a small pool of self-selected students who initially submitted emails, and also responded when contacted by the researcher. A related limitation is the likelihood that students who voluntarily completed the survey and those who agreed to be interviewed self-selected to participate and were therefore a less representative sample of the larger population of online students, particularly those who may be struggling and thus have little time or inclination to participate in a study.

While this study indicates correlation between LTTD and Teaching Presence and to a smaller degree, Cognitive Presence, it does not establish causality. For example, a student's engagement may emerge independently of LTTD, a byproduct of metacognitive development on the student's part, for example, or other causes. Also, this study focused on the learner-teacher dimension of LTTD, and so does not account for the influence of learner-content or learner-learner TD. Inclusion of those dimensions of TD might reveal a stronger correlation between TD and SRL, for example.

In this study, SRL sub-concepts correlated poorly with each other. In the original study a validated profiling scale of student self-regulation demonstrated clear self-ratings by students, however that was not apparent in this study. This indicates that the sample, community college students, may have been less appropriate for the OSLQ questionnaire, or that including it within a larger instrument may have affected the results. A further study using the QSLQ as the focus of the research, perhaps using a formal interview or survey/ observation mixed methods study might clarify the role of LTTD on student self-regulation.

This study is further limited by a lack of data on the impact of socioeconomic stressors outside of the course environment on learners and instructors, which can have a significant impact on learner perceptions. The sample of the population that chooses to complete the questionnaire will mean that there is a chance of sampling error through participant self-selection, though if the sample size is large enough this should be minimal. Finally, while conclusions based on data analysis may appear to "fit" reality, other conclusions from a different analysis of the same data may also fit as well.

Recommendations for Future Research

Further study into the relationship of transactional distance, teaching presence, and student satisfaction is needed using the emergent variables of Learner-Teacher Engagement, Cognitive Engagement, and Community Engagement. A mixed methods approach was useful in this study to reveal themes and explain phenomena that may not have emerged in standard survey research or with qualitative methods alone. For example, while SRL did not correlate with LTTD in this study, in the interviews it was apparent that undergraduate students may not reliably rate their own SRL skills. Further study into the role of teachers in fostering SRL in students is needed,

perhaps with a more formal survey guided interview process, because these skills seem to be critical for enabling cognitive engagement. Learning analytics technologies are a promising set of tools to improve learner-teacher engagement as well as cognitive engagement in the learning process by students and teachers and need more research on how to best implement them in the active classroom. For example, tracking student use of online resources within an LMS can give both the student and teacher feedback on actual time spent on a topic, and could track the pathway a student follows to find information and complete assignments. This could allow improvements in study practices as well as in the design of the course to make more effective use of student time and effort. It could also be used as a flag to alert the teacher to students needing further engagement from the teacher to be successful in the course. Usability studies are often used to develop and improve products and could be valuable in studying student patterns of behavior and the rationale behind them in real-time. This could be useful as part of a dynamic interaction between students, teachers, and instructional designers.

Summary and Conclusions

The single greatest predictor of student satisfaction in this study was the student's perception of teacher engagement in the form of Teaching Presence through instructional design and organization of the course, the role of facilitator, and direct engagement with students, and perceived LTTD, defined in this study as Learner-Teacher Engagement. LTTD correlated strongly with all three sub-concepts of Teaching Presence, and this was supported by the Phase 2 interviews. Low LTTD (higher Likert scores on the LTTD items) correlated to higher student satisfaction, while high LTTD (lower Likert scores) correlated with lower student satisfaction. Low LTTD also correlated to higher CoI score, but only for Teaching Presence, not Social

Presence, and only moderately for Cognitive Presence. LTTD did not correlate to student self-regulation skills. Based on interviews and survey data, students with high SRL skills value low LTTD as much as students with low SRL skills. While students in synchronous courses rated learner-teacher transactional distance lower than students in asynchronous courses on average, Satisfaction was nearly equal, and both rated just below Hybrid for Satisfaction. However, the survey response rate was too low to make a clear case for the relationship of course mode and student perceptions of LTTD. The mode of the course did not seem to be as important as the actions and perceived transactional distance of the instructor.

In interviews, students repeatedly praised their instructors who simply returned email messages promptly. Those students who reported prompt replies from their instructors by email also reported a stronger sense of community and were more positive in their overall satisfaction level with the course.

For some of the students interviewed for this study the value of online course offerings was primarily that it allowed them to enroll in college and take courses needed for programs that did not traditionally offer courses online. For example, M stated that she preferred to take online courses from home and would do so regardless of pandemic issues, however the required pre-nursing courses were offered online for the first time specifically due to the COVID-19 pandemic. This is somewhat concerning because many colleges are planning to roll back online offerings over the next few semesters due to budget, technological constraints, and preferences from faculty who were forced into online teaching by the pandemic but will want to return to the face-to-face classroom as soon as possible. If the history of educational technology innovations is a guide, the public funding and support for the continued development and maintenance of a robust IT infrastructure required for extensive online instruction will falter once the current

pandemic restrictions recede. This will leave some non-traditional students essentially cut off from a pathway to a college degree and career training, which is the core demographic for community colleges. The COVID-19 pandemic provided a unique opportunity for online course offerings to step into the mainstream of public education. This presented technical challenges and highlighted the need to teach instructors the skills required for effective online teaching, and students the basic metacognitive and self-regulation skills required to thrive online in higher education, however it was also largely a success, demonstrating that many students can and do learn effectively in online courses.

Undergraduate students are expected to have developed the basic self-regulation skills to successfully navigate online college courses. However, from the findings of this study, that expectation is not based on evidence. Learner-teacher engagement thus forms the foundation for cognitive engagement. The teacher should model the skills required for self-regulated learning in a variety of course modes, not assume the student has somehow acquired theses skills in an earlier, lower-level course where the demands for those skills may have been less, or absent. Acquiring the skills for successful learning is a fundamental challenge for students and the overarching role of the teacher.

"The goal of education is to enable individuals to continue their education."

— John Dewey

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Appendix A: Questionnaire

Questionnaire

	Item	Subconstruct	
1	My teacher knows what I know about the course module he/she teaches.	Co-understanding of skills	Learner-Teacher Transactional Distance (LT-TD) Questionnaire (Giossos et al., 2016)
2	My teacher knows my abilities on the course module he/she teaches.		
3	My teacher knows the way I learn better.		
4	My teacher knows the gaps I have on the course module he/she teaches.		
5	My teacher knows that the time I have available for study is limited.	Co-understanding of needs	
6	My teacher knows that, apart from my studies, I have to cope with many other things in my life.		
7	My teacher knows that I need help in my studies.		
8	My teacher knows that I need to communicate with the other students regularly.		
9	My teacher knows that I need encouragement.		
10	My teacher knows the difficulties I face in coping with the course module.		
11	My teacher takes into consideration the knowledge I have on the course module he/she teaches.	Awareness of skills	
12	My teacher takes into consideration the abilities I have on the course module he/she teaches.		
13	My teacher takes into consideration the way I learn better.		
14	My teacher takes into consideration the gaps I have on the course module he/she teaches.		
15	My teacher takes into consideration my opinion about the course module he/she teaches.		
16	My teacher takes into consideration that the time I have available for study is limited.	Awareness of needs	
17	My teacher takes into consideration that, apart from my studies, I have to cope with many other things in my life.		
18	My teacher takes into consideration the need I have for guidance and help in my studies.		
19	My teacher takes into consideration the questions I have on the course module he/she teaches.		
20	My teacher takes into consideration my general emotional state during my studies.		
21	My teacher takes into consideration that I need to communicate with him/her regularly.		
22	My teacher takes into consideration that I need to communicate with other students regularly		
23	My teacher takes into consideration that I need encouragement.		
24	My teacher takes into consideration the difficulties I face in coping with the course module.		
25	My teacher takes into consideration that I have the need not to feel isolated		

Questionnaire (continued).

26	The instructor clearly communicates important course topics.	Teaching Presence	Community of Inquiry (CoI) Questionnaire (Arbaugh et al., 2008)
27	The instructor clearly communicates important course goals.		
28	The instructor provides clear instructions on how to participate in course learning activities.		
29	The instructor clearly communicates important due dates/time frames for learning activities.		
30	The instructor is helpful in identifying areas of agreement and disagreement on course topics that help me to learn.		
31	The instructor is helpful in guiding the class towards understanding course topics in a way that help me clarify my thinking.		
32	The instructor helps to keep course participants engaged and participating in productive dialogue.		
33	The instructor helps keep the course participants on task in a way that helped me to learn.		
34	The instructor encourages course participants to explore new concepts in this course.		
35	Instructor actions reinforces the development of a sense of community among course participants.		
36	The instructor helps to focus discussion on relevant issues in a way that helped me to learn.		
37	The instructor provides feedback that helps me understand my strengths and weaknesses relative to the course's goals and objectives.		
38	The instructor provides feedback in a timely fashion.		
39	Getting to know other course participants gives me a sense of belonging in the course.	Social Presence	
40	I am able to form distinct impressions of some course participants.		
41	Online or web-based communication is an excellent medium for social interaction.		
42	I feel comfortable conversing through the online medium.		
43	I feel comfortable participating in the course discussions.		
44	I feel comfortable interacting with other course participants.		
45	I feel comfortable disagreeing with other course participants while still maintaining a sense of trust.		
46	I feel that my point of view is acknowledged by other course participants.		
47	Online discussions help me to develop a sense of collaboration.		

Questionnaire (continued).

48	Problems posed increase my interest in course issues.	Cognitive Presence	Community of Inquiry (CoI) Questionnaire (Arbaugh et al., 2008) (Continued)
49	Course activities pique my curiosity.		
50	I felt motivated to explore content related questions.		
51	I utilize a variety of information sources to explore problems posed in this course.		
52	Brainstorming and finding relevant information helped me resolve content related questions.		
53	Online discussions are valuable in helping me appreciate different perspectives.		
54	Combining new information helps me answer questions raised in course activities.		
55	Learning activities helps me construct explanations/solutions.		
56	Reflection on course content and discussions helps me understand fundamental concepts in this class.		
57	I can describe ways to test and apply the knowledge created in this course.		
58	I have developed solutions to course problems that can be applied in practice.		
59	I can apply the knowledge created in this course to my work or other non-class related activities.		

Questionnaire (continued).

60	I set standards for my assignments in online courses.	Goal Setting	Online Student Learning Questionnaire (OSLQ) (Barnard-Brak et al., 2010)
61	I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the semester).		
62	I keep a high standard for my learning in my online courses.		
63	I set goals to help me manage studying time for my online courses.		
64	I don't compromise the quality of my work because it is online.		
65	I choose the location where I study to avoid too much distraction.	Environment structuring	
66	I find a comfortable place to study.		
67	I know where I can study most efficiently for online courses.		
68	I choose a time with few distractions for studying for my online courses.		
69	I try to take more thorough notes for my online courses because notes are even more important for learning online than in a regular classroom.	Task strategies	
70	I read aloud instructional materials posted online to fight against distractions.		
71	I prepare my questions before joining in the chat room and discussion.		
72	I work extra problems in my online courses in addition to the assigned ones to master the course content.		
73	I allocate extra studying time for my online courses because I know it is time-demanding.	Time management help	
74	I try to schedule the same time every day or every week to study for my online courses, and I observe the schedule.		
75	Although we don't have to attend daily classes, I still try to distribute my studying time evenly across days.		
76	I find someone who is knowledgeable in course content so that I can consult with him or her when I need help.	Help Seeking	
77	I share my problems with my classmates online so we know what we are struggling with and how to solve our problems.		
78	If needed, I try to meet my classmates face-to-face.		
79	I am persistent in getting help from the instructor through e-mail.		
80	I summarize my learning in online courses to examine my understanding of what I have learned.	Self-evaluation	
81	I ask myself a lot of questions about the course material when studying for an online course.		
82	I communicate with my classmates to find out how I am doing in my online classes.		
83	I communicate with my classmates to find out what I am learning that is different from what they are learning.		

Questionnaire (continued).

84	I benefited from this course	Satisfaction	TDSTECH Questionnaire (Weidlich & Bastiaens, 2018) (Satisfaction section)
85	This course met my expectations		
86	I experienced and learned new things in this course		
87	The content covered in this course was not interesting*		
88	I would like to take more courses like this one		
89	I wish other courses were more like this one		
90	What is your year in college? (Drop down 1, 2, 3, 4, 5+)	Demographics	
91	How many online courses have you taken before the current course? (single selection) □ None □ 1-2 □ 3-5 □ 6+		
92	This course is conducted : (single selection) □ Completely online synchronously (class mostly meets together online at the same time) □ Completely online asynchronously (class mostly does not meet together at the same time) □ Blended online (blend of online synchronous and asynchronous class meetings) □ Hybrid face-to-face in person and online synchronous classes.		
93	I am taking this course online mainly because: (single selection, choosing COVID-19… triggers the two additional COVID-19 items #94 and #95, otherwise they are skipped.) □ COVID-19 pandemic restrictions prevent me from taking in-person classes □ I prefer to take courses online when possible. □ Work or other commitments prevent me from taking courses in person. □ My program or degree requires a course that is only available to me online.		
94	Having my classes taught online due to COVID-19 campus restrictions has been a positive experience for me.		
95	If not for COVID-19 campus restrictions I would prefer to take my course(s) in person in a classroom.		
96	If you are willing to participate in a 20-minute interview via videoconferencing please provide your email address here: _____		

Appendix B: Letters of Permission for Questionnaires

Appendix e contains the Email permissions from researchers who developed the scales and questionnaire used in the study to use and revise survey tools

Permission to use LT-TD Questionnaire

(Sent through Researchgate)

Permission to use the Learner-Teacher Transactional Distance ScaleReport message · Block user

Kurt Rutter

Apr 8, 2019

Aloha Dr. Giossos,

I am a PhD student in the Learning Technologies (LTEC) program at the University of Hawaii at Mānoa. I would like your permission to include the Learner-Teacher Transactional Distance (LT-TD) scale in my study on the impact of learner-instructor transactional distance on teaching, social, and cognitive presence, self-directed learning, and learner satisfaction in communities of inquiry. I read the paper by you and Drs. Koutsuba, and Mavroidis in the American Journal of
Distance Education (2016 vol. 30 issue 2) and found it a well validated instrument for measuring learner- teacher transactional distance at the course level. My study participants will be community college students enrolled in distance courses online. Hawai‘i is an interesting place for this study because students from all of the neighbor islands take online courses at any of the 7 campuses across the islands, and even though it is one system, each school has unique policies and support for distance ed. I’m particularly interested in how transactional distance between the instructor and student might correlate to teaching presence, especially considering the idea of teaching presence as well as self-direction and learner satisfaction. The LT-TD scale is especially good for this as it operationalizes the theory of transactional distance dimensions into measurable learner perceptions in virtual learning environments. How does LT-TD interact with the learner‘s sense of presence and self direction in a VLE is an interesting question to me.

I will be completing the UH IRB process and receive approval before deploying any research questionnaires for my dissertation.
Please let me know if you have any questions, suggestions, or restrictions on the use of the questionnaire, and whether I may use it in my dissertation.
Sincerely,
Kurt Rutter

-

Yiannis Giossosto you

Apr 9, 2019

Hello Mr. Rutter
It will be a great honor for me to use this scale in your research. There are no restrictions for its use.
Sincerely
Yiannis Giossos

Kurt Rutter

Apr 9, 2019

Thank you Dr. Giossos this is very helpful and generous.
Kurt

Permission to use CoI Questionnaire

Kurt Rutter <krutte@hawaii.edu> Sat, Jun 29, 9:38PM

garrison@ucalgary.ca

Aloha Dr. Garrison,

I am a PhD student at the University of Hawai‘i College of Education in the Learning Technologies (LTEC) program. I am interested in using the Community of Inquiry questionnaire as part of my research and would like to ask permission for the original authors to do that. I have not been able to reach Dr. Arbaugh as principle author by email so am reaching out to you for permission.

My dissertation is on the mediating effect of transactional distance (TD) on learners in communities of inquiry (CoI) related to teaching, social, and cognitive presence. Also how TD mediates self-directed learning and satisfaction in a CoI. My questionnaire will have items related to the learner‘s perception of presence in a CoI , self-direction, and their perception of learner-instructor transactional distance.

Please let me know whether it will be OK to use the CoI questionnaire as part of my dissertation research, and also if you would like more information on my study before making a decision.

Mahalo

D. Randy Garrison <garrison@ucalgary.ca> Sun, Jun 30, 8:54AM

Kurt,

You certainly have my permission to use the CoI questionnaire.

However, I would suggestion expanding your focus on self-direction to include shared direction. I have explored these concepts through the shared metacognition construct that includes both self and co-regulation (direction) consistent with the collaborative constructivist premise of the CoI framework and

each of the presences. Moreover, we have a questionnaire that could be useful in studying self and co-regulation within the CoI framework (see attached).

Garrison, D. R., & Akyol, Z. (2015a). Toward the development of a metacognition construct for the community of inquiry framework. (Developing a shared metacognition construct and instrument: Conceptualizing and assessing metacognition in a community of inquiry). *Internet and Higher Education*, 24, 66-71.

Garrison, D. R., & Akyol, Z. (2015b). Corrigendum to 'Toward the development of a metacognition construct for communities of inquiry.' *The Internet and Higher Education*, 26, 56.

I have also written a couple of blogs that be helpful if you choose to go this route.

http://www.thecommunityofinquiry.org/editorial16

http://www.thecommunityofinquiry.org/editorial19

All the best,

DRG

D. Randy Garrison

Professor Emeritus

University of Calgary

Email: garrison@ucalgary.ca

CoI Website: https://coi.athabascau.ca/

BLOG: http://www.thecommunityofinquiry.org/community

Permission to use OSLQ Questionnaire

lbarnardbrak@ua.edu August 2, 2019 3:26 PM

Kurt Rutter <krutte@hawaii.edu

Aloha Dr. Barnard-Brak

I am a PhD student in the Learning Technologies (LTEC) program at the University of Hawaii at Mānoa. I would like your permission to include the Self-Regulated Learning (SRL) Questionnaire in my study on the impact of learner-instructor transactional distance on teaching, social, and cognitive presence, self-directed learning, and learner satisfaction in communities of inquiry. I am interested in using the Online Self-regulated Learning Questionnaire as part of my research on student/instructor transactional distance . My study participants will be community college students enrolled in distance courses online. Hawai'i is an interesting place for this study because students from all of the neighbor islands take online courses at any of the 7 campuses across the islands, and even though it is one system, each school has unique policies and support for distance ed. I'm particularly interested in how transactional distance between the instructor and student might correlate to self-regulated learning, . I think the OSLQ questionnaire will help address a gap in transactional distance theory and communities of inquiry about the role of learner self-regulation (or autonomy) and how that might impact the learner's experience of transactional distance.

I will be completing the UH IRB process and receive approval before deploying any research questionnaires for my dissertation.

Please let me know if you have any questions, suggestions, or restrictions on the use of the questionnaire, and whether I may use it in my dissertation.

Sincerely,

Kurt Rutter

Barnard-Brak, Lucy <lbarnardbrak@ua.edu August 29, 2019 3:29 PM

Hi Kurt,

Please feel free to use and modify.

Thanks,

Lucy

Permission to use TDSTECH Questionnaire

Kurt Rutter <krutte@hawaii.edu Jun 29, 2019 11:32 PM

joshua.weidlich@fernuni-hagen.de

Aloha Dr. Weidlich,

I am a PhD student at the University of Hawai‘i in the College of Education Learning Technologies (LTEC) program. I am interested in using the satisfaction portion of the

transactional distance scale used in your and Dr. Bastiaens study on the mediating effect of transactional distance on satisfaction. My dissertation is on how transactional distance mediates the learner experience of presence in a community of inquiry as well as on self-directed learning and satisfaction.

Please let me know if it is OK to use the satisfaction scale from your questionnaire on the mediating effect of TDSTECH in my dissertation research.

Mahalo

Weidlich, Joshua <joshua.weidlich@fernuni-hagen.de Jun 30, 2019 9:14 PM

Aloha Kurt,

thanks for reaching out. Of course you can use whatever part you need for your research, I'd be happy to see it used. The satisfaction scale has been working pretty good for my research, so I think it will serve you well, too. Or are you instead planning on using the three items covering the satisfaction part of the usability dimension in TDSTECH? If yes, please note that this is only a small part of the TDSTECH construct that we've conceptualized. Using only these three items would mean you are only measuring satisfaction with the technology used for learning (in our case Moodle) and not TDSTECH as a construct. Of course, you are free to this, too.

I'm looking forward to reading about your research!

Best,

Josh

FernUniversität in Hagen

Fakultät für Kultur- und Sozialwissenschaften

Lehrgebiet Mediendidaktik

Universitätsstraße 33

D-58084 Hagen

Telefon: +49 (0)2331 987-4162

Von: Kurt Rutter <krutte@hawaii.edu>

Gesendet: Sonntag, 30. Juni 2019 11:32:12

An: Weidlich, Joshua

Betreff: Permission to use satisfaction scale

Appendix C: Interview Protocol

Title of Study

The Relationship of Student-Teacher Transactional Distance and Student Self-regulation, community Presence, and Satisfaction in Online Courses

Research Questions

RQ4 How do student perceptions of learner-teacher transactional distance influence decisions on the use of self-regulated learning skills?

RQ5 How do student perceptions of learner-teacher transactional distance influence participation in the online course community?

RQ6 How do students describe satisfaction in the context of online learning, and how do perceptions of learner-teacher transactional distance influence satisfaction in online courses?

Introduction

Follow the script below exactly to introduce the researcher and obtain verbal consent to proceed

before beginning any interview questions.

Script

Thank you for coming today. My name is Kurt Rutter and I am s graduate student in the University of Hawai‘i at Mānoa College of Education LTEC program
In case of questions or concerns here is my contact information.
Email: krutte@hawaii.edu
Phone: 808-631-9131
The purpose of today’s discussion is to better understand your perceptions of the online course

that you answered questions about in the survey.

Informed consent key points:

1. The purpose of the study is to better understand your perceptions of the online course that you answered questions about in the survey you completed for this study

2. This interview is designed to pose no risks to you.
3. Your identity will not be linked to your responses. That is, I will not report any information that could potentially make you identifiable, like your name or personal characteristics.
4. The data I collect will remain confidential. Only members involved directly with this research will have access.
5. You have the right to review the interview transcript, the material that is collected, and the data that have been gathered as the result of this session.
6. You have the right to withdraw from the study at any time without prejudice. You can choose to leave or not answer any questions asked should you feel uncomfortable at any time during our discussion of your experiences.
7. The interview will not be disseminated, and participants (me and you) will not be benefitting monetarily or otherwise from its completion.

Check for understanding and obtain consent:

- ❑ Are there any questions about the informed consent information?
- ❑ Do I have your consent to proceed with this interview?

Confirm permission to record the session:

- ❑ To help me in my analysis I would like to interview our session.
- ❑ Only the researcher will access audio recordings.
- ❑ Transcripts will only be available to members involved directly with the research.
- ❑ Instead of names I will use descriptors in the transcripts.
- ❑ As I reflect, summarize, and report on what we have discussed, I will never share information that would allow you to be identified.
- ❑ Check for understanding and obtain consent:
- ❑ Are there any questions about the intent to record our session? •
- ❑ Do I have your consent to record our session?

Ground rules:

- ❑ There are no right or wrong answers—I am interested in your perceptions and experiences.
- ❑ Please let me know if you wish to stop or take a break at any time. •Check for understanding:
- ❑ Are there any questions regarding the ground rules that were just shared?

Interview Questions

Interview Questions	Related RQ
1. **Question:** How would you describe your teacher's understanding of your learning needs and skills in the online course you completed the survey for?	RQ4, 5, 6
2. **Question:** Tell me about your process for deciding on strategies for learning in this online course? ○ **Follow-up question** ○ Can you think of an example when your teacher taught you learning skills or strategies based on their understanding of your needs and abilities? ■ **Potential Probes:** ■ Can you tell me more about that? ■ Why does that stand out in your mind?	RQ4
3. **Question:** How do you decide when to interact with other students in this online course? ○ **Follow-up questions** ○ Can you think of an example of when the teacher facilitated or encouraged you to reach out to or responded to classmates in the course? ■ **Potential Probes:** ■ Why does that stand out in your memory? ■ Why was that important to you?	RQ5
4. **Question:** How would you, in general, describe satisfaction with online learning? ○ **Follow-up questions** ○ Can you think of an example of when the teacher's understanding of your needs and skills in this course influenced your sense of satisfaction with the course? ■ **Potential Probes:** ■ Why does that stand out in your memory? ■ Why was that important to you?	RQ6
5. **Question:** Do you have anything that we might not have discussed that you would like to add about your experience in this online course? (use silence)	Open

Wrap-up (5 minutes)

Thank you for meeting with me today. Remember that the thoughts you shared with me today will be used to learn about your perceptions on student-teacher interaction in your online class(s), how you manage your own learning, and your sense of community and satisfaction with the online course.

Remember that your identity will remain private. What was said during this interview will remain confidential. In case I need to contact you to clarify something that you have said and to confirm your statements in this interview I want to confirm your email. I have XXX@XXX.XXX is that correct?

Please remember too that you can contact me with questions as well, krutte@hawaii.edu.

Appendix D: Informed Consent

Phase 1 Informed Consent Letter

Aloha! My name is Kurt Rutter and you are invited to take part in a research study. I am a graduate student at the University of Hawai'i at Mānoa in the College of Education. As part of the requirements for earning my graduate degree, I am doing a research project.

What am I being asked to do?

If you participate in this project, you will be asked to fill out a survey. You will also have the option to participate in a interview about your experiences taking online courses. All interviews will be done remotely using a videoconferencing app.

Taking part in this study is your choice.

Your participation in this project is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you. Your choice to participate or not participate will not affect your rights to services at the UH Campus Recreational Facilities.

Why is this study being done?

The purpose of my project is to learn about your perceptions on student-teacher interaction in your online class(s), how you manage your own learning, and your sense of community and satisfaction with the online course. I am asking you to participate because you are enrolled in at least one online class.

What will happen if I decide to take part in this study?

The survey will consist of a few demographic questions (year in school, how many online classes you have taken) and then 89 short statements, each with a 5-point scale from "Strongly Agree" to "Strongly Disagree" in a radio button format. It will take 25-30 minutes. The survey items will include statements like "My teacher knows that the time I have available for study is limited, "I feel comfortable participating in the course discussions" "I allocate extra studying time for my online courses because I know it is time-demanding", and "I experienced and learned new things in this course". The survey is accessed on a website to which I will provide you a link.

If you also agree to participate in an follow-up interview, you will be asked to include an email address that I can use to contact you with more information about the interview process.

What are the risks and benefits of taking part in this study?

I believe there is little risk to you for participating in this research project. You may become stressed or uncomfortable answering any of the survey questions. If you do become stressed or uncomfortable, you can skip the question or take a break. You can also stop taking the survey or you can withdraw from the project altogether.

If you also participate in the interview phase of the study, I will ask you questions about your experiences while taking online courses. If at any time you feel you do not want to answer a question you do not have to. You can also withdraw from the interview at any time, either completely or to take a break or reschedule. All interviews will be done remotely using a videoconferencing app.

There will be no direct benefit to you for participating in this study, either the survey alone or the survey and interview. The results of this project may help improve online course development.

Confidentiality and Privacy:
If you participate only in the survey, I will not ask you for any personal information, such as your name or address. Please do not include any personal information in your survey responses. I will keep all study data encrypted on a password protected computer. Only my University of Hawai'i advisor and I will have access to the information. Other agencies that have legal permission have the right to review research records. The University of Hawai'i Human Studies Program has the right to review research records for this study.
If you agree to also participate in the follow-up interview, I will need your email address, which may also reveal your name or other publically available inforamtion. I will only use your email to contact you for the interview. Any personal information will be scrubbed (deleted) from transcripts, and your contact information will be secured in an encrypted file not accessible over the internet.

Compensation:
You will receive no compensation for your time and effort in participating in this research project.

Future Research Studies:
Identifiers will be removed from your identifiable private information and after removal of identifiers, the data may be used for future research studies or distributed to another investigator for future research studies and we will not seek further approval from you for these future studies.

Questions: If you have any questions about this study, please call or email me at
Phone:(808) 245-8331
Email: krutte@hawaii.edu
You may also contact my faculty advisor, Dr. Peter Leong at
Phone: (808) 956-3902
Email: peterleo@hawaii.edu

You may contact the UH Human Studies Program at 808.956.5007 or uhirb@hawaii.edu to discuss problems, concerns and questions, obtain information, or offer input with an informed individual who is unaffiliated with the specific research protocol. Please visit http://go.hawaii.edu/jRd for more information on your rights as a research participant.

To Access the Survey: Please go to the following web page:
https://forms.gle/4qZtV1jWWZeXqeei7

You should find a link and instructions for completing the survey. Going to the first page of the survey implies your consent to participate in this study.

Please print or save a copy of this page for your reference.

Phase 2 Informed Consent Letter

University of Hawai'i
Consent to Participate in a Research Project
Jane Researcher, Principal Investigator
Project title: Evaluation of Services Provided via the Career Development and Counseling Program

Aloha! My name is Kurt Ruter and you are invited to take part in a research study. I am a graduate student at the University of Hawai'i at Mānoa in the Department of Psychology. As part of the requirements for earning my graduate degree, I am doing a research project.

What am I being asked to do?
If you participate in this project, I will meet with you online using a video conferencing application for an interview at a location and time convenient for you.

Taking part in this study is your choice.
Your participation in this project is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you. Your choice to participate or not participate will not affect your rights to services at the UH Career Development and Counseling Program.

Why is this study being done?
The purpose of my project is to learn about your perceptions on student-teacher interaction in your online class(s), how you manage your own learning, and your sense of community and satisfaction with the online course. I am asking you to participate because you are enrolled in at least one online class.

What will happen if I decide to take part in this study?
The interview will consist of 4-6 open ended questions. It will take 30 to 45 minutes. The interview questions will include questions like, "Tell me about your process for deciding on strategies for learning in this online course?" and "How do you decide when to interact with other students in this online course?

Only you and I will be present during the interview. With your permission, I will audio-record the interview so that I can later transcribe the interview and analyze the responses. You will be one of about 6-10 people I will interview for this study. With your permission, I will also video-record the interview so that I can analyze your movements during the interview. Following the interview, I will share the transcript with you so you can review your answers and add to or revise your answers and in general check the accuracy of the transcript.

What are the risks and benefits of taking part in this study?
I believe there is little risk to you for participating in this research project. You may become stressed or uncomfortable answering any of the interview questions or discussing topics with me during the interview. If you do become stressed or uncomfortable, you can skip the question or take a break. You can also stop the interview or you can withdraw from the project altogether.

There will be no direct benefit to you for participating in this interview. The results of this project may help improve the Career Development and Counseling program to benefit future students.

Privacy and Confidentiality:
I will keep all study data secure in a locked filing cabinet in a locked office/encrypted on a password protected computer. Only my University of Hawai'i advisor and I will have access to

the information. Other agencies that have legal permission have the right to review research records. The University of Hawai'i Human Studies Program has the right to review research records for this study.

After I write a copy of the interviews, I will erase or destroy the audio-recordings. When I report the results of my research project, I will not use your name. I will not use any other personal identifying information that can identify you. I will use pseudonyms (fake names) and report my findings in a way that protects your privacy and confidentiality to the extent allowed by law.

Compensation:
You will receive no compensation for your time and effort in participating in this research project.

Future Research Studies
Identifiers will be removed from your identifiable private information and after removal of identifiers, the data may be used for future research studies or distributed to another investigator for future research studies and we will not seek further approval from you for these future studies.

Questions:
If you have any questions about this study, please call or email me at
Kurt Rutter
Questions: If you have any questions about this study, please call or email me at
Phone:(808) 245-8331
Email: krutte@hawaii.edu
You may also contact my faculty advisor, Dr. Peter Leong at
Phone: (808) 956-3902
Email: peterleo@hawaii.edu

You may contact the UH Human Studies Program at 808.956.5007 or uhirb@hawaii.edu. to discuss problems, concerns and questions; obtain information; or offer input with an informed individual who is unaffiliated with the specific research protocol. Please visit http://go.hawaii.edu/jRd for more information on your rights as a research participant.

This document is a form-fillable PDF. To sign, please insert your signature below

If you agree to participate in this project, please sign and date this signature page and return it
Kurt Rutter
krutte@hawaii.edu

Keep a copy of the informed consent for your records and reference.

Signature(s) for Consent:

I give permission to join the research project entitled, "*Evaluation of Services Provided via the Career Development and Counseling Program.*"

Please check next to either "Yes" or "No" to the following:

◉ Yes
I consent to be audio-recorded for the interview portion of this research

○ No

Name of Participant (Print):

Participant's Signature **Date**

Signature of the Person Obtaining Consent **Date**

Appendix E: Semi-Structured Interview Transcript Selections

Student Q

p.129
I feel like the teacher kind of adapted to that. The teacher said, “Okay, I have a student. That means more than just me saying, Here's a piece of paper, read it. Tell me what your particular… I feel like. I feel like she was like, Okay, this, this student is learning differently than my other students or learning in a different way that I'm teaching. So maybe I have to reevaluate how I'm teaching and adapt to her. (Student Q, Pos. 84)

p.130
So my teacher, I had an English teacher last semester, and she was very, like, Okay, we, we just need to work together come together. And she was like, if we need one on one access, you can always ask this me, like, through zoom, or in a meeting, and that was good, the teacher would always reach out to us via email. So that was good. And she actually kind of not forced me but encouraged me to meet with her at least twice every month. So I had a six month class. So I meet with her two times, or one time, at least. (Student Q, Pos. 4)

p.138
I feel like it's the interaction between teacher and student, in class and out of class. So like, the English class that we had, she would send us a lot of emails, keep us updated, when we are going to do it, when we had a class. And the math class that I have right now is kind of like that. But he mostly talks about stuff in class. So like, all of what we need is leading up to what he's going to teach next. So I mean, learning from two different types of teachers is kind of best. But also keeping that communication with the student is to keep them engaged in the class so that they're not falling behind or getting bored of what they're doing to. So I think that's, it's the interaction in class and out of us. Keeping them engaged. (Student Q, Pos. 40)

p. 152
Yes. But like even, even just face to face <via Zoom>, like, like this interaction is kind of like what I was doing with my teacher, I would sit and I would have all of my stuff out to say, okay, what are you doing? And then, like, we're always updating our stuff. So she would make me take a picture and email it to her or send it to her via Google Docs. He would sit there and read it with us like it, it was it was a brand new experience for me. And I feel like it was probably a more advanced way of experiencing it. Because I was taught by the teacher. And then the teacher taught me how to make it better. (Student Q, Pos. 80)

p.153
Yeah. Because I feel I felt like later, in the class time, like you're getting comfortable with the teacher and how he was teaching. She would email us less throughout the class. And, and then we would ask her for like, more emails, like a day before, or like, prior to the deadline. So she would send out more emails in the back half of the class, because we asked her. So she's, like, yes, so the engagement from her

students, and them telling her that she basically upped the ante and made it comfortable for students better. (Student Q, Pos. 44)

p.154
So every class, she would always say, okay, reach out to me, if you want to, but it was kind of like an opportunity to be a better student. So it would kind of open that door. And I don't know if a lot of my other classmates are like that. But I was always jumping at the opportunity to get the teacher involved with my teaching to learn how I learned because I'm, like, how you say, I have to write everything down. (Student Q Transcript, Pos. 4)

Student E

p.131
So when I'm in a zoom meeting, and I feel like we both via the instructor and of course, the instructor in the classes established kind of a common understanding of what, of what our needs are and how to be successful with the course and all of that, I'd say that my, my ways of studying really start with how I'm able to... how comfortable I am in part, em... I guess the way that I evaluated is how comfortable I am asking questions in class with other students in the class, just because it just because with certain professors, if they say that if it's, somewhat, if it's more, or, an in person environment where they say, Okay, everyone can have their cameras on and I feel like... or not even that just, you can feel free to ask questions, or they really challenge you to, or, if they ask questions that will challenge our understanding a little bit, I'd say that that makes it that kind of sets up the environment for me to be a lot easier to answer those questions that challenged my thinking, and in a way answer my questions and how that relates to studying is that if I'm able to ask questions in the class and really engage my understanding, it really gives me a better understanding of the material so that when I go back and do the work on my own it, I feel like I kind of know already how the exam is going to be or...how what they're expecting from me, just because I've had those interactions (Student E Transcript, Pos. 59).
p.151
But, or it's required for each student to go to at least one module, but this is one that actually breaks us up into smaller groups. And the learning assistants are the ones that facilitate it, and that'll give us ways to review or study for the material. So even though it's not directly with the professors, it's a way for us to answer questions. ...give us a better understanding of the material, if we don't feel comfortable answering it in the huge class setting. (Student E Transcript, Pos. 79)

p.135
I'd say that it's ...between the way that I studied before COVID. And now, it really has, it really has changed the way that I study. When I was in person. I... it's interesting, because I felt like it was a little bit more difficult for me to find a study strategy. And that was mainly because I was in that place, I could feel myself being as one student compete, like, in a way competing with a bunch of other students because I've had the ...I've, it could possibly be because I've had interactions with the students in a physical classroom setting. But I guess... it felt a little more discouraging, if that makes sense. And I felt like I also didn't feel like it was in the right place for me to reach out and see if there were any

accommodations that they would have had for me versus when I started to transition into the online setting. It was you provided me a platform, it provided me a platform to actually reach out to the necessary people and let them know of whatever situations I may be going through it, it really focused my mind for you to be studying on my own. And then in that case, it made it a lot easier for me to study because I have a lot more time with myself without the distractions of potentially, like other students are just being in university settings. So it has its drawbacks. via online, definitely, especially the limitations it will take to study with other people if I wanted to. But in terms of studying on my own, it has really, it it's kind of a blessing in disguise, because it gave me a means of learning how to build those study strategies on my own without the influence of anyone else. (Student E Transcript, Pos. 49)

p.153
… I feel like the same students that participated these discussions are the ones that also are bringing up some of the questions about the lecture material directly to the professor's and... I guess in a way, not only does it help us build a community, but it also helps us to understand the material a lot better. (Student E)

Student C

p.132
I even told a couple of professors, I said, Hey, I would rather just read the material, watch the videos, learn it myself, I don't need to hear lectures. A lot of the videos are lectures from the professor's because they make their own videos. But you know, you can stop and start those things when you want it to take notes. And you can absorb what you need to absorb. (Student C Transcript, Pos. 10)
To me, it's just simple. I mean, in all honesty, nowadays, students could all go to college from home, everybody. But I think students from what I remember, you know, young, young students, they, they need to have that. What's the word that interaction with other people their age, the social part of it? I don't need that. Still learning. They are a little bit... (Student C Transcript, Pos. 14)

p.134
…hardly any time on Campus, hardly any, just sometimes we have to go for labs for agriculture, because labs, you know, you have to do certain things like dissect flowers, we had to, we had to do actual grafting of plant material, you know, stuff like that.
…You have to get hands on experience with certain things. (Student C Transcript, Pos. 5)

p.136
Well, I'll tell you what I'm, like I said, I like to stay ahead. I stay ahead of the game and because I self pace myself, if I get ahead in a certain subject, then I'll just let it sit for a few. And then I'll go concentrate on something that that I need to concentrate on. So it's, it's a matter of prioritizing, you know. Prioritize, prioritizing your studies. And you got to have, you got to be able to figure out, you know, what's most important now, and what can you leave for later? (Student C Interview transcription, Pos. 24)

p.138

And yeah, so for, you know, for the, in the military, you got to have a lot of hands on, you got to, you got to show what you're doing. So it's hands on, but, but for college, I mean, okay, so I'm taking, you know, basic courses like English 100, composition, easy because I wrote so much stuff in the military. You know, I'm taking history. And history is easy, because it's interesting. And so I and I, and I like it. I'm taking Hawaiian studies, interesting, you get to learn about the Hawaiian culture and about, you know, about all the things that happened with the overthrow of the Hawaiian Kingdom and all that, you know. You learn a lot. And so, the agriculture though, is, of course, the reason why I'm there. And it's really, really good. I like the hands on stuff. I like the plant biology stuff is really good. (Student C Transcript, Pos. 30)

p.153
I give everybody the proper respect. And I just take a step back, and I say, hey, these, these younger folks, they just don't have the work ethic, and maybe they don't have the understanding. So I have to be patient. But, you know, you just do your best to work with them. It can be frustrating. (Student C)

Student K

p.129-130
Not so good. Um, when I mean, that way is to two professors are very active online. They respond back within typically 24 hours, they answer questions, whatnot. The other two, we don't even hear from them. And even including taking quizzes or tests, I do have one professor, we don't even I don't even know how I did on a test that we took a month ago, or papers that have written so we haven't received anything back. And I know you guys have a bunch of students to grade and whatnot. But I feel like if they expect us to reach a deadline, they should also reciprocate that and respond back in time. So that's why I really don't know what those professors expect. ...I don't feel that they're really concerned if we're learning at all, while the other two are very, you know, concerned. (Student K Transcript, Pos. 4)

Yeah, so the accounting , the accounting side for me.... Because there's a lot of, you know, calculations involved and whatnot. So it's like, if you told me to read a book, I guess maybe some people learn that way. They can pick up a book and just read it. And then they learned all the equations or, you know, whatever they need to know. Actually my classes in taxes, actually, so I took a tax course. I was thinking about, you know, doing taxes, which I already do my own, but okay I thought I should learn all these [tax related] things. But... the teacher has not been....I haven't learned anything from the teacher, I'm sorry to say that. See, so I kind of I don't want to hurt her feelings. She's really nice. She seemed really nice. But I mean, I could have just bought some book online or watch YouTube. And instead of paying X amount for these credits to take this class, I could have done it on my own. That's kind of how it was. And then, you know, on the Laulima, you can see like, other people post questions. And there actually are other or multiple students posting the same questions that I have. So they're also struggling as well. So I mean, I don't know, I kind of feel like I wasted my money on taking that class to be honest.

I have professors who are just read this 100 pages this week, and write a paper. That's it. And then I have professors who they are there every week, they post themselves lecturing, or they have

slideshows, you know, a lot of videos are just to be interactive with the student because you have to keep our attention obviously, because, you know, and they answer questions, and then we have not daily but like weekly blogs, or questionnaires, you know, just have weekly participation. And that I feel is more successful rather than the professor assigning 100 pages a week and write your paper. (Student K Transcript, Pos. 8)

All the classes are asynchronous. But like, for instance, like oceanography, that professor is, I would say he's on it. Like, he has himself does, every week, he videos himself lecturing, or he goes through slides, but he's actually recording his voice doing the lectures and going through each slide, you know. And so he made it... every week he'll though he'll do three 30 minute lectures. And then he does questions, with videos. So and then, if you have a question, you will email him, obviously, but then he gets back right away. (Student K Transcript, Pos. 148)

p.131

One that's not proactive and just says read this. She has assigned group projects. And I do not... So then we do have this community of us. So we have to zoom each other, or we're on a group chat, you know, email, whatever, chat email. But considering that this is an online school, I don't think that group projects are successful or should be included. Because everybody is doing their own thing. That's. That's like you said, the expectation. I don't think that this certain professor really understands that this is distant learning. So everybody does it at their own pace, or whatever, own schedule. So now you want six people from all over to get together at a certain time to work on a project. And our grade depends on the other five people. Which I believe is not realistic. I mean, I don't think that it's realistic for them to... it's not acceptable, honestly. (Student K Transcript, Pos. 176)

p.133

Because I'm doing you know, distance learning. I, in the beginning, I made a schedule for myself that I was actually going to commit from this hour to whatever time to do this class, on this day, to make sure that I was on a schedule as if I was actually attending school, in person. I did go through the syllabus, actually printed that out. I don't know how... For myself, even though everything is online, I like to have the paper. So I printed all those out. Um, I got lucky. And on all my class, three out of the four classes, I didn't have to purchase any textbook. So everything was PDF online. I didn't print that out, because I was like, over 1000 pages, right? So. But no, it was more about like, time management for myself, because I'm at home, you know, I have other things going on. Everybody does that. So I designate a certain time and days that I would work on certain classes, considering I only have four. So I broke it down like you know, normally go to school Monday through Friday, we take a Monday, Wednesday, Friday or Tuesday, Thursday. So then I kind of did like, okay, every Monday at four o'clock, I'm gonna do this class No, and then ask to have dinner, whatever. Then at seven o'clock, I'm gonna do this class. And then Tuesday, I switch it up again, right, but a different time. (Student K Transcript, Pos. 56)

But what I've found early on within the first month, for example, like my philosophy course, that one hour of time, three days a week was not enough. That's what I'm seeing from your first question. I don't know what the professor's in their mind or what they believe their expectations of the students? Like should I be designating 10 hours, 12 hours a week to study? (Student K Transcript, Pos. 56)

But, um, I mean, I've asked other people, I don't know, maybe you're a fast reader, I don't know, but 100 pages a week to me that's a lot. And I have four classes. So 100 pages for that class, then X amount for another class. I mean, this whole semester, I feel like I had to kind of put certain courses on the backburner just to focus on a certain course. (Student K Transcript, Pos. 60)

For me, I'm over, I'm trying to get all A's in my courses. That's why I'm trying to prove to myself that I can get a 4.0. And I could just walk with a C and get my Associates, I'm trying to get the 4.0. So that's probably why. Also, I'm also, more stressed out and spending more time than I should, in courses. Because I do have, you know, we have to post on Laulima, you know, whatever. And I, I'm not saying that my papers aren't the best. But I'm like, Well, some people, they just put whatever, they don't even care, you know.
(Student K Transcript, Pos. 124)

So if that's the expectation, I think maybe it's a little too high. And that's why I say, I'm at a... this was a 200 level course, you know, I'm not even at 300, 400 level. So it's I say it's a little bit discouraging that if at this point, no this is actually 100 level course! So if there's an expectation for me to read 100 pages a week on 100 level course, and is it going to be 200 pages on a 200 [level course], you know, if I, if I continue to go to you, ah, how much more it's going to be, like you said, just gets worse and worse, worse. So... yeah, it was just, for the whole thing about how it I want to help, you know, I planned it out. Just everything I started the semester doing within the first couple weeks, went out the window after the first month. (Student K Transcript, Pos. 60)

p.155
My first time with online classes. Yes. I like that it is, um, I can do it whenever I want. I guess you could say, you know, it's flexible. That's the perk of this. But, um, I honestly, like if I was going to continue school, but at this point, I'm not after this semester, I would not recommend taking online classes. I have told other friends of mine who are like, well, I should go back to school too. And I was like, don't do it. If it's online <laughs>. I tell them everything... you know, and they kind of were like, yeah, you're right, I mean... (Student K Transcript, Pos. 40)

Student J

p.121

205

I'm actually, I was told by my counselor, when I started to think about going back to school that I only needed eight more courses. Because I have my associates degree in the hospitality industry. You know what? But after this pandemic, I was like, oh, maybe I should look at other options, because we got laid off. In the hospitality industry. So I was looking for something more solid. So I decided to go back to school for accounting. And then I found that accounting is not me.
p.129
On this other class that I'm taking, we need to be on Tuesdays and Thursdays. And she teaches via zoom. So everybody's online. And we're able to ask questions. She's even had extra, like, class time available even on Saturdays, she'll come on if someone is into a group to go on, try to figure out what, what the problem is?

But then everything is like online, like one class that I took was like, basically, on your own, the teacher tells you, this is your assignment. This needs to be turned in. On the test, you have any questions let him know, he's available. But I missed that interaction. (Interview with Student J Transcript, Pos.15)

p.155
Like, I'm to the point where I'm technically failing that class? Yeah, well, because it's my own choice. But I like it. I like the other one. Because she's on it. Say, come on, get those things more encouraging. You know what I mean? The other one is like, Oh, well, here's your test. Good luck. (Student J Transcript, Pos. 34)

Student L

p.128
Yeah, when you open the page, and you see like all this, like, you know, page of information, you already just, yeah, you're making you're, like, I made myself anxious. Before I even got to the point where I started submitting those papers and assignments, I was like, Oh, I cannot handle it's just, it's too much. It's too much. (Student L Transcript, Pos. 25)

Also, from the from the class, I realized that she, she works in the lab. She's young, she's doctor, but she's very young, she's Asian. She's like, I don't know, 30, like, maybe 30 to like, my age, but the way like, she talks in the lecture, you know, like, recording, it's like, it's just like, oh, imagine, this is bacteria. Okay. And, you know, like, like, she, she relayed this information…. I was like, oh, microbiology, I have no clue. Like chemistry. I didn't like chemistry. When I was little, when I was taking as a prerequisite. I was like, oh, chemistry again. But then she made it like, she related the information from microbiology to real life, that it'll be easier for us to understand. And that's what stick to my, to my head. Okay, that's this, like streptococcus .., okay? She like you know, showed this, like, awkward picture of the bacteria or like, the, the shape of it. And I was like, Okay, that's it. Okay, that's how it is gets transmitted. And that was fun. That was that was engaging, it was it was good.
(Student L Transcript, Pos. 91)

I have to see that the instructors are willing to actually, you know, be there for students. It's not like just throwing this information and you learn on your own like, Okay, I have those modules and like you do,

what, like, yeah, follow my steps, and you'll be fine. Or like, you know, I just like from the micro class, for example, this the professor, even though I haven't seen her even once in my life, but it felt like she was Yeah, like, every assignment that was due, she was like throwing those messages saying, Hey, don't forget, today's the last day to submit your assignment. She was kind of like engaging in like, you know, like, making sure we were, like, you know, doing like, well. (Student L Transcript, Pos. 83)

p.132
And for the hybrid class, since it's a nursing student, and we work as a group, it's definitely like, it's, it's a, as of right now, it's my support system as well, because that's the people that can understand what I'm going through and what is happening even though like, my family is very supportive, but they cannot really relate to that environment. And, yeah, by saying, okay, like, you're going to be, you'll do great years, you can do it, you know, that's not enough. And when I talk to my group mates, they're like, okay, you should, like focus on this, okay, you know, like, those tips and advices. And when I see that, you know, like, someone else is struggling as, like, a same as I am. And I understand like, okay, that's, it's normal. (Student L Transcript, Pos. 67).
…for the micro class from the instructor was from [another island], and most of the students who are from [that island], and I haven't engaged with even one student, like from that class from the online class, except when we were doing our assignments, we had to pose make a post and then reply to other two students. But that wasn't it was just, you know, like, okay, reply, and nothing beyond that (Student L Transcript, Pos. 67)

p.136
And for the hybrid class, since it's a nursing student, and we work as a group, it's definitely like, it's, it's a, as of right now, it's my support system as well, because that's the people that can understand what I'm going through and what is happening even though like, my family is very supportive, but they cannot really relate to that environment. And, yeah, by saying, okay, like, you're going to be, you'll do great years, you can do it, you know, that's not enough. And when I talk to my group mates, they're like, okay, you should, like focus on this, okay, you know, like, those tips and advices. And when I see that, you know, like, someone else is struggling as, like, a same as I am. And I understand like, okay, that's, it's normal. It's not something that I just, you know, came up with, and I'm not like, stupid, like, there's struggles somewhere else too. And yeah, that's, I kind of picks me up and gives me more strength to kind of like, go forward and like, try my best. (Student L Transcript, Pos 67)

And even more than that, it's not just even about the class. It's some thing like beyond that, you know, like, coming to class in the morning and like chugging okay? I like coming a coffee was it's like, I, I probably I have more friends right now than I, I had I like, I got from the I like living four years on Island, you know, like it from those two semesters, this group of people became like a second family for me, right? And then living on the island and working and doing all this hustle bustle. And yeah, I didn't I don't have as much friends from this past four years living on the island and I have now just from two semesters being in nursing school. (Student L Transcript, Pos 71)

Student M

p.129
Researcher:
So you reach out on your own and don't simply rely on what the instructor puts out there for people to consume.
Student M:
Yeah, no, I mean, I use that. I use that as my basis. But, I feel like there's just never been enough information in any of my, especially my more science courses, that, I could just take the test and understand the subject matter based on only the lectures and a textbook, I really don't think I could. (Student M Transcript, Pos. 51-54)
I mean, the teacher has everything to do with, with the content that they make available and the resources they make available. I don't know that the personality of the teacher really makes a difference if that's what you're asking. Um, I do struggle with a little bias if you know, with a heavily accented teacher that I have to use more brainpower to understand... it might affect that a little bit. Um, but not, not really. I mean, as long as they make lots of content available. I love the teachers that add in, like, here's a YouTube video to further explain or here's, you know, other resources, I do love them finding those resources for me <laughs>. So that would affect it, one that really brings in extra stuff. (Student M Transcript, Pos. 106)

I think freedom. I think, I think a lot of freedom to learn in my own way. And figure out what works. And then being supportive in that, you know, the class that microbiology class I'm currently taking, does, does allow that just because the lectures are on YouTube, I can access them from anywhere, and they have a transcript. So I can edit that transcript into coherence, which creates a kind of a kinetic working/learning experience for me. And I don't know of anybody else that does that. But having the freedom to do that has hugely made a difference in this class. Just the fact that it's on YouTube. (Student M Transcript, Pos. 94)

Student N

p.130
I feel like it depends on the teacher though, because the teacher, one of my teachers this semester, I feel like he's not very empathetic. And if you try to, like reach out to him, he won't really explain, like, explain the, the question you have and like a very descriptive way and honestly make me more confused. But then there's other teachers where they really do understand like, personal situations, too, that come up. And Distance Learning is not easy. And there's a lot of things going on too. But then some of them really do. Understand, like, what's going on, and then they'll like, change around things for you. (Student N Transcript, Pos. 22)

Student O

p.135
Okay, yeah, time management was a big one, because I learned from my first semester that I guess, knowing your working style, so because I have a crazy week and a crazy day as it is, I have to be super... I have to have like one day to have to schedule everything like I have to have made sure. So Sunday's is my only day off. So what I do in the afternoon, I go ahead and I make sure that I log in my phone, and also my calendar on my desk, all of the due dates throughout the whole week for each class, and I have a timer for my online phone. And I had to get used to that on the last half because my first semester was kind of like the guinea pig, right. (Student O Transcript, Pos 106)

Student S

p.130
But when I started, I took an English, and I speak English, I'm just Pidgin. And then, so I took English 100. And that teacher was very, very interesting. It was it, he would swear. But, you know, he was, he was really good in teaching English, he was very fast paced, which I am older, like, in my 50s, tried to go back to school, not really liking English, but I had to do it for my degree. So I was forced into it. And so although he was funny, he was very strict, and he wasn't very competent in teaching different generations, different generations, I am not a fast learner. So it means I need I need somebody to show me how to do it, you know, with this, and I, I had to figure it out on my own. And I and I figured it out with a lot of, but I stuck to it, I stuck to it. And I was so proud of myself, at the end of that English class, I really grew to admire him, because if he didn't do it, that way, I wouldn't have forced myself into going on and pursuing the rest of my classes that I have to get for etc. (Student S, Pos. 30)

p.131
Yes. He didn't support me the way I wanted to. But I had to push myself in learning on my own, so that I could continue. And then he got the next class I took was another EC class. And that one was, oh, yeah, it was an EC class. And it was easier for me to navigate. Yeah. Wow.
So like, I kind of liked and didn't like the teacher at the same time. But yeah, you felt like he was not far away from you, like, not understanding you or that he was just being tough. It's been, he was being tough. But I like I like being on zoom with the class. I like it. Yeah. (Student S, Pos. 34-35)

p.135
I think the online like, distance learning is going good. One thing I kind of liked was, even though we are online, like teachers would still do group projects, and then it would kind of force us to, you know, talk to other people. Um, so I kind of like that, because then like, I started, like, texting some people in that class, like, see how they're doing and food, honestly, kind of, like become friends. Like, I want to see that we're friends, because then we started like asking each other, like how we're doing, like, outside of school. So I liked how a lot of teachers started doing that. Um, because I would think that with online, like, there's no way that you could do group projects, but they kind of force it's like, no, you guys have to get like their email or their phone number. And it was kind of cool. (Student N Transcript, Pos. 47)

Appendix F: R Coding for Factor Analysis

```
##load packages
##Set working directory (where the data file is located).

setwd("C:/Users/krutt/Dropbox/LTEC/LTTDDatasets")


##load packages

library(psych)##A set of tools for multivariate analysis
library(REdaS)        ##
library(GPArotation)  ##
library(data.table)
library(ggplot2)      ##For plotting graphs
library(ggfortify)
library(semPlot)
library(ltm)
library(polycor)
library(dplyr)
library(lavaan)
library(lavaan.survey)
##Set the amount of space for printout (on the screen)otherwise it cuts off the bottom of tables...
options(max.print=999999)

##Load data
data <- read.csv(file ="CleanData_corrected.csv", header = TRUE, stringsAsFactors = FALSE)

##Set the variables with their specific item columns in the dataset
##Start with all sub concepts as defined by original surveys


CoUnderstandingSkills <- rowMeans(select(data, 1,2,3,4))
CoUnderstandingNeeds <- rowMeans(select(data, 5,6,7,8,9,10))
AwarenessSkills <- rowMeans(select(data, 11,12,13,14,15))
AwarenessNeeds <- rowMeans(select(data, 16,17,18,19,20,21,22,23,24,25))
TeachingPresence <- rowMeans(select(data, 26,27,28,29,30,31,32,34,35,36,37,38))
SocialPresence <- rowMeans(select(data, 39,40,41,42,43,44,45,46,47))
CognitivePresence <- rowMeans(select(data, 48,49,50,51,52,53,54,55,56,57,58,59))
GoalSetting <- rowMeans(select(data, 60,61,62,63,64))
```

```
EnvironmentlStructuring <- rowMeans(select(data, 65,66,67,68))
TaskStrategies <- rowMeans(select(data, 69,70,71,72))
TimeMangementHelp <- rowMeans(select(data, 73,74,75))
HelpSeeking <- rowMeans(select(data, 76,77,78,79))
SelfEvaluation <- rowMeans(select(data, 80,81,82,83))
Satisfaction <- rowMeans(select(data, 84,85,86,87,88,89))


##Add the overarching concepts of LTTD, CoI, SRL
LTTD <- rowMeans(select(data,
1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25))
CoI <- rowMeans(select(data,
26,27,28,29,30,31,32,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,
58,59))
SRL <- rowMeans(select(data,
60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83))


##Add Co-understanding and Awareness as a 2 variable version of LTTD...

 CoUnderstanding <- rowMeans(select(data, 1,2,3,4,5,6,7,8,9,10))
 Awareness <- rowMeans(select(data, 11,12,13,14,15,16,17,18,19,20,21,22,23,24,25))

x <-cbind(CoUnderstanding, Awareness, TeachingPresence, SocialPresence,
        CognitivePresence, GoalSetting, EnvironmentlStructuring, TaskStrategies,
TimeMangementHelp,
        HelpSeeking, SelfEvaluation, Satisfaction)
##Descriptive Stats

xcor <- round(cor(x, use = "complete.obs"),2)
xcor

##Principle Components (PCA) analysis. Uses lavaan package.
pca<- princomp(xcor, scores=TRUE, cor=TRUE)
summary(pca)

##Loading s of principle components

pca$loadings

##A Scree plot of eigenvalues.

plot(pca)
```

```
##Biplot of score variables
biplot(pca,col = c("white", "black"))

##Run EFA with nfactors set to equal the number of variables in cbind
fa(x, nfactors = 12, rotate = "varimax", max.print)

##
##PCA2, a PCA with LTTD as a single variable instead of Co-Understanding and Awareness

x2 <-cbind(LTTD, TeachingPresence, SocialPresence,
        CognitivePresence, GoalSetting, EnvironmentlStructuring, TaskStrategies,
TimeMangementHelp,
        HelpSeeking, SelfEvaluation, Satisfaction)
##Descriptive Stats

x2cor <- round(cor(x2, use = "complete.obs"),2)
x2cor

##Principle Components (PCA)
pca2<- princomp(x2cor, scores=TRUE, cor=TRUE)
summary(pca2)

##Loading s of principle components

pca2$loadings

##A Scree plot of eigenvalues.

plot(pca2)


##Biplot of score variables
biplot(pca2,col = c("white", "black"))

##Looking at SRL.
##   Zimmermans's (1978) model has:Phase (1) Goal Setting + Environmental Stucturing =
Forethought
##                          (2) Task Strategies + time Management Help + Help Seeking
##                             = Performance
##                          (3) Self-evaluation = Self-Reflection
```

```
## However, in this survey, Help Seeking and Self-Evaluation loaded together, and are highly correlated.
## So the proposal is that SRL can be described as Zimmerman's phases representing variables, but
## Self-Evaluation and Help Seeking are subconstructs of Self-Reflection.
##So,

##Add SRL subscales according to Zimmermen Model

ForeThought <- rowMeans(select(data, 60,61,62,63,64,65,66,67,68))
Performance <- rowMeans(select(data, 69,70,71,72,73,74,75))
SelfReflection <- rowMeans(select(data, 76,77,78,79,80,81,82,83))

##PCA3 with the modified SRL subscales

x3 <-cbind(LTTD, TeachingPresence, SocialPresence,
      CognitivePresence, ForeThought, Performance, SelfReflection, Satisfaction)

##Make a correllation matrix

x3cor <- round(cor(x3, use = "complete.obs"),2)
x3cor

##Principle Components (PCA) analysis. Uses lavaan package.
pca3<- princomp(x3cor, scores=TRUE, cor=TRUE)
summary(pca3)

##Loading s of principle components

pca3$loadings

##A Scree plot of eigenvalues.

plot(pca3)
##Biplot of score variables
biplot(pca3,col = c("white", "black"))

##Run a new EFA with nfactors = 8.

fa(x3, nfactors = 8, rotate = "varimax", max.print)


## PCA (pca4) with Teaching Presence subconstructs of Design & Organization and Facilitation
```

```
##Just looking at Teaching Presence for Design and Organization, Facilitating Discourse,
##and Direct Instruction subconstructs (Arbaugh & Garrison, 2008)
###This is running with Teaching Presence items, not as a subscale

TeachingPresence2 <- select(data, 26,27,28,29,30,31,32,34,35,36,37,38)
fa(TeachingPresence2, nfactors = 2, rotate = "varimax", max.print)

## Teaching Presence appears to be 2 factors: (1)Instructional Design/Organization
##                                    (2) Facilitation/Direct Instruction
## Add the 2 subconstructs of Teaching Presence from above
###Now it is running as two subscales, Design and Organization (DesignOrg)
###and Facilitation , which includes Facilitating Discourse and Direct Instruction.

DesignOrg <- rowMeans(select(data, 26,27,28,29))

Facilitation <- rowMeans(select(data, 30,31,32,33,34,35,36,37,38))


x4 <-cbind(LTTD, DesignOrg, Facilitation, SocialPresence, CognitivePresence,
        ForeThought,Performance, SelfReflection, Satisfaction)

x4cor <- round(cor(x4, use = "complete.obs"),2)
x4cor

##Principle Components (PCA) for pca4
pca4<- princomp(x4cor, scores=TRUE, cor=TRUE)
summary(pca4)

##Loading s of principle components

pca4$loadings

##A Scree plot of eigenvalues.

plot(pca4)
##Biplot of score variables
biplot(pca4,col = c("white", "black"))

##FA for x4

fa(x4, nfactors = 8, rotate = "varimax", max.print)
```

```
##Tucker Lewis Index = 1.032 and df = -8, df for null model = 36
## Try reducing the nfactor, only 4 factors had significant loadings on any factor.

fa(x4, nfactors = 4, rotate = "varimax", max.print)

## The degrees of freedom for the null model are  36  and the objective function was  6.11 with
Chi Square of  1210.92
##The degrees of freedom for the model are 6  and the objective function was  0.07
##Tucker Lewis Index = 0.959

#                 MR1  MR2  MR4   MR3   h2   u2 com
#LTTD              0.54 0.15 0.30  0.64 0.80 0.20 2.5
#DesignOrg         0.82 0.23 0.12  0.16 0.77 0.23 1.3
#Facilitation      0.76 0.14 0.20  0.49 0.87 0.13 2.0
#SocialPresence    0.38 0.24 0.68  0.17 0.69 0.31 2.0
#CognitivePresence 0.70 0.29 0.49  0.06 0.82 0.18 2.2
#ForeThought       0.38 0.66 0.26 -0.09 0.65 0.35 2.0
#Performance       0.14 0.79 0.18  0.28 0.76 0.24 1.4
#SelfReflection    0.07 0.36 0.52  0.40 0.57 0.43 2.8
#Satisfaction      0.79 0.19 0.20  0.13 0.71 0.29 1.3

fa(x4, nfactors = 3, rotate = "varimax", max.print)

## Collapsing Design & Organization into Teaching Presence.

x5 <-cbind(LTTD, TeachingPresence, SocialPresence, CognitivePresence,
        ForeThought,Performance, SelfReflection, Satisfaction)

x5cor <- round(cor(x5, use = "complete.obs"),2)
x5cor

##Principle Components (PCA) for pca5
pca5<- princomp(x5cor, scores=TRUE, cor=TRUE)
summary(pca4)

##Loading s of principle components

pca5$loadings

##A Scree plot of eigenvalues.

plot(pca5)
##Biplot of score variables
```

```
biplot(pca5,col = c("white", "black"))

##FA for x5

fa(x5, nfactors = 8, rotate = "varimax", max.print)



fa(x5, nfactors = 4, rotate = "varimax", max.print)


## A close look at Satisfaction

x5 <- select(data, 84,85,86,88,89)

x5cor <- round(cor(x5, use = "complete.obs"),2)
x5cor

##Principle Components (PCA) for pca5
pca5<- princomp(x5cor, scores=TRUE, cor=TRUE)
summary(pca5)

##Loading s of principle components

pca5$loadings

##A Scree plot of eigenvalues.

plot(pca5)
##Biplot of score variables
biplot(pca5,col = c("white", "black"))


fa(x5, nfactors = 5, rotate = "varimax", fm="minres", max.print)##6 factors because 6 variables.
```