

TEACHING PRESENCE AND ENGAGEMENT BEHAVIORS IN  
AN ONLINE COMPUTER APPLICATIONS COURSE:  
A THEORETICAL FRAMEWORK AND EMPIRICAL ANALYSIS

by

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## ABSTRACT

Academic research has consistently shown effective teacher presence to be a significant factor in student satisfaction, engagement, perceived learning, and sense of community. The need for effective teaching presence remains of significant importance, particularly with the vast growth of online courses and online degree programs. It is, therefore, also necessary to evaluate the instruments used to measure effective teaching presence. The purpose of this study was an examination of the construct validity of a survey instrument developed to assess effective online teaching presence. This study also assessed how well the construct validity of the teaching presence instrument fit the ICAP framework of observable student engagement behaviors. Data included teaching presence survey results from undergraduate students enrolled at a large research university in the United States. It also included students' aggregate course time and log in frequency as measured by the Blackboard LMS. No demographic data were collected, other than gender, which did not reveal significant data in the study. The study found that the teaching presence instrument did not measure the teaching presence construct as intended. The study also found that the construct validity of the teaching presence instrument did not fit the ICAP framework of observable student engagement behaviors. An examination of the aggregate Blackboard data revealed fewer total course hours and fewer course log in frequencies for activities requiring more cognitive ability.

DEDICATION

To Patrick and John David.

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## CHAPTER 1

### INTRODUCTION

Colleges and universities across the United States have joined the online education revolution, promising students the ability to take courses at any time, from anywhere, as long as they have an internet connection (Meyer, 2014). What began as a few students registering for a course or two a decade ago has turned into a massive number of learners today enrolling in fully online bachelor's and master's degree programs (Agrba, 2017).

Students appreciate, are attracted to, the flexibility and, often, the lower costs an online education can offer (Bawa, 2016; Meyer, 2014). However, upon entering the world of online learning, students—from traditional young adults to returning adults—have varied levels of difficulty managing their time (Angelino, Williams, & Natvig, 2007; Lee, Choi, & Kim, 2013) and being successful in the virtual classroom (Angelino et al., 2007, Choi & Park, 2018; Lee et al., 2013; Street, 2010). As a consequence, many colleges and universities are losing students as fast—and sometimes faster—than they enroll (Boton & Gregory, 2015).

There are numerous reasons for the departure, but recent research points to issues of student engagement with the material (Garrison, 2017; Meyer, 2014), lack of interaction with faculty (Garrison, 2017; Lee & Choi, 2011; Meyer, 2014), and disassociation from other students (Garrison, 2017; Lehman & Conceição, 2014; Meyer, 2014) in the online environment. As a consequence, this lack of interaction can produce ineffectual learning experiences (Akyol et al., 2009; Choi & Park, 2018; Street, 2010). Therefore, it is critical for colleges and universities desiring to remain competitive and successful in the arena of online education (Deming, Goldin,

Katz, & Yuchtman, 2015) to examine ways to acquire and keep students engaged through the learning process (Lehman & Conceição, 2013). It is hoped engagement efforts will assist colleges and universities in retaining students (Meyer, 2014) and produce more graduates (Meyer, 2014), while offering cost savings for higher education institutions (Deming et al., 2015).

The breakdown in learner engagement may also be related to the internal mission for colleges and universities to quickly create and make available an extensive variety of online programs in a broad range of disciplines to meet student demand (Foley-McCabe & Gonzalez-Flores, 2017). With online education a relatively new method of delivery for higher education, it is difficult for faculty and staff to be experts in their field as well as authorities in instructional technology and practitioners of successful online learner engagement (Vai & Sosulski, 2015). For the instructors who do readily embrace technology, many believe technology will solve any and all problems faced in a traditional or online classroom, often forgetting that laptops and tablets are an extension of human abilities, not a replacement or substitute for teaching, pedagogy, and leadership (Serdyukov, 2017). Technology, after all, is not a magic wand or perfect solution; as one learner commented, “students learn from their teachers; not from electronic gadgets” (Serdyukov, 2017, p. 13). This statement reaffirms the need for instruction, particularly online instruction, that is pedagogically and psychologically sound, meaningful, and effective (Serdyukov, 2017).

Research was undertaken by Driscoll, Jircha, Hunt, Tichavsky, and Thompson (2012) to fully and accurately measure the effect, quality, and effectiveness of delivering complex learning modules in asynchronous, online courses. Driscoll et al. determined successful online learning can be achieved in a broad range of settings, using differing methods and strategies. Improved

engagement (Burch, Heller, Burch, Freed, & Steed, 2015) can serve as a way to keep students focused and absorbed in the online learning process (Meyer, 2014). The quality of learning, according to Bennett and Green (2001), is not dependent on the environment through which it is delivered, but rather through careful preparation, appropriate technology, and the pedagogy used (Aslanian & Clinefelter, 2013; Serdyukov, 2017). Through research, it is possible to gain insight into student engagement best practices, helping instructors and administrators better support learners (Choi & Park, 2018; Shea, Li, & Pickett, 2006; Street, 2010). This insight will allow instructional designers and professors to make informed decisions regarding course design, pedagogy, and professional development, in an effort to provide an impactful, effective, and connected learning experience (Choi & Park, 2018; Shea et al., 2006).

### **Statement of the Problem**

The specific problem of interest was the examination of factors that demonstrate effective teaching presence (Kennan, Bigatel, Stockdale, & Hoewe, 2018; Kennette & Redd, 2015; Stronge, Ward, & Grant, 2011). Specifically, Garrison and Arbaugh (2007) and Arbaugh et al. (2008) suggested that quantitative analysis is needed to validate the structure of instruments assessing teaching presence in online environments.

Academic literature has consistently shown the importance of teacher presence in online learning (Garrison et al., 2010; Hung & Chou, 2015; Wicks, Craft, Mason, Gritter, & Bolding, 2015). Garrison (2007) stated that the growing research consensus has been that “teaching presence is a significant determinate of student satisfaction, perceived learning, and sense of community” (p. 67). Research conducted by Akyol et al. (2009) indicated that teaching presence provided leadership throughout a course of study. Regular instructor communication with students, teacher support, including responses to assignments, and email contact with the

instructor early in the semester were factors shown to contribute to student retention (Street, 2010). Students also remained more engaged and accountable when they viewed teaching presence representative of a “real” person (Kennette & Redd, 2015) who cared about students (Stronge et al., 2011).

Teaching presence makes up one part of the Community of Inquiry Framework (see Figure 1) concept that identifies the crucial prerequisites for a successful experience in higher education (Garrison, Anderson, & Archer, 2000). As described by Anderson, Rourke, Garrison, and Archer (2001) Teaching presence has three components, consisting of direct instruction (providing intellectual and scholarly leadership), instructional design and organization (clear and consistent course structure), and facilitating discourse (basic understanding, sharing meaning, raising questions, and making observations). Garrison et al. (2000) noted that online learning environments can provide particular challenges with establishing and sustaining an effective teaching presence, citing the asynchronous nature of online learning and the reliance on largely text-based communication and conversation, versus the non-verbal and meta-communication signals students may interpret in a face-to-face environment.

Current studies have concentrated on why teacher presence is important in online courses (Ma, Han, Yang, & Cheng, 2015), strategies that build teacher presence in online courses (Martin, Chuang, & Sadaf, 2018) and the relationship between teacher presence and student satisfaction in online courses (Ladyshevsky, 2013). Much work has focused on the perception of teacher presence in online courses, both from the instructor’s perspective (Richardson, Besser, Koehler, Lim, & Strait, 2016) and the students’ perspective (Martin et al., 2018). For example, a recent multiple-case study by Richardson et al. (2016) examined teaching strategies and the

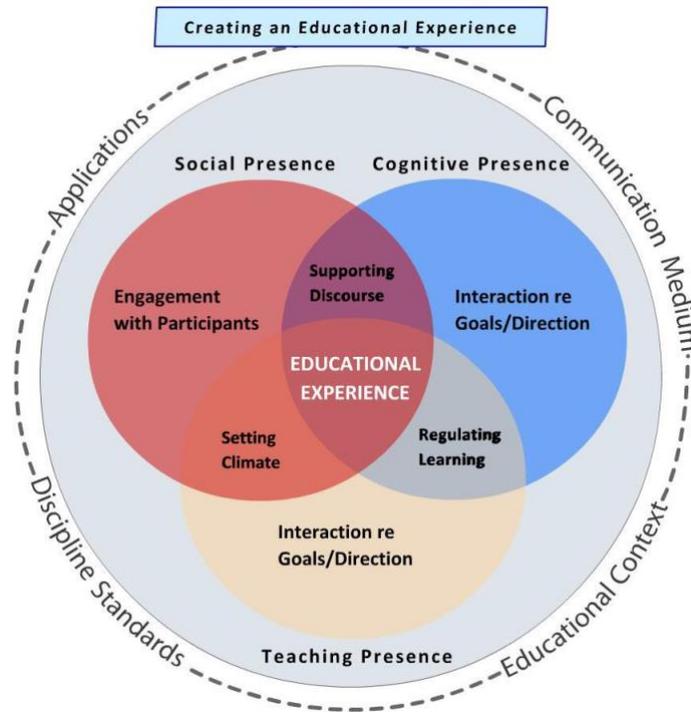


Figure 1. Elements of a community of inquiry. Adapted from Garrison et al. (2010).

importance of these strategies on learner participation but did not measure student behavior related to using the strategies. Martin and Bollinger (2018) asked 155 learners to rate the most beneficial student-instructor engagement strategies; however, the research did not analyze the influence of those strategies on the students' engagement behaviors.

In recent years, higher education administrators have focused on accountability and methods of evaluation of teaching quality (Carlucci, Renna, Izzo, & Schiuma, 2019). However, there is little agreement on appropriate teaching quality measures in higher education (Goos & Salomons, 2017). Further, Stronge et al. (2013) stated that while “teachers have a measurable impact on student learning . . . few empirical studies have addressed the matter of what high-performing versus low-performing do differently” (p. 348).

This is evidenced by a variety of recommendations for improving teaching presence in academia, but no consensus on best practices or methods. Shea et al. (2006) determined that effective instructional design and faculty who facilitate productive discourse produce an effective teaching presence. Stronge et al. (2013) explored factors such as positive relationships with students, holding high expectations of students, and classroom management, considering each in the context of student achievement. Kennette and Redd (2015) stressed the need for instructors to increase their sense of teaching presence, but instead of listing actions to implement, advised readers to consult a book by Lehman and Conceição (2010). The Community College Research Center (2013) indicated eight methods of establishing a greater teaching presence in online courses, recommending the use of live weekly chat sessions, use of audio and video for lectures, and clear rubrics for discussion board postings.

There remains an acute need for innovation in education, yet the process of implementing change to produce meaningful outcomes is too slow (Serdyukov, 2017). In addition, reform in education is traditionally top-down, becoming diverted, diluted, and losing strength on the way to implementation (Serdyukov, 2017). Little or no professional development, support, or resources for such changes may exist, and many teachers, lacking context, may see the directive as only valuable to the institution's bottom line (Meyer, 2014). Those instructors who do understand the "why" of enhancing the online experience for students often lack tools, time, and depth of course design knowledge (Justus, 2017). This results in frustration and an ongoing struggle to create an effective teaching presence while maintaining quality instruction in online courses, particularly those offered asynchronously (Meyer, 2014). Faculty may also be unaware of the negative ramifications of ignoring needed pedagogical shifts and adoption of techniques needed to design a successful and dynamic online instructional environment (Justus, 2017).

These challenges underscore the need to determine the best ways to create effective online teaching presence (Kennan et al., 2018). As recommended by Garrison and Arbaugh (2007) and Arbaugh (2008), quantitative analysis is needed to validate and assess (Carlucci et al., 2018) the structure of teaching presence instruments in online environments.

### Previous Research on the Teaching Presence Instrument

While the three Community of Inquiry model components (*social, cognitive, and teaching presence*) were initially only studied using content analysis methodology (Anderson et al., 2001; Garrison et al., 2000; Jefferies, Grodzinsky, & Griffin, 2003), an instrument was later piloted, modified, and utilized in subsequent studies shown in Table 1.

Table 1

#### *Studies Involving the Teaching Presence Component of the Community of Inquiry Framework*

TP/COI	Year	Number of Items	ID & Organiz.	Facil. Discussion	Direct Instruction	Primary Researcher	Population
TP*	2003	28/17	Yes	Yes	Yes	Shea	UG
TP*	2003	28/17	Yes	Yes	Yes	Shea	UG
COI/TP*	2005	42/17	Yes	N/A	Yes	Shea	UG
CC/TP	2006	20/17	Yes	N/A	Yes	Shea	UG
TP	2006	20/16	Yes	Yes	Yes	Arbaugh	MBA
COI**/TP	2008	34/13	N/A	N/A	N/A	Arbaugh	GRAD
TP	2016	13	N/A	N/A	N/A	Zhang	TEACH

\*Includes Participant Questions

\*\*Compares only major COI sections

A 17-item pilot survey on teaching presence was developed by Shea, Fredericksen, Pickett, and Pelz (2003) in a SUNY Learning Network study of online undergraduate students. A total of 28 questions were included in the 17-item survey, of which included items referring to both teachers/instructors and “other participants,” which allowed learners to rate their fellow students on several components of teaching presence. The pilot survey was utilized in a follow-up investigation with online undergraduate students the same year (Shea, Pickett, & Pelz, 2003). Items in both surveys loaded successfully into the three teaching presence components, direct instruction, instructional design and organization, and facilitating discourse, identified by Anderson et al. (2001). However, it was noted by Miller et al. (2014) that the instrument was created after discourse between Shea Fredericksen et al. (2003) and Anderson et al. (2001) and no apparent quantitative analysis of factor structure was conducted to validate either of the Shea, Fredericksen et al. (2003) or Shea, Pickett et al. (2003) study results using the teaching presence instrument.

Shea et al. (2006) later explored the factor structure of the teaching presence instrument as part of a 42-item Community of Inquiry (CoI) survey of online undergraduate learning communities. Seventeen of 20 items loaded successfully into only two of the three teaching presence components, direct instruction and instructional design and organization. The same year, Shea et al. (2006) analyzed both Rovai’s Classroom Community Index and the teaching presence survey in an online undergraduate environment with 17 of 20 items loading successfully into only two of the three teaching presence components, direct instruction and instructional design and organization. Arbaugh and Hwang (2006) later examined teaching presence in online MBA courses. Their study revealed that the 16 of 20 teaching presence items loaded successfully into the three teaching presence components, direct instruction, instructional

design and organization, and facilitating discourse. Arbaugh et al. (2008) simultaneously examined all components of a 34-item Community of Inquiry (CoI) framework, testing the construct validity of the social, cognitive, and teaching presence sections with online graduate students; the teaching presence section contained 13 items. Zhang, Lin, Zhan, and Ren (2016) utilized the 13-item teaching presence instrument (see Appendix A) identified by Arbaugh et al. (2008) to measure teaching presence and student engagement behaviors as identified by Chi and Wylie's (2014) Interactive-Constructive-Active-Passive (ICAP) framework. The Zhang et al. (2016) study surveyed teaching professionals in China.

### **Conceptual Framework**

The overarching conceptual framework for this dissertation was Chi and Wylie's (2014) Interactive-Constructive-Active-Passive (ICAP) framework (see Figure 2). According to Chi and Wylie, the method by which students obtain knowledge can be categorized into four engagement behaviors, which include passive, active, constructive, and interactive. The Interactive-Constructive-Active-Passive (ICAP) conceptual framework hypothesizes that as students engage more with instruction, they move from lower to higher stages (from passive to active to constructive to interactive), increasing learning with student's progression to the next stage (Chi & Wiley 2014). To clarify, higher stages in ICAP equate to deeper learning and understanding (Chi & Wiley, 2014). ICAP has been empirically supported through research (Doymus, 2008; Lin et al., 2016; Menekse, Stump, Krause, & Chi, 2013; Zhang & Lin, 2013).

In its initial stages, the framework was designed by Chi (2009) as a way to classify and "differentiate between active, constructive, and interactive in terms of observable overt activities and underlying learning processes" (p. 73). Chi proceeded to test her hypothesis against evidence in the literature. ICAP (interactive>constructive>active>passive) was first evaluated by

predicting equivalent learning outcomes for two activities classified in the same mode (e.g., both constructive) and selecting an activity and predicting the results based on contrasting conditions (e.g., summarizing material in an active way—rephrasing, compared to summarizing in a constructive way—inferring) (Chi, 2009).

The naming structure of the ICAP framework is based on the overt, or observed, behavior (Chi, 2009). Listening to a lecture or watching a video are examples of the passive mode, as these are passive activities in which a student is receiving information, but not physically moving or manipulating anything (Chi & Wiley, 2014). Students learn and receive information during the passive stage of this taxonomy, but do not engage in any other overt, or observable manner (Pitterson, Brown, Pascoe, & Fisher, 2016). Examples in the active category include taking notes verbatim, repeating phrases, or highlighting text passages (Chi & Wiley, 2014). These actions are considered “active” in this taxonomy because of the overt, or observed activity (Chi, 2009). This may cause confusion, as in traditional literature, active learning can refer to a method of learning or the outcome of learning and memory (Chi & Wiley, 2014). The naming structure of the next category in the ICAP framework is constructive, identified this way because of the overt behavior observed (Chi & Wiley, 2014). In the constructive mode, learners generate, or construct, by self-explaining, inferring, comparing and contrasting, causing a deeper understanding and more potential for transfer of knowledge (Chi & Wylie, 2014). The fourth category of the ICAP framework, interactive, is named as such because learners, for example, would be observed in dialogue with a peer, co-creating, or co-inferring (Chi & Wiley, 2014). In this interactive stage, students have the potential to innovate or construct something that neither student could have created by themselves (Chi et al., 2018).

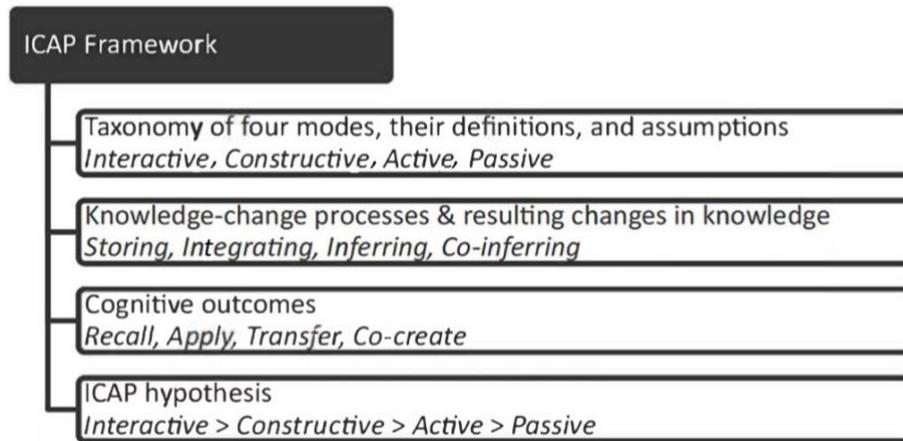


Figure 2. The ICAP Framework. Adapted from Chi & Wiley (2014).

### **Additional Frameworks Considered for This Study**

Though the ICAP conceptual framework was ultimately chosen for this research, three other frameworks were considered. The first was Engagement Theory, developed by Kearsley and Shneiderman (1998). The basic principles of Engagement Theory, often referred to as “relate-create-donate” (p. 20), include student collaboration, ensuring creative, purposeful projects or activities in learning, and contributing or donating a worthwhile project to the external community (Kearsley & Shneiderman, 1998). Engagement Theory also underscores that the use of technology enables and enhances engagement with others as well as the task at hand (Kearsley & Shneiderman, 1998). With its necessity for learner collaboration and an outside customer, the researcher determined ICAP provided a more appropriate framework than Engagement Theory.

The second framework considered for this study was a student engagement framework developed by Burch et al. (2015). The framework was based on Astin’s Student Involvement Theory (1984) and W. A. Kahn’s (1990) employee engagement research. The Burch et al. (2015) framework submits that student engagement is built on four components: emotional engagement,

physical engagement, cognitive engagement in class, and cognitive engagement out of class. The engagement referenced by the Burch et al. framework is defined by a student's time, drive, and level of commitment, which are proportional to that student's learning (Astin, 1984). That engagement is further explained by physical and psychological energy devoted to the academic experience and can be described by actions like time studying, interacting with peers, talking to faculty members, and participating in student groups (Astin, 1999). Terms like inclination, enthusiasm, take part in, and dedicating energy to, further explain engagement on the part of the student or learner.

The third framework considered for this study was the Community of Inquiry (CoI) developed by Garrison et al. (2000). The CoI framework theorizes that students are able to learn as a result of the combination of three concepts: cognitive presence, social presence, and teaching presence. Research over the years has reinforced the efficacy of the three concepts, further revealing that they intersect and interrelate, forming an effective and engaging learning experience for students (Meyer, 2014). Following the CoI model, a well-designed and implemented course encourages student interaction, problem solving, deep reflection, and critical thinking (Meyer, 2014). The CoI framework, reflective of John Dewey and collaborative, constructivist principles, is used to assess the process of learning (Swan et al., 2009) and different educational approaches (Garrison et al., 2000). Ultimately, as the CoI framework serves to explain and promote a community of inquiry, it was decided that ICAP provided a more appropriate framework for examining teaching presence and student engagement behaviors.

### **Passive Mode of Engagement**

Chi and Wiley (2014) defined the passive mode as the lowest level of engagement in the ICAP framework. Learners receive information from materials, but do not overtly perform any

other actions related to processing the information. The researchers further clarified that this passive mode can be described as a student paying attention to an instructor delivering a lecture or listening to a professor without taking notes (Chi & Wiley, 2014). Chi and Wiley did concede that it is possible, while observing a video or listening to a lecture, for students to appear in a passive state but actually be engaged and processing materials deeply. This is not considered passive engagement (Chi & Wiley, 2014).

### **Active Mode of Engagement**

Chi and Wiley (2014) explained the active mode of ICAP as including some overt, observable, action involving manipulation of a portion of the instructional materials that can involve a tangible object related to the learning. As shown in Table 2, the active mode can include the playing, pausing, and rewinding of a video, highlighting a passage of text, or rehearsing or repeating instructional materials (Chi & Wiley, 2014). Chi and Wiley were careful to distinguish between passive and active modes of engagement, explaining that the latter requires three components: motoric behaviors, manipulation, and focused attention on certain and distinct portions of the learning material or object.

The researchers also point out that distinguishing between passive and active modes can sometimes be difficult, as it must be determined whether or not a behavior is directly related to a student focusing his or her attention on a specific activity versus mindless behavior (Chi & Wiley, 2014). To further clarify, Chi and Wiley (2014) determined backchannel expressions in dialogue, such as “mmm” and uh-huh,” fall into the active mode of engagement, symbolizing that the listening partner is merely agreeing and affirming the other speaker.

Table 2

*Examples of Learning Activities by Mode of Engagement (Chi & Wiley, 2014)*

Examples of Learning Activities by Mode of Engagement

	PASSIVE	ACTIVE	CONSTRUCTIVE	INTERACTIVE
LISTENING to a lecture	Listening without doing anything else by oriented toward instruction	Repeating or rehearsing; Copying solution steps; Taking verbatim notes	Reading out-loud; Drawing concept maps; Asking questions	Defending and arguing a position in dyads or small group
READING a text	Reading entire text passages silently/aloud without doing anything else	Underlining or highlighting; Summarizing by copy-and-delete	Self-explaining; Integrating across texts; Taking notes in one's own words	Asking and answering comprehension questions with a partner
OBSERVING a video	Watching the video without doing anything else	Manipulating the tape by pausing, playing, fast-forward, rewind	Explaining concepts in the video; Comparing and contrasting to prior knowledge or other materials	Debating with a peer about the justifications; Discussing similarities & differences

**Constructive Mode of Engagement**

The defining characteristic of the constructive mode of engagement is a behavior that is generative, meaning that the learner constructs a new product or output beyond the original information presented (Chi & Wiley, 2014). The researchers offer the example of a constructed output with a student creating a new, original diagram after reviewing the detailed solution to a physics problem (Chi & Wiley, 2014). Further, Chi and Wiley (2014) explained that an action can be considered generative if a student creates new ideas after reading a text, provides justification for a learning step, or explains what an instructional problem means on a personal level. The interactive level can also be reached if a student produces inferences as a result of working through a learning challenge. Related to the use of a tutor or other one-on-one instruction, the constructive mode can occur if a student is encouraged to produce an idea or

construct that takes the learning further than a merely “active” yes or no response (Chi & Wiley, 2014).

### **Interactive Mode of Engagement**

The highest mode of engagement in the ICAP framework is the interactive level, defined primarily as a dialogue or discourse between partners. In order to meet the constructive criteria, dialogue between the two partners must be constructive, and the two partners must take turns during the interaction (Chi & Wiley, 2014). Chi and Wiley (2014) defined the partner as a colleague, instructor, parent, or computer device with the ability to respond, or dialogue, in a constructive manner. To further define this, Chi and Wiley (2014) explained that if two learners interact without dialogue, having only a physical interaction like mirroring gestures or copying the other’s words, this falls into the active mode of engagement category. In order for interpersonal behavior to reach beyond active and constructive engagement to interactive engagement, each learner must advance the conversation; both people must exchange information and substantially further the conversation by offering ideas that neither party could develop on their own (Chi & Wiley, 2014). This conversation should be fluid and dynamic, with both sides asking questions, clarifying positions, and taking turns to understand and make mental adjustments to new knowledge (Chi & Wiley, 2014).

### **Statement of Purpose**

The purpose of this quantitative cross-sectional non-experimental study was to analyze the construct validity of the 13-item Arbaugh Teaching Presence instrument and to determine if the instrument loaded into the three teaching presence components, direct instruction, instructional design and organization, and facilitating discourse, as identified by Anderson et al. (2001). Second, the research determined, through statistical methods, if the Arbaugh Teaching

Presence instrument fit the ICAP framework of observable student engagement behaviors. The ICAP framework is defined by Chi and Wylie (2014) as a method of categorizing the way students obtain knowledge into four engagement behaviors (passive, active, constructive, and interactive). The ICAP framework hypothesizes that as students engage more deeply with instruction, they progress from lower to higher cognitive stages (from passive to active to constructive to interactive) (Chi & Wiley 2014). The ICAP naming structure was determined based on students' overt, or observed, behavior during stages (interactive>constructive>active>passive) of the learning process as defined by Chi (2009).

### **Significance of the Study**

The demand for online courses, fierce competition for higher education resources, and the enormous retention challenge facing colleges and universities require educators to implement measures and methods that enhance student engagement (Meyer, 2014). As such, despite years of planning lectures, activities, and assignments for successful face-to-face courses, educators can no longer afford to rely on traditional formats for online course delivery (Stern, 2004). Educators must instead determine how to create an effective, vibrant online course that provides an exemplary teaching presence for online students (Serdyukov, 2017).

The perception of teacher presence in online courses has been researched, the majority from the instructor's perspective (Richardson et al., 2016) and, to a smaller degree, from the students' perspective (Martin et al., 2018). While teaching strategy best practices are often examined (Richardson et al., 2016), rarely is student engagement behavior studied, related to using the strategies. For example, while Martin and Bollinger (2018) asked learners to score valuable student-instructor engagement strategies, the research did not explore the effect of those approaches on student engagement behaviors. The lack of empirically proven techniques

underscores the need for further research and examination of instruments assessing effective online teaching presence (Kennan et al., 2018).

The outcome of this research contributes to existing literature by providing an examination and validation of the constructs of an established teaching presence instrument, as determined by the direct instruction, instructional design and organization, and facilitating discourse components (Anderson et al., 2001). This study also contributes to the literature of the field as the teaching presence instrument had not yet been studied in the context of this study; specifically, undergraduate students in an online, asynchronous computer technology course at a public, 4-year university. Further, the statistical analysis determined whether the Arbaugh Teaching Presence instrument fit the ICAP framework (e.g., interactive>constructive>active>passive). In the future, these methods can be replicated with a broader population of undergraduate college students, allowing further academic contributions to and a clearer understanding of best practices of teaching presence and student engagement behaviors in online undergraduate courses.

### **Research Questions**

This study examined and analyzed the construct validity of the Arbaugh Teaching Presence Instrument using Exploratory Factor Analysis with the three identified teaching presence components, direct instruction, instructional design and organization, and facilitating discourse (Anderson et al., 2001). The study also examined, through statistical methods, whether the construct validity of the Arbaugh Teaching Presence instrument fits the ICAP scale of observable student engagement behaviors.

Specifically, the following questions guided this study:

Research Question 1. Does the Arbaugh Teaching Presence Instrument measure the teaching presence construct as intended?

Research Question 2. Does the construct validity of the Arbaugh Teaching Presence Instrument fit the ICAP framework of observable student engagement behaviors?

### **Methods**

Since the research goals were to designed to assess the construct validity of the Arbaugh Teaching Presence instrument and the ways in which the instrument fits the ICAP framework of observable student engagement behaviors, a cross-sectional quantitative study was designed. Further, as the research goals did not require any manipulation of participant behavior, a non-experimental design was chosen. The research targeted undergraduate students enrolled in an online, asynchronous Computer Technology Applications (CTA) course offered at a 4-year, public research university during the Fall 2018 semester. The students enrolled in the CTA course were chosen as a convenience sample, which was a known limitation of the research. The online CTA course offered five sections, in Fall 2018, which provided 125 students eligible to participate in the voluntary research. Three students did not complete or dropped out of the course, which provided a final student sample size of 122.

The CTA course was offered through the university's College of Education. Many of the students enrolled in the course declared education as their major of study. The majority of the students in the course were traditional undergraduate students with a classification as freshmen, sophomores, or juniors. The students were considered "on campus" students for tuition purposes, but the course was offered in an asynchronous, online format with no in-person meetings between the teacher and students. All students enrolled in the course, age 18 and older, were invited to participate in the research study. If a student was not yet 18 years of age, that student

was not permitted to participate in the study. The Computer Technology Applications course was created by the university's CTA program director, in conjunction with the university's Instructional Design and Technology (IDT) department. The IDT department provides teachers comprehensive instructional design services in gathering, organizing, and designing course content, activities, assessments, discussion boards, and online lectures. The number of modules, assignments, discussions, papers, and projects were identical in each section of the course. All of the courses' learning modules were offered in an online format through the Blackboard Learning Management System (LMS).

For the current study, statistical analysis was completed on the 13-item Arbaugh Teaching Presence (ATP) instrument, its content extrapolated from the Community of Inquiry (CoI) framework created by Garrison et al. (2000) (see Figure 1). The content and structure of the CoI Teaching Presence instrument was introduced by Anderson et al. (2001) and Shea, Frederickson et al. (2003). It was later revised by Shea, Pickett et al. (2003), Shea et al. (2005; 2006), Arbaugh and Hwang (2006), and Arbaugh et al. (2008), the latter of which was utilized by Zhang et al. (2016).

Using data from administering the ATP instrument, SPSS 25 software was used to conduct Exploratory Factor Analysis (EFA) and assess the construct validity of the Arbaugh Teaching Presence instrument. Factor analysis was utilized to examine underlying patterns of variables and determine if the items could be condensed into a smaller set of factors (Hair, Black, & Babin, 2018). The analysis further determined if there were any ways in which the Arbaugh Teaching Presence instrument fit the ICAP framework of observable student engagement behaviors. In the future, these data can be extrapolated and applied across a broader population of undergraduate college students.

## **Teaching Presence Survey**

The 13-item Arbaugh Teaching Presence instrument (Zhang et al., 2016) chosen for this study was adopted and modified from previous research by Shea et al. (2003; 2005) and Arbaugh et al. (2006; 2008) and was based on original teaching presence research of Anderson et al. (2001). Zhang et al. (2016) concluded that the influence of online instructors may affect and encourage deeper learning by influencing students to construct, infer, collaborate, or co-create new ideas, knowledge, or projects. Zhang et al. (2016) classifies teachers as facilitators, with their responsibilities including online course design, schedule, and structure, as well conducting educational instruction and lectures. To enhance the student-instructor connection, it is necessary for teachers to provide timely feedback to students, observe online social activities, and deliver instructions (Zhang et al., 2016).

## **Assumptions of the Study**

This study was conducted at a 4-year public university in the United States. It was assumed, for the purposes of this research, that all participants answered survey questions in an honest and open manner. It was also assumed that all participants experienced similar phenomenon to the study, this particular study focusing on engagement in an online, asynchronous course. The course teachers were surveyed to confirm no face-to-face interaction took place during the Fall 2018 semester. It was assumed participants had a sincere interest in participating in the research surrounding this study without other motivation. To be included in the study, all participants were 18 years of age or older. Those under the age of 18 were excluded from the study data. All study participants were considered at-will volunteers with the ability to withdraw from the study without any ramifications at any time. The anonymity and confidentiality of all study participants was preserved.

Chi et al. (2018) shared three assumptions that the ICAP framework imposes. The first assumption stated that while learners' overt behavior is a strong marker of broad cognitive processes, learners' overt behavior used in combination with student-generated "products" (either created or expressed) better reflect cognitive engagement. The second assumption stated that cognitive knowledge-change processes (changes in one's knowledge) result from overt behaviors and the products or expressions students subsequently form as a result of those behaviors (Chi et al., 2018). The third assumption stated that students' overt behaviors and the knowledge-change process that happens as a result accurately reflects the students' cognitive mindset the majority of the time; thus, acknowledging that the ICAP framework works well, but is not perfect (Chi et al., 2018). Finally, the assumption existed that not all activities, though designed by instructors and intended for students as active, constructive, or interactive, may produce a new and significant output, idea, dialogue, or project (Chi, 2009; Chi & Wiley, 2014).

### **Delimitations and Limitations of the Study**

The current study's results were affected by the following delimitations and limitations. Delimitations included (a) the data obtained were drawn from a convenience sample of undergraduate students enrolled in a 15-week Computer Technology Application (CTA) course; (b) the results of the research may not be applicable to other 4-year institutions in other regions, as only one 4-year research university in the United States was selected for this study; and (c) the research results are not applicable to courses delivered as hybrid or face-to-face learning opportunities, as the CTA course was classified as being 100% online. The small sample size was another delimitation, as was the lack of ability to analyze demographics, such as age and gender, making the findings from this study not generalizable to larger populations. As all of the data were gathered from undergraduate students, this was also a delimitation, as findings from

this study may not be generalizable to graduate students and learners in a professional environment.

Limitations of the current study include the self-reporting of undergraduate students who completed the Arbaugh Teaching Presence instrument, as the results may have been influenced by positive or negative perceptions that were unrelated to teaching presence in this particular course. Therefore, findings from this study may not be generalizable to other undergraduate students enrolled in different courses at the same university who may have different positive or negative perceptions for those different courses. Another limitation included the naming convention of the current study's framework. The ICAP (interactive>constructive>active>passive) acronym can be confusing for academics and teachers if they are not aware that the components of the framework are named for the overt, observable behaviors (Chi, 2009; Chi & Wiley, 2014). Additionally, the division of constructive and interactive cognitive level classifications in ICAP have proven problematic in the current study, as the cognitive effort needed to create new items from existing or new knowledge (constructive) and the cognitive effort required to work in concert with a peer to develop a project or solve a problem (interactive) can be argued to be equally challenging from intellectual and reasoning standpoints. Therefore, the division of constructive and interactive level classifications was noted as a study limitation. It should also be noted that it can be difficult to accurately assess, confirm, and record the entirety of overt, observable engagement behaviors of learners, as outlined by the ICAP framework, particularly in online courses, as was the case with the current study (Chi, 2009; Chi & Wiley, 2014). Therefore, the challenge of accurately observing, assessing, and recording overt student engagement behaviors was noted as a study limitation. A final limitation noted that although instructors may design active, constructive, or interactive tasks for learners, those

assignments may not yield new dialogue or significant advancement of an idea (Chi, 2009; Chi & Wiley, 2014).

### **Operational Definition of Terms**

*Asynchronous instruction:* In this method of instruction, course content is delivered to students through an Internet-based system, typically a Learning Management System.

Communication or connection between learner-learner, instructor-student, and learner-content do not transpire at the same time. No face-to-face course component is utilized (Watts, 2016).

*Attrition:* The act of learners dropping out of a course or program in higher education, or a reduced commitment to academics. Attrition can stem from challenges with technology, isolation, motivation, engagement, or self-regulation, among other reasons (Kahn, Everington, Kelm, Reid, & Watkins, 2017).

*Blended learning/Hybrid learning:* This classification of learning is defined as a mixed approach to education using both face-to-face and fully online instruction (Mozelius & Hettiarachchi, 2017).

*Cognitive engagement:* A student's thoughtfulness and willingness to undertake the effort required to master complicated skills and ideas (Fredricks, Blumenfeld, & Paris, 2004).

*Communality:* The amount or quantity of a variable's variance that is common variance (Field, 2013). The extent of variance shared between an original variable and all other variables in an analysis (Hair et al., 2018).

*Content validity:* Verification that the content of a test parallels the content of the concept it was proposed to measure (Field, 2013).

*Correlation matrix:* Table showing intercorrelations between all variables (Hair et al., 2018).

*Eigenvalue*: A column sum indicating variance accounted for by a factor (Hair et al., 2018).

*Disengagement*: An attitude or demonstration by students who are not interested, withdraw, or give up in the face of learning; external and internal factors fail to have an influence on these students (Senthil Kumar & Sundar, 2018).

*Distance learning*: A system in the educational field from which learners receive packages of educational material, seminars, or lectures, as well as assignments to be completed at home (Senthil Kumar & Sundar, 2018).

*Engagement/Engagement activities*: “The way a student (voluntarily) engages with learning materials in the context of an instructional or learning task, reflected in the overt behavior the student exhibits while undertaking an activity” (Chi & Wiley, 2014, p. 219).

*Engagement behaviors*: The smaller, granular behavioral actions and activities that can be observed and detected while students learn, determined by the amount of cognitive engagement (Chi & Wiley, 2014).

*Factor*: A linear combination of the original variables which represents the underlying constructs that account for the original set of observed variables (Hair et al., 2018).

*Factor analysis*: Technique for identifying clusters of variables (Field, 2013). A statistical technique to examining patterns of complex, multidimensional relationships (Hair et al., 2018).

*Factor loadings*: Correlation between original variables and factors (Hair et al., 2018).

*Factor rotation*: Manipulation of factor axes to accomplish a simpler and more meaningful factor solution (Hair et al., 2018).

*Learning Management System (LMS):* A system that delivers all lectures, assignments, assessments, and communication to learners asynchronously through an Internet-based software portal (Walker, Lindner, Murphy, & Dooley, 2016).

*Online course/Online learning:* A mechanism in the educational field that delivers content to learners, typically physically miles apart, who are connected through internet technology and access resources through computers, laptops, tablets, and smartphones (Senthil Kumar & Sundar, 2018). A course in which all or most of the information, typically 80%, is delivered online (Allen & Seaman, 2007).

*Oblique factor rotation:* Factor rotation computed so that the extracted factors are correlated (Hair et al., 2018).

*Orthogonal factor rotation:* Factor rotation in which factors are extracted in order for axes to be preserved at 90°. Each factor is considered independent of (orthogonal to) all other factors. Each factor's correlation is determined to be 0 (Hair et al., 2018).

*Overt activities:* An activity is considered overt when it can be observed, when it can be prompted or influenced by the instructor, can be measured via frequency of occurrences, and can be coded and evaluated as proof of mediators in learning (Chi & Wiley, 2014).

*Principal component analysis:* Technique for identifying clusters of variables (Field, 2013).

*Retention:* The act of learners remaining enrolled in a course or program in higher education. (Kahn et al., 2017).

*Synchronous instruction:* In this method of instruction, students enjoy real-time interaction using videoconferencing, webcasts, scheduled at specific times, during which all students are expected to attend and participate (Er, Özden, & Arifoglu, 2009).

*Traditional course/Face-to-face instruction:* Synchronous instruction that takes place in a face-to-face setting and includes lectures, discussions, assignments, and assessments. (Watts, 2016). According to Allen and Seaman (2013), face-to-face instruction is categorized as courses in which zero to 29% of the content is provided to students via online learning.

*Validity:* The extent to which a measure accurately exemplifies the concept of study; how well a concept is described or defined by a measure (Hair et al., 2018).

*Varimax:* Most commonly used and most popular orthogonal factor rotation method. Used to simplify columns in a factor matrix. In general, considered a good choice among orthogonal factor rotation methods to attain simplified factor structure (Hair et al., 2018).

### **Summary**

This dissertation is divided into five chapters: an introduction, a review of the literature, the research methodology, results, and discussion. Chapter 1 includes a statement of the problem and an introduction to the theoretical framework of the study, as well as a discussion of the process, significance, assumptions, and limitations of the study undertaken by the investigator. Chapter 2 covers a review of the existing literature, including a discussion of the current literature focused on student engagement and teaching presence. The history behind the interactive-constructive-active-passive (ICAP) framework is discussed. Chapter 3 includes the study's research methodology, as well as the setting of the study, selection of participants, data collection, and data analysis. Findings of the study are included in Chapter 4. Chapter 5 covers a discussion, recommendations, and conclusions related to the study findings in Chapter 4.

## CHAPTER 2

### REVIEW OF THE LITERATURE

Across the nation, colleges and universities are under intense scrutiny and pressure to recruit more students every year (Meyer, 2014), increase graduation rates (Meyer, 2014), and increase their online presence (Redmond, Abawi, Brown, & Henderson, 2018), all while managing funding cuts (Finkelstein, Conley, & Schuster, 2016), an aging faculty (Kaskie, 2017), and fewer resources (Bowen & Tobin, 2015; Boyer, 2016). While higher education institutions will see some success in attracting college students to enroll in online courses with scholarships (Korn, 2018) and grants (Marks Jarvis, 2016), after 6 years, fewer than half of those students complete a degree or certificate at the same institution, according to the National Student Clearinghouse (NSC, 2017). Twelve percent of students are still enrolled in college after that same 6 years without completing a degree, and the NSC (2017) reports that one in three students leaves higher education permanently.

According to the NSC (2017), 4-year public colleges graduate 65% of students, with private not-for-profit institutions topping that margin by 11%, with more than three-fourths of all enrollees securing a credential. Students at community colleges fare far worse, with a 38% graduation rate; the rate is identical for those students who transfer from community college to a 4-year school (NSC, 2017). The burden to increase student populations has many administrators reaching beyond typical demographic boundaries to recruit students (Jaschik, 2018) into online programs which promise flexibility (Watson et al., 2016), technological sophistication (Bonk & Zhang, 2006; Serdyukov, 2017), and access to courses 24/7 (Stoltz-Loike, 2017) as long as the

students have an Internet connection and a reliable laptop or tablet (Foley McCabe & Gonzalez-Flores, 2017). Yet, online attrition rates are a persistent challenge for institutions of higher education globally (Bawa, 2016; Botton & Gregory, 2015; Park & Choi, 2009).

California community colleges paint a slightly better picture for online courses, with retention rates trailing face-to-face course completion rates by only 7% (Meyer, 2014). The University of Memphis, however, saw a different phenomenon, with online courses rating both better and worse when compared to face-to-face retention rates (Meyer, 2014). The North Dakota University System, perhaps one of the most promising in support of online education, touts an 85% completion rate for online courses with undergraduate students (Meyer, 2014).

### **Online Learning**

The growth of online learning over the past 3 decades has been unprecedented (Senthil Kumar & Sundar, 2018). Thirty years ago, after a survey of more than 2,000 higher education institutions, the number of students enrolled in online courses was deemed insignificant (Allen & Seaman, 2007). In 2002, students taking at least one online course reached more than 1.6 million, equating to nearly 10% of the total enrollment at postsecondary institutions (Allen & Seaman, 2007). That percentage doubled by 2006, with just under 3.5 million students enrolled in one or more online courses (Allen & Seaman, 2007). Seven years later, Allen and Seaman (2013) reported that the number of students enrolled in one online course reached 6.7 million. Seaman, Allen, and Seaman (2018) reported that online learning enrollment continues to grow, with the number of students registered for at least one online growing 5.6% from 2015 to 2016.

Kumar and Seaman (2018) made the distinction between online learning and distance learning, the latter of which was offered to students through seminars, packages of educational material, and home assignments. Online learning, in comparison, offers students instructional

content through internet technology (Kumar & Seaman, 2018). Though connected by technology, students enrolled in online learning are often, but not always, physically separated by geography and time zones (Kumar & Seaman, 2018). It is not surprising that a majority of public colleges and universities reported online instruction as a part of their principal long-term strategies (Allen & Seaman, 2010, Seaman et al., 2018). Online enrollment growth remains steady for public institutions, with private colleges and universities experiencing similar growth, but on a smaller level (Seaman et al., 2018).

## **Issues in Online Learning**

### **Student Retention Rates**

Despite the growing demand (Serdyukov, 2017; Sorenson & Donovan, 2017) for fully online courses and programs, often students experience difficulty finding academic success (Bawa, 2016; Thompson, Miller, & Pomykal Franz, 2013). According to Smith (2010), as many as 40% to 80% of distance learning students drop out of online classes. That trend, unfortunately for institutions of higher education, is not diminishing (Bawa, 2016; Meyer, 2014). This puts colleges and universities at risk of losing significant amounts of tuition unless a solution is found for the attrition (Deming et al., 2015).

The National Student Clearinghouse Research Center (2014) reported that for for-profit undergraduate programs, the average retention rate was 46.2%, compared to public and private universities' retention rates of 68.2% (public) and 72.9% (private). Sorenson and Donovan (2017) cited that students' reasons for dropping out include personal or family emergencies, requiring a break from school, financial issues, personal financial situation changes, and absence of internet access. However, only 29% of the students who withdrew from school completed the

2014 National Student Clearinghouse Research Center survey, leaving 71% unaccounted for (Sorenson & Donovan, 2017).

Lee and Choi (2011) studied a decade of online course retention issues. The authors coded 35 empirical studies and identified nearly 70 dropout factors, which they sorted and combined into three main categories. The first group, identified as “student factors,” included challenges related to academic background, relevant experience, skills, and psychological attributes (Lee & Choi, 2011). The second group, named “course/program factors,” was comprised of issues with course design, instructional support, and interactions, with the third category being “environmental factors” like problems with work commitments and a lack of a supportive environment (Lee & Choi, 2011). Learners’ misconceptions about workload and expectations also affect student retention (Bawa, 2016).

Bawa (2016) and Lee and Choi (2011) underscored that one impacting factor is typically not enough to cause a student to drop out; numerous factors can affect retention. Making the issue more complicated is the assertion by Sorenson and Donovan (2017) that retention is difficult to define, yet vital for the survival of institutions and programs. It is not surprising that a survey by Allen and Seaman (2013) found 74% of academic leaders view low retention rates in online courses as a barrier to the growth of online instruction. Private, for-profit institutions reported the most concern about low retention rates, with 89.7% reporting it as an important or very important barrier; the number was smaller for public and nonprofit institutions, with 68% and 70%, respectively, rating low retention rates as an important or very important barrier to the growth of online instruction (Allen & Seaman, 2013).

## **Faculty Acceptance**

Continued faculty resistance to teaching in an online environment remains a concern among higher education academic officers, who stated faculty acceptance is critical (Bawa, 2016; Allen & Seaman, 2013, Allen, Seaman, Poulin, & Straut, 2016). Faculty may resist embracing online courses as developing and teaching such classes can place additional time and effort demands on instructors (Bawa, 2016; Allen & Seaman, 2013). Among institutions with more than 10,000 online students enrolled, only 60% of faculty accept the value and legitimacy of online education (Allen et al., 2016). However, most leadership at colleges and universities do not report that faculty attitudes pose a barrier to running successful online programs (Allen et al., 2016).

## **Synchronous and Asynchronous Online Courses**

Sorenson and Donovan (2107) identified lack of support and absence of instructor interaction as two common factors that contribute to poor student retention in higher education. The absence of presence and interaction can add to feelings of isolation and disengagement reported by some students in online courses and may have a negative influence on learner performance and/or motivation (Bawa, 2016; Sorenson & Donovan, 2017).

A portion of student engagement and interaction can be bridged in synchronous online courses (Duncan, Kenworthy, & McNamara, 2012). Virtual office hours can be scheduled and held at a regular time each week as well, allowing students to access instructors and gain opportunity for extra help (Gregori, Martinez, & Moyano-Fernández, 2018). Asynchronous online learning courses have been found to be more popular (Meloni, 2010) and considered as good or better than face-to-face (Shaffhauser, 2018). Online learning can be beneficial for those

students who find it useful to self-reflect (Bonk & Zang, 2006) or like to consider both sides of a topic or problem before venturing a discussion post reply (Higley, 2013).

Asynchronous learners also have the benefit of flexibility of time (Roach, 2014; Serdyukov, 2017), allowing the students to access the material day or night on a variety of devices (e.g., cell phones, tablets, and laptops). Students who are not rushed to digest learning have the ability to process concepts at higher levels in Bloom's taxonomy, with some students reaching the evaluation level (Roach, 2014).

The challenge of asynchronous learning is that it can remove the human connection offered by face-to-face and synchronous courses as well as the immediacy and availability of instructors to answer questions and provide information (Bawa, 2016; Boton & Gregory, 2010). This can lead to as many as 40% to 80% of students withdrawing from online classes (Bawa, 2016; Smith, 2010). That trend of attrition, unfortunately for institutions of higher education, is not diminishing (Gregori et al., 2018). Even more concerning is that many learners will not complete degrees (Choi & Park, 2018) and the students who remain may be unable to connect with course content (Choi, 2016) or have substandard retention of educational material (Choi et al., 2018).

### **Active Learning**

It has long been accepted by educators that learning is an active process (Chi, 2009) and while students are able to learn while passively receiving information, student outcomes tend to be improved by learning actively (Chi & Wiley, 2014). Further, a meta-analysis of more than 200 studies, specifically focused in STEM environments, demonstrated that students benefit more from active learning than traditional lecturing (Freeman et al., 2014).

Educational researchers often define active learning as a process that requires students to engage cognitively and deeply with instructional materials (Bonwell & Eison, 1991), making students active partners in their own learning and development (Chi, 2009). Active learning, when discussed in motivational terms, is often thought of as an attitude or interest in exploring the learning materials (Chi, 2009). In emotional terms, active learning can be expressed as how a student reacts, positively or negatively, to the academic community of instructors and classmates; in behavioral terms, active learning can be seen as participating on a large scale, such as the regularity of a student attending class or turning in assignments (Chi & Wiley, 2014). To cognitively engage students using active learning techniques, instructor approaches include scaffolding activities, small group projects, partnered interactions, and developing students' critical awareness of the process of thinking and learning (Wiggins, Eddy, Grunspan, & Crowe, 2017). However, as Wiggins et al. (2017) pointed out, these techniques are typically carried out without any measure of consistency or effectiveness. Chi and Wiley (2014) concurred that instructors who wish to integrate active learning practices to make lessons more engaging often do not receive training on how to create such activities, nor are they made aware of the criteria for defining ideal active learning activities, or best practices for modifying existing lessons to achieve optimal active learning.

In the current research literature, different active learning approaches have been identified, but few studies have compared the success of each effort side by side. As such, Chi and Wiley (2014) proposed the ICAP theoretical framework to categorize different "active learning" tasks that students can complete and teachers can observe. Each active learning category or level corresponds to one of four overt engagement behaviors which stimulate the

cognitive process of learning, ranging from the most engaging mode to the least engaging mode: interactive, constructive, active, and passive (Chi & Wiley, 2014).

### **Learning Activities**

The ICAP framework, as described by Chi (2009), compares and contrasts one learning activity with another learning activity during the learning process, independent of what is done by the instructor or what happens within the learning system. For the purposes of this research, the term *learning activities* is used broadly and refers to instructional or learning tasks assigned by an instructor, examples of which can include reading, problem-solving, and summarizing charts and diagrams (Chi & Wiley, 2014).

### **Overt Learning Activities**

Overt learning activities, as defined by Chi (2009), are implied as those observable tasks students undertake and complete while learning from an educational resource. According to Chi and Wiley (2014), an activity is considered overt when it can be observed, when it can be prompted or influenced by the instructor, can be measured via regularity of occurrences, and can be coded and evaluated as evidence of mediators in learning. Recognizing and observing overt learning activities, it should be noted, is one method of determining the level of students' cognitive processing as related to the four modes of engagement as outlined in ICAP (Pitterson et al., 2016). Research is in progress to determine more in-depth effects of students' cognitive processing, and thus, overt learning activities, as related to students' cognitive load, task complexity, mental exertion, and concentration (Pitterson et al., 2016).

### **Engagement**

In higher education, student engagement is a concept unfailingly connected to positive learner outcomes, including higher graduation rates (Redmond et al., 2016). Student engagement,

according to Kuh, Cruce, Shoup, and Kinzie (2008), may also influence grades and persistence shown by students of diverse racial and ethnic backgrounds. Carini, Kuh, and Klein (2006) reported students with the least ability often benefit the most from engagement.

Research has also shown online learning engagement connects to improved academic performance (Meyer, 2014), and students who have a positive experience in an online course are more likely to enroll in another course in the future (Blackmon & Major, 2012). Data about these experiences can assist colleges and universities wishing to boost online enrollment (Blackmon & Major, 2012), but there is limited empirical evidence directly examining engagement in online learning (Zhang et al., 2016).

In a study by Burch, Burch, and Womble (2017), the researchers considered engagement and learner behavior, but in the context of a university policy aimed at increasing engagement by mandated web-based instruction. As the Burch et al. (2017) research revealed, students forced to use the LMS were shown to have lower engagement, differentiating between learner participation and learner engagement. It is important to note that the two concepts are not one and the same. Participation, as described by the Burch et al. (2017) study, included logging on to the LMS, observing videos, and completing activities and assignments.

The term engagement has been defined by Kuh (2009) as “. . . the more students study a subject, the more they know about it, and the more students practice and get feedback from faculty . . . on their writing and collaborative problem solving, the deeper they come to understand what they are learning” (p. 5). Astin (1984), in his Student Involvement Theory, defined student engagement as the amount of psychological and physical energy learners devote to the university experience. Meyer (2014) also stated that engagement results when students’

participation in learning contributes to their knowledge and sustains additional immersion in coursework.

The educational practice of student engagement is connected to the time and energy students apply to activities related to academics (Barkley, 2010; Kuh, 2001; Pascarella & Terenzini, 2005). The concept of student engagement can be broken into two components: (a) the time and effort students invest in studying, practicing, receiving feedback, and solving problems (Kuh, 2001), and (b) the way in which colleges and universities support student success by using resources and by providing services and opportunities for students (Kuh, Kinzie, Schuh, Whitt & Associates, 2005). Barkley (2010), meanwhile, took a simpler approach, maintaining that student engagement begins at the intersection of motivation and active learning and occurs on a continuum. Wang and Decol (2104) further explained that engagement results when the motivation to conscientiously excel at academic goals or tasks is put into action.

In order to provide more engaging online learning experiences, which research has identified points to improved academic performance (Barkley, 2010) and a better likelihood that a student will stay in school (Meyer, 2014), colleges and universities need to find more improved ways to appeal to distance learners (Watts, 2016). By understanding the factors that contribute to or detract from learning engagement (Burch et al., 2017) instructors will better connect with online learners. Important, for educators, should be acquiring those techniques that provide the greatest degree of engagement (Garrison, 2017) with the widest variety of students (Bonk & Zhang, 2006).

Some measures have been put in place to boost engagement, such as the requirement of mandatory web-based learning systems (Burch et al., 2018) at some institutions of higher education and the integration of technologically advanced course tools (Duncan et al., 2012), yet

there remains no system or method that will guarantee student engagement. Burch et al. (2017) approached student engagement in a different manner, choosing instead to allow the engagement experience, and causes for such engagement, to be identified by the students themselves. Further, Burch et al. differentiated between engagement and participation, revealing that while a student may interact with the course material, this does not equate to engagement with the same.

For the purposes of this research, engagement was not used in the traditional sense, as a student being willing to put forth needed effort to master skills and comprehend complex ideas (Fredricks et al., 2004). Rather, *engagement* or *engagement activities*, according to Chi and Wiley (2014), referred to

the way a student engages with the learning materials in the context of an instructional or learning task, reflected in the overt behavior the student exhibits while undertaking an activity, such as summarizing at the end of each paragraph, either orally or in written form. (p. 219)

As a teacher can design tasks that produce higher or lower levels of learner engagement, a student's engagement, therefore, is tied to and elicited from categories of active learning (Chi & Wiley, 2014).

### **Teaching Presence**

Nearly 2 centuries ago, teachers in one-room schools often taught a group of children in a variety of grades, serving as a content expert, learning administrator, and facilitator of the students' social community (Anderson et al., 2001). One hundred seventy-five years later, teaching remains a multifaceted, complex, and work-intensive profession. In the 21st century, new challenges face faculty, including the responsibility of creating stimulating online learning experiences that provide a basis for student growth and knowledge development (Blackmon & Major, 2012). Twenty years ago, only 8% of undergraduate students were enrolled in online

learning (Radford, 2011), but that has changed dramatically, with learners demanding more online programs to fit their busy lifestyles (Lehman & Conceição, 2014; Serdyukov, 2017).

With the rapid growth of online learning programs comes concern over lagging student retention. Many students simply are not prepared for the rigors of learning without an instructor's presence in the classroom, as illustrated by low achievement (Fredricks & McColsky, 2012) and lack of connection to a group of learners (Dixson, 2015). It has been concluded that instructors must implement different teaching practices to ensure those students' satisfaction in the virtual learning environment (Cole, Shelley, & Swartz, 2014). Those instructors, committed to learning excellence, are crucial to a university's success (Leroy, Palanski, & Simons, 2012; Serdyukov, 2017). Research stressed the significance of utilizing student engagement techniques to boost student engagement (Meyer, 2014) which has been shown to produce a higher quality of graduate (Teacher Education Ministerial Advisory Group, 2014).

As Meyer (2014) noted, engagement is connected to encouraging student outcomes, with some research suggesting a connection between student engagement and student completion. Meyer (2014) also explained that the failure to note the importance of positive student engagement in online learning environments meant endangering the retention of students who are academically qualified but feel severed from the learning environment.

### **The Concept of Teaching Presence**

The idea of teaching presence was first developed as part of the Community of Inquiry (CoI) framework (Garrison, Anderson, & Archer, 2001). CoI, which combines social, cognitive, and teaching presence, grew out of the work of John Dewey and was established to guide online learning research and practice (Garrison & Arbaugh, 2007). It contended that higher-order

learning is best experienced as a “community of inquiry” composed of teachers and learners (Arbaugh et al., 2008). That said, while both social and cognitive learner interactions are necessary to create an effective online learning community (Garrison et al., 2000), teaching presence is deemed the binding element in the CoI, as communications and exchanges, on their own, are not enough to make sure that online learning occurs (Garrison et al., 2000). Garrison and Arbaugh (2007) further depicted teaching presence as the “design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes” (p. 163).

According to CoI researchers, teaching presence greatly influences online learning, as it connects students and instructors separated by distances and time zones (Garrison et al., 2001) and affects perceived learning and student satisfaction (Garrison, 2007). The Community of Inquiry framework, according to Zhang et al. (2016), classified teachers as facilitators, with their responsibilities including online course design, schedule, and structure, as well conducting educational instruction and lectures. Garrison, Cleveland-Innes, and Fung (2010) explained that under CoI, teachers need to facilitate the following relationships: student-instructor, student-peer, and student-material. To enhance the student-instructor connection, it is necessary for teachers to provide timely feedback to students, observe online social activities, and deliver instructions (Zhang et al., 2016).

### **Three Components of Teaching Presence**

Arbaugh and Hwang (2008) contended that meaningful learning experiences require learners to demonstrate critical thinking and participate in social aspects of an educational environment to be successful; however, these interactions also require clearly defined parameters and a focused direction and, consequently, the need for teaching presence. As identified in

Anderson et al. (2001), teaching presence contains three components: instructional design and organization, facilitating discourse, and direct instruction.

### **Instructional Design and Organization**

Under the first component of teaching presence, instructional design and organization, Garrison et al. (2000) emphasized structure, including timeline, protocol, and format (Anderson et al., 2008). It is described as the clear planning and consistent design of the online course organization (Anderson et al., 2001), most of which occurs before the course begins (Arbaugh et al., 2008). According to Arbaugh et al. (2008), of teaching presence's three components, this one has the greatest likelihood of being accomplished entirely by the instructor. The following descriptors were included by Anderson et al. (2001):

- setting curriculum
- designing methods
- establishing time parameters
- utilizing the medium effectively
- establishing netiquette.

### **Facilitating Discourse**

The second teaching presence component identified by Anderson et al. (2001) was facilitating discourse, which can be defined as the instructor and learners engaging with each other and actually working in concert (Arbaugh et al., 2008) to provide a vibrant and viable online learning environment. Arbaugh and Hwang (2008) explained facilitating discourse as how students interact with the information provided in the course, as well as with the instructors and learners, to reach consensus and understanding. Under facilitating discourse component (Anderson et al., 2001), the following descriptors were listed:

- identifying areas of agreement and disagreement
- seeking to reach consensus and understanding
- encouraging, acknowledging, and reinforcing student contributions
- setting the climate for learning

- drawing in participants and prompting discussion
- assessing the efficacy of the process.

### **Direct Instruction**

The third teaching presence component described by Anderson et al. (2001), direct instruction, requires the instructor to be a content expert. In this component, the instructor provides academic leadership through the sharing of subject matter expertise (Arbaugh et al., 2008). Arbaugh et al. (2008) emphasized that a subject matter expert, and not a facilitator, must serve in this role because of the need to diagnose comments for accurate understanding, injecting sources of information, and directing discussions in useful directions, scaffolding learner knowledge to raise it to a new level. Direct instruction (Anderson et al., 2001) included the following descriptors:

- presenting content and questions
- focusing the discussion on specific issues
- summarizing discussion
- confirming understanding
- diagnosing misperceptions
- injecting knowledge from diverse sources
- responding to technical concerns.

It should be noted that in studies conducted by Shea, Fredericksen et al. (2003); Shea, Pickett et al. (2003); and Arbaugh and Hwang (2006), analysis of the 28-item teaching presence instrument used validated the three components: instructional design and organization, facilitating discourse, and direct instruction (Anderson et al., 2001) as shown in Table 3. In later studies by Shea et al. (2005; 2006), only two of the teaching components (Anderson et al., 2001) were validated in the 17-item instrument used (instructional design and organization and direct instruction); however, ancillary analysis by Miller et al. (2014) of the Shea et al. (2005) study indicated that an analysis of the 17-item teaching presence instrument validated the three

components: instructional design and organization, facilitating discourse, and direct instruction (Anderson et al., 2001).

Table 3

*Comparison of Teaching Presence Component Loadings in Previous Studies*

Teaching Presence Components	Shea, Fredericksen et al. (2003)	Shea, Fredericksen et al. (2003)	Shea et al. (2005)	Shea et al. (2006)	Arbaugh (2006)	Miller et al. (2014) Ancillary analysis of Shea et al. (2005)
Instructional Design/ Organization	Yes	Yes	Yes	Yes	Yes	Yes
Directed Instruction	Yes	Yes	Yes	Yes	Yes	Yes
Facilitated Discussion	Yes	Yes	No	No	Yes	Yes

**ICAP Framework**

The overarching framework for this dissertation is Chi and Wylie’s (2014) Interactive-Constructive-Active-Passive (ICAP) framework (see Figure 1), an active learning theory that categorizes learners’ engagement as demonstrated by those students’ behaviors (Chi et al., 2018). ICAP (Chi & Wiley, 2014) encompasses a taxonomy that includes four modes of engagement, listed in decreasing levels of cognitive engagement: interactive, constructive, active, and passive. Each level of cognitive engagement is named and defined based on the cognitive processes that mode represents and is demonstrated by learners’ generative, manipulative, or attentive behaviors, both to be discussed in more detail in the passage that follows (Chi et al., 2018).

Additionally, as definitions of the terms, *engagement* and *active learning* can vary, the ICAP framework assists in further defining *engagement* and *active learning* to advance the current academic literature, and in turn, examine those student activities which can promote deeper and more meaningful learning (Chi et al., 2018).

### **History of the ICAP Framework**

ICAP was first presented by Chi (2009), in a paper introducing only three of the four currently utilized cognitive categories of overt behavioral engagement. Chi (2009) shared evidence in the academic literature that supported the ICAP theory that there existed varying levels of overt behavioral engagement, beginning with active, progressing to a level with more behavioral engagement, constructive, and culminating with the interactive level, which produced the greatest amount of measurable overt behavioral engagement. It should be clarified that the term “active” in ICAP has dual uses. The first use identifies the aforementioned category of overt behavioral engagement. The second use, as defined in Chapter 1 of this research, explains that “active” learning denotes three categories of cognitive engagement as first introduced by Chi (2009) (see Figure 3) (Chi et al., 2018).

The ICAP (Chi & Wiley, 2014) framework was later expanded to include the passive mode (see Figure 3) as the academic literature cited in the Chi and Wylie paper (2014) referred to and referenced the passive mode as a method of comparing and contrasting it to the three previously cited active modes. After constructing the ICAP (Chi & Wiley, 2014) framework, the researchers tested the hypothesis that the level and depth achieved in successful student learning is dependent on the activities the student completes; more specifically, as represented by the ICAP framework, interactive activities are more advantageous to student learning than constructive activities, which are more helpful than active activities, which are more useful than

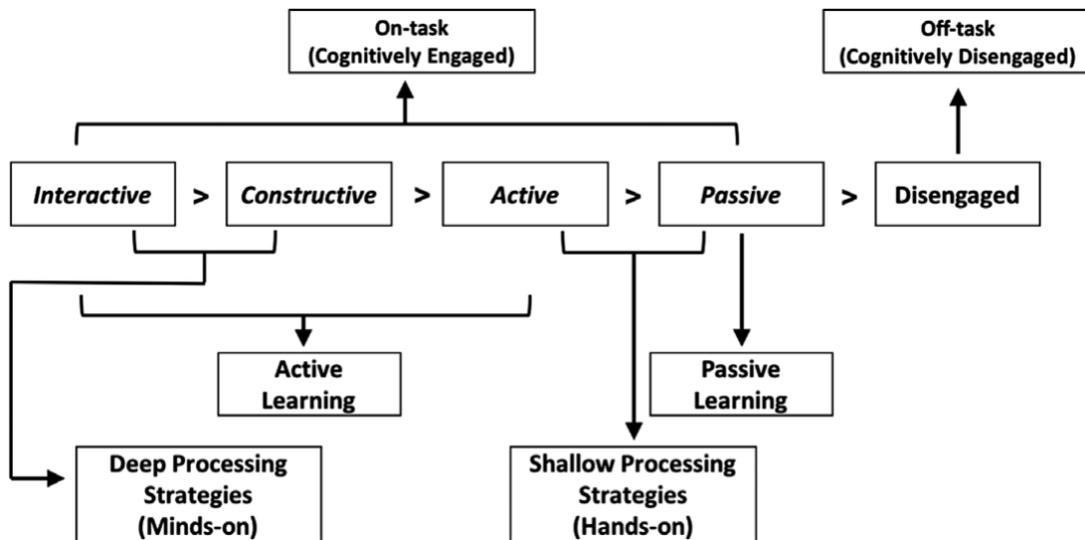


Figure 3. Terminologies corresponding to ICAP. Adapted from Chi et al. (2018).

passive activities (interactive>constructive>active>passive) (Chi et al., 2018). Identifying these relationships, according to Chi (2014), is helpful in the design of learning environments and in choosing effective activities to maximize student learning. Of importance to note (see Figure 3) is the distinction between the shallow processing (hands-on) categories of the passive and active modes versus the deep processing (minds-on) strategies of the constructive and interactive ICAP modes.

### Elements of the ICAP Framework

**Passive engagement mode.** The passive mode of engagement, also termed “paying attention” (Chi et al., 2018) or “receiving information” (Wiggins et al., 2017), is described as a mode in which students are receivers of information (Pitterson et al., 2016). That is, learners are accepting knowledge from instructional materials without performing any other activity or behavior related to learning (Chi & Wiley, 2014) and without overtly engaging with the educational resources (Wiggins et al., 2017).

The knowledge-change process underlying the passive state of engagement can be classified as the taking in, encoding, and storing of new knowledge in isolation, which does not result in deep thinking (Chi et al., 2018). In short, the learning occurs at a shallow and isolated level and can be quickly recovered and utilized for simple tasks, like remembering steps in an easy process or recalling answers to a short test (Chi et al., 2018), but only in the presence of a cue or context (Chi & Wiley, 2014). The passive state happens without students activating past information and connecting it to the new knowledge. While it is possible that students who appear to be or are observed to be in the passive state are actually experiencing deep learning (Chi & Wiley, 2014), on average, students have not progressed to a higher mode of engagement, like constructive or interactive (Chi et al., 2018).

**Passive engagement behaviors.** Examples of common passive engagement behaviors include paying attention to a lecture without overtly engaging with the instructor or instruction, reading text silently or aloud without accomplishing anything else, listening to a lecture without taking notes (Chi & Wiley, 2014). Examples also include watching a video (Pitterson et al., 2016), recalling basic answers to test questions, and learning how to use simple equipment, like an ATM machine (Chi et al., 2018).

**Active engagement mode.** The active engagement mode, also termed “manipulating” (Chi et al., 2018), can be classified as students performing focused motor movement for an educational assignment (Wiggins et al., 2017), undertaking an action or physical manipulation with the instructional materials (Chi & Wiley, 2014), or when the students are physically completing a task during or as a result of educational instruction (Pitterson et al., 2016). As mentioned in the ICAP framework, the word “active” classifies and categorizes “overt activities” (Chi, 2009). It should also be noted that active activities exceed and achieve a greater level of

learning than do passive activities (Chi & Wiley, 2014). The active engagement mode is further delineated from the passive mode by requiring that the overt activity include motor skills, focused attention, and manipulation rather than a task that can be observed but is carried out without thought or consideration (Chi & Wiley, 2014).

Cognitively, the knowledge-change process associated with the active engagement mode results in learners' attention centering on the object or item being manipulated (Chi et al., 2018). In its simplest form, this action causes three cognitive processes to occur in the student: store, activate, and link (Chi et al., 2018). To expand the explanation of this cognitive chain of events, the active mode allows the new information received to be connected (stored) with existing knowledge (Chi et al., 2018), which stimulates (activates) students' existing knowledge (Pitterson et al., 2016), which allows the students' subsequent stored information to be more complete and easier to retrieve (linked) (Chi et al., 2018).

**Active engagement behaviors.** Examples of common active engagement behaviors include highlighting text, gesturing, pointing, paraphrasing, selecting, repeating, and manipulating objects (Chi, 2009). Examples also include underlining or copying sections in a textbook (Wiggins et al., 2017), rotating objects for examination, searching for objects in a determined location (Chi & Wiley, 2014), choosing, and rehearsing (Chi et al., 2018).

**Constructive engagement mode.** Constructive engagement mode, also called "generating" or "generative" (Chi et al., 2018), moves beyond the active mode in the ICAP framework, and happens when learners generate, synthesize (Wiggins et al., 2017), or create outputs or products beyond what the learning materials provided (Chi & Wiley, 2014). The information generated by the student in the constructive mode includes new relevant ideas or concepts that stretch beyond the original information the student has received (Chi, 2009). By

drawing on their own existing knowledge, and combining it with the new knowledge, learners in this mode should be able to produce a new idea not contained in the specific information just shared in the learning materials (Pitterson et al., 2016). To be certain new ideas are being produced, it is crucial for one to analyze the content of the output (Chi, 2009). To further clarify this concept, two characteristics are required for a student's activity to be considered constructive (Chi, 2009). First, the idea or product generated should be overt and externalized, either verbally or physically (i.e., hypotheses from analyzing, predictions from monitoring, a concept created from sketching) (Chi, 2009). Second, as mentioned earlier, the output cannot be contained in the original educational materials (i.e., the student produces a concept map that contains new ideas or unique inferences not contained in the instructional information or other sources) (Chi, 2009).

Cognitively, the knowledge-change process associated with the constructive engagement mode requires that students produce new ideas by inferring from either knowledge linked with new educational content or from prior knowledge that has been activated. In short, the constructive process, though it need not be complex, should include the processes of activating, linking, inferring, and storing (Chi et al., 2018). To be clear, the new information or ideas generated by a student do not reach the classification of a new discovery or breakthrough; the new knowledge produced by the learner must simply extend beyond what is contained in the academic material presented (Chi et al., 2018). One issue to be noted is the concern that not all activities, though intended for students to produce a new output, may result in the generation of new information, though instructional scaffolding (Chi & Wiley, 2014), as well as prompting from an instructor, and requesting that a learner self-explain can often push the activity to the constructive level (Chi, 2009).

**Constructive engagement behaviors.** Examples of common constructive engagement behaviors can include, but are not limited to explaining, elaborating, justifying, providing reasons, connecting/linking, reflecting, predicting, generating hypotheses, constructing concept maps, and self-monitoring (Chi, 2009). Another example would include tutoring or prompting by an instructor that requires a student to reply with more than a yes or no answer (Chi & Wiley, 2014).

**Interactive engagement mode.** Interactive engagement mode, also called “collaborating” (Chi et al., 2018) requires that learners engage in a dialogue that meets two criteria: (a) utterances from both partners, peers, or experts must be primarily constructive, that is, generating or producing outputs or products beyond what was contained in the learning materials and (b) partners, peers, or experts must participate in a sufficient degree of turn taking during the dialogue. Learners engaging interactively, contributing knowledge and critiquing information meaningfully, results in students producing work at the highest level of cognitive processing (Pitterson, 2016). Wiggins et al. (2016) described the interactive mode as one in which learners participate in a substantive exchange of knowledge, leading to new concepts and ideas, with the end result being the production of a tangible product or concept that reflects each student’s views, notions, and perceptions. The dialogue between partners should be dynamic and ongoing, instead of each student delivering mini-lectures to the other (Chi & Wiley, 2014). This interaction allows for questions, rephrasing, self-explaining, revisions of thought processes, mental adjustments, and integration of new knowledge versus one student dominating the conversation with the other student listening, agreeing, or affirming (Chi & Wiley, 2014). As the overt activity of dialogue can be broken down into content and patterns, it is important for a

researcher to determine if the conversation can be classified as truly interactive or merely constructive (Chi, 2009).

Cognitively, the knowledge-change process associated with the interactive engagement mode involves the processes of store, activate, and link, combined with infer-from-own knowledge, infer-from-partner knowledge, infer-from-shared knowledge between the partners, and infer-from-the-inferred knowledge of the partner (Chi et al., 2018). As human dialogue is rich in content, complex, and dense, it has been deemed the appropriate measure for the interactive engagement mode versus simply analyzing gestures (Chi, 2009).

Wiggins et al. (2017) determined that interactive activities contain an increased level of responsibility for students, as each is expected to play an active role in the dialogue and contribute equally to the conversation. As Wiggins et al. indicated, his research revealed that interactive teaching strategies are likely to result in better student outcomes and may be the best option for STEM classrooms. It is important to note that while instructors shared that student learning improved, more effort was also required by the instructors to prepare and conduct interactive activities versus constructive activities for students (Wiggins et al., 2017).

### **Interactive Engagement Behaviors**

Examples of common interactive engagement behaviors, completed with a peer, partner, or expert, include guided activities requiring dialogue (responding to scaffoldings, revision of errors after feedback is given) (Chi, 2009). Other examples include construction activities with joint dialogue (argue, defend, confront, and challenge) and partners creating a process (by incorporating a partner's ideas, views, and inputs) (Chi, 2009).

## Summary

While engaging online learners poses a significant challenge to institutions of higher education and the teaching community, there are many opportunities and techniques available that can lead to enhancements in engagement and improvements in academic outcomes (Bodily, Graham, & Bush, 2017). Learners who are engaged often show increased time on task, energy, and dedication to academics (Bodily et al., 2017), but if students do not feel connected in the online environment, colleges frequently experience poor student retention (Sorenson & Donovan, 2107). Lack of support and absence of instructor interaction were identified as two factors that contribute to retention problems, causing feelings of isolation and disengagement, which negatively impact learner performance and motivation (Sorenson & Donovan, 2017).

According to researchers, teaching presence has the ability to influence online learning, as regular teacher support and positive interaction with students can help bridge the feeling of online learning isolation (Garrison et al., 2001; Lynch, 2016). Teaching presence has also been shown to influence perceived learning and student satisfaction (Garrison & Arbaugh, 2007). In an effort to identify factors that may enhance or impede the quality of the online educational experience, Zhang et al. (2016) examined the link between teacher presence and online learners' engagement behaviors. By using Chi and Wylie's Interactive-Constructive-Active-Passive (ICAP) framework (2014), students' overt behaviors were categorized into four modes, listed here in decreasing levels of cognitive engagement: interactive, constructive, active, and passive. As ICAP postulates that cognitive processing increases as students partake in active learning opportunities, with the interactive mode providing the most heightened cognitive experience, it will be crucial for teachers and academic leaders to better understand the ICAP framework and

the categorizing of learning activities—especially those which stand to have the most positive effect on cognitive engagement (Pitterson et al., 2016).

## CHAPTER 3

### RESEARCH METHODOLOGY

This study addressed construct validity of the Arbaugh Teaching Presence (Arbaugh et al., 2008) instrument in an online educational setting. The methodology used for this research was a quantitative approach. Statistical analysis was used to determine the construct of the survey through exploratory factor analysis. Additionally, descriptive analysis was used to determine if there were ways in which the construct validity of the Arbaugh Teaching Presence instrument fit the ICAP scale (Chi & Wiley, 2014) of observable student engagement behaviors.

#### **Setting of the Study**

The current study was conducted at a 4-year public research university in the United States. Students surveyed in the study were enrolled in Computer Technology Applications (CTA), offered online through the university's College of Education. Five online sections of CTA were offered during the Fall 2018 semester. All CTA course material was offered through the Blackboard Learning Management System (LMS). The course introduces students to computer applications relating to problem solving, critical thinking, instruction, data management, and web page development. Computing proficiency was required for a passing grade in this course. Prerequisites for enrolling in CTA include a fundamental mastery of word processing, software applications, keyboard functions, utilities, and software.

Elements of the CTA course include a personal video introduction created by each student and posted to the course site, a reflection on the student's current level of technology skills, the building of a web resource portfolio, and the exploration of learning theories. Students

create a personal blog; over the 15-week semester, students post five individual blog entries about topics related to learning styles, distance delivery of information, and web 2.0 tools. After being assigned to a group, students complete a project describing an ideal classroom or training environment, including selection of technology and software. Each group member completes a peer review evaluating each team member's level of participation. Students also build a comprehensive educational website designed to engage and inform students. The website must contain detailed content, supporting images, a list of resources, and a complete lesson plan. Students' final assignment requires the creation of an educational video with a topic chosen from a list provided by the instructor. The students are responsible for researching the topic, writing a script, creating slides, and narrating the video presentation. The number of modules, assignments, discussions, papers, and projects were identical in each section of the course.

The Computer Technology Applications course was created by the university's CTA program director, in conjunction with the university's Instructional Design and Technology (IDT) department. The IDT department provides teachers comprehensive instructional design services in gathering, organizing, and designing course content, activities, assessments, discussion boards, and online lectures. The ITA department oversight, summative analysis of the course, and subsequent review by the director of the department ensure the course is held to quality and consistency standards.

### **Participants**

The participants in the study were 122 undergraduate students with a classification as freshmen, sophomores, or juniors enrolled in a Computer Applications Technology course at a 4-year research university located in the United States. Though the course was offered in an asynchronous, online format with no in-person meetings between the instructor and students, the

students were classified as on campus for tuition purposes. While the course was not restricted to education majors, the majority of the students who took the course were education majors. All students enrolled in the course, age 18 and older, were invited to participate in the research study. If a student was not yet 18 years of age, that student was not permitted to participate in the study.

### **Survey Instrument**

For the current study, students completed the 13-item Arbaugh Teaching Presence (ATP) instrument, which reflects the three factors of teaching presence concept proposed by Anderson et al. (2001): instructional design and organization, facilitating discourse, and direct instruction. The 13-item Arbaugh Teaching Presence instrument uses a 5-point Likert-type scale ranging from 1 (Totally Disagree) to 5 (Totally Agree) to identify the student responses.

The 13-item ATP was derived from a 28-item teaching presence instrument created by Anderson et al. (2001) and Shea, Fredericksen, et al. (2003). Shea, Pickett, et al. (2003) used the 28-item instrument in two undergraduate student studies; however, the researchers did not utilize quantitative validation to examine the results (Miller et al., 2014).

Shea et al. (2006) later explored a modified, 20-item version of the original 28-item teaching presence instrument using principal component analysis (PCA). PCA revealed a two-factor model (instructional design and organization and directed facilitation, with Cronbach Alpha scores of .97 and .93, respectively), instead of the original three-factor model proposed by Anderson et al. (2001). Arbaugh and Hwang (2006) also examined the structure of the 20-item version of the instrument using confirmatory factor analysis with Cronbach Alpha scores of .90, .94, and .89 for instructional design and organization, facilitating discourse, and direct

instruction, respectively. After dropping 4 of the 20 items, the remaining 16 items loaded into the original three-factor model (Arbaugh & Hwang, 2006).

Principal component analysis was later conducted by Arbaugh et al. (2008) on the three elements of the Community of Inquiry (CoI) Framework, which include social presence, cognitive presence, and teaching presence. The data from the Arbaugh et al. (2008) study supported the construct validity of the three CoI elements, though a potential fourth factor was indicated, but not supported by scree plot results. The study produced a Cronbach's Alpha of .94 for the teaching presence element in the CoI framework.

Zhang et al. (2016) utilized the 13-item teaching presence instrument from the Arbaugh et al. (2008) study to examine the impact of teaching presence on online engagement behaviors with middle-school teachers in China. Factor analysis in the Zhang et al. study (2016) produced a Cronbach's Alpha of .98. The eigenvalue for the one factor extracted was 10.42 (Zhang et al., 2016). Using the ICAP (interactive>constructive>active>passive) framework, Zhang et al. (2016) examined the impact of teaching presence on student's overt, observable engagement behaviors. Teaching presence had a significant impact on interactive and constructive modes of the ICAP framework but did not influence the active and passive modes (Zhang et al., 2016).

### **Research Questions**

This study tested the constructs of the Arbaugh Teaching Presence Instrument using factor analysis and determined, through statistical methods, if there are ways the construct validity of the Arbaugh Teaching Presence instrument fit the ICAP scale of observable student engagement behaviors.

Specifically, the following questions guided this study:

Research Question 1. Does the Arbaugh Teaching Presence Instrument measure the teaching presence construct as intended?

Research Question 2. Does the construct validity of the Arbaugh Teaching Presence Instrument fit the ICAP framework of observable student engagement behaviors?

### **Data Collection**

The 13-item Arbaugh Teaching Presence instrument was administered in the final two weeks of the Fall semester of 2018 to students enrolled in five online sections of CTA (n=122). This study used an anonymous online survey for data collection. The intent was to gather post-course data to determine students' perceptions of teaching presence in the online course.

Permission was requested and received from the teachers in all five sections for their students to participate in the study. Students who visited Qualtrics through the study's dedicated URL were first required to read an informed consent letter and check a box indicating their understanding and agreement to participate in the study. The letter explained the study purpose and assurances that participation was voluntary, and all responses were anonymous. Once the student indicated consent, he or she was permitted to continue to the Arbaugh Teaching Presence survey. A waiver of documented consent was requested by the researcher and granted by the university's Institutional Review Board (IRB). The waiver of documented consent was put in place to eliminate any breach of confidentiality since there would be no way to link the participants to the study if consent was waived.

The Qualtrics survey software was used for data collection. No individual demographics, grades, IP addresses, or identifying information of the participants was gathered, aside from an optional question which allowed participants to indicate gender. No information specific to the courses was gathered in the Qualtrics survey. Survey responses were collected and secured using

Qualtrics ([www.qualtrics.com](http://www.qualtrics.com)). Data were downloaded after collection was complete. Data were stored in a file located on a secure computer in a locked room.

Aggregate data from the five online CTA courses were also collected from Blackboard after the end of the Fall 2018 semester, requested by the researcher and granted by the university's Institutional Review Board (IRB) (see Appendix B). Data included the aggregate number of student ( $n=122$ ) logins for each of the online course's 25 assignments and tasks, as well as the aggregate time students spent in each of the online course's 25 assignments and tasks. The results of this aggregate data were examined in relation to Research Question 2. As the vast majority of the respondents were female (96%), the results of the gender question in the Qualtrics survey was determined to be statistically insignificant for application and discussion in this study.

### **Data Analysis**

For the population size of  $n=122$ , a 73% response rate was received from the CTA students ( $n=89$ ). Data collected in the survey were input into SPSS version 25. For the purposes of this research, the Likert-type scale responses were treated as interval ratio variables (Cooper & Schindler, 2014). Utilizing SPSS version 25 for statistical calculation, exploratory factor analysis was used with untransformed variables. Variables were kept untransformed as there was no need to change the distribution of variables (an assumption of normality was not relied upon for this analysis). Principle component analysis (PCA) was the chosen method of factor extraction. Orthogonal rotation was selected using Varimax with Kaiser normalization. Rotation converged in 10 iterations.

## **Exploratory Factor Analysis**

Exploratory factor analysis (EFA) is a widely used multivariate statistical method used to develop, improve, and evaluate tests, scales, and instruments used in the psychology and education (Morgado, Meireles, Neves, Amari, & Ferreira, 2018). According to Costello and Osborne (2005), the technique was created to investigate and explore data sets. Cooper and Schindler (2014) associate exploratory data analysis to the job of police detectives and other investigators, tasked with the search for clues and evidence. Exploratory factor analysis, added Cooper and Schindler, is the first step in the search for evidence, without which confirmatory factor analysis (CFA) has nothing to evaluate.

Hair et al. (2018) described factor analysis as a tool for examining the structure of correlations in a number of variables, including questionnaire responses and test items, by identifying factors, or sets of highly-interrelated variables. Williams, Brown, and Onsmann (2012) similarly described factor analysis as a technique used to reduce a set of variables into a smaller group of variables, known as factors and is utilized to determine the construct validity of an instrument, survey, or self-reporting scale (Costello & Osborne, 2005; Morgado et al., 2018; Williams et al., 2012). Construct validity is a type of validity that is determined from a combination of subjective judgments and empirical data, or data based on observations (Patton, 2009) and is used to examine what an instrument is in fact measuring (Morgado et al., 2018). Construct validity indicates how accurately an instrument measures the construct it is meant to assess (Nunnally & Bernstein, 1994). Exploratory factor analysis contained several steps: extraction of factors, factor interpretation, rotational method, assessment of sample size (Costello & Osborne, 2005), and interpretation (Williams et al., 2012).

## **Extraction of Factors**

Data extraction was performed to reduce a large number of items into factors. Principal component analysis (PCA), a data reduction method, is commonly used in EFA and is the default method in many statistical programs, including SPSS (Costello & Osborne, 2005; Williams et al., 2012). One criticism of PCA is that it is a data reduction method rather than true factor analysis (Costello & Osborne, 2005).

Hair et al. (2018) recommends that the selection of PCA versus factor analysis be based on both the purpose of the factor analysis [exploring data or testing a hypothesis, according to Field (2014)], and what is known about the existing variable variance. As the purpose of factor analysis is utilized specifically to reveal latent (inferred, not directly observed) variables, and the purpose of this study was to explore the data set, factor analysis was not the appropriate choice for this research. Considering that the Arbaugh Teaching Presence instrument is well understood (Arbaugh et al., 2008; Garrison et al., 2001, 2010; Shea & Bidjerano, 2010, Zhang et al., 2016) and has been widely utilized in academic research (Garrison et al., 2001, 2010; Shea & Bidjerano, 2010; Shea & Pickett, 2006; Shea et al., 2005), principal component analysis was the preferred method for this study. Field (2014) noted that when PCA or factor analysis is used, generalization of the results can be achieved by cross-validation (analysis of different samples produces the same factor configuration).

## **Number of Factors to Retain**

Following factor extraction, described by Field (2014) as the method of determining how many factors to retain, several methods exist for deciding on the number of factors to keep. In determining how many factors to extract, Hair et al. (2018) recommended combining predetermined criteria and empirical evidence with a conceptual foundation, meaning the

researcher should begin with the general number of factors and an estimate of how many factors can be reasonably supported. Several methods exist for determining the number of factors to extract and it is not uncommon for researchers to utilize several methods to make a determination of the number of factors to retain. Hair et al. (2018) reminded researchers to maintain a balance between too many factors, which can cause difficulty with clear analysis, and too few factors, which may not accurately represent the entire set of variables. Field (2014) advised that while it is valid to retain only those factors with large eigenvalues, it must also be determined if the eigenvalue is sufficiently large to signify a meaningful factor.

### **Rotation**

Rotation is used in EFA to produce a simplified and clear data structure that produces easier interpretation of results (Williams et al., 2012). It is important to note that performing rotation cannot improve analysis characteristics of the analysis, including each item's extracted amount of variance (Costello & Osborne, 2005). The two rotation techniques that can be performed are orthogonal rotation and oblique rotation. In the orthogonal context, factors are rotated while keeping them independent, while factors are allowed to correlate in oblique rotation. Orthogonal rotation is the most commonly used rotation method and is believed to produce more easily interpreted results; it is noted that best fit and factorial suitability, both conceptual and intuitive, should be used (Williams et al., 2012). SPSS offers seven methods of rotation, including Varimax rotation, which Field (2014) considered a suitable approach that simplifies and can clarify the factor interpretation. For the purposes of this study, orthogonal Varimax rotation was utilized.

## **Sample Size**

Sample size is an important consideration in exploratory factor analysis, however, there are differing opinions on the size of samples needed (Williams et al., 2012). Costello and Osborne (2005) indicated that no strict rules remain in terms of EFA sample size. In a 2005 study of 303 articles containing some form of EFA or CFA, Costello and Osborne (2017) reported a subject to item ratio of >5:1 to <10:1 used in 63% of the articles; nearly 15% of the articles contained subject to item ratios of 2:1 or fewer. In considering overall size of the sample, it is often suggested that 300 cases are needed for factor analysis. Hair et al. (2018) recommended no fewer than 50 observations and prefers a sample size of 100 or more and Sapnas and Zeller (2002) suggested that a sample size of 50 cases may provide a suitable factor analysis.

## **Interpretation**

Once extraction and rotation are complete, the data are interpreted to determine commonalities. In general, three or more variables (or items) are needed to load into a factor in order for it to be considered suitable, with five or more items loading into a factor considered desirable and solid (Costello & Osborne, 2005). The strength of factor loading is also interpreted, with communalities of .50 considered low to moderate and .80 considered high. Once variables are attributed to factors, theoretical commonalities can be determined after thorough and systematic analysis (Williams et al., 2012). Factors are then given names, labels, or titles to reveal meaningful and descriptive interpretations which reflect the factors' conceptual intent.

Exploratory Factor Analysis revealed three factors associated with the implementation of the instrument in this sample. Three to five items loaded into each of the three factors and were subsequently labeled and titled according to theoretical commonalities.

## **Summary**

This study, using exploratory factor analysis, addressed whether the Arbaugh Teaching Presence instrument measures the teaching presence construct as intended. Additionally, quantitative and descriptive analysis were used to determine if the Arbaugh Teaching Presence instrument fit the ICAP scale of observable student engagement behaviors. Comprehensive results are provided in Chapter 4.

## CHAPTER 4

### RESULTS

This study served to explore the construct validity of the 13-item Arbaugh Teaching Presence (ATP) instrument. The study also examined whether the construct validity of the Arbaugh Teaching Presence instrument fit the ICAP scale of observable student engagement behaviors. This chapter is presented in the following order: Context of the study, instrument descriptive statistics, findings, and a summary.

#### **Context of the Study**

The current study targeted undergraduate students enrolled in an online, asynchronous computer technology course offered at a 4-year, public research university in the United States during the Fall 2018 semester. The students enrolled in the computer technology course were chosen as a convenience sample, which was a known limitation of the research. The online computer technology course offered five sections, in Fall 2018, which provided 122 students eligible to participate in the voluntary research.

The computer technology course was offered through the university's College of Education. Many of the students enrolled in the course declared education as their major of study. The majority of the students in the course were traditional undergraduate students with a classification as freshmen, sophomores, or juniors enrolled at the research university during the Fall 2018 semester. The Qualtrics survey software was used for data collection. No individual demographics, grades, IP addresses, or identifying information of the participants were gathered, aside from an optional question that allowed participants to indicate gender. As the vast majority

of the respondents were female (96%), the gender demographic was determined to be a statistically insignificant construct for application in this study.

Aggregate data from the five sections of the online CTA course were collected from Blackboard after the end of the Fall 2018 semester. Data included the aggregate time students spent in each of the online course’s 25 assignments and tasks, as well as the aggregate number of student logins for each of the online course’s assignments. The 25 activities and tasks included watching lecture videos, creating a website, designing a lesson plan, delivering a group project, and writing several reflective blog posts. For the purposes of this study, as seen in Table 4, the 25 student assignments were grouped into two categories: “active,” which contained 11 activities, and a combined “constructive/interactive” grouping, which contained 14 activities (Chi, 2009; Chi & Wiley, 2014) as the CTA course contained only one interactive group assignment. The ICAP classifications of the 25 activities were objectively confirmed by a university instructional designer and a faculty member with no ties to this study.

Table 4

*Student Activity and Task Groupings According to the ICAP Framework*

Active	Constructive/ Interactive
Course Schedule	Creating a Blog
Course Introduction	Reflection Blog
Readings	Group Member Rating
Syllabus	Intro Discussion
Module 1: Introduction	Learning Theories Activity
Module 2: Technology	Lesson/Training Plan
Module 3: Classroom Tech	Presentation
Module 4: Using Software	Reflection Tech Skills
Module 5: The Internet	Reflection Learning Styles
Module 6: Technology	Situation Reflection Blog
Module 7: Tech in Schools	Software Infographic
	Web 2.0 Tools Blog
	Web Resource Portfolio
	Group Project

Calculations from the aggregate data revealed that the total time spent in the course for all students was 57,126 hours, which translated to each student spending an average of 468 hours in the CTA course. The total recorded student logins for the CTA course was 10,062, which translated into an average of 83 logins per student. As shown in Table 5, the total student time logged into the CTA course for “active” tasks and activities represented 81% of the total time students spent logged into the course versus 19% of student time spent on “constructive/interactive” tasks and activities. Total student logins for the “active” category represented 69% versus 31% in the “constructive/interactive” category.

Table 5

*Aggregated Student Blackboard Data*

Total Activities	Number of Activities	Total Time (hours)	Total Logins	Mean Time (hours: minutes)	Mean Logins
Active	11	12183	9,446	32:39	9.14
Constructive/ Interactive	14	1109	616	7:47	4.04

**Instrument Descriptive Statistics**

As the goals of the research were to assess construct validity of the Arbaugh Teaching Presence (ATP) instrument and ways in which the ATP instrument fit the ICAP framework of observable student engagement behaviors, a cross-sectional quantitative study was designed. Further, a non-experimental design was chosen, as the research goals did not require any manipulation of participant behavior. The 13-item Arbaugh Teaching Presence instrument was

administered at one institution in the Fall of 2018. The participating institution was located in the United States. Participants in the study were enrolled in five sections of an online, undergraduate Computer Technology Application (CTA) course. Of the student population (n=122), 91 students completed the survey, yielding a response rate of 75%. Of these responses, two (1.5%) were rejected as the student consent form was not completed. This resulted in a population of 89, which yielded a 73% response rate. Responses were scored using a Likert-type scale (1= Strongly Disagree) to (5 = Strongly Agree).

Mean responses for the 13 items ranged from 4.42 for Item 10 (*Instructor actions reinforced the development of a sense of community among course participants*) to 4.69 for Item 4 (*The instructor clearly communicated important due dates/time frames for learning activities*) (Table 6). Standard deviations were highest for Item 5 (s = 1.00) (*The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn*), and lowest for Item 1 (s = 0.80) (*The instructor clearly communicated important course topics*). When considering all respondents' ratings, the 13 items collectively yield a mean score of 4.56 (s = 0.94).

## **Findings**

### **Construct Validity of the Arbaugh Instrument**

To answer the first research question, which asked whether the Arbaugh Teaching Presence Instrument measured the teaching presence construct as intended, distinct statistical methodologies were employed, using SPSS version 25 to conduct all statistical analyses. Exploratory factor analysis (EFA) was utilized to examine the construct validity of the ATP instrument. For the purposes of this research, it was determined that all Likert scale responses would be treated as interval ratio variables (Cooper & Schindler, 2014).

Table 6

*Descriptive Statistics for Instrument Questions*

	Mean	Std. Deviation	Analysis N
Q1	4.6854	0.80616	89
Q2	4.6180	0.93548	89
Q3	4.5843	0.93916	89
Q4	4.6966	0.90960	89
Q5	4.5281	1.00102	89
Q6	4.5393	0.86676	89
Q7	4.4382	0.98805	89
Q8	4.5169	1.01256	89
Q9	4.6067	0.93685	89
Q10	4.4270	1.05408	89
Q11	4.4831	1.02372	89
Q12	4.6180	0.89830	89
Q13	4.6180	0.89830	89

First, it was determined that the dataset was suitable for exploratory factor analysis (EFA). It was observed that 13 of the 13 items correlated at least .3 with at least one other item, suggesting reasonable factorability (see Appendix C). Principal component analysis (PCA) was performed to extract variables from the correlation matrix. PCA allowed for a more comprehensive analysis of variance, revealing significant detail related to the nature of the factors. As the Arbaugh Teaching Presence instrument, as a sub-component of the Community of Inquiry (CoI) survey, is well-researched and utilized in academic research (Arbaugh et al., 2008; Garrison et al., 2001, 2010; Shea & Bidjerano, 201, Zhang et al., 2016), no latent variables were

sought in the analysis. Varimax with Kaiser normalization method of rotation was selected as an aid in data reduction (Field, 2014). Rotation converged in 10 iterations.

The Kaiser-Meyer-Olkin measure of sampling adequacy was .95, above the recommended value of .6. The scree plot (Appendix D) and Rotated Component Matrix (Table 7) determined that three meaningful factors exist. The component loadings are desirable with at least three variables per factor loading above .540. The component plot in rotated space (Figure 4) shows the component loadings in three-dimensional space.

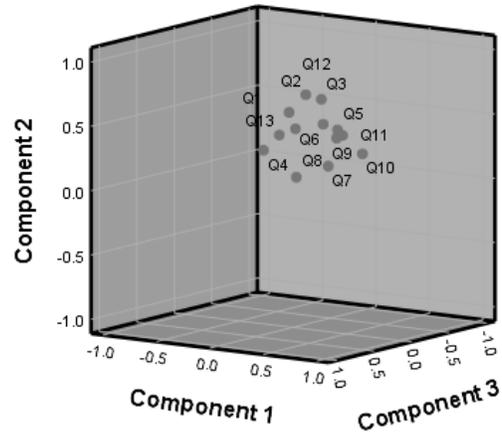
It was expected, based on previous teaching presence research (Shea, Fredericksen et al., 2000; Shea, Pickett et al., 2003), that the 13 items in the Arbaugh Teaching Presence instrument would load as shown in Table 8, with four items loading into Instructional Design (ID) & Organization (*Communicated Course Topics, Clarified Course Goals, Clarified Learning Activities, Communicated Due Dates*), which Anderson et al. (2000) described as the structure of the course, largely organized before the course begins. Six items were expected to load into Facilitated Discussion (*Interpreted Course Topics, Clarified Course Topics, Directed Engagement, Kept Students on Task, Encouraged Exploration of Concepts, Reinforced Community*). The descriptors for this element included the participants in the course engaging with each other equally, seeking to reach consensus and understanding, setting the climate for learning, reinforcing student contributions, and identifying areas of agreement and disagreement (Shea et al., 2003). Three items were expected to load into Directed Instruction (*Focused Discussion, Clarified Areas to Improve, Provided Timely Feedback*). Teaching presence's directed instruction descriptors included the instructor leading the class as a subject matter expert, presenting content and questions, focusing the discussion, summarizing discussion, and confirming understanding (Shea et al., 2003).

Table 7

*Rotated Component Matrix Resulting From Factor Analysis*

	Facilitated Discussion	ID & Organization	Directed Instruction
Communicated Course Topics	0.362	<b>0.679</b>	0.570
Clarified Course Goals	0.353	<b>0.782</b>	0.333
Clarified Learning Activities	0.480	<b>0.755</b>	0.307
Communicated Due Dates	0.289	0.412	<b>0.808</b>
Interpreted Course Topics	<b>0.665</b>	0.543	0.356
Clarified Course Topics	0.568	<b>0.585</b>	0.408
Directed Engagement	<b>0.701</b>	0.290	0.532
Kept Students on Task	0.549	0.219	<b>0.740</b>
Encouraged Exploration	<b>0.678</b>	0.484	0.385
Reinforced Community	<b>0.856</b>	0.367	0.295
Focused Discussion	<b>0.725</b>	0.509	0.373
Clarified Areas to Improve	0.393	<b>0.549</b>	0.529
Provided Timely Feedback	0.349	0.518	<b>0.682</b>

### Component Plot in Rotated Space



*Figure 4.* Component plot in rotated space. This figure represents a graphical view of the factor loading associated with each item.

Table 8

*Expected Versus Actual Factor Loadings*

	Expected Factor Loading	Actual Factor Loading
Communicated Course Topics	ID & Organization	ID & Organization
Clarified Course Goals	ID & Organization	ID & Organization
Clarified Learning Activities	ID & Organization	ID & Organization
Communicated Due Dates	ID & Organization	Facilitated Discussion
Interpreted Course Topics	Facilitated Discussion	Directed Instruction
Clarified Course Topics	Facilitated Discussion	ID & Organization
Directed Engagement	Facilitated Discussion	Directed Instruction
Kept Students on Task	Facilitated Discussion	Facilitated Discussion
Encouraged Exploration of Concepts	Facilitated Discussion	Directed Instruction
Reinforced Community	Facilitated Discussion	Directed Instruction
Focused Discussion	Directed Instruction	Directed Instruction
Clarified Areas to Improve	Directed Instruction	ID & Organization
Provided Timely Feedback	Directed Instruction	Facilitated Discussion

The exploratory factor analysis, however, subsequently revealed actual factor loadings different from the predicted factor loadings. In the actual factor loading, 5 of the total 13 items, or 38% of the items, matched the expected factor loading. The instructional design and organization category matched three of four factors at 75%, the facilitated discussion category matched one of six factors at 17%, and the directed instruction category matched one of three

factors at 33%. It was determined that the construct validity of the Arbaugh Teaching Presence Instrument poorly measured the teaching presence construct as intended.

In review, the first goal of this research was to determine if the Arbaugh Teaching Presence (ATP) instrument measured the teaching presence construct as intended. Overall, this analysis indicated that the dataset was suitable for exploratory factor analysis. Principal component analysis (PCA) was performed to extract variables from the correlation matrix and it was determined that three meaningful factors existed. The component loadings are desirable with at least three variables per factor loading above .540. However, EFA subsequently revealed actual factor loadings different from the predicted factor loadings in all three of the teaching presence components.

### **Comparison of ATP Construct Validity to Established ICAP Literature**

To answer the second research question, whether the construct validity of the Arbaugh Teaching Presence Instrument fit the ICAP framework of observable student engagement behaviors, both statistical and descriptive methodologies were employed, the latter relying on empirical deduction and existing literature. The overarching framework for this dissertation was Chi and Wylie's (2014) Interactive-Constructive-Active-Passive (ICAP) framework that categorizes learners' engagement as demonstrated by those students' observable behaviors (Chi et al., 2018). The four elements of ICAP (Chi & Wiley, 2014) (i.e., interactive, constructive, active, and passive), are listed in decreasing levels of cognitive engagement. Each level is named and defined based on the cognitive processes that level represents and is demonstrated by learners' observable behaviors (Chi et al., 2018).

After reviewing the existing academic literature (Anderson et al., 2001; Arbaugh et al., 2006; Garrison et al., 2000; Shea, Fredericksen et al., 2003; Shea, Pickett et al., 2003; Shea et al.,

2005), it was determined that the three teaching presence components as shown in Table 9 (Instructional Design & Organization, Directed Instruction, and Facilitated Discussion), as identified by Anderson et al. (2001), corresponded to three specific ICAP category groupings (Chi, 2009; Chi & Wiley, 2014): passive, active, and a grouping combination of constructive and interactive.

Table 9

*Comparison of ICAP Framework and Teaching Presence Components*

Teaching Presence Components	ICAP Framework
Instructional Design/ Organization	Passive
Directed Instruction	Active
Facilitated Discussion	Constructive/ Interactive

It was expected, based on existing academic literature (Chi, 2009; Chi & Wiley, 2014) that the three groupings of the ICAP framework would load as shown in Table 10. It was expected that four items would load into the passive category (*Communicated Course Topics, Clarified Course Goals, Clarified Learning Activities, Communicated Due Dates*), a mode named as such because, in it, students are observed as being passive receivers of information (Pitterson et al., 2016). The passive mode is classified as the taking in, encoding, and storing of new knowledge (Chi et al., 2018) in which information is quickly recovered and utilized for simple tasks (Chi et al., 2018). The passive mode of ICAP corresponds most closely to the teaching presence category of instructional design and organization as outlined by Shea,

Fredericksen et al. (2003) as this element is defined as establishing the structure of the course, including time parameters, utilizing the medium effectively, and setting curriculum, all of which direct students to perform passive engagement behaviors.

Six items were expected to load into the constructive/interactive mode (*Interpreted Course Topics, Clarified Course Topics, Directed Engagement, Kept Students on Task, Encouraged Exploration of Concepts, Reinforced Community*). The previous two categories were combined by the researcher as the 13-item Arbaugh Teaching Presence instrument did not provide specific survey questions that reflected the categories individually. Constructive engagement mode (Chi et al., 2018) is demonstrated when learners generate, synthesize (Wiggins et al., 2017), or create outputs or products beyond what the learning materials provide (Chi & Wiley, 2014). Interactive engagement mode, also called collaborating (Chi et al., 2018), requires that learners engage in a dialogue that meets two criteria: (a) utterances from partners, peers, or experts must be primarily constructive and generating outputs beyond the original learning materials and (b) learners must participate in a sufficient degree of turn taking during the dialogue. The constructive/interactive mode fits most closely with the teaching presence category of facilitated discussion and directs both instructors and students to equally engage and participate in the course (Shea et al., 2003).

Three items were expected to load into the Active category (*Focused Discussion, Clarified Areas to Improve, Provided Timely Feedback*). The active engagement mode is classified by students acting with or physically manipulating instructional materials (Chi & Wiley, 2014) or when the students physically complete a task during or as a result of educational instruction (Pitterson et al., 2016). To clarify, in ICAP, this category was named “active” as it categorizes students’ overt behavior activities (Chi, 2009) which include highlighting text,

paraphrasing, selecting, repeating, and manipulating objects (Chi, 2009). The active mode of ICAP corresponds most to the teaching presence element of directed instruction (Shea, Fredericksen et al., 2003), defined as the instructor leading the class as a subject matter expert, setting the climate for learning, reinforcing student contributions, and identifying areas of agreement and disagreement, which would prepare students to perform active behaviors in the active category of ICAP.

Utilizing the exploratory factor analysis results as a guide, and substituting ICAP elements for those most similar to the Teaching Presence components (instructional design & organization = passive, directed instruction = active, and facilitated discussion = constructive/interactive), the actual factor loadings were different from the predicted factor loadings in all three of the ICAP groupings (Instructional Design (ID) & Organization, Directed Instruction, and Facilitated Discussion) as seen in Table 10. In the actual factor loading, 5 of the total 13 items, or 38% of the items, matched the expected factor loading, with three of the four passive category factors matching at 75%, one of the six constructive/interactive category factors matching at 17%, one of the three active category factors matching at 33%.

In review, the second goal of this research was to determine whether the construct validity of the Arbaugh Teaching Presence Instrument fit the ICAP framework of observable student engagement behaviors. By utilizing the results of the EFA performed for Research Question 1, and substituting the three identified Teaching Presence components with three ICAP element groupings, (instructional design & organization = passive, directed instruction = active, and facilitated discussion = constructive/interactive), it was determined that the construct validity of the Arbaugh Teaching Presence Instrument poorly fit the ICAP framework of observable student engagement behaviors.

Table 10

*Expected Versus Actual ICAP Factor Loadings*

	Expected Factor Loading	Actual Factor Loading
Communicated Course Topics	Passive	Passive
Clarified Course Goals	Passive	Passive
Clarified Learning Activities	Passive	Passive
Communicated Due Dates	Passive	Constructive/ Interactive
Interpreted Course Topics	Constructive/ Interactive	Active
Clarified Course Topics	Constructive/ Interactive	Passive
Directed Engagement	Constructive/ Interactive	Active
Kept Students on Task	Constructive/ Interactive	Constructive/ Interactive
Encouraged Exploration of Concepts	Constructive/ Interactive	Active
Reinforced Community	Constructive/ Interactive	Active
Focused Discussion	Active	Active
Clarified Areas to Improve	Active	Passive
Provided Timely Feedback	Active	Constructive/ Interactive

## **Summary**

The goals of this study were to assess the construct validity of the Arbaugh Teaching Presence (ATP) instrument and to determine if ATP instrument fit the ICAP framework of observable student engagement behaviors. After exploratory factor analysis, it was determined that the Arbaugh Teaching Presence (ATP) instrument poorly measured the teaching presence construct as intended. It was further determined, through statistical methodologies, empirical deduction, and existing literature, that the construct validity of the Arbaugh Teaching Presence Instrument poorly fit the ICAP framework of observable student engagement behaviors.

## CHAPTER 5

### DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this quantitative, cross-sectional, non-experimental study was to analyze the construct validity of the 13-item Arbaugh Teaching Presence Instrument and whether the construct validity of Arbaugh Teaching Presence instrument fit the ICAP framework of observable student engagement behaviors. ICAP (Chi & Wiley, 2014), which categorizes the way students obtain knowledge into four observable, overt engagement behaviors (passive, active, constructive, and interactive), was used as an overarching theoretical framework for this study. It should be noted that ICAP's (Chi & Wiley, 2014) four modes of engagement are listed as levels of cognitive engagement, with interactive being the highest level of cognitive engagement, followed by constructive, active, and passive at the lowest level.

The importance of teacher presence in online learning has consistently been shown in academic literature (Garrison et al., 2010; Hung & Chou, 2015; Wicks et al., 2015). As stated by Garrison and Arbaugh (2007), "teaching presence is a significant determinate of student satisfaction, perceived learning, and sense of community" (p. 67). Garrison and Arbaugh and Arbaugh (2008) recommended that quantitative analysis is necessary to validate the structure of teaching presence instruments, particularly in online environments. Kennan et al. (2018) and Miller et al. (2018) stated that further research and additional examination of current instruments assessing effective online teaching presence is necessary.

A quantitative, cross-sectional, non-experimental study was utilized to analyze the construct validity of the Arbaugh Teaching Presence instrument. The study measured students'

perceptions of teaching presence in an online, asynchronous computer technology course offered at a 4-year, public university during the Fall 2018 semester. The concept of teaching presence was not defined for students prior to or during the Qualtrics survey. One-hundred twenty-two students were eligible to participate in the voluntary research. The computer technology course was offered through the university's College of Education. Many of the students enrolled in the course declared education as their major of study. The majority of the students in the course were traditional undergraduate students with a classification as freshmen, sophomores, or juniors. No demographic data other than gender were recorded in this study, in order to maintain a strict focus on construct validity. As the respondents were overwhelmingly female (96%) (n=85), with only four students identified as male, the gender construct was deemed statistically insignificant for the study's application.

Chapter 5 includes a discussion of the findings of this study as described in Chapter 4, including implications and conclusions. It also includes recommendations for further research.

## **Evaluation of Findings**

### **Construct Validity of the Arbaugh Instrument**

The first research question examined the construct validity of the 13-item Arbaugh Teaching Presence instrument and asked if the instrument measured the teaching presence as intended. Teaching presence was defined as “the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes” (Anderson et al., 2001, p. 5). Teaching presence, as described by Anderson et al. (2001) includes three components: instructional design and organization, facilitating discourse, and direct instruction. According to Anderson et al. (2001), instructional design and organization involve the structure and format of the course, including setting the

curriculum, establishing time parameters, and utilizing the medium effectively. Facilitating discourse focuses on the engagement between learners and the instructor, and can involve acknowledging student participation, identifying areas of agreement and disagreement, and encouraging discussion. Direct instruction, according to Anderson et al. (2001), involves the instructor not just facilitating the online course but taking on the role as a subject matter expert and academic leader. In the direct instruction component, the instructor deals with the content more specifically by focusing the discussion on specific issues, confirming understanding, and summarizing the discussion (Garrison & Anderson, 2003).

### **Arbaugh Teaching Presence Qualtrics Results**

Before performing exploratory factor analysis to analyze the construct validity of the Arbaugh Teaching Presence instrument, the study first reviewed the Arbaugh Teaching Presence survey results from the CTA students (n=89), which yielded a 73% response rate on Qualtrics. Responses were scored using a Likert-type scale (1= Strongly Disagree to 5 = Strongly Agree). When considering all respondents' ratings, the 13 items collectively yielded a mean score of 4.56 (s = 0.94). Mean responses for the 13 items ranged from a low of 4.42 for Item 10 (*Reinforced community*) to a high of 4.69 for Item 4 (*Communicated due dates*). Standard deviations were highest for Item 5 (s = 1.00) (*Interpreted course topics*) and lowest for Item 1 (s = 0.80) (*Communicated course topics*). These results indicated the CTA students perceived a high degree of teaching presence for the Fall 2018 semester, indicating that the CTA teachers were viewed as clearly communicating with students in the course, were helpful in guiding understanding, and reinforced a sense of community among participants.

These results can be interpreted to support previous academic research stating that teaching presence greatly influences online learning, as it connects students and instructors

separated by distances and time zones (Garrison et al., 2001) and affects perceived learning and student satisfaction (Garrison & Arbaugh, 2007; Lowenthal, 2009). A study by Miller et al. (2014) revealed a moderate to strong relationship between teaching presence and student satisfaction; as student perceptions of teaching presence moved in a positive direction, perceived satisfaction with the instructor and the course also moved in a positive direction. It can be deduced, based on the Miller et al. (2014) study, that if student perceptions of teaching presence moved toward the negative, the perceived satisfaction with instructors and the course would also move toward the negative.

As online learning requires self-regulation and self-efficacy, some learners in the study could translate a deep connection with the learning materials to perception of a strong teaching presence (Zhang et al., 2016). Research by Zhang et al. (2016) demonstrated that teaching presence influences students' perceptions about learning and also demonstrated a connection between teaching presence and online learner engagement. It is noted in a study by Miller et al. (2014) that students who are academically self-directed, independent, and self-motivated still expressed the importance of having the leadership of a high-quality instructor.

The Qualtrics survey results supported the assertion that providing online learning experiences that promote engagement also stimulate student growth and knowledge development (Blackmon & Major, 2012), as students agreed or strongly agreed that instructors encouraged learners to explore new concepts in the course, supported productive dialogues, and guided the class to understand course topics to assist in clarifying thinking. The Qualtrics results related to communication of important topics, goals, and learning activities also support the Shea and Bidjerano (2010) conclusion that medium to high teaching contact and engagement with students resulted in improved learning outcomes for online learners versus face-to-face students. As

demonstrated by Miller et al. (2014), as students' perception of teaching presence increases, so do students' opinions of course and instructor satisfaction. Further, research underscores the significance of utilizing student engagement techniques to boost student engagement (Meyer, 2014) which historically yields a higher quality of graduate (Teacher Education Ministerial Advisory Group, 2014). It can be interpreted that such engagement techniques are reflected in the student perceptions of strong teaching presence in the areas of encouraging dialogue and discussion, providing feedback, assisting students to clarify thinking, and identifying areas of agreement and disagreement that help students to learn.

As there was only one group activity in the course, students in the survey may have "agreed" or "agreed strongly" with a positive sense of community in the class when in reality a connection existed only with the instructor or only during the 1 week of group activity. Similarly, because students in the study reported overarching positive feelings about teacher presence in the course, they may have also selected "agree" or "strongly agree" to a question about the instructor keeping students engaged in productive dialogues, despite there being only one introductory discussion board in the 1st week of the course. It is possible that if the undergraduate students who took the survey were largely new to online learning, they required and received greater attention in the CTA course, which generated strong feelings about teaching presence. Similarly, if the instructors in this study assumed a strong and active role in the course, this can influence students' perceptions of connectedness (Shea et al., 2005), which could translate into positive teaching presence perceptions.

### **Aggregate Blackboard Data**

Calculations from the aggregate data revealed that the total time spent in the course for all students was 57,126 hours, which translated to each student spending an average of 468 hours

in the CTA course. An average of 468 hours per student is larger than the recommended minimum hours per semester of course time and student preparation time, according to the Carnegie Unit of measure for higher education (USNEI, 2008). The traditional Carnegie Unit measure of one credit hour denotes 1 hour per week of scheduled class time and 2 hours of time spent in student preparation (USNEI, 2008). Over an entire semester of 15 or 16 weeks, this represents approximately 45 hours of class time and approximately 90 hours of time spent in student preparation (USNEI, 2008). To account for the large discrepancy in average hours spent in the CTA course, a limitation is noted in this study that students may have logged into Blackboard on a laptop or computer and left the window open while completing tasks unrelated to the CTA course, thus inadvertently logging longer hours than was necessary to complete CTA task and assignments.

The total recorded student logins for the CTA course was 10,062, which translated into an average of 83 logins per student. As shown in Table 10, the total student time logged into the CTA course for “active” overt, observable tasks and activities represented 81% of the total time students spent logged into the course versus 19% of student time spent on “constructive/interactive” overt, observable tasks and activities. Total student logins for the “active” category represented 69% versus 31% in the “constructive/interactive” category.

As only aggregate data were obtained from Blackboard, and as ICAP is based on overt, observable behaviors, the passive category, the lowest level of cognitive engagement in the ICAP framework, was not included in the time and logins data set. This was due to the researcher determining that the content in the CTA course contained very few lectures and a very small amount percentage of text could be classified as “passive.” Rather, the majority of text, information, and URLs contained in the course would be classified as “active” in that focused,

thoughtful attention was used to click, scroll, manipulate, and download course information (Chi & Wiley, 2014), as well as other observable, overt processes that resulted in students cognitively storing, activating, and linking information (Chi et al., 2018). The naming construct of “active” represents the overt, observable behavior a learner is engaged in during the process.

The active category results in learners focusing attention on an object or item being manipulated (Chi et al., 2018) and the resulting behavior can often be classified as a motor movement for an educational assignment (Wiggins et al., 2017) or the process of students physically completing a task during or as a result of educational instruction (Pitterson et al., 2016). Examples include paraphrasing, repeating (Chi, 2009), copying sections in a textbook (Wiggins et al., 2017), examining items or objects in the text, searching for items or objects in a determined location (Chi & Wiley, 2014), and highlighting text (Chi, 2009). Examples of passive tasks, in comparison, are reading text silently without accomplishing anything else or listening to a lecture without taking notes, without focused thought or consideration (Chi & Wiley, 2014).

It can be interpreted that the disparity in the total time students spent logged into the course performing “active” (81%) and “constructive/interactive” (19%) overt, observable tasks and activities was a result of the time that the undergraduate students in this particular CTA course required to focus and pay thoughtful attention to the information in the course (Chi & Wiley, 2014). This necessitates focused motor movement for an educational assignment (Wiggins et al., 2017), an action or physical manipulation performed with the instructional materials (Chi & Wiley, 2014), or the physical completion of a task, during or as a result of, educational instruction (Pitterson et al., 2016). Similarly, this same reasoning can be applied in the category of total student logins, with the “active” category representing 69% versus 31% in the “constructive/interactive” category. It can be inferred, as well, that students would perform a

majority of the constructive/interactive assignments and tasks independent of the Blackboard LMS. Cognitively, the knowledge-change process associated with the constructive and interactive engagement mode requires that students produce new ideas by inferring from either knowledge linked with new educational content or from prior knowledge that has been activated (Chi et al., 2018). Examples of those constructive/interactive assignments taking place outside the Blackboard LMS include building an external student website, constructing a lesson plan in a Microsoft Word document, building a PowerPoint presentation, and writing and creating blog posts and reflections on an external website or blog.

Wiggins et al. (2016) described the interactive mode as learners participating in an equal, dynamic, and ongoing exchange of knowledge, leading to new ideas, and producing a product or concept that reflects each student's views, notions, and perceptions. Only one such interactive activity, a group project, took place in the CTA course for the purposes of this study, which is the reasoning behind combining the constructive and interactive categories. Of note is the assumption and limitation that not all activities, though designed by instructors and intended for students as active, constructive, or interactive activities, may produce a new and significant output, idea, dialogue, or project (Chi, 2009; Chi & Wiley, 2014).

To ensure assignments are being completed at the appropriate cognitive level in ICAP, it is crucial for an instructor to analyze the original information the students received, as well as the content of the output (Chi, 2009). In further describing students performing tasks in an online environment on the active level, Chi (2009) offered an example of a student selecting from a menu, manipulating items, or moving tubes and liquid in virtual chemistry lab. Chi (2009) stated that it is likely by performing the activities, learners become more engaged, but that there is no guarantee, through observation alone, that the engagement reaches a deep level. To assess

whether a task has been engaged in on an active level, an instructor would need to assess, during or after the student performs the task, if the manipulations were mindless or intentional.

In considering the assessment of online activities performed at a constructive level in ICAP, it is recommended the online students demonstrate the new knowledge externally, as internal output is extremely difficult to evaluate (Chi, 2009). Examples of an external output could include articulating an answer in a discussion board, in a reflective paper, in a blog post, or through a drawing, which demonstrates that the student has extrapolated a better, more complex comprehension of an idea or come to a deeper, more detailed conclusion based on the original information presented (Chi, 2009).

In considering the assessment of online activities performed at an interactive level in ICAP, it is recommended that the instructor analyze the content of the external discourse (Chi, 2009). The analysis will determine if the dialogue patterns are equal (interactive) or not equal (not interactive) (Chi, 2009). For example, if one student is dominating the conversation or presentation and the other student participates very little, this would not be considered an equal, or interactive, exchange of ideas (Chi, 2009). Methods which would allow an instructor to assess in an online environment would be the viewing of a video recording of a student presentation or discussion, a transcript of the student presentation or discussion, or the analysis of a paper written in a wiki, which allows each student to participate in an online project in real time, and for an instructor to view and assess the contributions and edits performed by each student (Chi, 2009).

It should also be noted that although ICAP is composed of levels of cognitive engagement (interactive>constructive>active>passive), the researcher disagrees that the interactive level of observable engagement behaviors is superior to the constructive level of

observable engagement behaviors (Chi, 2009). The deep processing (minds-on) strategies of the constructive and interactive ICAP modes are already displayed as a cohesive pairing versus the pairing of the shallow processing (hands-on) categories of the passive and active modes, as shown in Figure 3 (Chi et al., 2018).

To that point, it can be argued that depending on the context of the learning project, either interactive or constructive engagement behaviors could be utilized with a greater level of cognitive processing. As an example, on a constructive level, the development of a cure for cancer, created by an individual person based on existing research could be superior to a balanced, interactive discussion on possible solutions to water quality issues in a particular lake in the Midwest. In addition, it could also be argued that, on a constructive level, the creation of artwork similar to the Mona Lisa is also superior to a balanced online discussion or debate surrounding two candidates for city mayor in the state of Louisiana. Similarly, an individual, constructive level contribution to the world of literature, such as *War and Peace*, may outweigh a balanced and interactive discussion on battle strategy during the Civil War. To summarize, it is not the opinion of the researcher that interactive discussions or debates are not meaningful, impactful, or powerful, as demonstrated by summits on world peace or environmental policy; however, it is clear to the researcher that the division and scaffolding between the two ICAP levels of constructive and interactive should be removed, and instead, collapsed into one category.

To that end, a quasi-experimental study by Wiggins et al. (2017), specific to STEM, found a small, but significant benefit for the 350 undergraduate students participating in interactive learning activities as compared to constructive learning activities. The benefit, however, was described as the difference on a posttest between a student with a cumulative GPA

.25 higher than his or her peers and the authors stated that it is unlikely similar studies repeating the measure would yield similar significant results. By adding demographic variables, the study did not reveal better fit to the model (Wiggins et al., 2017). It was concluded by the researchers that while the interactive mode activities may be optimal for STEM learning in well-resourced classrooms, adopting the practices is a challenge for instructors, requiring more time, organization, preplanning, and effort to create than constructive activities (Wiggins et al., 2017). Wiggins et al. (2017) suggested that the greatest gains in student learning may happen by shifting current active learning assignments to constructive tasks (Wiggins et al., 2017).

For the purposes of this study, interactive and constructive categories of ICAP were treated as one component representing the highest cognitive level of overt engagement behaviors. The combined interactive/constructive mode was followed by the active mode, representing a moderate level of student engagement behaviors, and finally, passive, indicating the lowest cognitive level of student engagement behaviors.

### **Exploratory Factor Analysis**

To further examine the construct validity of the ATP instrument, exploratory factor analysis was completed, using principal component analysis (PCA) to extract variables from the correlation matrix and determine if meaningful factors existed. The component loadings were desirable with at least three variables per factor loading above .540. However, when comparing the expected factor loadings for the three teaching presence categories, the EFA revealed actual factor loadings different from the predicted factor loadings in all three of the teaching presence components, as shown in Table 8.

In the actual factor loadings resulting from the EFA, as shown in Table 8, five items (*Interpreted Course Topics, Directed Engagement, Encouraged Exploration, Reinforced*

*Community, and Focused Discussion*) loaded into Facilitated Discussion. The descriptors for this element include equal engagement of instructor and students, with an emphasis on seeking to reach consensus and understanding, setting the climate for learning, reinforcing student contributions, and identifying areas of agreement and disagreement. Five items (*Communicated Course Topics, Clarified Course Goals, Clarified Learning Activities, Clarified Course Topics, and Clarified Areas to Improve*) loaded into Instructional Design and Organization which involves, primarily, the structure of the course (Shea et al., 2003). Three items (*Communicated Due Dates, Kept Students on Task, and Provided Timely Feedback*) loaded into Directed Instruction. The descriptors for this element, according to Shea et al. (2003) include the teacher acting as a subject matter expert who manages and directs discussion, clarifies areas to improve, and provides timely feedback.

By utilizing the results of the EFA and the three identified Teaching Presence components as described by Anderson et al. (2001) (instructional design & organization, directed instruction, and facilitated discussion), 5 of the 13 items, or 38% of the items, matched the expected factor loading, as shown in Table 8. The instructional design and organization category matched three out of four factors for a loading efficacy of 75%, the directed instruction category matched one factor of three for a loading efficacy of 33%, and the facilitated discussion category matched one factor out of six for a loading efficacy of 17% as shown in Table 8. It was determined that the construct validity of the Arbaugh Teaching Presence Instrument was a poor fit for measuring the teaching presence construct as intended. Interestingly, and as noted above, the teaching presence category that aligned best in expected and actual loadings was instructional design and organization, which can be attributed to undergraduate students being able to better identify questions which focused on instructional design and organization versus the other two

categories of facilitating discourse and directed instruction, which may be more difficult for this level of students to interpret (Arbaugh, 2007; Garrison et al., 2010). This supports research by Arbaugh (2007) which posited that since instructional (or course) design and organization happens before the course begins, it could be a distinct component of CoI, followed by the combined elements of social presence, cognitive presence, and teacher presence.

There are several interpretations for the results that the 13-item Arbaugh Teaching Presence instrument did not measure the teaching presence construct as intended. Substantial changes and modifications were made to the original wording and structure of the teaching presence instrument since its inception by Shea, Fredericksen et al. in 2003. As displayed in Table 1, the teaching presence instrument began as a 28-item instrument in Shea, Fredericksen et al.'s 2003 pilot study with undergraduate students. Both instruments contained questions about other participants, which allowed learners to rate their fellow students on several components of teaching presence. Each study's factors loaded successfully into the three teaching presence components, direct instruction, instructional design and organization, and facilitating discourse. Subsequently, Shea et al. (2005) tested the teaching presence instrument again, but this time, using the entire 42-item Community of Inquiry instrument.

Arbaugh and Hwang (2006) later utilized a 20-item version of the teaching presence instrument with MBA students, with 16-items loading into the three teaching presence components during the analysis of the item's construct validity. Arbaugh and Hwang later examined teaching presence in online MBA courses; this study revealed that the 17-items in the teaching presence survey loaded successfully into the three teaching presence components. A reduced number of questions about other participants/fellow students was included in the latter two versions of the teaching presence instrument but were removed when the participant items

did not load during factor analysis. The teaching presence scale was reduced to a 13-item instrument in 2008 when Arbaugh et al. used the scale in the testing and validation of a 34-item version of the Community of Inquiry instrument. In 2016, Zhang et al. utilized the 13-item teaching presence instrument with teaching professionals but did not perform construct analysis.

It is the opinion of the researcher, through examination of the academic literature, that the changes made since 2003 may have compromised the integrity and structure of the original teaching presence instrument. Further support for this assertion is drawn from the Shea et al. 2005 and 2006 studies, which both resulted in only two (instructional design and organization, and direct instruction) of the three factors loading into the components of the teaching presence.

Reasons for study results discrepancies could include changes to the wording and structure of the original teaching presence instrument and/or differences in characteristics and motivations of the study participants. The wording of the 13-item Arbaugh Teaching Presence instrument may need to be refined and it may be necessary to return to the former wording and structure of the 17-item survey. Other explanations for the discrepancies may be that the context in which the measurement occurred influenced the construct validity (Arbaugh et al., 2008) or that students possessing higher cognitive ability tried to decode the survey, resulting in unreliable responses. It is possible that the undergraduate students in this particular study believed that the instructor only serves as a subject matter expert for the class and that little engagement or discussion is necessary or expected, thus causing a misunderstanding of the questions and skewed answers. It is also possible that student perceptions of teachers may have been influenced by positive or negative experiences or feelings wholly unrelated to the teaching presence construct being measured, thus skewing the results. While the 13-item survey may need to be

refined, it is important to note that the fundamental theoretical basis of the teaching presence instrument can be considered intact based on the existing academic literature.

### **Comparison of ATP Construct Validity to Established ICAP Literature**

The second research question for this study asked if the construct validity of Arbaugh Teaching Presence instrument fit the ICAP framework of observable student engagement behaviors. Utilizing the exploratory factor analysis results as a guide, and substituting ICAP elements for those most similar to the Teaching Presence components (instructional design & organization = passive, directed instruction = active, and facilitated discussion = constructive/interactive), the actual factor loadings were different from the predicted factor loadings in all three of the ICAP groupings (Instructional Design (ID) & Organization, Directed Instruction, and Facilitated Discussion) as seen in Table 10.

By substituting the three ICAP element groupings for those most similar to the Teaching Presence components, (instructional design & organization = passive, directed instruction = active, and facilitated discussion = constructive/interactive), 5 of the 13 total instrument items, or 38% of the items, matched the expected factor loading. In examining the three separate categories of passive, active, and constructive/interactive, the passive factors matched at 75%, the active factors matched at 33%, and the constructive/interactive matched at 17%.

For this portion of the study, the passive category of ICAP was included, as the instructional design and organization tasks of teaching presence are conducted almost exclusively before the course begins; a responsibility almost entirely completed by course teachers. The ICAP passive stage is named as such because it occurs at a shallow and isolated level without manipulation or action (Chi et al., 2018), but only in the presence of a cue or context (Chi & Wiley, 2014). Further, as a result of the instructional design and organization

performed prior to the course beginning, it can be deduced that most undergraduate students would, at the start of a course, superficially “take in” the text (Chi et al., 2018), read the course text silently or aloud, or pay attention to a short lecture without overtly engaging with the instruction (Chi & Wiley, 2014). This isolated information, that does not include deep thinking, could include the instructor posting general information for students to check in the course, including course topics, course goals, activities, and due dates.

There are several interpretations for these results that the construct validity of the Arbaugh Teaching Presence Instrument poorly fit the ICAP framework of observable student engagement behaviors. Similar to Research Question 1, reasons for the discrepancies could include needed wording changes and modification of the structure of the original teaching presence instrument and/or differences in characteristics and motivations of the study participants. As mentioned earlier, phrasing of the 13-item Arbaugh Teaching Presence instrument may need to be refined and it may be necessary to return to the former wording and structure of the 17-item survey. It is possible that students in this study interpreted several pairs of survey questions to be similar and answered them as such. For example, three questions appear to be similar in that they all include the phrase “course topics.” In addition, students in this study may have attempted to combine two questions that included the word “feedback” and two questions involving “learning activities.” It is also possible students in this study had a difficult time differentiating between two questions involving milestones in the course, specifically, “due dates and timeframes” and keeping participants “on task.”

### **Implications**

The outcome of this research contributes to existing literature by providing an examination and validation of the construct of an established teaching presence instrument, as

determined by the direct instruction, instructional design and organization, and facilitating discussion components (Anderson et al., 2001). While it was determined in this study that the construct validity of the 13-item Arbaugh Teaching Presence instrument did not measure the teaching presence as intended and that the Arbaugh Teaching Presence instrument did not fit the ICAP framework of observable student engagement behaviors, there are several implications for practice.

### **Construct Validity of the Arbaugh Instrument**

The significance of teacher presence in online learning has been reliably demonstrated in academic literature (Garrison et al., 2010; Hung & Chou, 2015; Wicks et al., 2015); however, Garrison and Arbaugh (2007) and Arbaugh et al. (2008) recommended that quantitative analysis is necessary to validate the structure of teaching presence instruments, particularly in online environments. Kennan et al. (2018) and Miller et al. (2018) have also stated that further research and additional examination of current instruments assessing effective online teaching presence is necessary. There exists concern among researchers that when completing existing teaching presence instruments, community college and undergraduate students may be unable to delineate between instructional design, facilitating discourse, and directed instruction survey items (Arbaugh, 2007; Garrison et al., 2010). Specifically, modifications of the number of items and the wording of the teaching presence instrument since 2003 (see Table 1) may have compromised structure and validity of the original teaching presence survey. In short, a reliable, well-researched teaching presence instrument is needed for use in online learning environments.

While the growth of Quality Matters and the existence of tools like the National Survey of Student Engagement (NSSE) and various national assessments of student satisfaction and learner retention underscore the importance of teaching presence, the results of this study also

indicate there exists a gap among educators and facilitators on the definition and components that make up the concept of teaching presence. It would be worthwhile for educators to share a common understanding of the three components of teaching presence (instructional design and organization, facilitated discussion, and directed instruction), so teachers understand principles that combine theory, academic research, and skills required for successful online teaching. In order to provide students a strong sense of teaching presence and a supportive online community, it is necessary for teachers to undergo training on the significance, importance, and best practices for teaching presence in order to create a successful online experience for students. Simply training teachers in online learning, LMS management, and technical skills is not enough.

Another implication involves past discrepancies over the strength of three components of teaching presence (instructional design and organization, facilitated discussion, and directed instruction). Further study should be undertaken to determine the importance, impact, and connection between the three areas that comprise this construct. If the three components are studied and it is determined that one or more greatly influence student engagement, satisfaction, and learning outcomes, it would further define areas of needed focus and skill development for teachers who teach in online learning environments. An awareness of the importance of teaching presence in online instruction may encourage university administrators to fund professional development specific to establishing teaching presence in online courses.

In the literature, researchers examining the teaching presence instrument have pushed for a focus on outcomes vs. processes and empirical research vs. research based on student perceptions (Miller et al., 2018; Rourke & Kanuka, 2009). In addressing empirical research versus student perceptions, Rourke and Kanuka (2009) criticized the prevalence and use of student self-reported surveys versus descriptive statistics. Referencing outcomes versus

processes, Rourke and Kanuka (2009) cited references to more than 200 studies containing the Community of Inquiry (CoI) framework and the teaching presence instrument. According to Rourke and Kanuka (2009), only five studies were shown to measure learning; the remaining studies did not demonstrate first-hand instances of learning. Akyol et al. (2009) responded to Rourke and Kanuka (2009), stating the CoI framework is primarily a process model focused on the educational transaction within a constructivist orientation, rather than an outcomes-based measure. The teaching presence concept is also process-based as researchers define it as the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes (Anderson et al., 2001).

Finally, Arbaugh (2007) suggested further research is needed on the teaching presence component of the Community of Inquiry to determine the possibility that course design and organization is a distinct construct from teaching presence. Since instructional (or course) design and organization happens before the course begins, it could be a distinct component of CoI, followed by the combined elements of social presence, cognitive presence, and teacher presence. (Arbaugh, 2007).

### **Comparison of ATP Construct Validity to Established ICAP Literature**

The ICAP framework was developed by Chi (2009) as a method of classifying and differentiating between active, constructive, and interactive observable engagement activities and the underlying cognitive processes. The ICAP framework could be further developed and strengthened by additional evaluation of equivalent learning outcomes for two activities classified in the same ICAP mode (e.g., both constructive), and by selecting tasks in different categories of ICAP and predicting results based on contrasting conditions [e.g., rephrasing material (constructive) compared to summarizing material (active)] (Chi, 2009). For teachers,

instructional designers, and academic researchers, it would reinforce the usefulness of the ICAP framework to have further instruction, rubrics, and best practices developed for the use and application of the framework in designing, developing, and evaluating specific tasks and activities in online coursework.

Additionally, as mentioned in the delimitations and limitations section, it would strengthen the ICAP framework to further investigate the division of constructive and interactive components (Chi, 2009; Chi & Wiley, 2014). As both levels of behaviors (constructive and interactive) can be seen as equally intellectually challenging, the issue of combining the modes or keeping them separate is likely to be debated by research by researchers, academics, and teachers who use the ICAP framework.

### **Implications for Practitioners and Administrators**

Implications for instructors include a focus on creating a clear, purposeful online course design for students to have the time, resources, and direction to do their best work, especially for those new to online learning. Further, instructors should recognize that undergraduate and graduate students likely have different teaching presence needs, and it is the instructor's job to recognize and adjust for that support. Administrators, in examining how best to measure teaching presence, can implement Quality Matters, or a similar benchmarking tool for online course design, which include rubrics/standards for course interactions, feedback, and communication. Administrators, additionally, must determine best practices for assessing online teaching presence which go beyond the beyond the traditional student-reported surveys or the examination of discussion forums to address criticisms of outcome versus processes and empirical research versus perception (Rourke & Kanuka, 2009).

## **Recommendations for Future Research**

There are a number of recommendations for future research based upon the review of the related literature, results, conclusions, delimitations, and limitations of this study. In the future, this study could be replicated with a larger population of undergraduate college students, across multiple courses, allowing additional academic contributions.

### **Construct Validity of the Arbaugh Instrument**

Future research specific to the Arbaugh Teaching Presence instrument could include exploration using a replication of the exploratory factor analysis, and confirmatory factor analysis, and structural equation modeling. EFA, CFA, and SEM could be considered if researchers determined that modification of the 13-item instrument's wording may reveal additional insights regarding teaching presence. Utilizing a larger and wider sample for the Arbaugh Teaching Presence instrument, as well as incorporating demographic information, would possibly produce meaningful academic results. In addition, examining the ATP across different courses and majors may yield valuable insights, as would a multi-institutional study. Employing mixed methods may also strengthen the existing research, as would a study employing only qualitative methods, allowing for deeper research into the specific teaching presence components of instructional design and organization, facilitated discussion, and directed instruction. As such, each of the three components of teaching presence could be studied individually with both undergraduate and/or graduate students.

Future qualitative research could focus solely on learners, teachers, or both sets of participants. In terms of a focus on individual teachers, quantitative and qualitative information specific to teaching practices and communication style and the influence of both on teaching presence could provide significant insights for future educators. In the future, comparative

research on the 13-item and the 17-item version of the teaching presence instrument should be considered, based on the results of the current study. The use of multiple disciplines and institutions, as well as quantitative and qualitative methods to extract results, could prove useful in the academic and practical considerations of teaching presence and its influence on the success, satisfaction, retention, and engagement of students.

Finally, more teaching presence research is needed (Kennan et al., 2018; Miller et al., 2018). A challenge remains in identifying and reaching agreement on the factors and components that demonstrate effective teaching presence (Kennan et al., 2018; Kennette & Redd, 2015). Further study of the teaching presence instrument between college levels is needed. Community college and undergraduate students may be unable to delineate between instructional design, facilitating discourse, and directed instruction (Arbaugh, 2007; Garrison et al., 2010). As mentioned previously, researchers have pushed for a focus on outcomes vs. processes and empirical research vs. research based on student perceptions (Miller et al., 2018; Rourke & Kanuka, 2009).

In addition, as instructional (or course) design and organization happens before the course begins, further research should be undertaken to determine if instructional design and organization is a distinct component of CoI, followed by the combined elements of social presence, cognitive presence, and teacher presence. (Arbaugh, 2007). Clearly, it is time for researchers to create a new instrument that measures teaching presence, teaching effectiveness, and examines subsequent student learning outcomes.

### **Comparison of ATP Construct Validity to Established ICAP Literature**

As mentioned in the delimitations and limitations section, it would possibly strengthen the ICAP framework to further investigate the division and/or combination of constructive and

interactive components (Chi, 2009; Chi & Wiley, 2014). It is likely this separation of observable, overt engagement behaviors (constructive and interactive), both equally intellectually challenging, will continue to be debated in future research by researchers, academics, and teachers. It is recommended that further study investigate these two components of the ICAP framework using a more substantial population of undergraduate students similar to the students utilized in this study. It would further expand the understanding and use of this framework by investigating the two components in a multi-departmental or multi-university study. It would be prudent to determine how the demographic components of age, gender, or income would impact a proposed combination of the constructive and interactive components.

Further, as the ICAP framework measures the specific overt, observable engagement behaviors of learners (Chi, 2009; Chi & Wiley, 2014), it would add to the academic research if best practices were outlined in determining how best to classify observable behaviors into the proper ICAP level, especially when working in online learning environments. Additional studies are necessary in larger populations of undergraduate students to provide further examples, observations, and clarifications of the overt, observable ICAP behaviors in each of the four categories (interactive>constructive>active>passive), particularly in the passive component, which can be difficult to quantify in an online environment. These examples could be further expanded and delineated by comparing undergraduate and graduate online students in similar disciplines, comparing online students in different academic majors, and examining the overt, observable behaviors in professional online environments, the latter similar to the Zhang et al. (2016) study. When researching examples and further clarification of overt engagement behaviors, it would also add to the academic literature if it could be determined whether and how the demographic components of age and gender impact the results of the research. A larger

quantitative, mixed-methods, or multi-institution study, utilizing undergraduate and/or graduate students, may provide additional academic insights.

Finally, another recommendation for future research includes the further development and validation of an instrument to measure the levels of cognitive engagement that represent the four levels of the ICAP framework. While ICAP provides a way for teachers and instructional designers to categorize tasks and activities in order to promote deeper learning and more student engagement, Pitterson et al. (2016) have piloted a tool for students to self-measure how they cognitively engage to complete course assignments, including cognitive load, task complexity, mental exertion, and concentration. The tool was constructed using interviews of 48 undergraduate students (Pitterson et al., 2016). The student self-reported tool measuring the level cognitive engagement during the completion of tasks, when completed, will add to the resources teachers and instructional designers can utilize when creating future courses and activities.

### **Conclusions**

The main emphasis of this study's investigation of teaching presence was to examine the construct validity of the 13-item Arbaugh Teaching Presence instrument and, further, to determine whether the ATP fit the ICAP framework of observable, overt student engagement behaviors. Even though the study outcomes were not as expected, the research results serve as the groundwork for future studies focusing on or related to teaching presence.

The motivation behind initiating this study were conclusions in recent academic literature on the rapid growth of online courses, the increasing issue of student retention in online courses, and the impact of teaching presence and student engagement as related to both challenges. As a result, this study investigated whether the Arbaugh Teaching Presence instrument measured teaching presence as intended in a particular online undergraduate learning environment. The

study also examined ways in which the construct validity of the Arbaugh Teaching Presence instrument fit the ICAP framework of observable student engagement behaviors. Although the findings revealed poor fit considering both the ATP instrument and the ICAP framework, the results underscore the necessity to continue research on the construct of teaching presence, which is shown to influence and be a crucial factor in online learning (Garrison et al., 2010; Hung & Chou, 2015; Wicks et al., 2015). Garrison (2007) underscored that teaching presence is an important influence when examining student satisfaction, perceived learning, and sense of community, leadership throughout the course of online study (Akyol et al., 2009), and a contributor to student retention (Street, 2010). Students also remained more engaged and accountable when they considered teaching presence illustrative of a “real” person (Kennette & Redd, 2015) who showed genuine caring and concern about students (Stronge et al., 2011).

It is important to note that generalizations of this study’s findings must be made with caution due to the small sample size and the multi-instructor formats of the course. Future research studies with larger sample sizes, across multiple disciplines and institutions could be carried out to derive more generalizable results. Keeping these points in mind, it is the opinion of this researcher that the components and tenets of teaching presence (Anderson et al., 2001, Garrison et al., 2000) remain effective and crucial for effective and meaningful online course design, development, and implementation.

In conclusion, this study has contributed to the practice of the field by recommending a replication of the current study, using exploratory factor analysis to assess the construct validity of the 13-item teaching presence instrument. In addition, it was recommended that future researchers perform confirmatory factor analysis and structural equation modeling using the ATP survey. EFA, CFA, and SEM could be considered if researchers determined that modification of

the 13-item instrument's wording may reveal additional insights regarding teaching presence. Utilizing a larger and wider sample of students taking the ATP, as well as incorporating demographic information, would possibly produce meaningful academic results.

This study has also contributed to the practice of the field by recommending further investigation into the combination of the constructive and interactive components of the ICAP framework (Chi, 2009; Chi & Wiley, 2014). Although ICAP is composed of levels of cognitive engagement (interactive>constructive>active>passive), the researcher disagrees that the interactive level of observable engagement behaviors is superior to the constructive level of observable engagement behaviors (Chi, 2009). Additional quantitative or mixed-methods research with a larger population may provide additional academic insights.

This study has contributed to the literature of the field by concluding the 13-item Arbaugh Teaching Presence instrument did not measure the teaching presence construct as intended. Through examination of academic literature, modifications to the teaching presence instrument since 2003 may have compromised structure and validity of the original teaching presence survey. It is the opinion of the researcher that the wording of the 13-item Arbaugh Teaching Presence instrument may need further validity assessment with a larger undergraduate population. It may be necessary to refine the 13-item instrument or return it to the former wording and structure of the original 17-item survey. Similarly, it was determined that the construct validity of the Arbaugh Teaching Presence Instrument did not fit the ICAP framework of observable student engagement behaviors. Even though the study outcomes were not as expected, the research results serve as the groundwork for future studies focusing on or related to teaching presence.

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APPENDIX A

TEACHING PRESENCE MEASURES INSTRUMENT

5-point Likert-type scale

1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree

1. The instructor clearly communicated important course topics.
2. The instructor clearly communicated important course goals.
3. The instructor provided clear instructions on how to participate in course learning activities.
4. The instructor clearly communicated important due dates/time frames for learning activities.
5. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.
6. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.
7. The instructor helped keep course participants engaged and participating in productive dialogues.
8. The instructor helped keep the course participants on task in a way that helped me learn.
9. The instructor encouraged course participants to explore new concepts in this course.
10. Instructor actions reinforced the development of a sense of community among course participants.
11. The instructor helped focus discussion on relevant issues in a way that helped me learn.
12. The instructor provided feedbacks that helped me understand my strengths and weaknesses relative to the course's goals and objectives.
13. The instructor provided feedback in a timely fashion.

APPENDIX B

INSTITUTIONAL REVIEW BOARD (IRB) CERTIFICATION

November 21, 2018

Laura McNeill  
College of Education  
Box 870302

Re: IRB#: 18-OR-427 "The Relationship between Teaching Presence and Online Engagement Behaviors: A Replication Study"

Dear Laura McNeill

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review categories 5 & 7 as outlined below:

(5) Research involving materials (data, documents, records or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis)

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

Your application will expire on November 15, 2019. If your research will continue beyond this date, complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, complete the Modification of an Approved Protocol Form. Changes in this study cannot be initiated without IRB approval except when necessary to eliminate apparent immediate hazards to participants. When the study closes, complete the appropriate portions of the IRB Request for Study Closure Form.

Please use reproductions of the IRB approved stamped consent form to provide to your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,



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APPENDIX C  
REPRODUCED CORRELATIONS

**Reproduced Correlations**

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	
Reproduced Correlation	Q1	.917 <sup>a</sup>	.849	.862	.845	.813	.835	.754	.769	.794	.728	.821	.817	.867
	Q2	.849	.846 <sup>a</sup>	.862	.694	.778	.793	.651	.611	.746	.688	.778	.744	.756
	Q3	.862	.862	.895 <sup>a</sup>	.698	.838	.839	.719	.656	.809	.779	.846	.766	.769
	Q4	.845	.694	.698	.906 <sup>a</sup>	.704	.734	.752	.846	.707	.637	.721	.768	.866
	Q5	.813	.778	.838	.704	.864 <sup>a</sup>	.840	.814	.748	.851	.874	.891	.748	.757
	Q6	.835	.793	.839	.734	.840	.830 <sup>a</sup>	.785	.741	.825	.821	.861	.760	.780
	Q7	.754	.651	.719	.752	.814	.785	.859 <sup>a</sup>	.842	.821	.864	.854	.716	.758
	Q8	.769	.611	.656	.846	.748	.741	.842	.896 <sup>a</sup>	.763	.769	.785	.728	.810
	Q9	.794	.746	.809	.707	.851	.825	.821	.763	.843 <sup>a</sup>	.872	.882	.737	.751
	Q10	.728	.688	.779	.637	.874	.821	.864	.769	.872	.955 <sup>a</sup>	.918	.695	.691
	Q11	.821	.778	.846	.721	.891	.861	.854	.785	.882	.918	.924 <sup>a</sup>	.762	.772
	Q12	.817	.744	.766	.768	.748	.760	.716	.728	.737	.695	.762	.736 <sup>a</sup>	.783
	Q13	.867	.756	.769	.866	.757	.780	.758	.810	.751	.691	.772	.783	.856 <sup>a</sup>
Residual <sup>b</sup>	Q1		-.030	-.001	-.016	.015	-.020	.020	-.011	.003	-.006	-.001	-.043	.000
	Q2	-.030		-.049	.010	-.038	-.046	.048	.043	.014	-.013	.010	-.041	-.053
	Q3	-.001	-.049		.017	-.010	-.030	-.006	.027	-.029	.000	.015	-.027	-.016
	Q4	-.016	.010	.017		.011	.009	.005	-.033	.032	.009	-.025	-.063	-.050
	Q5	.015	-.038	-.010	.011		-.020	-.016	-.033	-.034	.008	-.034	-.054	.064
	Q6	-.020	-.046	-.030	.009	-.020		-.015	-.027	-.001	-.006	-.031	.018	-.001
	Q7	.020	.048	-.006	.005	-.016	-.015		-.048	-.031	-.031	-.010	-.039	-.017
	Q8	-.011	.043	.027	-.033	-.033	-.027	-.048		-.007	-.009	.034	.004	-.041
	Q9	.003	.014	-.029	.032	-.034	-.001	-.031	-.007		-.021	-.030	-.026	-.027
	Q10	-.006	-.013	.000	.009	.008	-.006	-.031	-.009	-.021		-.016	.032	.011
	Q11	-.001	.010	.015	-.025	-.034	-.031	-.010	.034	-.030	-.016		.009	.000
	Q12	-.043	-.041	-.027	-.063	-.054	.018	-.039	.004	-.026	.032	.009		-.023
	Q13	.000	-.053	-.016	-.050	.064	-.001	-.017	-.041	-.027	.011	.000	-.023	

Extraction Method: Principal Component Analysis.

a. Reproduced communalities

b. Residuals are computed between observed and reproduced correlations. There are 4 (5.0%) nonredundant residuals with absolute values greater than 0.05.

APPENDIX D  
SCREE PLOT

