EXPLORING BLENDED LEARNING RELATIONSHIPS IN HIGHER EDUCATION USING A SYSTEMS-BASED FRAMEWORK

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ABSTRACT

The adoption of a blended learning approach is increasing among higher education institutions with a significant amount of research that focuses on linear relationships. However, there is limited research on how the blended learning environment functions and interacts as a complex system. There is a need for more research that explores the relationships that exist within a blended learning environment using a system-based framework, such as the Complex Adaptive Blended Learning Systems (CABLS) framework. The purpose of this qualitative phenomenological study was to explore the perceived relationships that exist within the CABLS in a higher education blended learning environment. Interviews were conducted with the learner, teacher, institutional administrators, and learning support staff. A thematic analysis was used to identify themes to better understand stakeholder relationships within the CABLS framework. The results of this study seek to provide all stakeholders with a better understanding of the complex interdependent relationships within the CABLS framework to optimize a collaborative approach to blended learning.

Keywords: Blended learning, higher education, complex adaptive systems, framework, stakeholders, relationships.

INTRODUCTION

Blended learning has expanded in education over the past several years. According to Graham, Woodfield, & Harrison (2013), blended learning is a learning environment that utilizes both "face-to-face and computer-mediated instruction" (p. 4). The blended learning approach is gaining momentum globally and it is evolving into the "new standard" (Graham, Woodfield, & Harrison, 2013; Liu et al., 2016; Smith & Hill, 2019) While blended learning has moved away from traditional classroom teaching theories, it has numerous advantages, some of which include reduced seating time, increased flexibility in student learning, and increased student control in their learning environment (Horn & Fisher, 2017). More institutions are adopting blended learning environments due to the perception that this approach leads to improved student engagement (Garrison & Kanuka, 2004; Graham & Robison, 2007; Manwaring, Larsen, Graham, Henrie, & Halverson, 2017). This educational shift may help students obtain a higher quality learning experience with improved learning outcomes (Garrison & Kanuka, 2004; Garrison & Vaughan, 2013; Graham et al., 2013; Hew & Lo, 2018; Means, Toyama, Murphy, & Baki, 2013; VanDerLinden, 2014).

A system-based perspective can be used to understand and evaluate the complexities of a dynamic ecosystem. Wang, Han, & Yang (2015) proposed the CABLS framework that is grounded in the adaptive systems theory. Complex adaptive systems theory has been used to comprehend the dynamic relationships between non-linear systems (Wang et al., 2015). Complex adaptive systems are described as dynamic systems that

"exchange matter, energy, or information across its boundaries and use that exchange of energy to maintain its structure" (Cleveland, 1994). These subsystems exist on the "edge of chaos" and have the ability to always maintain balance and stability in the midst of chaos (Waldrop, 1992). Complex adaptive systems have five key characteristics: complexity, self-organization, adaptability, dynamism, and the ability to coevolve (Cleveland, 1994). These components keep the system healthy and innovative.

As seen in Figure 1, Wang et al.'s (2015) CABLS framework addresses six interdependent components of a blended learning ecosystem. The framework offers a clear view of the six subsystems (teacher, learner, institution, learning support, technology, and content influence the blended learning environment) that interact with one another in a blended learning environment (Wang et al., 2015). These subsystems function as dynamic units rather than silos of isolation (Wang et al., 2015). The CABLS can give stakeholders a better understanding of the different components of blended learning which may help make the process more effective (Wang et al., 2015). This framework can serve as a guiding force to drive blended learning research and institutional adoption of cohesive blended learning environments.

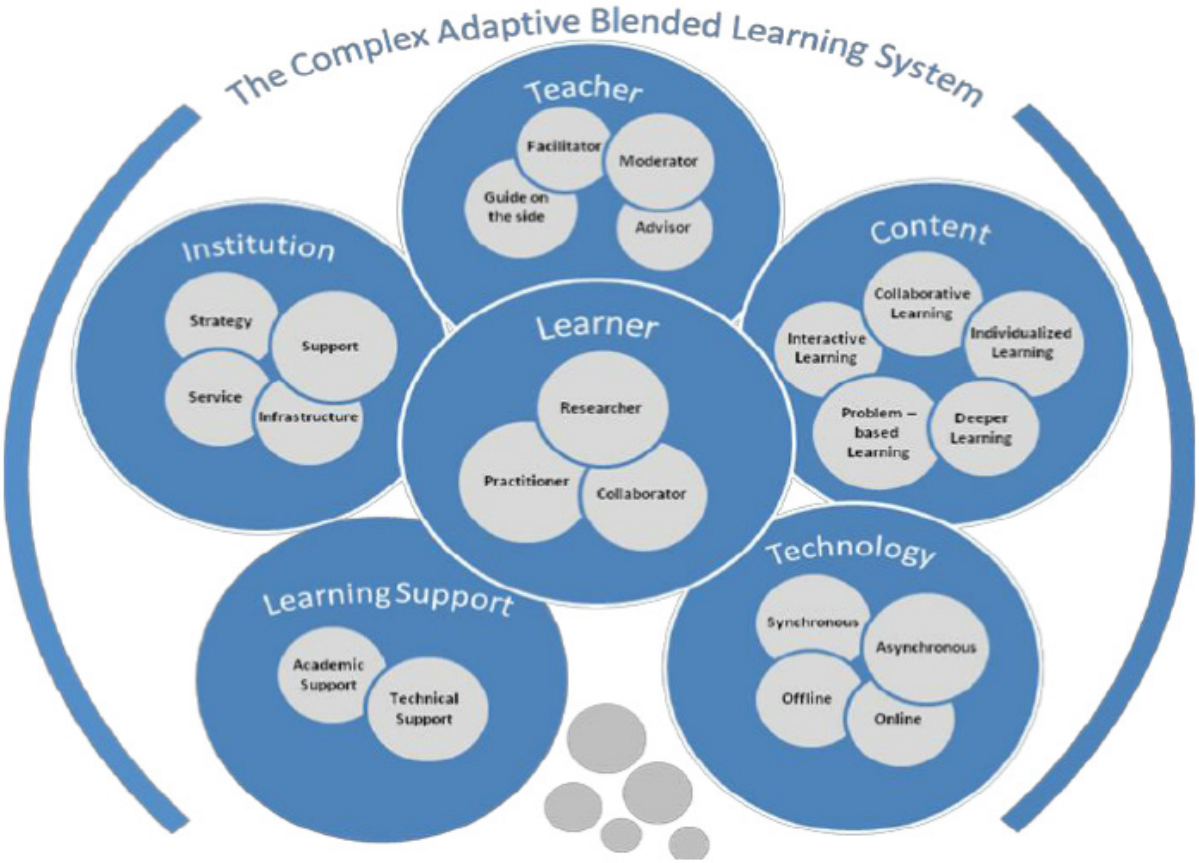

Figure 1. The complex adaptive blended learning system (Used with permission from Wang et al., 2015)

The adoption of a blended learning approach is increasing among higher education institutions, however there is limited research on how a blended learning environment functions as a complex system (Wang et al., 2015). Wang et al. (2015) suggested that future research should focus on the non-linear relationships in blended learning with application of the Complex Adaptive Blended Learning Systems (CABLS) framework to higher education institutions. There is a need for more research focused on how individuals perceive the non-linear relationships using a blended learning framework, such as the Complex Adaptive Blended Learning Systems (CABLS) framework. This gap in the literature presents a need for researchers to explore all six of the inter-dependent components in a higher education environment. Through understanding the webbed roles and relationships within a blended learning environment, stakeholders in higher education institutions and researchers can participate in more collaborative practice and inclusive research.

Blended learning is a widely used model of learning in education. In a systematic review and metanalysis using 56 articles, Liu et al. (2016) found that blended learning, compared to no intervention, had positive effect on learning. In addition, blended learning instruction was found to be as effective or more effective that traditional instruction for knowledge acquisition (Liu et al., 2016). Blended learning also has positive impacts at the course level. Vo, Zu, and Diep (2017) conducted a metanalysis that compared student's performance in a course that utilized a blended learning approach to student performance in a traditional classroom. The results showed that students in STEM disciplines had improved learning outcomes compared to those in a traditional classroom environment (Vo et al., 2017). A blended learning environment leads to positive student outcomes, however little research addresses the dynamic relationships that contribute to these beneficial outcomes.

There are many relationships that exist within a blended learning environment. Numerous research studies have explored linear relationships within the blended learning environment (Boelens et al., 2018; Holmes & Prieto-Rodriguez, 2018; Horn & Fisher, 2017; Thurab-Nkhosi, 2018) however, none have explored the dynamic relationships amongst all of the components involved in the blended learning environment (Wang et al., 2015). In a qualitative study Boelens et al. (2017), explores faculty's perceptions regarding blended learning instruction. In addition to students' perceptions, faculty and staff perceptions have also been explored. In a mixed methods study, Holmes and Prieto-Rodriguez (2018) 46 evaluated how staff and 470 students perceived a blended learning management system. Results showed that both groups felt the LMS was effective and appreciated the interactivity of the LMS tools (Holmes & Prieto-Rodriguez, 2018). However, there were differences in opinion around the accessibility on the online content (Holmes & Prieto-Rodriguez, 2018). Administrator perceptions have also been explored within blended learning research. Thurab-Nkhosi (2018) conducted a qualitative study that explored administer officer's and dean's perceptions of the implementation phase of blended learning. Results showed that leaders should provide a clear vision and strategies for effective blended learning (Thurab-Nkhosi, 2018). While these studies explored several linear relationships within the blended learning environment, no studies were found that addressed all components in Wang et al.'s (2015) CABLS framework.

PURPOSE OF THE STUDY

The purpose of this qualitative phenomenological study was to explore the perceived relationships of a higher education blended learning environment using Wang et al.'s (2015) CABLS conceptual framework. Previous research has focused on linear-relationships in a blended learning environment. This study seeks to address a gap in the research by exploring the complex relationships that exist in a blended environment using multiple stakeholder groups (i.e. teachers, learners, institutional administrators, learning support members) The following central research question was used to guide the studies' direction: How do stakeholders perceive their relationships within the CABLS framework in a higher education health science blended learning environment? The purpose and research question generated the following two research objectives: 1). Explore how stakeholders perceive relationships within the CABLS framework subsystems (i.e. teacher, learner, institution, learning support, technology, and content) in a blended higher education setting. 2). Discover how the CABLS framework may allow stakeholders and researchers to understand the complex, dynamic, and collaborative relationships within a blended learning ecosystem.

METHOD

To meet the stated objectives, a phenomenology approach (Creswell & Creswell, 2017). Phenomenology is used when the researcher seeks to explore the essence of a phenomenon (Creswell & Poth, 2018). This approach focuses on understanding the meaning of an individual's lived experience (Creswell & Poth, 2018). Institutional Review Board (IRB) approval from University of Saint Augustine for Health Sciences (USAHS) was obtained prior to data collection. All participants reviewed, thoroughly understood, and signed an informed consent document that was approved by the IRB. Data and confidential documents were stored in an electronic password protected drop box to which the principal investigator and co-investigator had access to. The participants were made aware of the purpose of the research, the timeline, their rights, and

the confidentiality agreement. The participants agreed to the parameters of the study. The interviews were recorded using either Skype for business, a recorder, or both means. These recordings were transcribed to be further analyzed.

Participant Selection

Participants were selected from USAHS, a higher education institution located in Saint Augustine, Florida. We determined we would interview various stakeholders from this institution due to its adoption of a blended learning approach. The stakeholder groups were derived from the CABLS framework and consisted of: faculty, students, institutional administrators, and learning support. Purposive sampling was used using criterion and snowball strategies (Creswell & Poth, 2018). Criterion sampling was used to select cases that met the criteria for one of the four stakeholder groups (i.e. faculty, students, learning support, institutional administrators). Snowball sampling was used to select participants based off feedback from individuals that know what participants might be 'information-rich' candidates (Creswell & Poth, 2018).

A total of 24 participants were included in the study. In order to explore perceived relationships within each component of the CABLS framework, 6 participants from each stakeholder group were interviewed. According to Guest, Bunce, & Johnson, 2006, the majority of the findings can be collected within 6 interviews, with saturation occurring within 12 interviews. Only 6 interviews were conducted within each stakeholder group due to participant availability.

Faculty were selected that teach blended courses within the master's in occupational therapy program. Students were sampled from the 8th term flexible occupational therapy program cohort. This cohort completed the didactic blended learning coursework, which provided the students with deep insight into their blended learning experiences. The flexible program offers blended and online courses for students to pursue their Master of Occupational Therapy. Students typically complete the online portion of their studies throughout the week and complete the laboratory hands on component on the weekends in a face to face manner. Learning support participants were sampled from technical support and academic support teams within the university (Wang et al., 2015). Institutional administrators were selected that oversaw blended learning programs and processes.

Data Collection and Analysis

Qualitative data was collected using interviews. 45-60 minute semi-structured interview sessions were held for each stakeholder. Interviews were conducted by the principal investigator and the co-investigator with the learner, teacher, institutional administrators, and learning support staff. The interviews were held via web conferencing (Skype) or face-to-face at USAHS. The stakeholder groups were chosen in order to provide the perceptions and experiences needed to answer the research question. The interviews allowed the researchers to explore how the stakeholders perceived their relationships within their blended learning environment. Field notes were taken during the interview process. All interviews were recorded and transcribed for analysis. Interview data was stored in a password protected electronic drop box to which the principal investigator and the co-investigator had access. Interviewees were compensated for their time with a small gift card. The semi-structured interview guide is included in Appendix A. The interview questions were aligned with the subsections of Wang et al.'s (2015) CABLS conceptual framework. The questions were constructed to understand stakeholder's perceptions of the perceived relationships within the framework.

Our data analysis processes used the structured methods from Creswell and Creswell (2017), Creswell and Poth (2018), Moustakas (1994), and Saldaña (2016). The data sources within this study included 24 interviews, transcript documents, field notes, and analytic memos. The data was organized into files using NVivo software. All codes were placed into the NVivo software system with the participant's personal information decoded. Additional files were created for analytic memos and reflexive journals.

Trustworthiness

Throughout the data analysis process, the investigators maintained trustworthiness through achieving the standards of credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). This structured process increases confidence in the study's findings (Creswell & Poth, 2018). Credibility was achieved through triangulation and the process of member checking. Triangulation was achieved by including multiple investigators and stakeholder groups in the study. Member checking involved participants reviewing and verifying the accuracy of the interview transcripts. Transferability was achieved by creating a rich and thorough description of the procedures, participants and context within the study. This process allows the reader to determine if the findings can be transferred to other settings. Dependability was achieved through the use of an audit trail. An audit trail serves as a transparent record of raw data, methodological processes notes, and analytic memos. This allows the reader to assess and determine if proper research steps were taken throughout the study. Confirmability was achieved by using a reflexive journal. The researchers kept a journal to document thoughts that reflected upon the researcher's perspective and biases.

Data Analysis and Representation

All data was reviewed multiple times before the initial coding process. In Vivo codes were selected for the initial coding because they represented the actual language of the participants (Saldaña, 2015). According to Ravitch and Carl (2016), a code can be a word or phrase that ties meaning to the data (Ravitch & Carl, 2016). The codes can merge together to form categories or significant statements that organize data into sets based off a similarity within the data (Creswell & Creswell, 2017; Moustakas, 1994; Ravitch & Carl, 2016). Based off the initial coding, significant statements were developed to allow for data to be grouped in categories that summarized the initial codes (Creswell & Creswell, 2017; Moustakas, 1994; Saldaña, 2015). After the data was categorized into significant statements, broader meaning units or themes were developed to represent clusters of data (Creswell & Creswell, 2017; Moustakas, 1994). A theme represents significant concepts within the data sets (Ravitch & Carl, 2016). Themes can be "summary statements, causal explanations, or conclusions" (Rubin & Rubin, 2011, p 193). Finally, a textural description, structural description, and composite description were developed (Creswell, & Creswell, 2017; Moustakas, 1994).

FINDINGS

Themes: Perceived Framework Relationships

Through reviewing the interviews, transcript documents, field notes, and analytic memos, several themes emerged from the data. See Figure 2 for the significant statements and themes for perceived stakeholder relationships.

Theme 1: Collaborative Relationships

Participants expressed that their relationships involved collaboration with the other stakeholders within the CABLS framework. Collaboration centered around curriculum development, problem solving, student learning, and technology selection. Responses for curriculum development included the following signature statements:

- We collaborate together during curriculum development. We are working with the academic leadership for accreditation and what standards we need to meet, and what policies are in place. We are working with learning support, like the librarians and student services, to make sure that we have the right resources, and they have the right resources to help students. We are making sure that we're using the best technology and how that technology can help convey the content better. We're developing the content and revising the content as necessary. We're working with students and thinking about student's reactions prior to learning. I work with the faculty member and the content, and we fill everything out on a blueprint.

Responses for problem solving included statements such as: "When we have issues; when students are kicked out of quizzes or exams. That creates an issue in the classroom, so everyone has to pull together to figure out how to handle the situation". Responses for student learning included statements such as "it should be a partnership where we're supporting each other in our goals, and helping to figure out what works best for the student" and "technology is there and it's beautiful and it's great to use for our anatomy students, but if you just put in the library and say okay students access this, they never will unless you incorporate it as part of what you do with your class". Responses for technology selection include:

- When I come up with a new potential technology that we want to investigate, I need to talk to specific faculty who I believe might find this technology useful for their courses, discuss it with them and get their feedback so that when I evaluate the technology I can have a better idea of what it is that I'm looking for to meet those specific needs and objectives.

Theme 2: Complex Relationships

Participants expressed that they had complex relationships within the CABLS framework. The complex relationships were focused around meeting complex technology needs and having multiple components. Responses for meeting complex technology needs included the following significant statements: "they try to upgrade the technology as much as they can. It's just technology is difficult and trying to keep it updated and upgraded is difficult", "the challenge is dealing with the technology that's not working", and "students have several different types of systems that they're trying to connect with, multiple platforms, operating systems, desktop computers, laptop computers, iPads and things like that". Responses for multiple components included words and phrases such as "we all interact together to help the learner move through the process" and

- I think that the Title IV example is a perfect one because if the content is not developed properly so that students are encouraged and engaged on a weekly basis with such active interactions, then they don't qualify for the Title IV and the program's not eligible. If the technology doesn't measure that then we have no way of determining if that's occurring. If the learner's not engaging in that then they can't receive the Title IV, they get cut off from Title IV. If the learning support is not available to assure we are able to measure, then we don't have a method for tracking it. If the institution isn't compliant with that then, and doesn't have the proper resources in place, then again, we're going to lose that eligibility to the Federal Government. And then finally, the teacher has to track it and assure that it's always documented and available should we be called upon to produce that information.

Theme 3: Dynamic Relationships

Participants expressed that their relationships were dynamic. The dynamic relationships had an emphasis on an evolving nature, innovation, learning experience, and problem solving. Responses that alluded to an evolving nature included the following signature statements: "when it comes to technology, it is always changing", "during my experience in this blended program, there has been so much change", and "continually update".

Responses that focused on innovation included statements such as "because you have to be very open-minded and put yourself out there trying something new", "that students could actively see cutting edge technology that's being used appropriately for the clients that we would service" and "a lot of innovation that's created for blended material". Responses that focused on the learning experiences included significant statements such as "content should be presented in different ways, so the student can be able to interact with the information", and "dynamic learning".

Responses that focused on problem solving included statements such as "there is a lot of troubleshooting involved", "If the learners or the students specifically struggle with using the technology, it doesn't work on their platform, they're using Mac vs. PC, for example", and "I have to go back and work with the technology, or work with the institution, or the learning support to address the specific issues that are brought up".

Theme 4: Interdependent

Participants expressed that their roles and relationships were interdependent. They reported an emphasis on communication and reliance. Responses that addressed communication included the following significant statements: "it is important that we are communicating back and forth, and they understand what the other folks are also experiencing", "with learning support, I knew that if there was a problem, I could call and I could get immediate help, and most of the time they did not leave the phone with me until problem was solved" and "as the student runs into particular issues along the way, they need to have resources they can reach out to". Responses that addressed reliance included "technology, dependability and user-friendly", "The expectation is that the student actually does the work", "the institutional administrator has to provide the framework that encourages you to grow as a student", "I expect the instructor to present the information in a clear way and be available for any questions", and

The infrastructure has to be there. You shouldn't attempt to do this if you don't have the technology to support it. The technology should almost be that, it shouldn't even be on anyone's radar because it's just there. It's one of those things that you really shouldn't think about because you don't have to think about because it's seamless and it's done.

Theme 5: Student-Centered Relationships

Participants expressed that their relationships within the CA- BLS framework were student-centered. These student-centered relationships were centered around best practice, engaging the learner, and student learning outcomes.

Responses for best practice included the following significant statements: "You have to be focused on what's best for the learner" and "stay current with the national guidelines". Responses for engaging the learner included statements such as "make sure that the information enables them to learn more effectively and become more proficient at their particular skills" and "the learner is actually the center of it all". Responses for student learning outcomes included words and phrases such as "we work together to help the learner throughout the process of gaining knowledge and meeting their goals", "I think the common goal is ultimately the learning outcomes of our students" and "common goal is that the student can apply the information from a particular course in real life situations".

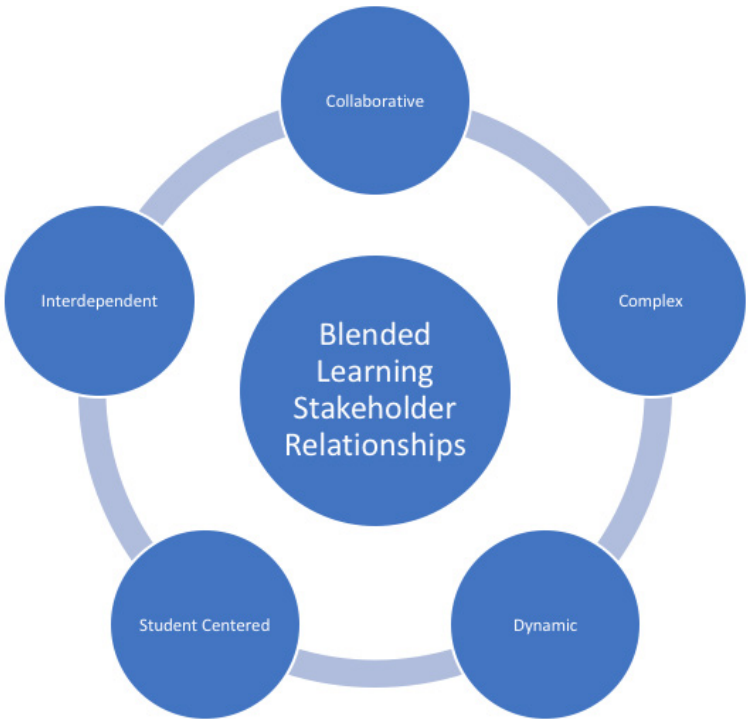

Figure 2. Relationships. This figure displays how stakeholders perceive their relationships of Wang et al.'s (2015) CABLS framework in a high education environment.

DISCUSSIONS AND CONCLUSION

Much of the previous research explored linear relationships between stakeholder groups (Boelens et al., 2018; Holmes & Prieto-Rodriguez, 2018; Horn & Fisher, 2017; Thurab-Nkhosi, 2018), however, none explored the dynamic relationships amongst all of the stakeholder groups in a blended learning environment (Wang et al., 2015). This study focused on exploring the dynamic relationships between different stakeholder groups by developing themes using all stakeholder groups identified in Wang et al.'s (2015) CABLS conceptual framework. Faculty, students, institutional administrators, and learning support members participated in this study to reflect upon their perceived relationships within a higher education blended learning context. Wang et al.'s (2015) CABLS framework was used to use explore the perceptions of stakeholders in a health science higher education setting. The application of the CABLS framework to this context revealed intimate and interdependent relationships that gives insight into the complexities of the blended learning ecosystem. The application of this framework allows for a deeper understanding of how stakeholders perceive meaning within various subsystems and within the entire blended learning system. It is important that all stakeholders have an appreciation of other's roles and how they interact with other components of the framework.

Faculty, students, institutional administrators, and learning support members reflected upon their perceptions of their relationships within the CABLS framework. All stakeholder groups collectively reflected upon how they interacted with the various components of the framework. These components included: the faculty, learner, institutional administrator, learning support, content and technology. Key themes were developed based off the data from all participants reflecting upon their relationships within the CABLS framework. Participants expressed that their relationships were collaborative, complex, dynamic, interdependent, and student-centered. The first theme revolved around participants feeling that collaborative relationships were necessary during curriculum development, problem solving, student learning, and technology selection. It was perceived that a collaborative approach was needed to pull together all stakeholders for input and decision making. Zanin-Yost and Dillen (2019) conducted a study with nursing faculty and librarian support staff and collaboration was also identified as key to support students' academic success. These findings support a collaborative approach from multiple academic stakeholders to ensure a well-developed blended learning environment and positive academic experience.

The second theme centered around participants perceiving the relationships within the CABLS to be complex. Participants perceived that they often had to work with complex technology needs in a blended learning environment. The technologies often had to be properly selected, integrated, updated, and implemented to provide a smooth learning experience. Participants also felt there were multiple moving pieces and multiple stakeholders that were involved in a blended environment. A positive student learning experience often depended upon all of the CABLS components working together in unison. Hamilton (2015) also supported this through the application of a complex systems framework when designing a personized learning community (PLC). Hamilton (2015) explained that there are several components or learning features within a PLC that are dependent upon each other and drive one another. These findings support that the complexities of the blended learning ecosystem need to work together for it to function properly.

Thirdly, participants perceived their relationships with the CABLS framework to be dynamic. There was a perception that a blended learning environment is always evolving and changing. Participants also expressed that there are many innovative approaches and technologies that are used in blended learning. Stakeholders felt that ongoing change allowed for content to be presented in multiple ways to facilitate dynamic learning. The constant exposure to new technologies required stakeholders to take on an open mind to try something new. When a new technology was introduced, stakeholders had to work together to select, implement, and troubleshoot problems. Evenhouse et al. (2017) reported the introduction of a course in blended learning environment can have a challenging transition. Instructors and faculty reported that consistent support as an innovation is introduced increases the chances of adoption and use (Evenhouse et al., 2017). These findings support that a blended learning environment is dynamic and constantly changing, and support and input from stakeholders facilitates positive change.

The fourth theme focused on interdependent relationships. Participants felt that communication was crucial in understanding how all stakeholders are working together in a blended learning environment. Responses confirmed that there was a feeling of reliance on other components of the CABLS framework to create a successful learning environment for the students. It was perceived that faculty, administrators, learning support staff, students, content, and technology had a natural reliance on each other to cultivate a healthy blended learning environment. Stakeholders stressed the multifaceted infrastructure and supportive technology needs to be in place to allow for a seamless learning experience. Kumar and Pande (2017) stated that a blended learning environment is an ecosystem that involves various stakeholders and technology. All of the ecosystem components must function together synchronously to achieve an effective learning platform (Kumar & Pande, 2017). A blended learning environment is a multifaceted ecosystem with intertwined and interdependent relationships.

Finally, all stakeholders perceived that their relationships were student-centered. Stakeholders expressed a responsibility to stay in line with best practice standards to provide an optimal learning experience for the students. Participants felt they had to work together throughout the blended learning process to help students meet their learning goals and course outcomes. NaliakaMukhale and Hong (2017) found that faculty should adopt a student-centered approach to optimize the achievement of student learning outcomes. In addition, Tamim (2018) found that successful teaching strategies in a blended environment should have a focus on "student-centered practices, particularly collaborative projects and student led activities" (p. 70). These findings suggest that a blended learning environment should support a collaborative and student-centered approach.

There were a few limitations of this study and implications for future research. This qualitative study was conducted within a health science higher education institution. The findings cannot be generalized to other populations to the same degree. The faculty and student participants were sampled from a graduate occupational therapy program. There may be limited carry over to other programs. There is the potential for future research to expand beyond this study. Future research could focus on the application of this system-based framework within other institutions or programs that offer a blended learning environment. Researchers could consider using a quantitative research approach that considers multiple variables (i.e. multivariate analysis or regression analysis) to examine the effectiveness of a blended learning environment while considering all components of the CABLS framework. Future research could also explore the roles of the various stakeholders within Wang et al.'s (2015) CABLS framework to gain a deeper understanding of their roles and perceptions within the blended learning environment.

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APPENDIX A

Semi-Structured Interview Guide

This interview guide is aligned with the components (i.e. faculty, learner, institutional administrator, learning support, content and technology) identified in Wang et al.'s (2015) CABLS framework.

- How would you describe your role and responsibilities in blended learning as a
- (faculty member, student, administrator, learning support member)?

- How does your role as a (faculty member, student, administrator, learning support member) interact with the other components of the framework (tell me about your relationships/interactions with the faculty, learner, institutional administrator, learning support, content and technology)?

- Can you describe a blended learning experience in which you interacted with the other components (faculty, learner, institutional administrator, learning support, content and technology) of the framework?

- Can you describe how all the stakeholders (teacher, learner, administrator, and learning support) of the blended learning framework work together to achieve a common goal?

- In your experience, what characteristics does an effective
- (faculty member, student, administrator, learning support member) have in a blended learning environment?

- What expectations do you have for the other components/stakeholders of the framework?

- Would you like to add anything else before we conclude the interview session? Do you have any questions?