A STUDY OF SCAFFOLDING PRACTICES FOR ENHANCED LEARNING ENGAGEMENT IN COURSENETWORKING, AN ACADEMIC SOCIAL NETWORKING SITE

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Submitted to the faculty of the School of Education
in partial fulfillment of the requirements
for the degree of
Doctor of Education
in the Department of Instructional Systems Technology

Indiana University
June 2023

Accepted by the School of Education Faculty, Indiana University, in partial fulfillment of the requirements for the degree of Doctor of Education.

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Date of Defense
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ACKNOWLEDGEMENTS

I would not have been able to complete this dissertation and my EdD study without the support of my academic advisors, colleagues at CourseNetworking and faculty users, and my family. I want to express my deep appreciation to each of them.

First and foremost, I feel incredibly lucky to have had Dr. Bonk as my academic advisor. Over the past decade, he has not only shared valuable knowledge and insights with me, but also connected me to many wonderful people and opportunities in the field. I cannot thank him enough for always being available for guidance, for sharing ideas and resources, and for inviting me to talk about my dissertation with other IST students. These opportunities allowed me to constantly reflect on and improve my work.

I would also like to express my appreciation to Dr. Brush and Dr. Hickey for being my dissertation committee faculty. Their thoughtful feedback has been invaluable, and I could not ask for a better doctoral committee.

I am also grateful to Dr. Ali Jafari and my other colleagues at CourseNetworking and IUPUI CyberLab for providing the platform, data, and feedback, and for allowing me time to conduct this study. In addition to the CN team, I would like to express my deep appreciation to the faculty users who generously participated in this study and those who trusted my support in the past. They have helped me build my expertise in CN and social pedagogies. I hope this study will contribute to the future development and application of CN, as well as other social learning platforms that enhance teaching and learning.

On a personal note, I must express my heartfelt appreciation to my parents for their love, encouragement, and sacrifices that have brought me to this point. I would not have completed this dissertation without them. I also want to thank my husband, Yujie, and my daughters, Everly and Claire, for allowing me to devote a large amount of time to my doctoral study. The EdD study has been a long journey for us, and while it will soon come to an end, I will never forget the special moments of writing a research paper on the delivery bed of Everly and reading articles while feeding Claire – these pieces are the building blocks of this dissertation. I wish I could have focused more on my role as a mom, but I also hope that my daughters have felt the courage from my EdD experience to pursue their education and personal growth fearlessly throughout their lives.

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A STUDY OF SCAFFOLDING PRACTICES FOR ENHANCED LEARNING ENGAGEMENT IN COURSENETWORKING, AN ACADEMIC SOCIAL NETWORKING SITE

With sociocultural theory and connectivism gaining acceptance and social networking sites (SNSs) being widely used in the past couple of decades, educators have been exploring using SNSs to support online learning, particularly, in higher education. Existing studies have demonstrated that SNSs can be effective in improving communication, collaboration, and community building. However, the impact of SNSs on learning engagement heavily relies on the involvement and support of instructors, with more guidance and support producing better engagement.

This dissertation took a mixed-method approach to study higher education instructors' scaffolding practices and learning engagement in an academic SNS called CourseNetworking (or CN). Usage data from 11,215 courses were analyzed to understand how unique features and instructor participation affected learning engagement. Additionally, the 12 most active courses were examined through course site observations, faculty interviews, Social Network Analysis (SNA), and artifact analysis to identify effective scaffolding strategies and challenges.

This study found that although polls, Anar Seeds goals, hashtags, and badges were associated with higher engagement, these unique features were underutilized. A second finding is that the faculty participants implemented various scaffolding strategies (i.e., technical, metacognitive, strategic, conceptual, social) to engage their students in CN. Third, although instructors' participation in CN discussion correlated with increased engagement, their

participation levels varied greatly. Notably, only one faculty participant intentionally faded scaffolding by implementing intense support and guidance at the beginning. Forth, the biggest challenge reported by faculty participants was the low participation of some students. In addition, faculty hoped to receive regular email newsletters to learn how to better use the platform.

Based on these findings, the study recommended that instructors increase their use of the unique features, such as setting up a course Anar Seeds goal, suggesting hashtags, and awarding badges as incentives. A TREAT model was proposed to guide instructors in planning, executing, and evaluating effective scaffolding strategies in CN, including how to arrange their own participation and develop student agency over time. The study also recommended that the CN team share effective scaffolding practices with instructors through email newsletters and Rumi Tips and leverage the power of the next-generation AI to deliver effective scaffolding.

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TERMINOLOGY AND DEFINITIONS

Anar Seeds

A learning gamification feature in CN is the use of Anar Seeds. “Anar” is the Persian word for Pomegranate, the fruit with many seeds. In Persian culture, this fruit is a symbol of prosperity and ambition. In a CN course, users receive Anar Seeds or points for a variety of activities, ranging from creating a post, reflecting on a post, rating a post, answering a poll, to visiting the course, selecting a best reflection, and wining Post of the Week. The more active a student is in a course, the more seeds they collect. Course instructors have the option set up an Anar Seeds goal and tie it with a portion of the course grade. Anar Seeds help motivate learners, regulate participation, and encourage positive peer competition (CourseNetworking, 2022)

CourseNetworking (CN)

An academic social networking site, thecn.com, that was launched in 2012 and has been designed and developed by the author’s team at IUPUI CyberLab. The site supports social learning through unique features, such as posting and networking, social LMS, learning gamification, and a life-long ePortfolio.

Engagement

Student engagement in learning is a key interest in this study. This dissertation adopts the Double Helix Model of Student Engagement (Barkley & Major, 2020) to capture engagement as a synergy of both motivation (feelings) and active learning (thinking).

Intelligent Learning Agent

An Artificial Intelligence (AI) powered learning assistant (Jafari, et al., 2022). The intelligent learning agent in CN is Rumi, which provides personalized learning recommendations and tips to individual users.

Learning Gamification

The use of game-like elements and mechanics, such as points, badges, and leaderboards, to engage learners and promote learning (Bovermann & Bastiaens, 2020).

Learning Management Systems (LMS)

Web-based software that is used to facilitate the delivery of online, face-to-face, and blended courses (Rottmann et al., 2020). Typical features of an LMS are announcements, assignments, grade book, files, roster, discussion forums, etc.

Scaffolding

Guidance or support given to students from instructors or more knowledgeable others to help them complete learning tasks and achieve learning goals (Christensen, 2020; Jumaat & Tasir, 2014).

Scaffolding Fading

The intentional and gradual removal of support as students become capable of accomplishing the scaffolded learning task on their own (Belland, 2014; Collins et al., 1989). In the context of SNS and this study, fading also involves the transfer of discussion moderation and community-building responsibilities from instructors to students while maintaining the same level of student engagement in social discussions.

Social Networking Site (SNS)

An online platform that connects users based on shared interests, activities, backgrounds, or real-life relationships ("Social networking service," 2022). SNSs are a subset of social media.

Social Network Analysis (SNA)

A specific analysis that studies patterns of relations of a social group. It relies heavily on graphic imagery to reveal and display the connection patterns (Lee & Bonk, 2016; Marin & Wellman, 2011).

TREAT Model

The scaffolding model that this study recommends to CN faculty based on the findings. It emphasizes five elements: (1) Technical Scaffolding, (2) Requirements and Rules, (3) Examples, (4) Agency and Autonomy of the students, and (5) Techniques.

CHAPTER I INTRODUCTION

Background and Problem Statement

Learning engagement is what today's educators strive to achieve because it is positively associated with academic achievement (Kun, 2009; Reschly & Christenson, 2012) as well as students' social-emotional well-being (Sutton, 2021). Traditional classroom teaching falls short in driving engagement and the recent decades have witnessed the paradigm shift from instructor-centered to student-centered learning (Hannafin & Land, 1997; Koehler & Meech, 2022; Wright, 2011). Since the 1990s, sociocultural theory has become more prominent, which emphasizes learning through interactions with the cultural environment and with each other (John-Steiner & Mahn, 1996; Pellegrino, 2020; Turuk, 2008; Wang, 2007).

With the rapid development of Web technologies especially social media in the last 15 years or so, people can easily connect and communicate with each other regardless of cultural backgrounds and geographic locations. According to PEW Research Center's latest data, as of 2021, 84% of US adults aged 18-29 report that they use at least one social media site. Facebook remains the most widely used social networking site (SNS), with 70% of its US adult users visiting the site daily. As SNSs are widely used, educators and scholars become interested in using them for educational purposes. A number of studies have been carried out to examine the applications of SNSs in higher education. Through these studies, the following themes have emerged:

1. Universities and colleges implement social networking technology and strategies to recruit and retain students.
2. Individual students have been using popular SNSs for learning.

3. Educators and educational programs leverage SNSs to support the development of various online academic communities.
4. Instructors integrate SNSs in their courses to facilitate communication, collaboration, critical thinking, engagement, and other learning objectives.

Looking into the first theme, these are studies discussing social media as a marketing and branding tool for schools to attract and engage students (Chen & Divall, 2018; Clark et al., 2016; Nevzat, et al., 2016). When higher education institutions implement SNSs for student recruitment and retention, it is more of an administrative strategy rather than an instructional endeavor. Therefore, this theme is not the focus of this dissertation.

Upon examining other themes, it becomes apparent that a significant proportion of the empirical studies lack a specific emphasis on instructional interventions. These studies simply conducted surveys to ask students of different backgrounds about their spontaneous use and perceptions of SNSs for learning. For instance, Bryla (2014) carried out a large-scale survey with more than a hundred higher education institutions in Poland to study the purposes and patterns of college students' SNS uses. Similarly, Karimi et al. (2014) compared the motives for using SNSs among higher education students from four different countries.

Through studies that have examined the purposeful implementation of SNSs in a specific learning context, several challenges have been brought to attention. First, although promising effects on communication and collaboration are commonly discovered, applying general-purpose SNSs, such as Facebook, Twitter, or Yammer, raises concerns about privacy (Waycott et al., 2017; Wilson, 2013) and distractions when the platform is also used for personal purposes (Nkhoma et al., 2015; Rambe, 2012). Second, although the current generation of students grows up with new technology, their familiarity with social media does not make the transition from social networking tools to pedagogical tools any easier (Churcher et al., 2014). Many students still need careful scaffolding and guidance in using SNSs for engaged learning, which includes but is not limited to constructive discussions, meaningful interactions, and positive collaboration (Okoro, 2012). Finally, in order to effectively guide students, faculty members need to acquire an adequate knowledge of the unique technology and adopt effective scaffolding practices. However, the literature review (see Chapter2) has revealed inadequate studies that can prepare faculty for such a purpose. Among the limited empirical studies that involved instructor-guided use of SNSs, the majority have only documented individual use cases – in one single course. Some of these studies lacked detailed descriptions of the implemented scaffolding strategies and rationales behind the strategies. It was even rare to see systematic studies of scaffolding practices in academic SNSs and how scaffolding practices affect learning engagement.

Purpose of Study and Study Context

This dissertation aims to find out what technology features and student scaffolding practices are effective in keeping students engaged in the SNS learning environment. This EdD dissertation narrows the study context to a specific academic social networking site named CourseNetworking (or CN), which is a learning platform the researcher of this study has been designing and supporting through her work.

CN, www.thecn.com, was first launched in 2012 with seed funding from Indiana University. It has been continuously developed and commercialized at IUPUI CyberLab[1], an educational technology laboratory that has over 30 years of history in inventing and developing online learning platforms. Today, CN is being used by nearly two million users around the

[1] The lab website is https://cyberlab.iupui.edu/

world, with the majority in higher education. CN supports both free individual users as well as licensed institutions with the latter primarily in the United States and Malaysia.

The CN platform is designed for social, global, and engaging learning. Its unique and primary features are social discussion and networking (e.g., post, reflection, poll, rating, hashtags, follow), gamification (e.g., Anar Seeds point system, digital badges, and leaderboard), a lifelong user ePortfolio, as well as an Artificial Intelligence (AI) powered personal assistant named Rumi.

Although CN's look and feel are very similar to Facebook, Twitter, LinkedIn, and other popular SNSs, it is specifically designed for education. Students in CN can safely interact with each other in their courses and also have opportunities to reach out to students or educators with similar academic interests outside of their classrooms and even schools. The CN platform is both FERPA (Family Educational Rights and Privacy Act) and GDPR (the EU General Data Protection Regulation) compliant to protect students' privacy and rights. Therefore, within this specific academic SNS platform, student privacy and non-academic distractions are of lesser concern compared to general purpose SNSs. However, students on the CN platform still need careful guidance to be fully engaged in the social networking-based learning environment, which is a challenge to many instructors due to a lack of knowledge and experience with such platforms.

The CN team often receives requests from instructors, seeking support in implementing the platform. Their most common questions are about what features to use, what rules and expectations to set up for positive social interactions, how to motivate students, and how often instructors should interact with students on the platform. They also ask about specific instructional and support strategies. Importantly, through daily user support, we have accumulated some best practices. However, our recommendations to instructors have not been based on a systematic and scientific study. So, the goal of this dissertation is to generate a research-based understanding of scaffolding strategies that have been implemented in CN–what have worked and what struggles faculty are facing. The CN team will then be able to recommend effective practices and guide faculty to better engage their students in the social learning environment. Although the findings from this dissertation are not expected to be generalized to another context, the discovered scaffolding strategies and practices may shed light on using other social learning platforms.

Research Questions

Through this dissertation, the following research questions are to be answered:

RQ1: What features of CN do instructors leverage to increase learning engagement?

RQ2: What scaffolding strategies do instructors implement in CN to foster learning engagement? What works and what does not?

RQ3: What specific instructional tactics are utilized by CN instructors to fade their scaffolded assistance and allow for increasing student agency over time?

RQ4: What challenges do instructors face when using CN to engage students in learning?

Significance of Study

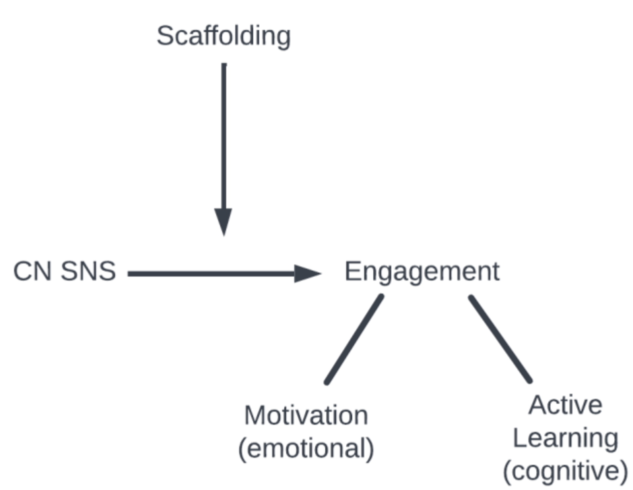
Figure 1 outlines the major constructs of this dissertation. This dissertation explores instructor scaffolding practices that affect student engagement in the CN. Student engagement is signified through motivation and active learning, following the Double Helix Model by Barkley and Major (2020), which will be articulated in the literature review chapter along with other key concepts.

This dissertation addresses existing research gaps in three ways. First, a specific academic SNS, the CN platform, is studied. This addresses the research gap regarding the scarcity of studies on academic SNSs. Second, this dissertation collects data from multiple courses and instructors, allowing comparison and summarization of richer data, which could contribute to a deeper understanding of effective faculty's scaffolding practices. Third, this dissertation specifically focuses on instructor scaffolding practices that enhance learning engagement, examining the connections between these two critical concepts.

From a practical standpoint, the insights gained from this dissertation will benefit faculty members and the CN team to improve their daily practice with study-based recommendations. The TREAT model proposed at the end of the dissertation provides an easy-to-follow framework for faculty to prepare, execute, and evaluate their scaffolding practices. Leveraging the TREAT model, the CN R&D team could potentially enhance their current AI-based smart learning agent to provide smart tips to instructors and automate some effective scaffolding practices throughout their system.

Figure 1

Dissertation Outline



CHAPTER II LITERATURE REVIEW

Construct1: SNS for Learning at Higher Education

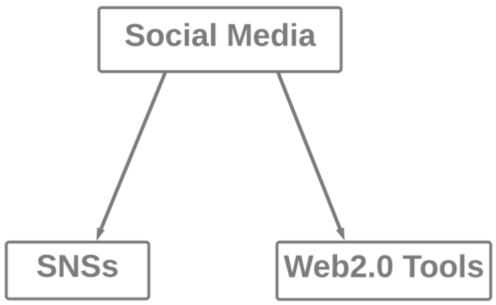
SNS and Similar Concepts

A Social Networking Site or SNS is an online platform that connects users based on shared interests, activities, backgrounds, or real-life relationships (“Social networking service,” 2023). In addition to networking features, these platforms typically support users to post updates, share resources, and interact with each other. Popular SNSs are Facebook, Twitter, LinkedIn, etc.

Social media is a synonym for SNS. When referring to platforms like Facebook and Twitter, these two terms can be used interchangeably. However, when it comes to education research, some scholars consider Web 2.0 tools social media (Churcher et al., 2014; George et al., 2013, Gülbahar et al., 2017). Here, Web 2.0 tools include Google Docs, SurveyMonkey, Wikis, blogs, and a wide range of interactive content tools. Such categorization is reflected by this broad definition from Evans (2014): social media are Web or mobile applications that connect users with online content or with each other. Figure 2 outlines the relationship between social media, SNSs, and Web 2.0 tools based on Evans’ definition. Since Web 2.0 tools encompass a wide range of content creation and content sharing tools, this study will only focus on SNSs – a subset of social media that connect people. Publications that studied social media but did not mention an SNS were intentionally excluded from the literature review.

Figure 2

Relationship between Social Media, SNSs, and Web 2.0 Tools



Theories Behind SNS for Learning

Both sociocultural theory and connectivism serve as the theoretical underpinnings of the use of SNSs for learning.

Sociocultural Theory. The sociocultural theory views learning as a social practice. From this perspective, learning happens through social interactions (Vygotsky, 1978) and within communities (Wenger, 1998). People use tools grounded in their culture, such as language, to make sense of the world. Their identity and surrounding environment influence what they learn and how they learn.

Another critical concept of the sociocultural theory is the Zone of Proximal Development (ZPD). Vygotsky (1978) defined ZPD as “the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers" (p. 86). The guidance from more skilled others is also called scaffolding, which is fundamental to learning (Christensen, 2020). Such guidance is expected to fade gradually while learners become capable of performing learning tasks on their own (Belland, 2014; Chun & Cinnamon, 2022).

Connectivism. Siemens (2005) proposed a learning theory for the new digital era. In contrast to the sociocultural theory, which focuses on individuals acquiring knowledge and achieving full cognitive development via social interaction, connectivism is based on the premise that learning happens outside of the mind of an individual. In the era when both technology and information are rapidly developing, according to Siemens, the ability to learn via social networks is far more important than obtaining specific knowledge. In other words, learning is more critical than having specific knowledge. From a connectivist view, learning happens in social networks in the form of nodes, flows, and connections. “Nodes that successfully acquire a greater profile will be more successful at acquiring additional connections. In a learning sense, the likelihood that a concept of learning will be linked depends on how well it is currently linked” (p. 5).

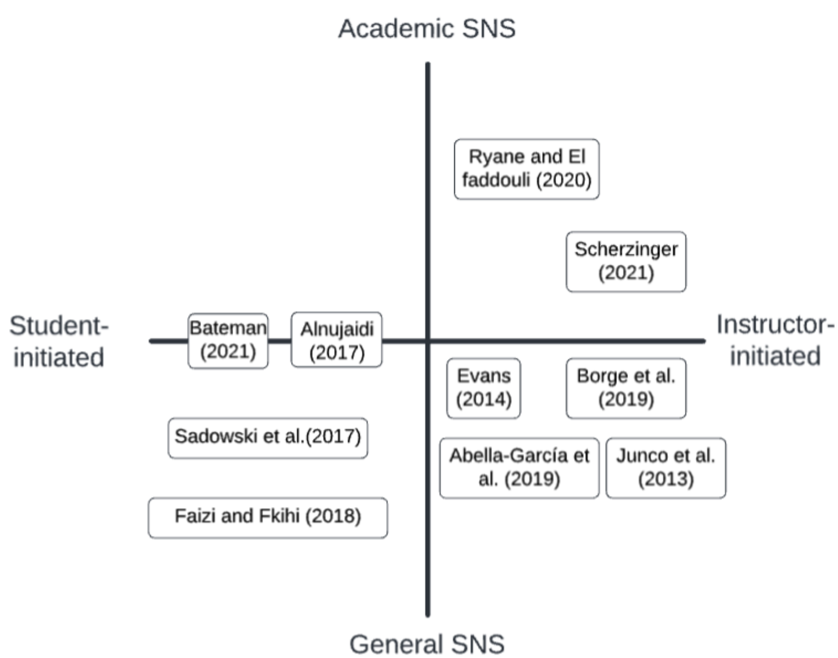
Both sociocultural theory and connectivism have substantiated the implementation of SNSs for learning, which can be witnessed through empirical studies that designed learning activities based on these theories (Borge et al., 2019; Churcher et al., 2014; Ozan, 2013). The unique technical affordances of SNS platforms enable learners to connect, communicate, and collaborate with each other at an unprecedented level. Their interactions can happen anywhere and anytime–before, during, and after a class. In such a virtual and social learning environment, the sources and exchange of information become more diverse and dynamic. It is vital for instructors to adopt effective support strategies to better guide and engage students so that they can thrive in such a new learning environment with greater possibilities.

SNS as a Learning Tool in Higher Education

In the last 15 years or so, scholars have been exploring and documenting the various ways SNSs are used as a learning tool in higher education. After reviewing empirical studies in this area, this study put the SNS uses into four categories based on two factors. The first factor is the type of SNS being used. Depending on the target user population, it may be a general-purpose SNS that is for everyone to use, such as Facebook and Twitter, or an academic SNS that is specifically created for students and educators, such as CourseNetworking, Edmodo, and subject-specific platforms. The other factor is the initiator of SNS-based learning – if students choose to use SNSs for their learning spontaneously, it is student-initiated; whereas, if the learning is initiated by instructors, it is instructor-initiated. Among the instructor-initiated SNS uses, there are variances based on the amount of instructor guidance, which ranges from loosely guided to closely guided. Figure 3 illustrates the four categories with representative empirical studies in each category. The section below will briefly explain each category and the representative publications.

Figure 3

Categorizations of Ways SNSs Have Been Used for Learning in Higher Education and Representative Publications



Note. Figure 3 was created by the dissertation author.

Student-initiated Use of General SNS. This use type is the bottom-left quadrant of Figure 1. It can be characterized as (a) organic and informal use of SNSs initiated by students to address individual learning needs, (b) social networks primarily residing in Facebook and other general SNSs, which students may also use for other purposes. A couple of studies capturing this use type can be found below.

Sadowski et al. (2017) conducted a survey and an in-depth focus group with over 355 higher education students in Australia to examine their use of SNSs for education. Close to 60% of the participants reported using SNSs for their studies, among which connecting and communicating with other students accounted for the primary usage, followed by connecting to learning content. Facebook was identified as the mostly used SNS platform. The students created course groups on Facebook to work with their peers on group projects, answer each other's questions, and overcome feelings of isolation and disconnection in online learning. Some of the focus group participants expressed resistance to using SNS for learning due to peer pressure, distractions, and concerns about privacy.

In Faizi and Fkihi (2018), 253 Moroccan higher education students completed a survey to share their experience of using Facebook for learning. The study found that almost all the participants were active Facebook users, among which 87.4% of the students used Facebook to comment and view other students' posts, share links to learning resources, announce class updates, and answer each other's questions. Near half of the participants believed that Facebook had positively impacted their learning experience. However, the students rarely interact with their teachers on Facebook; therefore, the study encouraged faculty to become more actively involved in the use of Facebook for learning.

Student-initiated Use of Academic SNS. This use type is the top-left quadrant of Figure 3. It can be characterized as (a) organic and informal use of SNSs initiated by students to address individual learning needs, and (b) students using SNSs that are specifically designed for learning.

A data search using the general terms “Social Network Site” and “Higher Education” rarely finds any publications meeting the criteria. Since the students’ self-initiated and self-organized use of SNS for learning is not the focus of this dissertation, the paragraphs below will give a quick view of a couple of use cases that fall between the left two quadrants.

Bateman (2021) documented the lived experiences of six higher education students participating in their institution’s online academic social network. In the network, these students formed or joined learning communities, posted or viewed learning and career information, and offered or received help on assignment frustrations. This study found that the academic social network helped students develop a sense of acceptance, belonging, and self-validation. It also introduced them to multiple perspectives and cultures. Overall, the experience increased students’ social presence, which in turn enhanced cognitive presence and learning satisfaction. Since the study did not mention which SNS platform was used, it was put in between the left two quadrants.

Alnujaidi (2017) studied how SNSs were used by EFL (English as a Foreign Language) students in Saudi higher education institutions. The student survey found that YouTube, Twitter, and Instagram were the most popular, but academic SNSs such as Classmates and English Baby were also used. These students appreciated the authentic language and cultural context in SNSs, where they were able to gain practical English knowledge and skills through interactive activities. These students expressed confidence in learning new SNS skills but also reported challenges of learning via SNSs.

Instructor-initiated Use of General SNS. This use type is the bottom-right quadrant of Figure 3. It can be characterized as (a) instructors initiating the learning activities, (b) Facebook, Twitter, Yammer, and other general SNSs being used to host the learning activities, and (c) instructors designing the social learning activities in different ways and their involvement in discussions as well as their requirements on students' participation varying from case to case. This use type has been mostly studied compared to the other three. Below are several empirical studies that demonstrate incremental sophistication in learning design and instructor guidance.

Evans (2014) documented how a large group of UK students of an IT management course used Twitter. At the beginning of the semester, they were asked to create a Twitter account if they did not already have one. Both the tutors and the students were encouraged to post with specific hashtags during the 12 weeks of the semester. The study did not state whether posting on Twitter was required or graded. The instructor's participation was not described either. This Twitter use case seemed to be loosely guided, and its main purpose was to make tutors more approachable to students.

A more structured Twitter use case is Abella-García et al. (2019). In this study, education-majored students participated in mandatory Twitter activities in course modules about education technology. Students were required to create at least 100 tweets by making personal reflections, sharing information about education technology, and retweeting others' tweets. They were also asked to follow a minimum of 30 education professionals. Instructors of the course gave students guidance on how to select information and write good tweets. The instructors also participated in the community by retweeting students' tweets to disseminate them to a larger audience. In a follow-up survey, students reported perceived learning through exchanging knowledge and perspectives with classmates and field experts.

Junco et al. (2013) conducted a couple of interesting experimental tests to study how the design of Twitter activities might affect their impact on student engagement and grades. The first test implemented Twitter in the experimental group with theoretically driven pedagogies. Course instructors closely assisted students in using Twitter and frequently interacted with them on

Twitter. Students were also required to complete four posting assignments, each on a specific learning topic. This test yielded significant engagement and grade increase in the experimental group compared to the control group. In the second test, the experimental group also integrated Twitter, but as an optional activity with limited instructor participation. This test found no difference in engagement and grade increase between the experimental and control groups. The scholars then reached the conclusion that when Twitter is used in a course, its associated activities should be carefully designed, required, and guided by instructors.

Borge et al. (2019) adopted the university-licensed Yammer platform to foster social discussion and an online community of learners. With 42 junior and senior college students enrolled in an introductory human-centered design course in the US, they created and followed a sociocultural activity design model to systematically scaffold student discussions on Yammer. Their strategies included but were not limited to training students to lead discussions and moderate the community, creating guidelines to articulate community values, and creating grading criteria to hold students accountable for community development. Through these well-designed strategies, students were able to problematize course content by engaging in higher-level thinking and argumentation around the learning topics. The study also found that when the instructor transferred the discussion moderation and community building responsibilities to students, the quality of student posts and engagement was sustained.

Instructor-initiated Use of Academic SNS. This use type is the top-right quadrant of Figure 3. It can be characterized as (a) instructors initiating the learning activities, (b) SNSs specifically designed for teaching and learning are implemented, and (c) just like the previous use type, varied design and support practices can be observed across cases in this category. Instructor-initiated Use of Academic SNS is the category this dissertation study belongs to. Since these platforms are designed and used only for academic purposes, issues such as security, privacy, and distractions that prevail on general SNSs (Nkhoma et al., 2015; Rambe, 2012; Waycott et al., 2017; Wilson, 2013) are no longer a major concern, In terms of available literature, it is worth noting that a general database search through the keywords “Social Networking Site” and “Higher Education” rarely finds publications about academic SNSs. The search requires entering the name of a specific platform, such as “Edmodo” or “CourseNetworking” to yield expected results. However, quality research is still limited. The section below will give a glimpse into a couple of use cases in this use category.

Edmodo is a globally wide-used academic SNS. Some scholars also call it a Social Learning Network (SLN) (Durak, 2017; Yünkül & Cankaya, 2017). As of 2019, the Edmodo network had more than 100 million users from 400,000 schools in about 140 countries (Alqahtani, 2019). Ryane and El faddouli (2020) documented how they used Edmodo in three hybrid computer science courses. A purposefully designed structure was adopted in all three courses to support knowledge integration in the online setting. The course instructor shared learning resources on Edmodo and frequently interacted with students in the class network. Students were motivated by the instructor’s encouraging messages and answers to their questions. The study did not mention how students’ Edmodo participation was assessed nor how students interacted with each other. But it is evident that the instructor played a major role in leading the communications in Edmodo.

CourseNetworking (or CN) is the academic SNS that this dissertation studies. So far, the CN platform has been used by global users from over 140 countries but there are only a few published studies about the platform. One example is Scherzinger (2021), which captured how CN was used during the COVID-19 pandemic to give students “a platform to speak their anxieties and find comfort” (p.399). In order to curate an open classroom atmosphere of sharing and support, the instructor constantly posted about her pandemic experiences and feelings. She also responded to many students, giving them encouragement and supportive information. The CN was intentionally set as an extra-credit activity to invite students to participate whenever they felt they needed to.

SNS’ Impacts on Learning

SNSs affect learning in multiple ways. The most prominent and uncontroversial impact SNSs have on learning is that they facilitate communication, collaboration, and community-building (Zachos et al., 2018). However, there is no unanimous consensus regarding the impacts on engagement and academic performance measured by test scores or GPAs. Engagement will be discussed later as the second construct of this dissertation. The section below will look into communication, collaboration, community-building, and academic performance.

Communication, Collaboration, and Community-building. The connective and participatory nature of SNSs makes them effective tools for communication, collaboration, and building online learning communities. This point has been substantiated by various studies. VanDoorn and Eklund (2013) found that students had a positive perception of using Facebook for asynchronous communication, which could complement face-to-face communication, especially for distance and off-campus students. In addition, after studying 73 undergraduate students from a marketing course, Pinto (2014) discovered a positive correlation between the amount of Yammer usage and student communication effectiveness. Similarly, Voorn and Kommers (2013) revealed that social media, including SNSs, could help develop communication skills and increase the self-confidence of introverted students who might otherwise hesitate to interact with others. Importantly, Sánchez et al. (2014) found through a student survey that building and maintaining social relations was the most important purpose for students to use Facebook. Based on this finding, they recommended that educators use SNSs to achieve greater levels of cooperation and teamwork in educational activities.

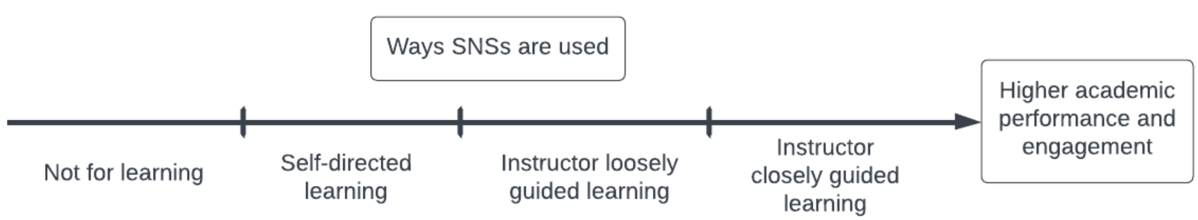
When it comes to community-building, SNSs have been proven to create active learning communities of varied sizes and subject areas. Aladsani (2021) created a learning community for a 77-student Computer and Society course on Telegram, where frequent student-instructor and student-student interactions happened in social, academic, and emotional dimensions. On a bigger scale, Lima and Zorrilla (2017) documented how a large learning community was formed by over a thousand global students in a social MOOC about Information and Communications Technology.

Academic Performance. In theory, when a technology tool supports communication, collaboration, and community-building, it has a great chance to ultimately improve students' academic performance. However, when academic performance is merely measured by test scores, course grades, or GAPs, the relationship between SNS and academic performance becomes obscure. Existing studies have yielded inconsistent and even contradicting findings in this aspect. In some studies (Gavrin & Lindell, 2017a; Junco et al., 2011), SNS usage and academic performance were positively correlated; in some studies (Alwagait et al., 2015; Gupta, 2013), these two variables were independent, whereas, in other studies (Kirschner & Karpinski, 2010; Tafesse, 2020), SNS use was found to have a negative relationship with student academic performance.

A factor that can clear the confusion is how SNSs were used in each study. The studies that did not discover an impact or found a negative impact typically implemented a survey to ask students how often they had been using general SNSs, then correlate the time with grade data. In most of these cases, students did not seriously use SNSs for learning. In general, the more students use SNSs for learning and are guided by instructors, the better the learning outcomes. Figure 4 illustrates the academic performance progression and correlated ways SNSs being used. In the two positive examples mentioned above (Gavrin & Lindell, 2017a; Junco et al., 2011), instructors of both studies carefully designed and guided the social learning activities. Therefore, they both found a positive correlation between SNS usage and student academic performance. Since the ways SNSs are integrated greatly affect learning outcomes, the instructor's role in guiding SNS-based learning becomes increasingly important. In fact, this is why this dissertation examines faculty scaffolding practices to better understand how SNSs can be effectively integrated with teaching and learning.

Figure 4

Academic Performance Progression and Ways SNSs Are Used



Note. Figure 4 was created by the dissertation author.

Construct2: Student Engagement When Using SNS for Learning

Student Engagement Definition

Lave and Wenger (1991) argued that learning emerges from engagement in social interaction. Since SNSs offer the space and technology for social interaction, it has great potential of fostering student engagement. However, what exactly is engagement? Although educators strive for student engagement, the concept itself is highly abstract and complicated to define. The popular definition from Kuh et al. (2005/2010) has "…the amount of time and effort students put into their studies and other activities that lead to the experiences and outcomes that constitute student success" (p. 9). It is hard to judge if this is the best definition because "time and effort" only captures a part of the concept, and this definition also has gone beyond course level to co-curricular and extra-curricular activities. It may be a working solution to use a synonym, "learning involvement," as the definition and then describe what engagement looks like: engaged students often enjoy their learning process, stay motivated and focused on the learning topics, and go above and beyond instructor expectations. In the SNS learning environment, students also actively interact with others, push each other into higher-level thinking through discussions, and take responsibility for developing and maintaining their online learning community.

Dimensions of Engagement and the Double Helix Model

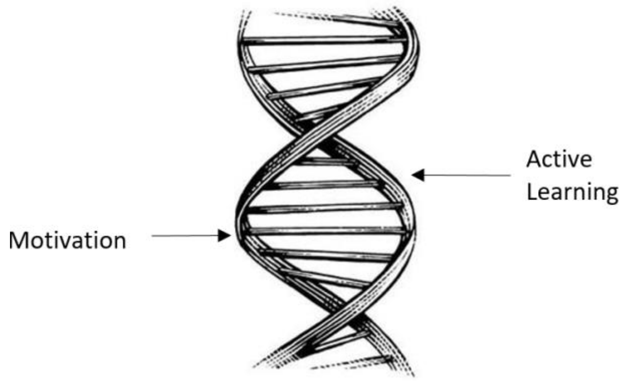
The description above has touched on the different dimensions of engagement. So far, academic, behavioral, cognitive (or thinking), and affective (or emotional, feelings) are the four commonly recognized dimensions. Some scholars accept all four categories, such as O'Donnell and Reschly (2020), some accept three categories–behavioral, cognitive, and emotional, such as Fredericks et al., (2004), and some condensed them to two–feelings and thinking, such as Barkley and Major (2020).

This dissertation adopts Barkley and Major's (2020) two-dimensional engagement model, also called the Double Helix Model of Student Engagement (see Figure 5) because it captures engagement from the two most substantial dimensions of engagement. Barkley and Major consider engagement the **mental status** of a student, which is represented by the intersection of their feelings and thinking. The feelings dimension refers to the passion, excitement, desire, interest, and enthusiasm to participate in learning. In other words, it is the “motivation” to learn. The thinking dimension finds students making sense of new knowledge by connecting to their existing understanding, asking deep questions, synthesizing, and analyzing data, articulating their thinking process, reflecting, and monitoring their learning progress and outcomes. The thinking dimension is also called “active learning”. Barkley and Major view student behaviors, such as participating in discussion, “the outcome of engagement” (p.10), instead of a separate dimension or type of engagement.

Barkley and Major (2020) believe that motivation and active learning are both indispensable for engagement and learning success. An example would be that if motivated students only create superfluous, redundant, and off-topic posts in an online discussion, it is doubtful that they are truly engaged or going to learn much. Similarly, if students are provided with active learning opportunities, but hesitate to participate, it is unlikely that either learning engagement or outcomes is high. “Motivation and active learning work together synergistically, and as they interact, they contribute incrementally to increase engagement…engagement may be better described as a double helix in which active learning and motivation are spirals working together synergistically, building in intensity…” (p. 9).

Figure 5

Double Helix Model of Student Engagement (Barkley & Major, 2020, p. 10)



SNS's Impact on Engagement

According to the literature review of this study, the impact of SNS on learning engagement in higher education has not been extensively studied. Among the studies that have examined the relationship between SNS use and learning engagement, a positive connection has been discovered by the majority. Through a series of experimental studies conducted by Junco et al. (2010, 2013), a significant increase in engagement was found in each control group that used Twitter for course discussions. Hortigüela-Alcalá et al. (2019) also found higher motivation in students who used Twitter and Instagram in a physical education course compared to their counterparts who did not use any SNSs. In a meta-analysis (Cartledge et al., 2013) on how SNSs had been used for medical education, all the nine qualified articles reported student engagement as a result of implementing SNSs as an intentional intervention.

An exception to the positive connection between SNSs and engagement is Koranteng et al. (2019), which discovered that higher education students did not consider SNSs an effective learning tool, and their knowledge sharing on SNSs did not contribute to engagement. What could possibly explain this contradicting finding are two factors. First, Koranteng et al. did not implement any intentionally designed and guided learning interventions. They only surveyed a diverse student body about their personal use of SNSs, which likely involved a good number of non-learning uses. In fact, this finding reflects how SNSs affect academic performance–the more purposefully guided usage, the better outcomes. To put it in another way, engagement is "significantly associated with the pedagogical usages of social networks" (Hortigüela-Alcalá, 2019, p. 419). Second, the way Koranteng et al. measured engagement is questionable. In their survey, only two short Likert questions, "I spent more time doing academic work" and "I participate more in challenging academic work" (p. 1151), were used to measure engagement. Although these two questions resonated with Kuh et al.'s (2005/2010) definition of engagement, which highlighted the "time and effort" students put into their studies, they might be too simple to capture the multifaceted and complex nature of engagement. Relatedly, even the engagement instrument in Junco et al.'s studies was questionable because the National Survey of Student Engagement (NSSE) that they used was intended to measure overall college engagement, not learning engagement within a course. When such an instrument was adopted to measure course-level engagement, it might have brought in confounding variables from outside of the class that also affected student engagement. These issues of measuring engagement naturally lead to the discussion about how learning engagement should be measured in the SNS environment.

Measure Engagement in SNS Environment

According to Barkley and Major (2020), since engagement is a mental status, it is difficult to measure. Barkley and Major do not view behaviors as another type of engagement but claim that behaviors, as the outcome of engagement, signal engagement. This indicates that student behaviors can be observed to capture engagement. Hu and Li (2017) recommended that researchers combine both quantitative and qualitative methods to capture and analyze student engagement from different dimensions.

In traditional classrooms, instructors and researchers measure engagement by observing student learning behaviors and analyzing their work samples as evidence of engagement

(Chapman, 2003; Hu & Li, 2017). In online contexts, technology tools provide a variety of readily available data, such as page views, logins, word counts, assignment submission time, etc. When it comes to SNSs, the following unique measures can help measure student engagement from multiple dimensions:

Post Analysis. Posts and comments on SNSs vividly document student conversations and interactions. Many SNS studies have adopted post analysis as a study method (Doney et al., 2020; Elmasry et al., 2014; Naghdipour & Eldridge, 2016). When studying how Twitter affected student engagement, Junco et al. (2010) used students' sample tweets to illustrate how they were engaged in various learning activities. Junco et al. (2013) conducted a thematic analysis to find out which discussion topics students were most engaged with. Taking a quantitative approach, Pai et al. (2017) counted the number of posts, comments, and likes in their Facebook group to study the pattern and level of student participation. They considered posting outside of business hours (i.e., at night and on weekends) and exceeding expected post amount indicators of engagement.

Post analysis gives insights into student learning engagement through both quantitative and qualitative data. Post number counts, comment number counts, word counts, and embedded media counts are basic quantitative measures of engagement. Typically, students who create more posts and comments, write longer posts, and use rich media resources, show a higher level of engagement. Qualitatively, post content analysis gives a lens to both cognitive and emotional engagement. It answers questions such as: What did students post? Were their posts relevant to the learning topics? How did students engage in cognitive thinking? Did they facilitate each other or did their instructors push them to think deeper? What were the emotions expressed through the posts?

Social Network Analysis (SNA). SNA is the analysis of relationships of members of a social network (Lee & Bonk, 2016; Marin & Wellman, 2011). Graphs are often used to visualize patterns with nodes representing individuals and links (or edges) representing the connections between individuals. SNA can be helpful to gain insights into learning engagement through the centrality of a node and the density of an entire network (De Laat et al., 2007). A member who has a higher degree of centrality tends to be more active, engaged, and influential within a network, whereas a network with a higher density value typically has more members communicating and collaborating with each other (Scott, 1991).

SNA has been applied in SNS studies to analyze learner participation, interaction patterns, and dynamics of learning communities. One of these studies is Norm et al. (2015), in which students who used Facebook Groups for an unstructured learning activity were put into four roles (i.e., lurkers, gradually mastering members, recognized members, and coaches) based on their centrality degrees in the SNA. These four roles formed a continuum of social participation and the students moved in either direction on the continuum during the operation of the learning activity. This study compared SNA data from the first and the last four weeks of the learning activity. Traxler et al. (2016) is another study that leveraged SNA. In this study, an introductory physics course on the CourseNetworking platform was examined by correlating the student position in their network with their final course grade.

Learning Gamification Data. Learning gamification uses game-like elements and mechanics to engage learners and promote learning (Bovermann & Bastiaens, 2020; Kapp, 2012). Points, badges, and leaderboards are the most common gamification elements (Alomari et al., 2019; Subhash & Cudney, 2018).

Gamification and Engagement. The effect of gamification on student engagement and motivation has been demonstrated by numerous studies. In Sailer and Homner's (2020) meta-analysis, 38 empirical studies were analyzed to measure the extent to which gamification affects cognitive, motivational, and behavioral learning outcomes. Significant and positive effects of gamification on the three learning outcomes were found. After a systematic review of 41 empirical studies, Subhash and Cudney (2018) found that improved student attitudes, engagement, and performance were primary benefits of gamified learning in higher education. Poondej and Lerdpornkulrat (2016) conducted a quasi-experimental study to examine the effect of gamification on learning engagement. In this study, 577 undergraduate students from six Information Literacy Skills classes were assigned to two groups. Within the experimental group, experience points, missions, levels, leaderboards, and achievement badges were implemented. A student survey was sent out at the end of the class to measure engagement in each group. The results showed that the experimental group had a higher engagement than the control group. Mese and Dursun (2019) investigated the effects of gamification on motivation through experience points, badges, leaderboards, feedback, rewards, levels, progress bars, and various restrictions. The qualitative results showed that gamification motivated the students to participate and to interact with their peers.

Although the aforementioned studies did not utilize gamification data (e.g., number of points earned, number and types of badges received, ranking on a leaderboard) to measure engagement, the discovered association between gamification and engagement shed light on viewing gamification data as an indicator of engagement.

Anar Seeds as An Engagement Indicator. The three primary gamification elements-points, badges, and leaderboards-are present in CN as unique learning features and they provide data that signal student engagement.

Of these three gamification features, Anar Seeds are the most used because they automatically operate without instructors having to set it up. The Anar Seeds system in CN awards users “pomegranate seeds,” or points, when they participate in various activities, such as posting, commenting on posts, answering polls, rating others’ posts, visiting their course, selecting a best reflection, and so on. Students earn seeds through both active participation (e.g., making a post or reflection) and passive participation (e.g., visiting the course or rating others’ posts), supporting the argument of existing research that even though lurking, which refers to observing others’ posts, seems passive, it is “highly contributive to collaborative knowledge building” and a valid form of participation in online communities (Bateman, 2021; Chen & Chang, 2013, p. 22). Although there are diverse opportunities to earn seeds, certain rules must be followed. For instance, students must meet the minimum word count in a post or reflection to earn the seeds, and they cannot exceed the seeds cap for each activity in a day and in a week - the cap is to encourage a sustained effort. Because of its automatic nature, the broad range of activities, and the specific rules, Anar Seeds offers a more precise measure of participation and a valuable view into engagement. This study posits that the more Anar Seeds a student or a course earns, the more active they are, and also likely to exhibit higher levels of cognitive and emotional engagement compared to their less active counterparts.

In a CN course, instructors may set up an Anar Seeds goal for students to complete. When students go way above and beyond that required seed goal, it gives a stronger indication of engagement.

Existing literature provides evidence of utilizing Anar Seeds as a measure of participation and an indicator of engagement. Gavrin and Lindell (2017b) documented the use of CN in a large-enrollment physics course where students expressed feeling motivated to earn Anar Seeds. In another study by the same authors (Gavrin & Lindell, 2017b), Anar Seeds was used to quantify student participation and was found to be positively correlated with homework effort and outcomes. In other words, students who participated more in CN also spent more effort on homework and earned better scores. This finding suggested that "students did not 'trade off' time in CN for time spent on their homework" and "we can treat participation in CN as a form of engagement with the class" (p.9).

Construct 3: Scaffolding Practices in SNS Learning Environment

Definition of Scaffolding

According to Belland (2014), the term *scaffolding* for learning was first used by Wood et al. (1976). Soon, it was associated with the concept of Zone of Proximal Development (ZPD) proposed by Vygotsky (1978). In the traditional sense, scaffolding is the support given to children to enable their cognitive development. Over time, this original definition has evolved to cover a vast variety of learners and broader learning outcomes. For example, Jumaat and Tasir (2014) have defined scaffolding as "guidance or support from teachers, instructors, or other knowledgeable persons that facilitate students to achieve their goals in learning" (p. 74). In Christensen (2020), scaffolding is defined as "any support given to a learner to complete a task" (p. 118). This study adopts such a broader definition of scaffolding to capture instructors' guidance and support to students in the academic SNS environment.

A subsequent concept related to scaffolding is fading. According to Collins et al. (1989) and Belland (2014), fading is the gradual removal of support as students become capable of accomplishing the scaffolded learning task on their own; fading promotes the transfer of responsibilities from the more capable others to students. In the SNS learning environment, such responsibilities consist of discussion facilitation and moderation to ensure an engaging community that serves its purpose.

What is worth meaning is that scaffolding emphasizes the supporting role of instructors in the learning process. It fits SNSs well because, in such an informal learning space, students play a more active role in constructing knowledge through communication and social interaction.

Effective Scaffolding Practices in SNSs

Carefully scaffolded support can positively affect not only cognitive but also affective and metacognitive aspects of learning (Doo et al., 2020). In the SNS learning environment, instructor support is critical in ensuring learner satisfaction and performance (Ellahi, 2018). The importance of scaffolding encourages a continuous discovery of effective scaffolding practices. In the traditional sense of scaffolding, Pritchard (2010, p. 42) recommended the following five strategies:

- Explaining: providing guidance and practice.
- Giving cues: giving clues, constructive questioning, and feedback.
- Sorting information into an appropriate sequence.
- Modifying task: limiting the amount of information.
- Modeling: thinking aloud (i.e., thinking-speak).

These strategies focus on cognitive tasks. Although all of them can be applied to guide online discussions and spur cognitive engagement, the SNS learning space requires other strategies.

Ozan (2013) studied scaffolding in a connectivist mobile learning environment. Based on Vygotsky’s scaffolding theory, Berge’s (1995) learner support strategies, and connectivism, Ozan implemented Facebook, Twitter, other social media, and mobile devices in an Educational Graphics and Animation course. She put the implemented scaffolding strategies into four types: **instructional scaffolding** which supports students to learn, **social scaffolding** which facilitates students to connect and collaborate with others, **technical scaffolding** which assists students to use technology tools, and **managerial scaffolding which** helps students manage their own learning in the networked environment. Ozan also proposed to consider scaffolding from the **types, providers, strategies, and timing** of it. This study found that students preferred social scaffolding the most, followed by managerial, instructional, and technical scaffolding. Interestingly, the social scaffolding in the study was mostly provided by peers.

After conducting a series of experimental tests, Junco et al. (2010, 2013) proposed that Twitter can enhance learning engagement and performance when instructors do the following three things: First, they need to design Twitter activities following pedagogically sound theoretical frameworks. In their study, they followed Chickering and Gamson's (1987) seven principles of undergraduate education. Second, instructors should require students to use Twitter as part of their course. Third, instructors must actively engage with students on the Twitter platform. These findings have been echoed by other researchers who integrated SNSs through closely guided approaches. For instance, Abella-García et al. (2019) recognized that their requirements on the number of tweets to create and the number of expert accounts to follow had contributed to the positive learning outcomes in their study. Pai et al. (2017) emphasized that faculty responsiveness and student perception of faculty valuing SNS activities were central to their success with Facebook.

Following Vygotsky's theory, Churcher et al. (2014) implemented Facebook in a media studies course to increase student participation in course discussions, develop student ownership, and support knowledge sharing. They proposed four practices for higher education instructors to successfully scaffold students. First, implement SNSs as a pedagogical tool. This means that the design of SNS-based learning activities should follow sound pedagogical theories, which is similar to the first suggestion of Junco et al. (2010, 2013). Second, give students ownership for setting up participation rules in the social learning space. In this case, the instructor had a discussion with students and together they created nine class rules for using Facebook. Third, in order to ensure learning outcomes, instructors or tutors need to monitor and intervene in the conversations when incorrect information or confusion arises. Fourth, instructors should never assume students' familiarity with SNSs will naturally ease them into using SNS for learning purposes. Specific instructions, grading criteria, and examples of acceptable and non-acceptable posts often need to be provided to students early.

Borge et al. (2019) used Yammer to facilitate online discussion and learner community building. The instructor support practices in this study were formed based on the sociocultural theory of learning (i.e., Lave & Wenger 1991; Stahl, 2016; Vygotsky, 1978). A sociocultural activity design (SCAD) model was applied to guide the design, implementation, and evaluation phases of the SNS integration (See Table 1). Borge et al. put the scaffolding strategies into four categories. "**Distribution of labor"** relates to instructors gradually fading their contribution and developing students' agency in discussion moderation and community building. "**Values"** relates to setting up guidelines and community values that promote collaboration and knowledge-building discourse. "**Tools"** relates to selecting technology features and modeling the desired discussions. **"Rules"** relates to creating grading criteria to evaluate student performance and ensuring students adhere to course expectations. This framework not only helps instructors design and implement scaffolding strategies but also aligns the strategies with expected outcomes, giving opportunities to evaluate the effectiveness of each strategy and make adjustments.

Table 1

The SCAD Model for Developing an Online Community of Learners (Borge et al., 2019)

Activity system factors	Optimizing online discussion processes		Expected outcome
	Design considerations prior to implementation	Instructional considerations during implementation	
Distribution of labor	Provide students with agency over the community by devising tasks where students learn how to lead discussion and moderate the community	Require students to take on responsibility for moderating discussion and include students in ongoing decision-making about the community	A shift in participation occurs over time: the instructor fades as the main contributor and multiple students take on the role of moderating and leading inquiry
Values	Align course syllabus language and activities to promote collaboration and discourse and create guidelines to articulate community values to the learners	Promote collaboration and knowledge building discourse as central to learning	There is variation in posting behavior similar to naturalistic conversation. There is evidence that students read, reply, and synthesize others' posts and create long threads of inquiry rather than question-response pairings
Tools	Select a technology that provides opportunities for community building and cognitive resources to help students know how to carry out and regulate desired activity through the technology	Provide a dialogic space to discuss ideas related to content; have instructor model desired activity to connect course content to real-life practice, share resources, ask for help understanding topics, and reflect on their learning	Most student-led discourse is content-based, which includes a variety of cognitive activity, promotes higher-order thinking processes, includes reflection, and shows evidence of argumentation stemming from problematization of content
Rules	Create grading criteria that hold students accountable for contributing to community	Ensure all adhere to course expectations and requirements related to tool use and participation in online discussion	Students maintain community values and promote intellectual work even after instructor fades

Based on their experience using Twitter in a graduate-level education policy course, Nicholson and Galguera (2013) encouraged instructors to offer the following support to students: (a) providing explicit instructions to help students develop SNS literacies, which include how to identify, evaluate, and synthesize online information as well as how to communicate with others in the collaborative learning environment, (b) identifying student frustrations and struggles early and designing responsive interventions to address these challenges, and (c) creating an intimate and safe atmosphere for students to share their experiences, questions, and frustrations as a class.

Based on the aforementioned literature, the effective scaffolding strategies with SNSs are summarized in Table 2 following Ozan's (2013) framework. When it comes to the types of these scaffolding strategies, Ozan's technical scaffolding and social scaffolding are adopted here since they are both closely related to SNSs. In addition, the following three categories from Hannafin et al. (1999) are incorporated: (a) **conceptual scaffolding:** guiding learners in what to consider to approach understanding and providing them with explicit hints and prompts – this type of scaffolding directly ties to cognitive engagement or active learning in Barkley and Major (2020),

(b) **metacognitive scaffolding:** supporting student in managing their own learning, and (c) **strategic scaffolding:** suggesting alternative methods or procedures and providing expert advice.

Table 2

Effective Scaffolding Strategies in the SNS Learning Environment

Strategy	Provider	Timing	Type
Select appropriate technology features and guide students in using the features	Instructor and TA	Prior to and beginning of SNS implementation	Technical scaffolding
Set up participation requirements, rules, and community values	Instructor, TA, and students	Prior to and beginning of SNS implementation	Metacognitive scaffolding
Teach students how to effectively learn in the SNS environment, such as developing SNS literacy skills (identify, evaluate, and synthesize online information and communicate and collaborate with others)	Instructor and TA	Prior to and beginning of SNS implementation	Strategic scaffolding
Model argumentation, ask questions, give discussion prompts to help students develop understanding of concepts and cognitive skills	Instructor, TA, and peers	Beginning and during SNS implementation	Conceptual scaffolding
Encourage conversations and facilitate community-building	Instructor and TA	During SNS implementation	Social scaffolding

Note. Table 2 was created by the dissertation author.

Scaffolding Challenges in SNSs

Ineffective scaffolding practices and challenges of scaffolding in SNSs have not been extensively studied or discussed. At this stage, studies of closely guided SNS use cases remain their focus on what has worked. One problem brought up by Lima and Zorrilla (2017) in their study of a social MOOC was the lack of student initiation after instructor involvement and support were removed. What they found was that while the course was in session, with the instructors leading the conversations, the learners posted on their SNS platform actively. However, after the course ended, the scholars failed to see continued student engagement and community-building efforts. This lack of student agency and the failure of responsibility transfer from instructors to students brought attention to how much instructors should involve in SNS activities and how and when their involvement and support should fade away.

While Junco et al. (2010, 2013) called for active faculty engagement in the SNS space and Churture (2014) signified the importance of ongoing monitoring of student discussions, these scaffolding practices unavoidably face a real-world challenge – it is time-consuming. When the CN team supports instructors to adopt the CN platform, a frequently received question is “Do I have to read and respond to each post?” Faculty hesitate to adopt the technology due to concerns about the commitment they must put into moderating the social discussion. According to the definitions of scaffolding and fading, ideally, instructors should plan to gradually reduce their support and transfer the responsibility of discussion facilitation to students, which, as an integral part of scaffolding, promotes students’ skill gains over time (Belland, 2014). Therefore, to help more faculty willingly and successfully adopt SNSs, tactics of how to transfer responsibilities and develop student agency over are worth exploring.

In Borge et al. (2019), the instructors were able to curate a robust learning community. They then gradually removed their support but witnessed the flourishing of a learning community led by active students. What they accomplished not only set up an example but also gave educators confidence in achieving more efficient scaffolding practices. This dissertation gives attention to this topic by asking experienced CN faculty to share effective instructional tactics that allow their scaffolding to fade and students' agency to develop over time.

CHAPTER III STUDY METHOD

In order to achieve a deeper understanding of the instructor scaffolding practices that foster student engagement on the CN platform, a mixed-method design was implemented to answer the four research questions of this dissertation. According to Creswell (2015), a mixed-method design collects and analyzes both quantitative and qualitative data in a single study to build upon the strengths of both data types. The quantitative CN usage data, such as numbers of posts, Anar Seeds, and awarded badges from a large number of courses enabled inferential statistics to answer RQ1 regarding instructors' selection of unique features and its association with increased engagement. The quantitative data also helped identify courses for course site observations and faculty interviews.

It is worth noting that qualitative methods are the primary methods of this study. The faculty interviews, course observations, and artifacts analyses helped develop a deep understanding of scaffolding practices in specific learning contexts: how they were implemented, in which ways they affected student engagement, and why they had or had not worked. In the process of qualitative data collection and analysis, mainly for RQ2 and RQ3, quantitative data (e.g., counting instances of specific scaffolding strategies, number of instructor posts and reflections, and frequencies of interactions between two users) complemented and facilitated the interpretation of qualitative data.

Data Sources

In terms of RQ1, "What features of CN do instructors leverage to increase learning engagement?," the researcher drew upon the following data sources:

- Course-level usage data (i.e., course duration, number of users, Anar Seeds, posts, polls, badges, instructor-recommended hashtags, etc.)
- Course site observation
- Faculty interviews

For RQ2, “What scaffolding strategies do instructors implement to foster learning engagement? What works and what does not?” the following data were collected and analyzed:

- Faculty interview data
- Course site observations
- Scaffolding artifacts

To answer RQ3, “What specific instructional strategies and tactics are utilized by CN instructors to fade their scaffolded assistance and allow for increasing student agency over time?,” the following data were leveraged:

- Course-level usage data (i.e., instructor posts and reflections, and Anar Seeds)
- Course member interaction data for SNA
- Faculty interviews
- Course site observations

For RQ4, “What challenges do instructors face when using CN to engage students in learning?,” the following data were examined:

- Faculty interviews
- Course site observations

Data Collection Procedure and Methods

A three-step procedure was carried out to collect the aforementioned data. In Step 1, a massive number of CN courses and course-level usage data were queried. In Step 2, all courses were sorted based on participation, and the 12 most active courses were selected. In Step 3, for the selected 12 courses, course member interaction data was queried, and qualitative data was collected through course site observations and faculty interviews. Details of each step are described below.

Step 1: Query Course Data

Since most of the courses on the CN platform were higher education courses, the CN technical team directly queried all Classic courses[2] that had five or more users and were created between May 1, 2020, to April 30, 2022. A total of 11,419 courses were found and provided on a CSV[3] file with the following data fields: course name, CN Course ID, institution name, country, course instructor(s), instructor email address(es), course start date, course end date, the date the first student joined the course, the date the last student visited the course[4], number of users, average Anar Seeds (course total Anar Seeds divided by the number of users), number of instructor posts (including all post types), number of instructor reflections, course Anar Seeds goal, number of instructor-awarded badges, number of instructor-recommended hashtags, the average number of posts (including all post types), the average number of polls, Anar Seeds values modification (i.e., yes or no).

The 11,419 queried courses covered a wide range of subjects. Nearly 94% of them belonged to CN licensing institutions. The rest were created by individual instructors. These

[2] CN has two LMS course formats: Classic and Pathway. Classic has been primarily used by higher education.
[3] A file format commonly used for storing data. It looks and functions similar to Microsoft Excel files.
[4] The reason for querying the date the first student joined the course and the date the last student visited the course was that some CN courses did not record an end date or the recorded start date and end date were inaccurate. Therefore, this additional set of dates were used to cross-check course duration and calculate a series of monthly values.

courses were from 17 countries[5] (i.e., Austria, Belgium, Egypt, France, Greece, India, Malaysia, Maldives, Netherlands, Rwanda, Singapore, Spain, Sri Lanka, Taiwan, Thailand, Turkey, and the United States) with the majority from Malaysia (70%) and the United States (25%). In terms of course size, it ranged from five to 756 users, with an average of 29 users. The courses also had varied lengths from 0.5 to 40 months, with 3.7 months being the average length. At this stage, 204 courses that were shorter than two weeks were removed from the dataset due to the questionable accuracy of their start and end dates.

Since the queried courses came in different sizes and durations, to ensure the accuracy of data comparison among courses, a monthly value was calculated for the following data: average Anar Seeds, number of instructor posts and reflections, course Anar Seeds goal, the average number of posts, and average number of polls. The calculated monthly values were later used for the correlation analyses and the independent sample t-tests.

Step 2: Sort Courses Based on Participation

In this step, the 11,215 querried courses (excluding the 204 courses that were shorter than two weeks) were sorted with the aim of identifying the most active courses to study specifically. Although average Anar Seeds (i.e., course Anar Seeds/user) could be a good indicator of student engagement, some instructors had adjusted the Anar Seeds table in their courses. If they reduced the number of seeds for some activities, their students were likely to have received fewer seeds compared to courses that did not modify the Anar Seeds table or adjusted to award a larger number of seeds for the same activities. In fact, instructors who modified the Anar Seeds table usually knew the platform better and tended to put more effort into guiding their students. It

[5] This number was likely smaller than reality because nearly half of the courses did not indicate its country.

would contradict the goal of this study to exclude these courses and instructors from the next steps. Therefore, instead of sorting all of the queried courses based on average Anar Seeds, the queried courses were sorted based on the monthly average number of posts (i.e., course posts/user). Here the "posts" included all post types (i.e., Posts, Polls, and Events). Although more posts are not equivalent to better engagement, it indeed reflects higher participation, which could be an indicator of better engagement compared to lower participation.

Step 3: Data Collection from Selected Courses

After sorting the 11,215 quarried courses based on monthly average posts, 12 courses from the top of the list were selected with the aim to examine effective student engagement strategies through course site observations, SNA, and faculty interviews.

Selected Courses and Faculty Participants. When it came to selecting actively participated courses and their instructors, a combination of purposeful and convenience sampling was implemented. The researcher of this study followed the sorted course list to purposefully identify qualifying courses and faculty participants. During this process, some courses were eliminated due to non-participation of instructors or students, repetitive faculty in multiple courses, or non-higher education settings (e.g., faculty professional training courses). After identifying the first 10 qualifying courses from the top 30 courses, an email was sent to the primary instructor of each course to seek participation. See Appendix A for the invitation letter. Soon five instructors accepted the invitation, among whom four received CN support from the researcher in the past. Realizing the acceptance rate was significantly higher with acquainted faculty, the researcher primarily reached out to faculty she already knew when moving down the list to recruit more participants, which was where convenience sampling was incorporated. The recruitment process stopped once 12 faculty members confirmed their participation. The reason behind this decision was that these courses offered a diverse range of subjects, represented different countries, encompassed various course levels, had instructors with different experiences, and varied in class sizes. Another reason was that the selection process had reached the 829th most active course on the list and going further down would result in decreased student participation and likely limited insights into effective engagement strategies.

Table 3 below contains brief information on the 12 selected courses and corresponding primary course instructors. In order to protect the privacy of the participants, some course names were slightly altered, and each instructor was given a pseudonym.

Table 3

12 Selected Courses and Faculty Participants

Course	Rank[6]	Country	Course level	Duration	Primary instructor	Instructor's years of using CN prior to this course	Number of users
Business Ethics	1	Rwanda	Graduate	Oct 25-Dec 5, 2020	Michel	1	15
Intro to Global Literature	12	US	Undergraduate	Jan 10-May 14, 2022	Norm	9	59
Physics 200	16	US	Undergraduate	May 10-Aug 1, 2021	Aji	7	206
Mycology and Parasitology	19	US	Undergraduate	Aug 24-Oct 21, 2020	Barb	0	12

[6] The rank is based on monthly average posts, which is calculated by dividing the monthly total number of course posts by the number of users in the course

Strategic Marketing	25	Malaysia	Graduate	May 20-July 12, 2021	Joe	7	5
Interior Design	39	US	Undergraduate	Aug 25-Dec14, 2021	Mary	9	16
Cultural Virtual Exchange	125	US-Slovenia	Undergraduate	Oct 20-Dec14, 2021	Fu	9	71
Communications Law	157	US	Undergraduate	Jan 10-May 1, 2021	Adam	8	20
Teacher Education Globalization	175	US	Graduate	Jan 6-April 10, 2022	Beth	10	11
Japanese Culture	635	US-Japan	Undergraduate	Oct 27-Dec 11, 2021	Mizumi	0	31
Mechanics	741	US	Undergraduate	Aug 17-Dec 20, 2020	Andy	6	161
Communication Skills	829	Malaysia	Undergraduate	Oct 4-Dec 30, 2021	Jeremy	0	21

Course Site Observation. Once an instructor confirmed participation, their CN course site was observed in detail from the following aspects: (a) features that were used, including CN features as well as external tools and resources, (b) student engagement, capturing evidence of both motivation and active learning, (c) faculty involvement, such as course visits, posts and reflections, and signs of transfer of responsibilities, (d) scaffolding strategies demonstrated through posts, reflections, and the use of other tools, and (e) issues and challenges that the observer noticed as ineffective ways of engaging students. The course site observation sheet, recorded in Appendix B, was turned into an Excel spreadsheet to guide each course observation and the collection of observed data. Researcher notes were taken to record the researchers' thoughts, ideas, and reflections along the observation process.

One thing worth noting is that all 12 courses had ended before this study. This means that student learning in these courses would not be affected by the observation and the course sites most likely remained the same. This allowed the observer to revisit the course sites anytime if additional data or data verification was ever needed.

Data Collection for SNA. While a course site was being observed, posting-based interaction data (i.e., who made a post or reflection, who commented on that content, and the comment time) was queried by the CN technical team as "edge" data for SNA. The researcher also collected "node" data (i.e., every course member and their course role) from course rosters.

Faculty Interview. The 12 faculty participants were interviewed via Zoom separately, each for about 30-60 minutes. Each interview was conducted after the corresponding course site observation and SNA. This allowed the researcher to ask targeted questions. All interviews were semi-structured, following a series of guiding questions. See Appendix C. The interviewees were asked to briefly talk about their experience with CN and their course, their reasons of using CN, the technology features they found effective in enhancing learning engagement, and mostly, their scaffolding strategies and fading tactics. Toward the end of the interview, they were also asked to share the challenges and barriers of using CN to engage their students and give suggestions to the CN team.

Each participant was also requested to bring a scaffolding artifact to the interview. If they did not share a copy of the artifact by the time of the interview, they were reminded to share it after the interview. Most of the instructors shared the CN portion of their course syllabus, CN orientation materials they gathered for students, or their discussion prompts and post examples. These artifacts facilitated the faculty's articulation of their scaffolding strategies and offered concrete evidence of their practices.

The data collection procedure (i.e., course site observation, SNA, then faculty interview) was carried out course by course. It took around two and a half months to complete the data collection from all 12 courses.

Data Analysis Procedure and Methods

Quantitative Analysis of the Queried Course Data

First, a series of inferential statistics were calculated in SPSS to answer RQ1 and RQ3, specifically, whether higher engagement tends to occur when a unique CN feature is used and when faculty participate in discussions. Here, monthly average Anar Seeds was used to measure student participation and signal engagement. As discussed in the “Anar Seeds as An Engagement Indicator” part of Chapter 2, since the Anar Seeds system operates automatically inside every course, awards points for a variety of activities (i.e., both active and passive), and applies explicit rules, students’ Anar Seeds is not only a precise data source for participation, but a unique indicator of engagement.

To ensure validity and accuracy, 299 courses that had a modified Anar Seeds table were removed from the queried course dataset. In this step, a CSV file of 10,916 courses was imported into SPSS to run the following analyses:

1. Independent sample t-test to compare course average Anar Seeds between two groups: courses that had created polls and courses that did not have any polls. This comparison would help answer RQ1 regarding if the use of the poll feature connects with higher student engagement.
2. Independent sample t-test to compare course average Anar Seeds between these two groups: courses with an Anar Seeds goal and courses without an Anar Seeds goal. This

analysis aimed to answer RQ1; namely, whether setting up a course Anar Seeds goal by an instructor has the potential to help engage students.

   a. Follow-up analysis: Pearson correlation between course Anar Seeds goal and average Anar Seeds. This analysis stepped forward to answer if the bigger the Anar Seeds goal, the more Anar Seeds individual students tend to earn. In other words, if bigger Anar Seeds goals could potentially stimulate more engagement.

3. Independent sample t-test to compare course average Anar Seeds between these two groups: courses where the instructors awarded badges and courses where the instructors did not award badges. This analysis had the purpose to answer RQ1; specifically, whether using the badge feature tends to help engage students.

   a. Follow-up analysis: Pearson correlation between the number of instructor-awarded badges and average Anar Seeds. This analysis would give insights into whether the more badges that instructors award, the more engaged their students could become.

4. Independent sample t-test to compare course average Anar Seeds between these two groups: courses with instructor-recommended hashtags and courses without instructor-recommended hashtags. This analysis would answer RQ1 in regard to whether using the instructor-suggested discussion topics feature may help engage students.

   a. Follow-up analysis: Pearson correlation between the number of instructor-suggested hashtags and average Anar Seeds. This analysis tended to imply whether the more hashtags that instructors suggest, the more Anar Seeds that students would earn.

5. Independent sample t-test to compare course average Anar Seeds between these two groups: courses that had instructor posts or reflections and courses that had no instructor posts and reflections. This comparison aimed to answer RQ3; specifically, whether instructor participation in course discussion could potentially affect student engagement.
    a. Follow-up analysis: Pearson correlation between the number of instructor posts and reflections and course average Anar Seeds. This analysis was carried out to address whether instructor involvement in course discussion is positively associated with student engagement.

Social Network Analysis (SNA)

For each of the 12 selected courses, SNA was carried out prior to the faculty interview to better understand course network dynamics, especially changes in the instructor's position and influence in the class network over time (answering RQ3). Based on the SNA, targeted follow-up questions were asked during the faculty interviews to seek in-depth information and triangulate data. In order to run SNA, the prepared course "nodes" and "edge" data were imported into Gephi (https://gephi.org), an open-source network analysis tool. Gephi automatically generated network visualizations and calculated the instructor's centrality values - this study specifically calculated Eigenvector Centrality[7] values for each instructor at the first, second, and last thirds of their course. Decreasing values over time would suggest fading of scaffolding. Borge et al. (2019) ran a similar SNA using Gephi and confirmed the successful transfer of responsibility

[7] Eigenvector Centrality measures the influence of a node in a network. It assigns a relative score (value between 0.0-1.0) to each node, taking into account of connecting nodes' influence into the score of the node in question. The relative score also allows value comparisons between courses.

from instructor to students in a social networking discussion environment. Their study guided the SNA of this dissertation.

Qualitative Data Analysis

Thematic analysis was carried out to analyze the three qualitative data sources: (a) course site observation sheets, (b) faculty interview transcripts, and (c) scaffolding artifacts. Richards (2006) was followed to apply topic coding followed by analytical coding. According to Richards, topic coding is only for allocating content to topics. "It usually involves little interpretation. You are putting the data 'where they belong', a sort of data disposal" (p. 92). After allocating passages, analytical coding leads to "considering the meanings in contexts and creating categories that express new ideas…coding to gather and reflect on all the data related to them" (p. 94).

The topic coding began when the three qualitative data sources of a course were gathered. Codes in Table 4 were implemented to mark passages and screenshots and enable deeper-level analytical coding to answer each research question. Then a summary of the data analysis was written for the faculty participant to review. Once this coding process was completed for all 12 courses, passages and screenshots under each topic from different courses were brought together. A second round of cross-course analytical coding then began to allow comparisons, reflections, and eventually the emergence of themes.

Table 4

Topics and Codes for Qualitative Data Analysis.

Topics	Codes
Student engagement	Motivation Active learning

Course context	Purpose of using CN Discussion topics
Use of CN features Usage of external tools and resources	Anar Seeds Badges Hashtags Polls Tasks YouTube <Other features>
Scaffolding strategies ● technical scaffolding ● metacognitive scaffolding ● strategic scaffolding ● conceptual scaffolding ● social scaffolding	● Strategy ● Type/Category ● Provider ● Timing
Scaffolding fading	Faculty CN involvement Transfer responsibilities to students Fading tactics
Challenges	Challenges Needed Resources Needed Support Observed issues

Approaches to Ensure Validity

According to Anfara et al. (2002), internal validity is the trustworthiness of the conclusions and the match of the conclusions with reality. This dissertation took the following three approaches to ensure its validity.

Positionality and Reflexivity

In qualitative studies, researchers unavoidably serve as a research instrument. A researcher's identify, beliefs, life experiences, and motives shapes the design of a study, the way the study is conducted, and research outcomes (Holmes, 2020). Therefore, it is critical to acknowledge the researcher's positionality and lens (Yin, 2016) in order to increase transparency of a study.

The researcher came into this study as an insider. She worked as a critical member of the CN team, leading the development and pedagogical implementation of the platform. Through her work, she acquired profound understanding of the technology platform and built connections with faculty worldwide by supporting their utilization of the platform. Being an advocate of sociocultural and connectivist approaches of learning, the researcher believes in the power of academic networking and the potential of technologies in connecting, engaging, and empowering students. Although this study is directly related to the research's work and aimed to inform improvements of the CN platform, it is an independent research project built upon the researcher's genuine interests in finding out how to enhance support for students in an online social learning environment.

A related concept to positionality is reflexivity, which refers to the ability to examine and react to one's emotions, motives, and situation (Robinson & Wilson, 2022) and the ability to recognize one's influence on a study (Holland, 1999). In order to stay reflexive, the researcher took notes throughout the study to document reasons behind an interest or surprise in specific data, rationale behind altering or eliminating a code, and ideas behind making a recommendation. These reflective notes facilitated reflexivity and allowed for discovering positionality, tracking of thoughts, and writing a thick description to reveal the researcher's lens. This would in turn increase the transparency and trustworthiness of the study.

Iterative Coding

An iterative process was implemented when analyzing the qualitative data. For instance, the course site observation data were analyzed multiple times – before the faculty interview, after the faculty interview at the course level, and across courses. The researcher returned to some courses several times to confirm the evidence. In addition, certain passages were read several times to adjust their codes and categorization. An example of this was the categorization and recategorization of some scaffolding strategies.

Data Triangulation

First, the data of this study was triangulated between multiple data sources, specifically, quantitative data (CN usage and interaction data), course site observation data, faculty interview data, and scaffolding artifacts. For each research question, there was a main data source. For example, for RQ2, faculty interviews were the primary source, and the course site observations and scaffolding artifacts complemented the primary source. The complementary sources confirmed the analysis of the primary source as well as provided missing data. Second, member checking (Creswell & Miller, 2000) was carried out to ensure the accuracy of the qualitative data collection and interpretation. Member checking in this study was accomplished through the following two approaches: First, during an interview, the researcher restated and summarized responses to prompt the participant to confirm accuracy. Second, after each interview, a summary of the data analysis of the interview, course site observation, and scaffolding artifact was shared with the faculty participant to check accuracy. Among the 12 participants, nine responded with a confirmation of accuracy. The other three participants did not respond.

CHAPTER IV FINDINGS

RQ1: What Features of CN Do Instructors Leverage to Increase Learning Engagement?

In order to answer RQ1, CN usage and student engagement data from the queried courses was first examined, then the data from the 12 well-participated courses.

Findings from General Courses

Overall Usage of the Unique Features. As an academic SNS, CN does not only offer LMS functionalities but also social (e.g., posts, polls, hashtags) and gamification (e.g., Anar Seeds, badges) features. These unique features have been specifically designed to enhance learning engagement. Table 5 captures the usage of these unique features among the 11,215 queried courses.

Table 5

Usage of Unique CN Features in 11,215 Courses Created Between May 1, 2020, to April 30, 2022

Feature / Descriptive statistics	Posts (including post, poll, and event) created per user	Polls created per user	Course Anar Seeds goal[8]	Instructor-suggested hashtags	Instructor-awarded badges
Number (and percentage) of courses used the feature	8,151(72.68%)	1,170 (10.43%)	594 (5.30%)	413 (3.68%)	205 (1.83%)
Minimum	0.01	0.01	30	1	1

[8] As mentioned before, Anar Seeds operate automatically. This means students earn seeds regardless their instructors set up a course Anar Seeds goal or not.

Maximum	45.84	14.85	2000	62	1654
Average	1.60	1.32	333.32	9.37	51.25
Median	0.46	0.4	300	7	8
Mode	0.17	0.02	400	1	1

Two trends in using unique features emerged from these general courses. First, Post was the most used feature. However, there were still around 27% of the courses that did not create a single post. Among the courses that used the posting features, the average number of posts created per user was low (i.e., 1.60 posts/user) with the median (i.e., 0.46 posts/user) and mode (i.e., 0.17 posts/user) being even smaller. Second, only a small fraction of the courses set up a course Anar Seeds goal (i.e., 5.30%), suggested hashtags (i.e., 3.68%), or awarded badges (i.e., 1.83%). The median number of instructor-awarded badges, 8 badges/course, seemed to reflect the practice more realistically than the average value of 51.25 badges/course.

Unique Features and Engagement. Since students earn Anar Seeds through participating in various activities in CN, Anar Seeds could be used as a measurement of learning engagement. A series of Anar Seeds based correlation analyses and independent sample t-tests were computed with the intention to discover whether the use of unique CN features, specifically, polls, course Anar Seeds goals, instructor-suggested hashtags, and instructor-awarded digital badges may affect learning engagement. To ensure data consistency and validity, courses that had modified Anar Seeds values were removed from the following calculations.

Polls. A significant difference in monthly average Anar Seeds (i.e., monthly Anar Seeds/user) was found between courses that had no polls (M=10.48, SD=10.21) and courses that had polls (M=47.47, SD=56.38); t(879.01) =-19.38, p<.05. This result shows that students tend to be significantly more active when the Poll tool is used compared to when the tool is not used.

Anar Seeds Goal. When comparing monthly average Anar Seeds between courses without an Anar Seeds goal (M=11.60, SD=14.85) and courses with an Anar Seeds goal (M=67.07, SD=64.81), a significant difference was found between these two groups, t(363.31)=-16.29, p<.05. This result suggests that students tend to be significantly more engaged if their instructor set up a course Anar Seeds goal.

The follow-up Pearson collaboration analysis found a significant, medium, positive correlation between monthly average Anar Seeds and monthly course Anar Seeds goal, r(10,916)=.436, p=.000. This finding implies that, to a certain extent, the bigger the Anar Seeds goal the more engaged the students could become.

Instructor-awarded badges. A significant difference in monthly average Anar Seeds was found between courses without instructor-awarded badges (M=13.05, SD=18.09) and courses with instructor-award badges (M=41.22, SD=91.27); t(154.17)=-3.84, p<.05. This result suggests that students tend to be significantly more engaged if their instructors award them digital badges.

The follow-up Pearson correlation analysis, however, found no correlation between average Anar Seeds and the number of instructor-awarded badges, r(10,916)=.008, p=.404. This result was likely due to badges not being an Anar Seeds earning activity. In other words, CN did not award Anar Seeds for earning a badge. From another perspective, and probably more importantly, this result informs instructors that simply awarding many badges does not guarantee increased engagement. The number of badges to award should depend on what qualities to be recognized and the number of students who have met the criteria for the recognition.

Instructor-suggested Hashtags. There was a significant difference in monthly average Anar Seeds between courses where instructors did not suggest any hashtags (M=12.36, SD=16.55) and courses where instructors suggested hashtags (M=53.64, SD=73.03); t(288.81)=-9.6, p<.05. This result indicates that students tend to be significantly more active when their instructors suggest hashtags for course discussions.

The follow-up Pearson correlation analysis only found a significant, small, positive correlation between monthly average Anar Seeds and the number of instructor-suggested hashtags, r (10,916) =.256, p<.001. Like badges, the small correlation signals that more hashtags do not exponentially increase engagement. Instructors do not have to suggest a huge list of hashtags. It is more important to recommend hashtags that give good coverage of the core topics of the course.

Findings from Selected Courses

When looking into the 12 selected courses, data collected through course site observations and faculty interviews revealed specifics about feature usage. A summary of each course's utilization of CN, including the purpose as well as the external tools and resources employed, is presented in Table 6. This table provides a snapshot of the CN features utilized in each course, allowing for a more comprehensive understanding of the scope and extent of their use.

Table 6

Technical Features Used in the 12 Courses

Course	**Instructor**	**Purpose of using CN**	**CN features used**	**External tools and resources used**

Business Ethics	Michel	Used CN for social discussion. MBA students had deep conversations on topics, such as human rights, sustainable development, business innovation, etc.	Posts, hashtags, reflections, polls, Anar Seeds (600 seeds for 30% course grade), badges, Tasks	YouTube videos and weblinks
Intro to Global Literature	Norm	Used CN for flipped classroom. Students posted their initial reflections on assigned literature before going to each class. This activity prepared students for close reading and major paper assignments.	Tasks, DropBox (assignment submission and grading tool), GradeBook, posts, reflections, polls, Anar Seeds (1500 seeds for 30% course grade+5% extra credits)	Zoom recordings and YouTube videos
Physics 200	Aji	Used CN as an LMS. The social discussion part consisted of instructor-organized post assignments and free discussions. The post assignments encouraged students to share real-world applications of physics concepts. Through free discussions, students were encouraged to post things related to the course.	Tasks, quizzes, DropBox, GradeBook, posts, reflections, polls, Anar Seeds (600 seeds for 5% course grade)	Padlet, Perusall (in reading-heavy courses), eTextbook, YouTube videos (including pre-recorded lessons)
Mycology and Parasitology	Barb	Used CN for social discussion. Through CN students communicated with each other online during the pandemic, sharing learning resources, tips, and frustrations.	Posts, reflections, polls, Anar Seeds (250 seeds for 10% course grade), badge	YouTube videos and weblinks
Strategic Marketing	Joe	Used CN as an LMS. Through the posting activities, students responded to the instructor's prompts to share their reflections on each learning topic.	Tasks, quizzes, DropBox, GradeBook, posts, reflections, polls	YouTube videos and academic journals, WhatsApp, Google Meet

Interior Design	Mary	Used CN for social discussion. CN kept students engaged with each other and with course content informally – looking at interior designs outside of class.	Posts, hashtags, reflections, polls, Anar Seed (613 seeds - a whole pomegranate in CN for 5% extra credits).	
Cultural Virtual Exchange	Fu	Used CN for social discussion. Students from two countries were brought together in a CN course to exchange information and perspectives. The Post and Poll tools allowed them to share their knowledge and thoughts related to tourism and cultures. They extended class discussions and the students who were shy in the classroom got an opportunity to speak up.	Posts, reflections, polls, Anar Seed (300 seeds to get A)	YouTube videos and weblinks
Communications Law	Adam	Used CN for social discussion. Students posted news articles to connect what they learned in the course with the real world.	Posts, hashtags, reflections, polls, Anar Seed (1,000 seeds for 10% course grade)	Weblinks (sources were recommended by instructor) and YouTube videos
Teacher Education Globalization	Beth	Used CN for social discussion. Graduate students posted about their perspectives, teaching experiences, and research to extended in-class discussions.	Posts, reflections, polls, Anar Seeds (2000 seeds for 20% course grade), Tasks, ePortfolio, student creating their own CN courses	Jamboard, Prezi, VoiceThread, and other multimedia tools to share information and explain their perspectives
Japanese Culture	Mizumi	Used CN for social discussion. CN helped extend class discussions on Japanese culture and group projects.	Posts, hashtags, reflections, polls, Anar Seeds (100 seeds for 10% course grade), Tasks	

Mechanics	Andy	Used CN for social discussion. CN was used to connect students outside of the class. They posted interesting information and resources, helped each other with questions, and shared learning tips.	Posts, hashtags, reflections, polls, Anar Seeds (350 seeds for 5% extra credits), Tasks	YouTube videos and weblinks
Communication Skills	Jeremy	CN was used as an LMS. The instructor posted course updates and lecture recordings and used polls to take attendance. Students only posted their self-introductions and a couple of questions about homework.	Quizzes, Tasks, DropBox, GradeBook, posts, reflections, polls (for taking attendance), Anar Seeds (200 seeds for a badge), badges	Google Meet, Google Drive (for storing and sharing video recordings), one YouTube video

Two Main Purposes of Using CN. In general, CN was used either as a social discussion space or an LMS by these 12 courses. In courses with the latter purpose, LMS features, such as Tasks (i.e., content and activities organization and delivery tool), quizzes, DropBox (i.e., assignment submission and grading tool), and GradeBook, were used primarily compared to the posting and engagement features. Whereas courses that used CN for social discussion leveraged the posting and engagement features (i.e., posts, polls, reflections, hashtags, Anar Seeds, badges) primarily. It is worth mentioning that five instructors who used CN for social discussion also used the Tasks tool to provide students with specific discussion prompts and additional learning resources. The education professor, Beth, even encouraged her students (i.e., current or future teachers) to create their CN ePortfolios and develop their own courses in CN. The selection of these advanced features reflected Beth's seasoned instructional skills in catering to students' learning needs through available technology features.

Posts. In each of the 12 courses, a certain number of posts were created. See Table 7 for detailed usage data of posts as well as other unique CN features. The faculty interviews revealed two main purposes of having students post in CN: to connect students with each other and to connect students with learning topics. Some courses had an emphasis on one aspect, for instance, Communications Law and Teacher Education Globalization emphasized students reflecting on course topics in real-world settings, whereas Mycology and Parasitology and Mechanics aimed at connecting students online. Some courses had both objectives, such as Interior Design – its instructor, Mary, clearly stated the reason to incorporate CN in her course as "to engage (students) with each other and informally with the content." However, no matter whether an instructor adopts CN with a focus, both purposes are often fulfilled simultaneously. This is because, in an academic SNS environment, students naturally have course-related conversations with each other. This reflects the overall purpose of SNS in connecting users based on shared interests, activities, backgrounds, or real-life relationships ("Social networking service," 2023). If to interpret the connections through the Double Helix Model (Barkley & Major, 2020), when students post to primarily connect themselves with course topics (e.g., analyzing real-world cases, comparing data, and articulating their viewpoints), they are more engaged cognitively. On the other hand, when they post with the primary purpose of connecting with peers (e.g., seeking help, giving encouragement, and forming a study group), they are more engaged emotionally. Or, put in another way, their posts are likely to strengthen their emotional engagement.

Polls. Eleven out of the 12 courses had varied usage of the Poll tool. Four courses had less than one poll per user. The CN Poll tool supports anonymous polling - both instructors and students can create a poll with one or multiple questions and view a summary of the poll results. In these 12 courses, students created polls to survey opinions, check on each other's progress, and distribute pop quizzes. Some instructors created polls for similar purposes. Instructor Jeremy used the Pool tool for a different purpose: In his Communication Skills course, he had students report attendance by answering polls during lectures. He creatively repurposed the Poll tool while using CN as an LMS, which did not provide a dedicated attendance tool.

Anar Seeds. Among the 12 selected courses, six had a modified Anar Seeds table, and 11 had an Anar Seeds goal - eight courses counted Anar Seeds for course grade, two courses for extra credits, and one course for course completion badge. In that one course, Strategic Marketing, where an Anar Seeds goal was not set up, the course instructor was aware of the gamification effects Anar Seeds could have on student engagement. He explained during the faculty interview that he did not set up an Anar Seeds goal because they had to adhere to a Malaysian quality assurance guideline, which only recognized traditional assignments and exams as course assessments. Due to this reason, in order to motivate students with a tangible reward, he had to give away free textbooks once students reached the Anar Seeds goal.

When asked which CN features were helpful in engaging students, Fu appreciated Anar Seeds the most because it helped track and regulate student participation. She shared:

> I have to say that the Anar Seeds tool is very, very helpful. Because that's one way for all of us, not just faculty, but also students to keep track of the labor of their participation. So, both me and my contact (partner faculty) in Sylvania, use Anar Seeds for grading. We grade student participation based on Anar Seeds they accumulate.
>
> I do love the feature that you can set different numbers of Anar Seeds for different activities. That really helps. It is also very helpful that CN allows us to set a maximum number of seeds students can get in a day and in a week. Do you know why? Because we learned from our earliest experience that there were students who waited until the last weeks of the semester to try to catch up. And some of them even waited till the last days when most of the other students already checked out. At that time, nobody interacted with

> them, and they were just doing it for grades. So, I told them that it takes time to accumulate so many seeds. You have to be consistent. You cannot wait or just post a lot in one day.

Two issues were found regarding setting up a course Anar Seeds goal. First, Among the courses that had an Anar Seeds goal, three instructors did not enter the goal in CN, instead, they informed students about the goal through the syllabus or during class. In addition, instructors Michel and Mizumi, due to their limited experience with CN, had to adjust their Anar Seeds goals several times while their courses were progressing.

Hashtags. Only five courses among the 12 had instructor-suggested hashtags. Adam recommended 22 hashtags (e.g., #CopyrightOpinions, #FirstAmendment, #BonusLibelScenarios, #Defamation, #IdeasForRecords, #Newsgathering, #CourseIntroVideo) to highlight course topics and learning activities in his Communications Law course. He found hashtags valuable because there was no limit on how many hashtags students could add to a post. Adding multiple relevant hashtags to a post enabled students to see how course topics were connected in the real world. Andy, the instructor of Mechanics, defined 47 hashtags and repeatedly prompted students to use hashtags to label their posts. Below is one of the prompts:

> At any time, please post questions you have about the stuff we've been learning. Reflect on your classmates' questions if you have answers. For maximum effect, use one of the instructor-created hashtags, or create one of your own!

Badges. Only three instructors among the 12 awarded badges to students. Among the three, Barb only issued one Anar Seed badge, which was more a test than a purposeful instructional intervention. Jeremy awarded the Best Participant badge to two students who met the course Anar Seeds goal. Michel, in his MBA Business Ethics course, issued a total of 16 badges, which consisted of five Best Participant badges, four Anar Seed badges, three Outstanding Award badges, two Critical Thinker badges, one Great Post badge, and one Creative Thinker badge.

It is not difficult to find that although the use of hashtags and badges could boost engagement, they were underused in both the 12 selected courses and the general courses.

Table 7

Unique CN Features Used in the Selected Courses

Course	**Number of users**	**Posts created per user**	**Polls created per user**	**Course Anar Seeds goal**	**Anar Seeds values modified**	**Instructor-suggested hashtags**	**Instructor-awarded badges**
Business Ethics	15	41.07	9.4	600	no	3	16
Intro to Global Literature	59	38.54	1.78	1500	yes	0	0
Physics 200	206	17.81	5.94	600	yes	0	0
Mycology and Parasitology	12	8.75	0.67	250	no	0	1
Strategic Marketing	5	8	0.4	-	no	0	0
Interior Design	16	19.94	8.63	613	no	3	0
Cultural Virtual Exchange	71	12.38	2.21	300	yes	0	0
Communications Law	20	11.55	0.25	1000	yes	22	0

Teacher Education Globalization	11	14.73	1.09	2000	no	0	0
Japanese Culture	31	3.45	0	100	no	12	0
Mechanics	161	5.96	1.37	350	yes	47	0
Communication Skills	21	2.67	0.52	200	yes	0	2

External Tools and Resources. In addition to CN features, external tools and resources were used in most courses. YouTube videos and weblinks were the most used, by both instructors and students. Most of the YouTube videos and website links contained course-relevant, interesting content and they were embedded in posts and reflections to stimulate conversations. A couple of instructors, Aji and Joe, who used CN as an LMS, hosted their pre-recorded lessons on YouTube and shared them with students via the CN Tasks tool.

Aji also incorporated an interactive bulletin board tool named Padlet, a collaborative reading tool called Perusall, and eTextbooks. Joe, as well as another Malaysian instructor, Jeremy, used the instant messaging tool WhatsApp and the video conferencing tool Google Meet to complement CN.

In Beth's Teacher Education Globalization course, students linked their posts to multimedia content in Jamboard, Prezi, and VoiceThread to present information and articulate their perspectives in more visually appealing and engaging ways.

RQ2: What Scaffolding Strategies Do Instructors Implement in CN to Foster Learning Engagement? What Works and What Does Not?

Through course observations, faculty interviews, and artifact analysis, all five types of scaffolding strategies outlined in Table 2 were found evidence in the 12 selected courses. In the following sections, the scaffolding practices discovered within each type will be described.

Technical Scaffolding

Technical scaffolding refers to the purposeful selection of technology tools and features and the technical training and support given to students to use these features (Berge, 1995; Ozan, 2103). The 12 instructors' purposeful selection of technology features, including both CN and external tools, has been discussion through RQ1. This part will focus on how these instructors guided their students in using these features.

CN Orientation. Eleven out of the 12 instructors gave students a CN orientation before they started using the platform, which was mostly during the first two weeks. The instructors walked students through their CN course site either synchronously (i.e., Michel, Joe, Mary, Fu, Mizumi, Andy, and Jeremy) or asynchronously (i.e., Adam, Beth, Aji, and Norm).

Synchronous Orientations. The synchronous orientations were offered either in person or via video conferencing. Instructors Michel and Mizumi asked students to set up a CN account and access the course site during the orientation. This way they were able to offer immediate support to students who encountered technical difficulties early on to maximize their participation throughout the course.

Asynchronous Orientations. Among the asynchronous orientations, Adam and Beth shared the CN Post Overview video created by the CN team to introduce the platform to their students; Aji recorded a CN navigation tour to prepare his students to use the new learning platform; Norm used a combination of university-produced, CN-provided, and self-created tutorials to get his students ready. In Norm's case, the university-produced video demonstrated how to create a CN account from the university's LMS, and the CN-provided tutorials introduced the platform navigation and general course features, in addition, the instructor wrote a couple of technical guides to explain specific features and address frequent questions from previous classes. See Appendix D as one of the guides.

Ongoing Technical Support. It is worth noting that some instructors, like Michel and Aji, gave students ongoing technical scaffolding by explaining specific features and answering technical questions via posts and reflections. Figure 6 is such a post from Aji.

Figure 6

Aji Explains Specific CN Features to Students via Post

Metacognitive Scaffolding

According to Flavell (1979), Lai (2011), and Schraw and Moshman (1995), metacognition is the ability to be self-aware in the learning process. Students execute self-monitoring, self-regulation, and self-evaluation to maximize learning outcomes. Metacognitive scaffolding, therefore, involves supporting students in managing their own learning through self-regulation and self-monitoring (Hannafin et al., 1999). In an SNS learning environment, instructors need to define and announce participation expectations, rules, and community values up front, and from there, students will be able to plan and regulate their behaviors and form positive relationships with each other.

Anar Seeds as a Metacognitive Scaffolding Tool. In CN, Anar Seeds is a gamification feature, it is also an efficient tool for metacognitive scaffolding because it already defines specific participation rules, specifically, what activities earn Anar Seeds, how many seeds each activity earns, minimum word counts for earning seeds from making a post and a reflection, maximum seeds to earn every 24 hours and every 7 days. Instructors can leverage Anar Seeds to clarify their expectations by setting up an Anar Seeds goal and modifying specific rules. As discussed in the previous RQ1 section, 11 out of 12 instructors set up an Anar Seeds goal and six modified the Anar Seeds rules.

Adam, the instructor of Communications Law, recognized the value of Anar Seeds goals and rules in helping his students plan, monitor, and adjust their own participation,

> The goal helped students understand what they needed to do. There was some transparency, and I emphasize this certainly through my instructions to them. There was some transparency in what they needed to do to sort of meet that goal. To meet the goal for the semester, they didn't have to post every single week, but they also couldn't post all at one time or at the end of the semester. There was sort of a balance of, you know, I want you to maintain participation, but that doesn't mean having to be at 100% all the time.

Other Ways to Communicate Requirements, Rules, and Values. A limitation of Anar Seeds is that it focuses on individual participation and quantitative measures. Students' self-monitoring and self-regulation should also cover how they interact with each other and the qualitative aspects of their posts. Several instructors went beyond Anar Seeds to communicate their expectations, rules, and community values in different ways.

During the three-hour CN orientation, Michel, the instructor of Business Ethics for a small group of African MBA students, explained the purposes of using CN and the expected students' roles and responsibilities. He emphasized the participation requirements and expectations,

> I reminded them that it was not only posting something or commenting on a post from their classmates but the posts to be put on this platform should be constructive and should add value to what their classmates had posted there.

In the following weeks, especially the first month of the course, he closely monitored students' posts, looking into posts with students during class and repeatedly reinforcing such requirements. The other instructor, Jeremy, also verbally communicated participation expectations and community values, such as following social networking etiquette to respect each other's comments and feedback.

Physics instructor, Aji, stated participation expectations in the course syllabus. He then reiterated the rules and expectations via posts during the course.

In her fully online course, Interior Design, Mary included a civility statement in the course syllabus, which guided students on how to interact with each other in the course, including in CN. Similarly, in Adam's fully online course, Communications Law, he identified online etiquette in the syllabus, which was not specifically created for CN but governed students' behaviors in CN.

In Mechanics, Andy created a one-page guide specifically for CN to emphasize participation rules and community values. In this guide, he recognized the values of CN and how students could leverage the strengths of the platform to connect with each other after class. He emphasized using CN to help each other:

- Help each other out with physics. CN is a great place to discuss physics ideas (which are tough for everyone). If you are unsure what some new idea is all about, post a question. If you can answer someone else's question, please help them out!
- Help each other with school. CN is also a great place to set up study sessions, share tips on exam prep or homework strategy, and share other resources.
- Help each other with the homework, but please don't "give away answers." People need to learn from the HW, so answers that amount to "just do this" aren't truly helpful. Give hints and explanations, not procedures and formulas.
- Help each other out as people. School can be hard, frustrating, depressing, etc., but we are all in it together. Please support each other's goals, interests, and efforts.

Besides making CN a supportive learning community, he also added that students could post about local events. The class did not have to limit their posts just to physics. He claimed, "ANYTHING you think will be of interest to a significant number of classmates is fine." In the end, Andy also made clear what should not be posted. He wrote:

- Don't post "junk" just to get Anar Seeds. That is a waste of everyone else's time and makes CN less useful for people trying to learn.
- This is a professional setting. Absolutely no personal/political/social attacks. Respect for one another is essential.

Thanks to these rules, since they were announced to students in the early stage of the course, according to Andy, there were rarely any violations. A complete copy of this one-page guide can be found in Appendix E.

Strategic Scaffolding

Strategic scaffolding involves suggesting effective approaches and resources and providing expert advice (Hannafin et al., 1999). In the SNS environment, the advice may cover what to post to achieve learning objectives, where to find high-quality resources for posts, how to engage in social conversations with each other, and so on.

Inspiring Post Ideas. In order to inspire post ideas, Fu showed a wide variety of exemplary posts from previous classes during the CN orientation. Since Michel had not taught the same course in CN before, he presented high-quality posts from other students in the class to give students ideas and set a benchmark. Barb, Mary, Adam, Andy, and Muzimi created starter posts of different types themselves, modeling the kind of posts they expected their students to post in the class. For example, Mary created the first post in her Interior Design course, seeking comments on the atmosphere created through the lighting applications in a photo of a restaurant. See Figure 7. Soon, her students began creating similar posts to connect what they learn in the class with real-world design cases. Barb, in her Mycology and Parasitology course, started the first Pictionary post by inviting the class to name the parasite or fungus in her drawing. See

Figure 8. Her students then created their Pictionary posts to practice recognizing parasites and fungi.

Figure 7

Mary's Example Post in Interior Design

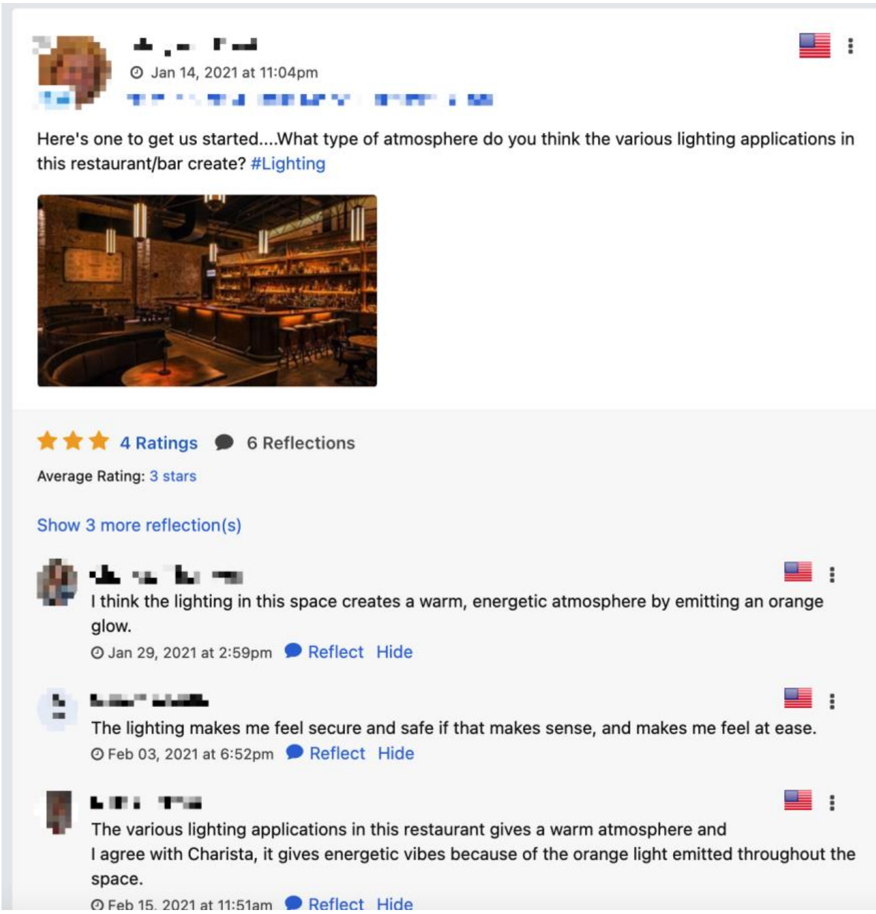


Figure 8

Barb's Example Post in Mycology and Parasitology

Recommending Post Resources. Since SNS is often considered an informal learning environment, many instructors leave it to students to find relevant information and resources to share with the class. The quality of the resources that students share, in turn, directly affects their learning experience and outcomes. Therefore, it is vital for faculty to scaffold students in identifying quality online resources in the study subject (Nicholson & Galguera, 2013). Among the 12 faculty participants, Adam, the instructor of Communications Law, has put specific efforts into this aspect. While asking students to reflect on news and legal issues relevant to journalists, he shared a dozen of reputable sources, including scholarly journals, legal blogs, social media accounts of attorneys and media law professors, and websites that documented U.S. Supreme Court cases. A complete copy of these resources can be found in Appendix F. Adam did not prohibit students from using other sources. He even made it clear that the resources he recommended were intended to serve as a good place to start. By referencing the instructor-recommended resources, the students were expected to become strategically more capable of finding equivalent resources.

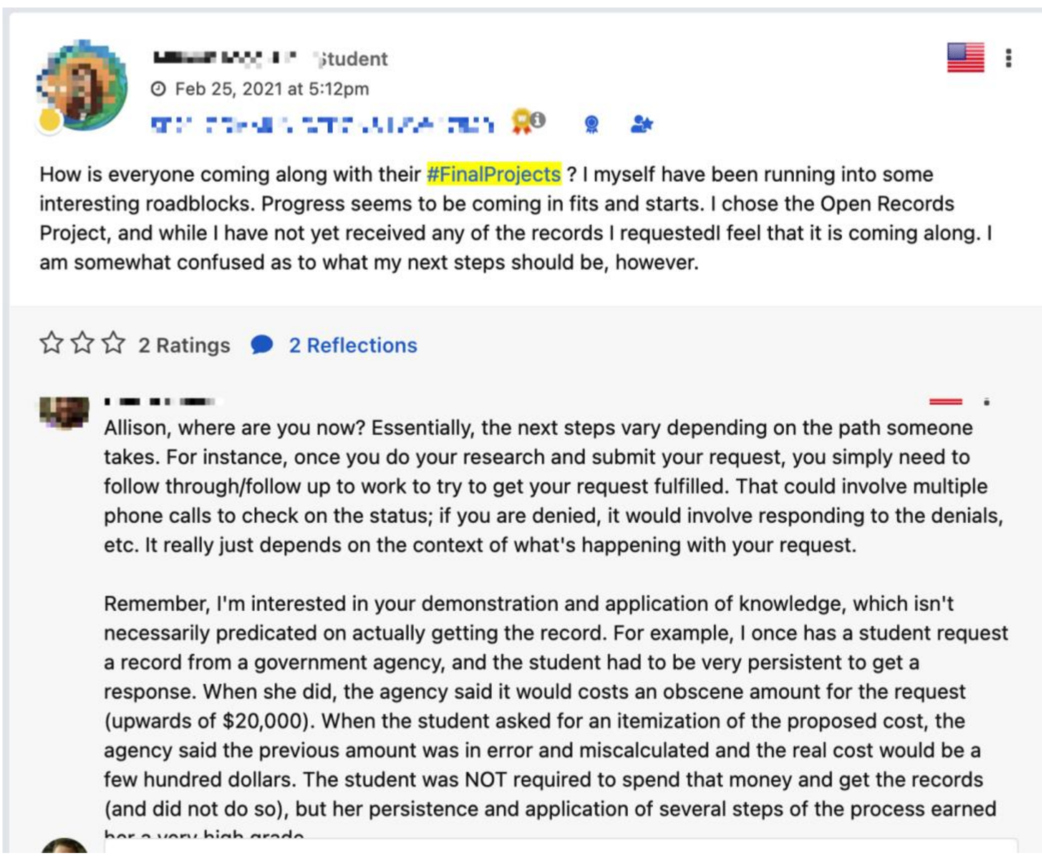
Suggesting a Different View. Instructor Fu taught a cultural virtual exchange course in CN. Her course vibrated high student engagement. For instance, in less than two months, the average number of posts reached 12.38/user and the average Anar Seeds went above the required 300 seeds/user. At the end of the course, many students expressed how much they enjoyed the course, especially being able to connect with students from a different culture. For example, one student posted, “I sincerely loved being in the class! Thanks for everyone’s participation! It was so cool to be able to connect with a class overseas!” Other students commented on the post, agreeing that it was “a great experience to be a part of.”

Fu, during the interview, revealed that one of her effective scaffolding strategies was to encourage students to view the discussion activities in CN as a cultural experience to enjoy instead of an assignment to complete. By suggesting a different angle to perceive their experience in CN, Fu released the profound power of feelings and emotions in increasing engagement - again, the motivation dimension of Barkley and Major’s (2020) Double Helix model.

Offering Strategies to Tackle Projects via Post Comments. In addition to helping students develop literacy skills and the mentality to effectively learn in an SNS environment, instructors also leveraged CN as a tool to provide strategic scaffolding on course activities. For instance, both Beth and Adam asked students to post about their course projects in CN. When students reported challenges and frustrations, the instructors commented on students' posts to offer strategic suggestions. One example can be found in Figure 9. When a student expressed experiencing roadblocks in the final project, Adam pointed the student in the right direction and shared how a previous student had handled a similar situation.

Figure 9

Adam Comments on A Student Post to Give Strategic Suggestions on Project



Conceptual Scaffolding

Conceptual scaffolding mainly concerns the cognitive side of learning engagement. It assists students in achieving an understanding of the key learning concepts (Hannafin et al., 1999) and developing their cognitive skills. This study found that in CN, instructors often provide conceptual scaffolding by carefully sequencing learning activities, providing detailed discussion prompts, modeling thinking processes, and commenting on students' posts to stimulate critical thinking.

Sequencing Learning. When asked about their scaffolding strategies in CN, several faculty participants immediately recalled how they purposefully sequenced learning contents and activities to reflect their complexity, from basic to more advanced, and to have them build upon each other.

Joe, who used CN as an LMS, carefully designed the sequence of the learning activities in his Strategic Marketing course to gradually engage students in more challenging cognitive tasks and develop their higher-order thinking skills. He set up task visibility conditions to require students to acquire compulsory knowledge and understanding before moving on to next-level tasks.

Aji, the physics faculty who also used CN as an LMS, highlighted the importance of teaching physics based on the interconnections between learning topics. He made sure that his students had acquired foundational knowledge before teaching them the next concepts. He shared the following during the interview,

> In order to have that good understanding, we have to understand how pieces connect. You can't teach physics as a random set of topics. So, scaffolding is not a choice…when I teach mechanics, I teach things that are not included in the syllabus, like certain mathematical concepts, such as vectors. I spend one whole week on vectors, making sure, regardless of whether the students have learned it outside or not, they will have no excuse for not knowing these required concepts. And so, because I make sure that happens, I can easily go into the next topic which is building upon vectors. I don't believe that is a waste

> (of time) because everything is going to be wasted unless they know the fundamental parts. Scaffolding is very strong here. And we can't do physics otherwise.

Norm viewed CN as part of the whole picture of his global literature course. He used CN to prepare his students for flipped classes: His students read assigned literature and posted their initial reflections in CN before immersing themselves in close reading during class and in-depth reflections in subsequent papers. Norm claimed that his scaffolding was involved in the design of these learning activities, which were built upon each other. Posting in CN laid a foundation - it brought students into new literature and prepared them for close reading and analytical writing. Norm shared,

> I want them to go into the reading knowledgeably…I keep adding little bits (background information about the literature) because I need to get them to the right place where they're ready first to go in and see the reading assignment and read it and then come back and do the post, ideally, before class. Then, in class, we look at a lot of key passages and I try to model close reading of a passage, which the posts don't necessarily do. Then later when they write their essay, I challenge them to focus on only one point and dig in more deeply.

Giving Detailed Discussion Prompts. In the courses that primarily used CN for social discussion, some instructors provided students with explicit and thought-provoking discussion prompts, which according to Thompson et al. (2016), support student interaction and co-construction of higher-order knowledge.

Michel in his Business Ethics course put students into pairs to discuss specific course topics. He gave each pair unique, intriguing questions to reflect upon. Below were the questions he asked a group about social entrepreneurship:

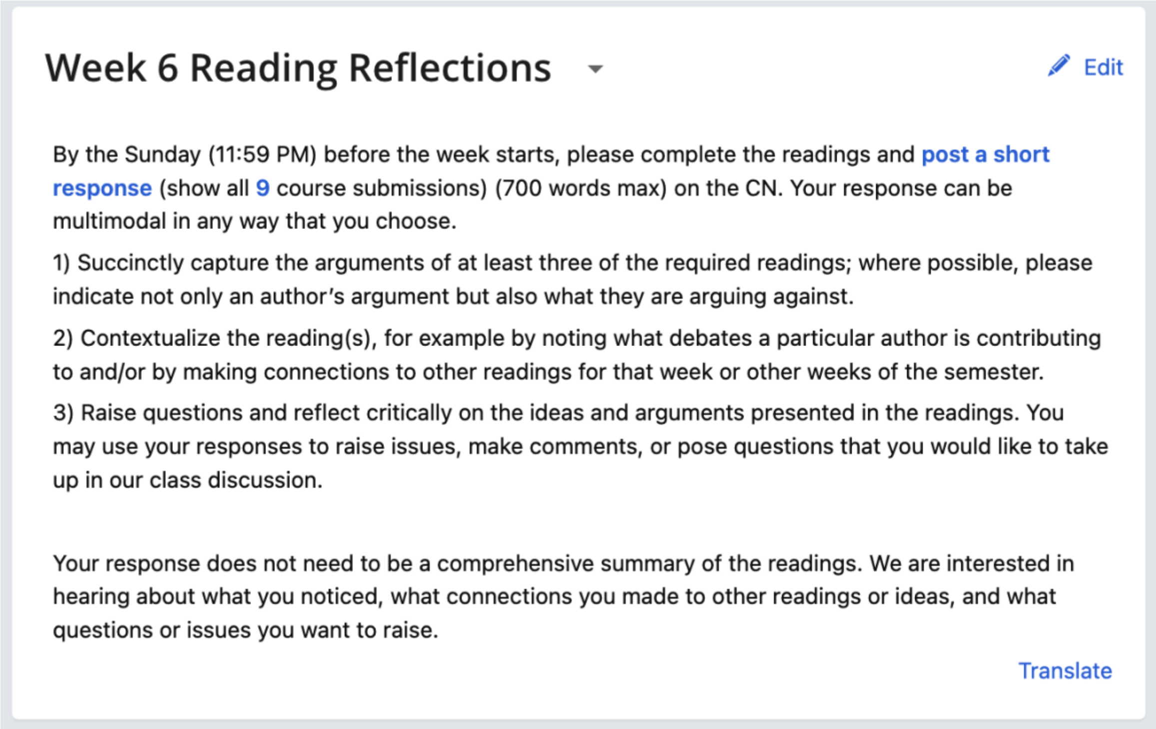
> Bornstein and Davis note that philanthropy has changed from the old model of strangers donating to strangers to a model based on connection and accountability. What has changed in society that might account for this change in philanthropic attitudes? How will this help and how might it hinder social entrepreneurs? Think like a Changemaker: Think of a cause that is important to you. How is this cause being addressed by society? By whom in society? How can we address this issue in a more effective or productive way? What can you, as an individual, do? What resources might be available to address this problem that are currently underused or overlooked? What assumptions does society make about the problem that may be flawed or no longer true?

In this example, Michel did not only ask one but a variety of questions, which students could choose based to answer based on their interests. These questions stimulated critical thinking by inviting students to debate from opposite angles (i.e., help or hinder), by having students assume an imaginary role (i.e., changemaker) and speak from their point of view, and by challenging existing assumptions. These practices have been supported by a wide range of studies on online discussions, such as Kanuka et al. (2007), Richardson and Ice (2010), and Thompson et al. (2016). Thanks to Michel's meticulously framed post prompts, the students of this course demonstrated high-level cognitive engagement through their discussions. They produced a large number of posts that involved synthesizing and analyzing data, asking deep questions, articulating thought processes, and making sense of new knowledge by connecting it to existing understanding.

Beth's graduate course in teacher education presented the same level of cognitive engagement as Michel's course. Beth gave weekly reading reflection prompts that assisted students in dissecting their thought processes, drawing connections between different readings, and posing questions. See Figure 10 for an example.

Figure 10

One of Beth's Weekly Reading Reflection Prompts



Week 6 Reading Reflections

Edit

By the Sunday (11:59 PM) before the week starts, please complete the readings and post a short response (show all 9 course submissions) (700 words max) on the CN. Your response can be multimodal in any way that you choose.

1) Succinctly capture the arguments of at least three of the required readings; where possible, please indicate not only an author's argument but also what they are arguing against.

2) Contextualize the reading(s), for example by noting what debates a particular author is contributing to and/or by making connections to other readings for that week or other weeks of the semester.

3) Raise questions and reflect critically on the ideas and arguments presented in the readings. You may use your responses to raise issues, make comments, or pose questions that you would like to take up in our class discussion.

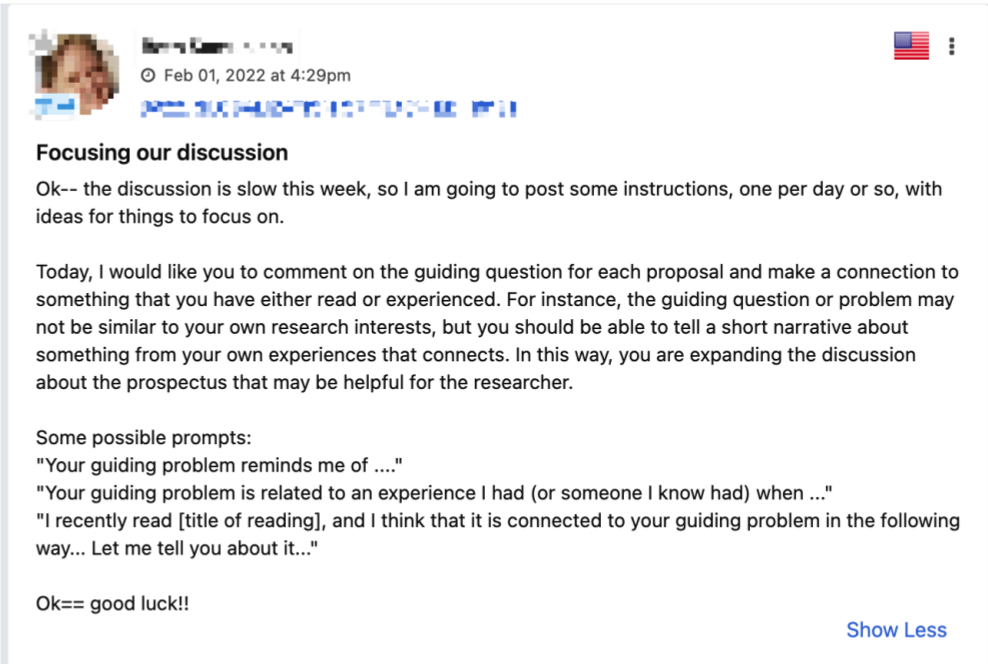
Your response does not need to be a comprehensive summary of the readings. We are interested in hearing about what you noticed, what connections you made to other readings or ideas, and what questions or issues you want to raise.

Translate

Besides the weekly discussion prompts, Beth also gave ad hoc prompts in reaction to class situations. When the CN discussion slowed down, in order to re-engage students, she prompted students to comment on each other's research plans by sharing relevant personal experiences and recent readings. In this prompt, she also included a brief template to help students understand her instructions and help them structure their own responses. Figure 11 is a screenshot of Beth's prompt.

Figure 11

Beth's Ad Hoc Discussion Prompt



Modeling Thinking Processes. Sometimes, discussion prompts that call for higher-order thinking processes may be too abstract for students to comprehend. In the example above, Beth gave students a brief template to illustrate the thinking process. Taking this approach one step further, some instructors wrote a concrete sample response to model the level of cognitive engagement they expected to see from their students.

Figure 12 is a discussion prompt from Joe's Strategic Marketing course. In this prompt, he included a concrete sample response. There is no doubt that this example would help his students understand the expectations. During the interview, Joe noted that he only gave such concrete examples in the first two weeks to not restrict students' creativity.

Figure 12

Joe's Discussion Prompt with a Sample Response

TUTORIAL ACTIVITY: VALUES & SATISFACTION

Successful firms have a competitive advantage because they are able to identify distinctive competencies and use these to create differential benefits for their customers.

Instructions:

1. Choose **ONE (1)** product you owned and are very satisfied with (happy to buy again).
2. Outline what distinctive functionality/features does it have that benefits you?
3. What are your ideas as to how this product could improve its competitive position?
4. Identify the STRATEGIC ORIENTATION OF MARKETING for this brand of the product. Provide brief justification.
5. Take a picture of it (or from Google image) and attach it with your answers below.

Example:

1. *I have chosen the Arissto Coffee Maker.*
2. *This coffee maker can allow me to enjoy brew coffee at home anytime and at a much lower price. The rental of the coffee maker is RM1 per month and each capsule only costs around RM2.*
3. *Improve the range of flavors to give customers more options to enjoy the coffee/tea at home.*
4. *Production concept - using low entry price to attract customers; Selling concept - giving various free customers for subscribing to the service and Marketing concept - customers would like to make their own brew coffee at home but do not want to pay for expensive coffee at the shop.*
5. *Attached picture:*

<CLICK HERE TO ATTEMPT>

View Related Posts Translate

Physics professor, Andy, encouraged his class to help each other with physics problems in CN. However, he found that sometimes, students easily gave away the direct answer. In order to scaffold how to help each other explore solutions and understand the concepts behind a problem, he intentionally modeled such responses in the early stages of the course.

To a certain extent, modeling higher-order thinking processes through posts and reflections is a new representation of the traditional think-aloud scaffolding strategy (Pritchard, 2010) in the SNS environment.

Making Thought-provoking Comments. The social character of the CN platform allows conversations to emerge easily. The course site observations found evidence of instructors chiming in student discussions, making thought-provoking comments to further engage students in understanding the learning concepts. Below are three comments, one from each instructor, on students' posts to seek explanations, prompt alternative solutions, and challenge existing perspectives.

> I would think that Japan is more popular for electronic products than electrical appliances. What would you say about this? (Joe)
>
> I think actual malice would be hard to prove in this case. In fact, I think negligence would be hard to prove also. What could/should have the reporter done more? (Adam)
>
> I just have to jump in and challenge your notion of 'native' or 'non-native.' If we are talking about a globalized world where teachers can connect with other cultures and ways of learning, why should we hold onto strict notions that can play into the ideas of nativists? (Beth)

Social Scaffolding

Social scaffolding is related to the effort in creating a sense of online community, where students communicate with each other and tackle learning challenges together (Berge, 1995; Ozan, 2013). This study discovered that CN instructors foster a learning community by encouraging conversations and networking, setting collective goals, and supporting collaborative decision-making.

Encouraging Conversations and Networking. Among the 12 studied courses, nearly half organized a self-introduction post activity. Jeremy asked his students to record a short video to introduce themselves to the class. Several instructors, Michel, Norm, Beth, and Joe, commented on every student's introduction post.

As mentioned before, Andy strived to cultivate a supportive learning community in CN. In his one-page guide, he highlighted "help each other" as the primary theme of the community and encouraged students to "support each other's goals, interests, and efforts." To achieve authentic conversations, Andy did not limit posts to the course topics. He invited students to post any physics topics – "find something cool, share a link, a photo, a video" and post "ANYTHING you think will be of interest to a significant number of classmates." In the one-page guide, Andy also encouraged students to follow each other and shared a related CN tutorial to show students how to do so.

Setting Collective Goals. One way to foster a sense of community and also to leverage the power of a community is to identify a collective goal and conjure everyone's courage and effort to accomplish that goal. Previous studies have proved the effects of goal setting on motivation and self-regulated learning (Cheung, 2004; Grant, 2005; Schunk, 1990). In addition to these benefits, shared goals, especially specific and challenging ones, tend to yield considerably higher group performance (Kleingeld et al., 2011).

Since physics is a relatively challenging subject, this study witnessed setting collective goals as a social scaffolding strategy by both physics instructors. Andy emphasized the importance of supporting one another through difficult times, writing in his CN guide, "School can be hard, frustrating, depressing, etc., but we are all in it together." The other physics professor, Aji, posted about class performance on major exams in CN. While sharing the class's score distribution graph of a recent exam, he wrote "...It seems the class did well. Let's make a note to improve this picture in the next two exams." In this post, he set a specific goal for the entire class. See Figure 13.

Figure 13

Aji Sets Collective Goal for The Entire Class

Collaborative Decision Making. In addition to identifying collective goals, some instructors valued their students' voices and promote collaborative decision-making to foster a sense of community. For example, Joe created a poll to survey the class about whether they would like to set up a WhatsApp group and asked them to vote for the ideal time to attend the online tutorial class. He then followed the majority's preference to set up the additional communication channel and the class meeting time. Similarly, Barb observed a student struggling to navigate through PowerPoint slides on their own when the class transitioned to an entirely online format during the pandemic. In response, she commented, "I know taking this class online is challenging. Would it be helpful if I did short video casts of the slides? Just a thought, you all let me know what might work best for you." According to Ryan and Deci (2000), learners feel intrinsically motivated when their needs for autonomy, competency, and relatedness are satisfied. It is evident that collective decision-making in a social learning community helps satisfy these needs and, in turn, increases student motivation.

Additional Notes

The preceding paragraph outlines the five types of scaffolding strategies utilized by the participating faculty in this study. There are a couple of noteworthy points to make.

First, it is important to note that these strategies are not mutually exclusive and often overlap with each other. For instance, clarifying participation expectations and community rules can be viewed as both metacognitive and social scaffolding, as it assists students in regulating their behaviors and guides them in interacting with each other in a community setting. Similarly, modeling what and how to post can serve as strategic scaffolding as well as conceptual scaffolding, if the example posts demonstrate higher-order thinking processes on the learning concepts. In addition, while most of the strategies discussed in this findings section were associated with one type of scaffolding to avoid redundancy, there are other ways to categorize these strategies. Therefore, it is necessary to recognize the interconnectedness and intricacy of the scaffolding strategies and types.

Secondly, as this study adopted a broad definition of scaffolding - any instructor assistance, guidance, and support that facilitate learning are considered scaffolding - some instructional practices did not fit well into any of the five scaffolding types. These practices will be mentioned in the next chapter.

RQ3: What Specific Instructional Tactics Are Utilized by CN Instructors to Fade Their Scaffolded Assistance and Allow for Increasing Student Agency Over Time?

Faculty's own use of CN affects their ability to assist and engage their students in the SNS learning environment. The more they use the technology, the more familiar they are with the unique features and the more opportunities they have to interact directly with students on the platform. The findings on RQ2 revealed that faculty could implement various scaffolding strategies by using different CN features, such as creating posts to model expected post behaviors and commenting on student posts to give technical support, engage students in high-order thinking, and create a sense of community. Therefore, in this part, the faculty's involvement in CN discussion, including its connection to learning engagement, is first examined before reporting findings on fading of scaffolding.

Faculty Involvement in CN Discussion

Since the social media-like posting features are the most unique and primary features of CN and their usage data is readily available, this study used the number of posts and reflections (i.e., comments on posts) instructors created in their courses to measure faculty's CN involvement.

Faculty Involvement in General Courses. Among the 11,215 queried courses, 7,823 courses (nearly 70%) had faculty participation in course discussions. The participation level, however, varied from one post or reflection to 1,082 posts and reflections in one single course. Among the courses that had faculty participation in course discussions, the average number of instructor-created posts was 12.04, the average number of instructor-created reflections was 13.11, and the average of combined instructor posts and reflections was 17.19. The median was seven posts, three reflections, and nine posts and reflections if counting both together. However, the mode of all three counts was only one. See Table 8 for detailed data.

Table 8

Faculty Participation in Course Discussion in 11,215 Courses Created Between May 1, 2020, to April 30, 2022

Feature / Descriptive statistics	Posts (including post, poll, and event) **and/or** reflections created by instructor(s) in a course[9]	Posts (including post, poll, and event) created by instructor(s) in a course	Reflections created by instructors(s) in a course
Number (and percentage) of courses used the feature	7,823 (69.75%)[10]	7,719 (68.83%)	3,167 (28.24%)
Minimum	1	1	1
Maximum	1,082	178	1,032
Average	17.19	12.04	13.11
Median	9	7	3
Mode	1	1	1

Note. This table counts posts and reflections of all instructors in a course. Some CN courses have multiple instructors, which may explain the large maximum numbers (i.e., 1,082, 178, and 1,032).

When comparing monthly average Anar Seeds (i.e., the number of Anar Seeds each course member earned per month) between courses[11] where instructors did not post or reflect

[9] This data adds instructor posts and reflections together in each course.
[10] Since in some courses, instructors only created posts or reflections, this number captures the courses where at least one of these contents were used.
[11] To ensure the validity of data, courses that had modified Anar Seeds values were excluded from this and the subsequent correlation analysis.

(M=6.06, SD=9.84) and courses where instructors posted or reflected (M=16.74, SD=23.96), a significant difference was found, t (10,854.82) =-32.99, p<.05. This result implies that students tend to be significantly more engaged if their instructors participate in course discussions in CN.

The follow-up correlation analysis found a significant, medium, positive correlation between the monthly average Anar Seeds and the monthly number of instructor-created posts and reflections, r(10,916)=.545, p=.000. This result indicates that when instructors are actively involved in CN discussion, their students tend to be more engaged as well.

One thing that must be noted is that instructors also earn Anar Seeds by making posts and reflections in CN and the course Anar Seeds includes instructor-earned Anar Seeds. This data fact contributed to the results of these two inferential statistics. Future studies should exclude instructor Anar Seeds from the course Anar Seeds when examining the relationship between faculty participation and student engagement.

Faculty Involvement in Selected Courses. Faculty participation in each of the 12 selected courses, measured by instructor posts and reflections, can be found in Table 9. The last column records each instructor’s relative centrality values in the first, second, and third phases of the course. The values were calculated by the SNA analysis software, Gephi, based on course members’ interactions through posts and reflections. Therefore, these three centrality values not only capture instructors’ participation in course discussion but also signal their withdrawal of scaffolding over time, in the context of this study, their assistance to students.

According to the data in Table 9 and course site observations, it is evident that the 12 instructors had varied degrees of participation. Joe and Jeremy, who used CN as an LMS, accessed their course sites frequently and led the posting activities throughout the time. Norm and Beth commented on most self-introduction posts, but afterward, only commented on student posts that sparked insights. Adam, Aji, Andy, and Barb commented frequently on student posts and made occasional posts of their own. Mary, Mizumi, and Fu only made a few posts and comments, although they logged in to CN often to monitor student participation.

Table 9

Faculty Participation in CN Discussion in 12 Selected Courses

Course	Instructor	CN course duration (months)	Instructor posts	Instructor reflections	Instructor Eigenvector Centrality over time (based on SNA)
Business Ethics	Michel	1	3	14	1st third:0.92 2nd third:0.12 3rd third:0.0
Intro to Global Literature	Norm	4	4	83	1st third:0.94 2nd third:0.51 3rd third:0.25
Physics 200	Aji	3	74	46	1st third:0.12 2nd third:0.31 3rd third:0.50
Mycology and Parasitology	Barb	2	14	34	1st third:1.0 2nd third:0.81 3rd third:1.0
Strategic Marketing	Joe	2	7	30	1st third:1.0 2nd third:1.0 3rd third:1.0
Interior Design	Mary	4	6	0	1st third:1.0 2nd third:0.19 3rd third:0.79
Cultural Virtual Exchange	Fu	2	2	5	1st third:0.005 2nd third:0.0007 3rd third:0.02
Communications Law	Adam	4	7	121	1st third:1.0 2nd third:1.0 3rd third:1.0

Teacher Education Globalization	Beth	4	8	39	1st third:0.92 2nd third:0.0 3rd third:0.38
Japanese Culture	Mizumi	2	6	0	1st third:0.0 2nd third:0.0 3rd third:0.23
Mechanics	Andy	4	56	180	1st third:0.88 2nd third:0.90 3rd third:0.86
Communication Skills	Jeremy	2	31	11	1st third:0.54 2nd third:1.0 3rd third:1.0

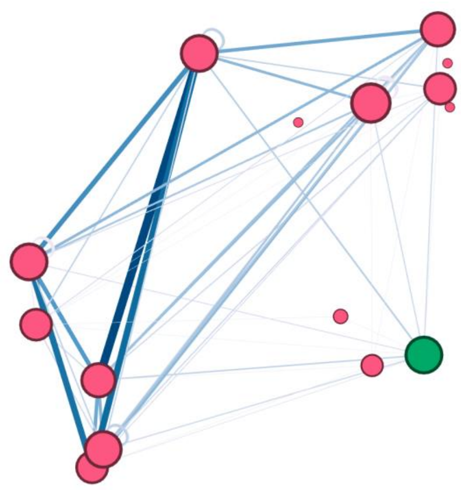
Fading of Scaffolded Assistance

According to the definition adopted in this study, fading in a SNS learning environment refers to the gradual reduction of support as students develop the ability to actively participate in meaningful social discussions and sustain their learning community. Therefore, regarding the evidence of fading, this study looked for two factors: (1) faculty assistance and (2) student agency over time. In the three-stage social network analysis of a course, these two factors were indicated by decreased faculty influence (i.e., measured through centrality value) and increased network density and student influence, as detailed in Borge et al. (2019).

Michel's Fading of Scaffolding. During the faculty interview, Michel was the only instructor who confirmed an intentional withdrawal of assistance over time. Michel's response was reflected by the SNA: Figures 14-16 were the network analysis of the first, second, and last thirds of the course. Michel was represented by a green node and the students were pink nodes. There was a clear decrease of centrality, or influence, of the green node over time, especially from the first to the second third of the course. In the first third, the green node was big and connected to multiple influential students. In the second third, the size of the green node decreased drastically and only kept one weak connection to an influential student. In the last third, the green node became even smaller and lost connection to any student. The instructor's Eigenvector Centrality values decreased from 0.92 to 0.12 to 0.00 over the three phases of the course. On the other hand, to signal a successful withdrawal, there is an expectation of finding either an increasing or at least a sustained network density (i.e., connections among students) and influential student nodes. While the network density of Michel's class decreased over time, certain students retained their influence within the network. The post content analysis also found that the majority posts created in the later stage of the course exhibited higher-level cognitive engagement including articulating key concepts, making connections to real-world applications, and posing deep questions. This evidence implies the successful transfer of responsibilities and the development of student agency.

Figure 14

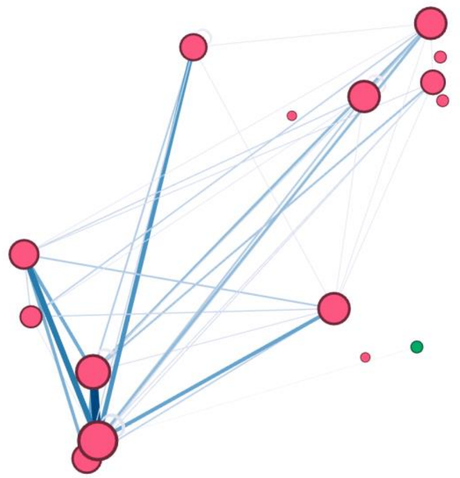
Business Ethics SNA, 1st Third. Instructor Eigenvector Centrality: 0.92



Note. The green node (instructor) was big and had connections (edges) to multiple influential students.

Figure 15

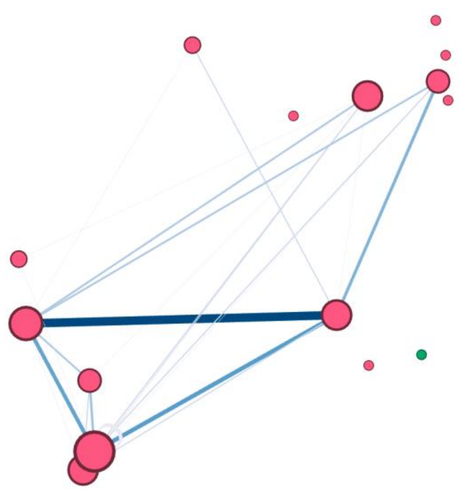
Business Ethics SNA, 2nd Third. Instructor Eigenvector Centrality: 0.12



Note. The green node (instructor) had a sharp decrease in size and was only weakly connected to one influential student. Students maintained the density of the network, and some remained as influential nodes.

Figure 16

Business Ethics SNA, 3rd Third. Instructor Eigenvector Centrality: 0.00



Note. The green node (instructor) became even smaller and lost all connections (edges) to students. Despite the network density decreased, some students remained as influential nodes.

Michel's Fading Tactics. Michel's course was a short, four-week MBA course. He shared,

> The support was intense in the first two weeks of the course. But then in the last two weeks of the course, I was a little bit enjoying the effort I provided in the first two weeks because everyone by that time was confident posting and making reflections.

The successful withdrawal of instructor assistance was indeed an exciting accomplishment, considering that Michel had not used CN extensively and his African adult students were inexperienced with new learning technologies. Michel's intense scaffolding effort in the first weeks of the course included the following instructional tactics:

- Gave close technical support at the very beginning of the course to make sure every student was able to log in to CN and knew how to post and comment.
- Highlighted the values of CN to the class and clarified expectations upfront.
- Provided detailed discussion prompts.
- Looked at post examples with students during class, giving feedback and reiterating expectations.
- Recognized active participants and high-quality posts during class and awarded them badges.
- Followed up with students who lacked participation privately, emphasizing the importance of CN discussion and urging them to catch up.

Reasons Behind No Fading of Scaffolding in Other Courses. The SNA graphs for other courses can be found in Appendix G. Norm, the instructor of Intro to Global Literature, was the other participant who had a decreasing centrality over time. However, during the interview, Norm denied the fading of scaffolding. He shared that fading instructor assistance was not implemented because the course introduced several pieces of literature to students, and each was different. He needed to provide the same amount of guidance, mainly through the Tasks tool, to help the students get ready for close reading and deep analysis of each book. His reduced centrality was likely due to the fact that he commented on almost every student's self-introduction post but afterward, he only commented on the insightful ones.

The major reasons that other instructors did not intentionally fade their scaffolded assistance were three. First, when CN was used as an LMS in Malaysia, the students were hesitant to step ahead of their professors to post due to the local culture. Joe and Jeremy were in this group. They shared during the interview that they needed to access CN daily to update course content and lead course discussions. Second, some instructors, such as Barb, Beth, and Adam, tried to chime in CN discussions as much as possible, but their involvement was affected by their availability and other responsibilities. Using Barb's words, if there was a decreased involvement and support, "it was just an overwhelmingness of the semester. It was not intentional." Adam also confessed,

> To be honest with you, I'm not as good as I should be engaging with my students in discussions. And probably I am more active early in the semester than I'm in later, but it's not intentional.

Third, some instructors did not think fading scaffolding was applicable to CN because they only used the platform as an informal and optional tool to connect students outside of class. As Andy shared during the interview,

> I'm not thinking of CN as the central activity of the course. So that's why I don't need to do that kind of structured learning for CN specifically. I do that sort of structure for other aspects of the course (in other learning spaces).

To summarize, the main reason scaffolding did not fade was because faculty members either did not believe it was possible or never even considered it.

RQ4: What Challenges Do Instructors Face When Using CN to Engage Students in Learning?

During the interview, each participating faculty was also asked about the barriers and challenges they experienced when using CN to engage their students, how they addressed these challenges, and the support they would like to receive from the CN team. Three main themes emerged from the responses.

Low Participation of Some Students

Eight out of the 12 participants revealed that the biggest challenge they encountered when using CN to engage students was the low participation of some students. Using Norm's words, "Some students just did not participate."

The Malaysian instructors, Joe and Jeremy, shared the fact that students in their local education system still viewed lectures and exams as primary learning activities, whereas posting in CN supplementary. Such a view hindered students from visiting CN often.

Mizumi taught Japanese culture to American students. To her, the biggest challenge was the minimal participation of some students regardless of her encouragement and CN being a portion of the course grade. Interestingly, these students attended in-person classes well and completed other course activities. The instructor suspected that the lack of CN participation was due to how these students used their time outside of the class, coupled with technical difficulties.

Beth suspected the lack of participation could be explained by multiple reasons: these students were not paying attention, they didn't hear CN enough, or they simply did not take the CN activities seriously. To overcome this challenge, Beth looked at posts with students together during class time and this tactic helped remind students that CN participation was an important part of the class.

Fu encountered the challenge from the two extremes: While a small group of students might dominate the CN discussion, there were always students who lacked the motivation to participate. She did not find a correlation between student CN participation and their performance on other assignments. The instructor believed that multiple personal factors might have contributed to this issue, but she was unsure what these factors exactly were.

Andy also experienced challenges from students on both sides of the spectrum – the students who were against the use of social media and those who were social media savvy and wished to use other SNSs, like Discord. He described the problem from the latter group as “It seemed that there was a constant race of features and opportunities among social media as a learning tool.” To react to the conflicting and diverse preferences, Andy chose to make CN discussion an optional activity only for extra credits. He acknowledged that students learn in different ways and that university professors should cater to diverse students by giving them suggestions, options, and guidance to maximize their learning.

Faculty Needing Efficient Support

Barb and Mizumi had the least experience with CN among the 12 participants – they had not used CN before teaching their course. They both experienced challenges in learning about the platform. Barb did not give students a CN orientation because, using her own words, “I was learning the platform at the same time the students were.” She shared,

> One of the biggest challenges for me was the fact that I tried to use something that I wasn't familiar with…I know there are tutorials, but sometimes it's hard to sit down and watch an hour-long tutorial, which you're not going to remember later. I had colleagues say, “Oh, it's just like a regular social media platform.” But then I realized that I don't know social media as much as I thought I did…I think if I had built my CN course and

framed it and scaffolded it better myself ahead of time, it probably would have supported the students better. Certain resources are needed to do that and they just may be out there, but I did not spend the time to dig through…It would be helpful if there were people, and there may be, I don't know, to help me get the course set up a little bit better.

Barb's experiences highlighted two things: First, using an academic SNS for teaching was different from using regular social media for other purposes. The instructor needed to learn the best practices to better engage her students. Such experience resonates with what Churcher et al., (2014) claimed, but from the faculty perspective: faculty's familiarity with social media does not make the transition from social networking tools to pedagogical tools any easier. Second, Barb preferred efficient ways to learn CN, like direct access to an expert or short tutorials. The major hurdle for her to learn CN was not knowing where to find the resources and not having time to consume lengthy materials.

Mizumi happened to encounter a similar learning curve and preferred to receive answers and advice directly from a CN expert. Since she was using the platform to teach another course when the interview happened, she asked the researcher several questions about how to use CN during the interview, such as Anar Seeds settings and engaging community collaborators.

Interestingly, the need for efficient faculty support materials was also expressed by several experienced faculty. Joe, who had taught in CN for seven years, suggested the CN team periodically send out short tips via email to instructors, such as "Tip of the Week" or "Tip of the Month" to help them use important CN features, receive feature updates, and gather instructional ideas. Joe's suggestion was repeated by Fu and Mary, who both had nine years of experience using CN. Fu hoped that the CN team could communicate with faculty to keep them informed of different CN use cases and new features. Mary hoped that the CN team could frequently send out newsletters to feature successful use cases and to share short tips on how to encourage different types of student participation.

Technical Challenges and Feature Wishlist

Several faculty participants also shared specific technical challenges, including features that were not available or not functioning as expected. Table 10 recorded the variety of expected features and the faculty who suggested them. At the moment this dissertation was being composed (March 2023), the CN team already completed some of the features, for instance, providing weekly Anar Seeds data and allowing pulling questions from a question bank based on question numbers. The team was making progress on improving the math equation editor, upgrading to LTI 1.3 to support auto sync with LMS rosters, and overhauling the Rumi interface to present Rumi content in more user-friendly ways.

Table 10

Faculty Suggested Features

Technical expectation	**Suggested by**
CN to support recording longer videos	Michel
CN to provide a more advanced math equation editor	Aji
CN to develop or integrate a free in-class polling and attendance-tracking tool	Aji
CN to improve the Global Posts feature to increase its usage and quality of users' global posts	Joe
CN to further distinguish course Anar Seeds and total Anar Seeds	Mary
CN to find a way to have Anar Seeds grade passback reflect students' status towards the real-time goal	Adam

CN to produce a native app or improve its web app to effectively and accurately push notifications to students' mobile phones, which will help attract students back to CN	Adam
CN to provide weekly Anar Seeds data for each course member	Mizumi
CN to automatically remove students who have withdrawn from the LTI-integrated LMS course	Andy
CN to provide more advanced analytics on student engagement in specific discussion topics	Andy
CN to adjust the Rumi interface to make its messages appear in a less interruptive way	Andy
CN to support pulling questions from a question bank based on question numbers	Jeremy
CN to develop a dedicated attendance tool	Jeremy

CHAPTER V DISCUSSION AND CONCLUSION

Increase the Use of Unique CN Features

Post Features

Based on the findings of RQ1, post features were the most used unique CN features. However, nearly 30% of the queried courses did not create any posts and after the top 2,570 courses, the average dropped below one post per user. Most of the courses that had low to zero use of the post features were from a few East Asian institutions that licensed CN as an LMS. These courses used CN with a focus on course management, such as instructors sharing learning resources (i.e., documents and lecture recordings), operating online quizzes, and tracking grades. In fact, based on the interviews with Joe and Jeremy, two faculty participants from the region, their local education system heavily relied on lectures and traditional assessments, which deprioritized student-centered activities, and in turn, diminished faculty's desire to incorporate social and engagement features into their instruction. On the other hand, as Joe shared, Malaysian students view their instructors as the authority of knowledge; therefore, they are reluctant to post without instructors asking them to do so and they may feel uncomfortable "stepping over" their instructors to comment on peers' posts. In such a culture, students would need more encouragement and guidance from their instructors, such as explicit discussion prompts for both posts and reflections, to willingly participate in social discussion.

Anar Seeds

Eleven out of the 12 selected courses had an Anar Seeds goal and used Anar Seeds to motivate and track student participation in CN. In contrast, an Anar Seeds goal was set up only in a small portion (5%) of the general courses. The statistic comparison between courses with and without an Anar Seeds goal suggested a significantly higher engagement in courses with an Anar Seeds goal. The correlation analysis also suggested setting a relatively higher goal for better engagement. These findings encourage instructors to leverage Anar Seeds in their CN courses. But faculty often encounter the question of how many seeds they should set as the goal for a course. Typically, without adjusting the default Anar Seeds table, 200-300 seeds are a reasonable goal for a 2–4-month course. Instructors are also encouraged to calculate a specific goal by using the unit seeds for creating a post and a reflection to multiply the expected number of posts and reflections. After teaching a course a couple of times in CN, instructors should have a better idea about the seeds and their students. They should be more confident in adjusting the goal or the default Anar Seeds values if needed.

In addition to setting up a course Anar Seeds goal, having the goal connect to tangible points or incentives is also critical to encourage student participation. Counting Anar Seeds for course grades or at least for extra-credit points is the ideal approach. This practice has been evidenced by other empirical studies, such as Abella-García et al. (2019) and Junco et al. (2013), where SNS posting was a mandatory assignment. When connecting Anar Seeds to course grade is impossible due to assessment restrictions, instructors may award students a badge, like Jeremy did in this Communication Skills class, or award students something else they would value. Joe gave away textbooks once his students met the set Anar Seeds goal in the first few weeks of the course. According to him, although costly, this practice indeed spurred engagement and helped prepare the students for the rest of the course.

Through course site observations and faculty interviews, two issues surfaced that might have hindered Anar Seeds' effects on engagement. First, three instructors (Mary, Fu, and Andy) did not enter an Anar Seeds goal in their CN course. They should have informed students about the goal in class or through their course syllabus, but if they had entered the goal into their CN course site, students would have seen the goal displayed on the top of the course page along their real-time Anar Seeds progress compared to the daily goal as well as the course Anar Seeds champion through the visual presentation of an Anar Seeds bar. These features would have helped students better monitor and regulate their participation. Second, Michel and Mizumi shared that they changed the Anar Seeds goal several times while teaching their course. In fact, if a goal will contribute to course grades, adjusting the goal, particularly increasing it, during the course may disrupt students' plans and decrease their engagement. Instructors who are still learning about Anar Seeds may keep their lessons learned in mind and not alter the Anar Seeds goal till the next class.

Hashtags and Badges

Although the sample t-tests proved that courses with instructor-suggested hashtags and instructor-awarded badges were more engaged, these two features were under-used in both the general courses and the 12 selected courses. While future studies may probe the reasons behind the low usage and address the barriers, this study encourages faculty users to give these non-traditional teaching features a try. For instance, making identifying a few short discussion topics a step of course set-up. The CN team should implement mechanisms to remind instructors to do so, which could be part of an interactive, step-by-step course set-up guide, or a tip popping up from the smart learning agent, Rumi. After all, suggesting a few hashtags to assist with content filtering should not cause any instructional concerns nor take much effort. Many instructors might skip the feature simply because they were unaware of it or unsure how it worked.

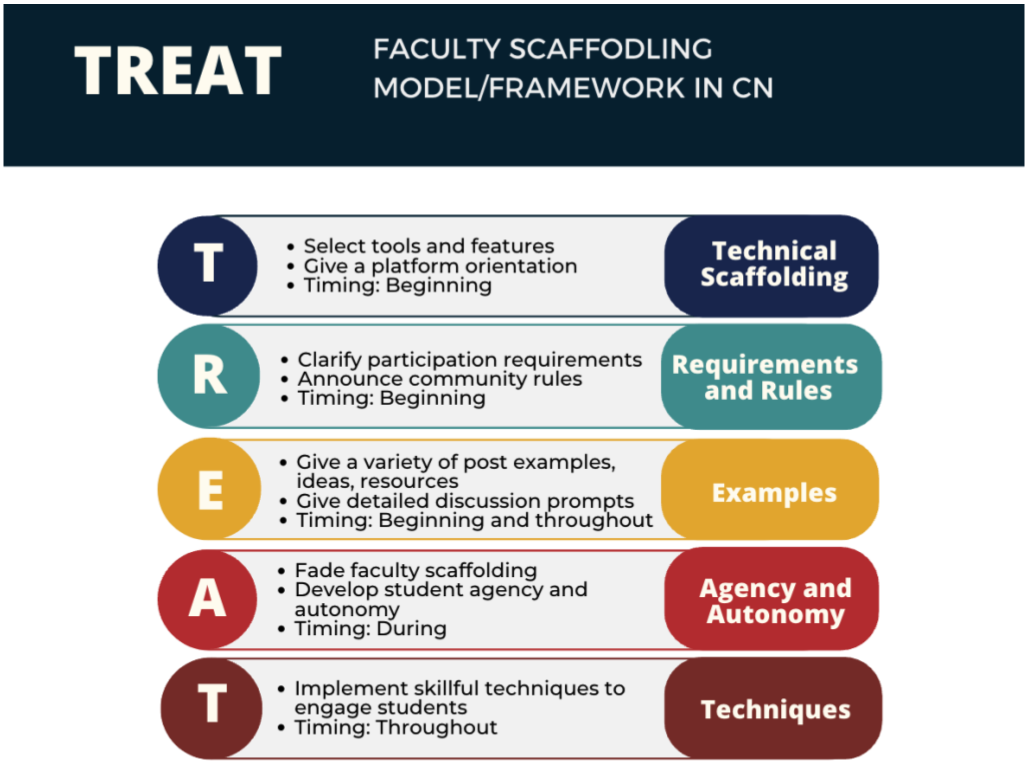
When it comes to badges, it is understandable that some faculty may question if they have the authority to issue students badges and if extrinsic rewards can truly motivate their students. This study encourages faculty to view the badges in their CN courses as informal, micro-incentives. These badges are a faculty's personal recognition of their students' participation and quality work in the class. CN has made issuing a badge convenient: there are nearly 30 pre-defined common badges that can be awarded with only a few clicks from multiple places (i.e., on a post, course Roster, GradeBook, and Badges page). Instructors may use badges to motivate students to complete optional learning activities and formative assessments, for instance, awarding the Best Participant badge for meeting course Anar Seeds goals, just like instructor Jeremy did. Although badges are an extrinsic motivator, when they are utilized to signify learning goals and intrinsic values such as efforts, curiosity, and mastery, they have great potential in enhancing engagement and cultivating intrinsic motivation (Alaswad & Nadolny, 2015; Saputro et al., 2017). Such positive impact is even elevated when badges are circulated through digital learning networks (de-Marcos et al., 2016; Hickey & Schenke, 2019).

The TREAT Model for Effective Scaffolding Strategies in CN

Based on the findings on RQ2 and RQ3, this section will delve into effective scaffolding strategies for using CN as an academic SNS and propose a TREAT model for faculty to follow. See Figure 17. TREAT is the acronym for Technical Scaffolding, Requirements and Rules, Examples, Agency and Autonomy, and Techniques – each represents a critical strategy for elevated student engagement and success. The following sections will introduce each component of the model and provide instructors with practical recommendations.

Figure 17

The TREAT Model



Technical Scaffolding

Technical scaffolding is a critical component of effective scaffolding, as it involves selecting appropriate technology features and guiding students in their use. As discussed in the previous section, there are several unique features available on the CN platform that have the potential to enhance student engagement, including posts, Anar Seeds, hashtags, and badges. This section will explore strategies for effectively guiding students in the use of these features and in navigating the overall platform.

RQ2 found that almost all the faculty participants of this study gave their students a CN orientation before CN was used. This is a good practice to introduce a new platform and help students understand how to gain access, the site navigation, and key features (Berge, 1995). If instructors are able to deliver this orientation synchronously, either in-person or online, it is likely to be more efficient because students could follow along to create their CN accounts and ask questions. If the orientation has to be asynchronous, instructors may record an orientation video, create text-based materials, or both. In the asynchronous case or if instructors are new to the platform, tutorials created by CN can be leveraged, as instructors Adam, Beth, and Norm did in their courses. CN's user support center, support.thenc.com, contains a wide variety of tutorials. Instructors can search for a topic and find relevant resources. For instance, if a course uses CN Post, the LTI plug-in tool, the CN Post Overview video is sufficient to introduce the site navigation and key features. If a course uses the CN LMS, the CN Quick Start Tutorial video gives a comprehensive overview. With these CN-created tutorials, instructors can focus on guiding students through course-specific items, such as some common questions and mistakes, just as Norm did.

During the CN orientation, it is helpful to explain why the platform is used and emphasize the values the platform will bring to everyone. Michel did so with his MBA students and repeated the value whenever needed. Such practice can find its support in the Universal Design for Learning Guidelines (CAST, 2018) as an important means to recruit student interest because it helps students internalize the purpose of the learning activity and build a personal connection to the new technology.

Requirements and Rules

Based on the findings from the 12 most active CN courses and empirical studies (Abella-García, et al., 2019; Borge et al., 2019; Junco et al, 2013; Nicholson & Galguera, 2013), what should accompany a technology orientation is clarifying participation requirements, rules, and community values upfront. This helps students understand faculty expectations and regulate their own learning.

As instructors Fu and Adam shared, faculty may set up a clear Anar Seeds goal and adjust the Anar Seeds values to guide students to plan and monitor their participation, for instance, how often they should post per week and how much they should write in each post and reflection. The course Anar Seeds goal and rules are better to be included in the course syllabus and explained during the CN orientation to obtain student attention and understanding.

As stated earlier, Anar Seeds only regulates individual participation and focuses on quantitative measures. For an online learning community, it is also necessary to define the expectations and rules for communication and interaction. This could be a one-page CN guide, like the one Andy created for his class (see Appendix E), or a civility statement or an etiquette lesson that governs entire student interactions, like what Mary and Adam did for their online courses. Since an online community will be formed, faculty should envision what kind of community culture they intend to cultivate, its values and norms, and then define posting guidelines, particularly, what and how students are expected to post in such a community (Borge et al., 2019; Nicholson & Galguera, 2013). Michel envisioned an intellectually stimulating community, therefore, he set the following general posting guideline,

> I reminded them (the students) that it was not only posting something or commenting on a post from your classmates but the posts to be put on this platform should be constructive and should add value to what your classmate had posted there.

Mary envisioned a supportive community; therefore, she encouraged students to create check-in to share progress and give each other study tips. Envisioning a similar community, Andy allowed students to post about events and topics beyond the course as long as they “interested the majority of the class.” He also clearly stated what should not be posted: do not give away answers to homework questions, do not post meaningless content just to get Anar Seeds, and “absolutely no personal/political/social attacks.”

Examples

After announcing general requirements and rules, the next step is to share with students a variety of post and resource examples. Churcher et al. (2014) advocated for giving examples of acceptable and non-acceptable posts to students early. This strategy was part of strategic scaffolding as well as conceptual scaffolding as examples help students formulate their own content, and if the examples demonstrate cognitive engagement, it stimulates higher-order thinking from the students as well.

As discussed in the findings section, examples can be given in different ways. Instructors themselves can create example posts at the beginning of the course to inspire ideas and model expected posting behaviors. Instructors may also show example posts from previous courses. They may suggest a list of possible post ideas as well as post resources in the syllabus or the CN orientation materials. They could also give detailed discussion prompts and post examples through the CN Task tool. Instructors may look at post examples with students in class, analyzing and commenting on the posts together. Such a strategy stimulates students to improve their post quality. According to Beth, looking at posts together in class also helped remind students to participate in CN.

Through the course observation, a large number of low-quality posts surfaced in one of the studied courses. These posts contained superficial or unrelated topics to the course. Many posts were created simply to earn Anar Seeds. For example, some students typed “seeds” 15 times in a post or 10 times in a comment to reach the minimum word count to earn some seeds;

some posted “I still need 200 seeds!...”; some created polls like “Still need seeds?” to earn seeds as well as poll their classmates’ statuses on meeting the goal. During the interview, the instructor even disclosed the intention to stop CN discussion in the future because it did not help students learn the course. By examining the instructions given to students and the instructor's posts, no evidence of detailed post examples was found. The instructor set a high Anar Seeds goal of 800 seeds, but only provided this brief instruction:

> These points are collected via interacting in CN by posting, liking posts, reflecting on posts, and creating polls for others to participate.

It is not surprising that many students had to post irrelevant content and post only about Anar Seeds to fulfill the high Anar Seeds expectation. If they were given ample and diverse post ideas, examples, and resources, they were likely to engage in the discussion more meaningfully and purposefully.

The other action this course instructor failed to take was clearly informing the students to not post just for earning Anar Seeds. Andy had this rule in his one-page CN guide. However, when asked if they emphasized what not to post, several faculty participants, including Andy, answered no. They did not highlight the “don’ts” because they did not want to limit students’ creativity or make them feel over-restricted. These instructors (i.e., Mary, Fu, Adam, Beth, and Andy) shared that with the examples and resources they provided, they rarely encountered any posts that did not meet their requirements. Therefore, to achieve meaningful social discussion, instructors should give priority to examples and resources over setting boundaries.

Another helpful strategy that can be paired with examples is to closely monitor students’ posts at the beginning of the course. Michel monitored student posts by himself, and Beth drew assistance from her teaching assistants. When low-quality posts were discovered, the instructors immediately reached out to the students to correct their posting behaviors. According to the instructors, this strategy prevented the problem from spreading in the social learning space and sustained student engagement. There was evidence of this strategy in Churcher et al. (2014) and Nicholson and Galguera (2013), which stressed the importance of instructors or tutors monitoring and intervening early on when inappropriate content or frustrations arise.

Agency and Autonomy

Active Faculty Participation in CN Is Necessary. The positive correlation between the number of faculty posts and reflections and course Anar Seeds through RQ3 indicates that faculty participation in CN discussion could potentially increase student participation and engagement. This finding was reflected by a student survey sent out by the CN team to all student users in November 2022. When asked how much they agree with the statement "I would participate in CN more if my instructors were regularly involved in CN activities," 67.00% of the 315 respondents answered strongly agree or agree, whereas only 5.71% answered strongly disagree or disagree. This data encourages active faculty involvement in CN activities.

The importance of faculty involvement in SNSs has been supported by existing studies. Ryane and El faddouli (2020) discovered that students felt motivated by instructors' comments on their posts in Edmodo. Junco et al. (2010, 2013) claimed that instructors must actively engage with students on Twitter to ensure enhanced learning engagement and performance. Pai et al. (2017) found faculty responsiveness and student perception of faculty valuing SNS activities critical to their success with using Facebook for learning.

Based on the findings of RQ2 of this study, instructors' posts and reflections were an important medium of several forms of scaffolding, including technical, strategic, conceptual, and social. Therefore, actively participation in CN discussion will give instructors the opportunity to naturally guide and support their students.

Faculty Time Commitment. The next question then surfaces: How much or how often should faculty be involved? Faculty always ask such question to the CN team, wanting to know the commitment they need to put into a social learning space. Andy, the instructor of Mechanics, gave an answer to this question through a simple calculation during the interview. He created 56 posts and 180 reflections in the 161-people course. As he stated,

> 180 reflections. This is over 17 weeks. So, we're really only talking about 10 per week, and each one is probably only a sentence or two. So we're talking about probably **less than 30 minutes per week to do those reflections**. Adding the time on writing and reading posts, it is probably about one hour per week. I check in CN once every day or two. I'll just scroll through the most recent posts, and CN has the very convenient red dots. So I just start at the top and I scroll until the red dots are gone, then I say, "Okay, so I've seen everything else before." And of course, anything that I reflect on or that I've posted, if students respond to that, then I get an email reminder at the end of the day - somebody reflected on a post that you also reflected on or somebody answered your poll or whatever, then I see that. But I don't spend too much time on it really. Like I said, maybe **an hour a week**. That's probably my total commitment once the semester has begun.

Considering Andy's course is quite large, for smaller courses, the time commitment may be around 30 minutes each week. This seems to be a reasonable amount of time for faculty to participate in online course discussions. Based on six years' experience of teaching active courses in CN, Andy's answer reassured that instructors do not need to spend outrageous efforts to be actively involved in CN.

Transfer Responsibilities to Students. While the majority of faculty probably can commit half to an hour every week, is it possible to cut the time shorter while maintaining or even boosting student engagement? Such transition would require a successful fading of scaffolding and developing student agency and autonomy. Theoretically, the self-determination theory claims that students feel more motivated when their needs for autonomy are satisfied (Ryan & Deci, 2000). Practically, Borge et al. (2019)' study has proven that student agency in discussion moderation and community building can be developed in an SNS environment.

Developing student agency and autonomy requires planning and tactics. This study suggests the following practices based on the findings of RQ3 and related research:

First, fading instructor support and gradually transferring moderating responsibilities to students should be an intentional endeavor. Faculty needs to carefully plan and execute the process. As the findings have revealed, most of the faculty participants of this study did not fade their scaffolding because they never thought about it or intended to do so. For example, after hearing about the concept during the interview, Mizumi expressed, "No, I did not fade my support and develop student agency in my course, but I like the idea and love to try out the strategy."

Second, after setting the goal of fading faculty support and developing student agency over time, instructors must give closer guidance and assistance at the beginning, just like what Michel chose to do. The strategies include but are not limited to a thorough technical orientation and close technical support that ensures every student can access the platform and use the key features, a clear statement of requirements and rules, and plenty of posting ideas and examples.

These strategies were all incorporated into the SCAD Model by Borge et al. (2019). In addition, instructors should also try to comment on students' initial posts, recognize active participants, and monitor and correct inappropriate posting behaviors.

The next step is to gradually transfer discussion moderation and community building responsibilities to students. This could start with faculty inviting students to co-define learning goals (Ames, 1992; Brophy, 2004), participation rules (Churcher et al., 2014), and assessment plans (Torrance, 2012). Faculty could also select student leads and train them on how to lead discussions and moderate the community (Borge, et al., 2019). With training and feedback, student leads may take turns to post discussion prompts and comment on others' posts to probe deeper reflection.

As student leads take on some of the faculty responsibilities, instructors may gradually withdraw their support to the entire class and their involvement in CN discussion. However, considering instructor participation is associated with higher student participation and students expect to interact with their instructors in the social learning space, faculty may request student leads to provide a list of posts that need the instructor's attention, for instance, questions that only the instructor can address, posts that demonstrate an exemplary quality to be recognized, posts that contain new insights to be discussed in class, etc. With the list of the URLs of these posts, instructors can quickly locate the target content and respond. Instructors could also request student leads to comment on weekly posts by a time, such as Sunday midnight, and they come in the next day to respond to any posts that have not been commented (Simon, 2018).

Finally, faculty should track and consider awarding student leads' contributions. They earn Anar Seeds for their posts and reflections. But if these seeds are not counted for course grades, grade points, or a digital badge, such as Community Moderator or Student Leader, can be awarded additionally to recognize their work.

Techniques

Through faculty interviews, the participants also shared smart techniques they implemented to foster student engagement. These techniques are context-specific, yet efficient. Since it is difficult to categorize most of these techniques, they are discussed in this section to spark innovative ideas and practices.

The technique Andy and Joe implemented was **creating reasons to bring students back to CN**. While some faculty felt exhausted from frequently reminding students to participate in CN, Andy found other ways to bring students back into CN. He described his technique as follows:

> What I do is that I create reasons why they (students) need to go back to CN. For instance, if they're going to do the lab this week, they have to download the handouts. And I purposefully post the handouts in CN and not in other places. So that is a reason to go there. Once in a while a student will email me and ask a question. That's the sort of thing they could have posted on CN. And I'll always help them. But then I'll say, "I think other people may be confused about this, too. Why don't you post our discussion on CN and tell other people what you have learned?"

With this technique, Andy did not only bring his students back to the online community but also saved himself time from potentially answering the same question multiple times to different students. Joe implemented a similar technique in a different context. As he shared, the students at his institution tended to ignore CN, especially since they returned to face-to-face classes after the pandemic. What Joe did was keeping the reflection activities, exercise quizzes, and class notes in CN to bring the students back to the online social learning space.

Besides creating reasons to attract students back to CN, there were also other skillful techniques shared by other faculty participants: as a strategic scaffolding strategy discussed in the findings chapter, Fu encouraged her students to view the posting activities as a virtual study-abroad experience to enjoy instead of an assignment to complete. This technique was powerful because it suggested a fresh new perspective and tackled students' emotions and feelings - the motivation dimension of the Double Helix model (Barkley & Major, 2020). Beth looked into posts with students during class when she noticed ignorance of the CN activities. As noted earlier, Jeremy awarded digital badges to students when he was not in the position to count Anar Seeds for course grades. Aji posted the overall class performance on major exams to evoke collective efforts and a sense of learning community, as a social scaffolding strategy.

As the last component of the TREAT model, techniques encompass a wide variety of possible scaffolding strategies and tactics that target specific learning contexts and challenges. While instructors may adopt the aforementioned techniques, this study encourages them to keep their minds and eyes open to discover techniques for their own classes. Skillful techniques originate from the willingness to improve student learning, trial and error, and continuous adjustments of everyday practice.

Solutions to Overcome the Challenges

Draw Findings from This Study to Better Engage Students

Findings of RQ4 revealed that the biggest challenge faculty experienced was the lack of participation of some students, under different circumstances and for various possible reasons.

The purpose of this dissertation is to discover the best faculty practices to enhance student engagement in CN, which directly address the challenge. Through collecting data from the 12 most active courses, common practices were discovered, and the effective scaffolding strategies were summarized into the acronym model, TREAT, to help faculty plan, implement, evaluate, and improve their assistance to students to maximize their learning engagement and outcomes.

The CN team could incorporate the findings and suggestions of this study into future faculty training and support materials. Considering the faculty's preference for receiving email newsletters, tips and use cases can be shared through this approach regularly. In fact, after the faculty interviews, the CN team has begun sending regular newsletters to instructors, which cover pedagogical tips, feature updates, use cases, and other resources. After the conclusion of this dissertation, a more systematic distribution of the effective scaffolding strategies and the TREAT models can be arranged.

Give Faculty Scaffolding Suggestions through Rumi Tips

In addition to newsletters, another efficient way to support faculty is to directly push suggestions and materials inside CN through Rumi Tips. This AI-powered personal assistant feature displays pre-defined, just-in-time messages to individual users, with the potential to address the challenge that faculty do not have time to dig through support materials themselves. Barb expressed an interest in receiving just-in-time tips while using CN. She said,

> It's great to have resources, but sometimes you don't always know where to find the resource. If it pops up on a window in front of your face, I would say "Oh, yes, it is here!"

Possible Rumi tips on scaffolding strategies may include:

- When an instructor accesses a new CN course, Rumi shares with them a course set-up guide that is built upon the TREAT model.
- After the first course post, if the course Anar Seeds goal has not been set up, Rumi prompts the instructor to set up an Anar Seeds goal and provides a link to the how-to guide.
- After the second course post, if there are no instructor-suggested hashtags, Rumi prompts the instructor to suggest hashtags and provides a link to the how-to guide.
- If the first 5 posts are made by students and there are no instructor posts or tasks in a course, Rumi reminds the instructor to share post examples and resources or give detailed discussion prompts.
- If there is a lack of instructor participation in CN discussion, Rumi gives advice on how to arrange their involvement, such as 5 minutes a day or 10 minutes every other day, and how to use posts and comments as tools for strategic, conceptual, and social scaffolding.
- If an instructor remains one of the top three active course members into the second third of the course, share tactics for developing student agency in moderating discussions and community building.

The CN team needs to measure the effectiveness of these tips and make revisions based on feedback. In general, after a tip is shown to an instructor a few times, it probably should stop popping up. Different tips and tip settings may be applied to teachers based on how experienced they are with the platform.

Utilize AI to Scaffold Students

During the writing of this dissertation, ChatGPT, a next-generation AI application, has taken the world by storm. The app reached 100 million active users only two months after its initial launch, becoming the fastest-growing web application in history (Curry, 2023; Nerdynav, 2023; Hu, 2023). The world has witnessed its powers in natural language processing, contextual reasoning, a broad knowledge base, creative writing, and adaptability (Deng & Lin, 2023; Qin et al., 2023). A variety of everyday applications, from search engines to communication messaging tools to note-taking apps, have integrated GPT, the rudimentary language model, to increase people's productivity and work quality (Bishop, 2023; Korn, 2023; Lipscombs, 2023). Educators are trying to figure out how to react to the unprecedented changes AI brings to teaching and learning, although the focus seems to have been on preventing academic cheating and plagiarism (Lieberman, 2023; Khalil & Er, 2023; Susnjak, 2022). Despite concerns about the negative impacts of AI on teaching and learning, educators should consider how AI can be utilized to improve learning engagement and outcomes. Can AI be utilized to provide some of the scaffolding in the TREAT model directly to students? To answer this question, this study recommends that the CN team embrace the possibilities of AI and work to bring them to fruition in the near future. The possibilities that the CN team could explore are as follow:

- Technical Scaffolding: The current Rumi Agent already has the capability to push out relevant CN tutorials to students. By adding GPT-based AI components, Rumi could participate in social discussion, for instance, answering students' technical questions about how to use specific CN features. Through machine learning algorithms such as Name Entity Recognition (NER) and unsupervised keyword extraction methods, CN could also recognize keywords in a post and automatically add hashtags (Liu, 2022; Jafari et al., 2023; Padmanandam, in press)
- Requirements and Rules: Once instructors set up a course Anar Seeds goal, Rumi can remind students to participate if they are behind. The next-generation AI agent could also

monitor and alert inappropriate posts, such as the ones irrelevant to course topics, made to only earn Anar Seeds, including insulting languages, etc.

- Examples: The next-generation AI agent, with its massive knowledge and strength in creative writing, may create sample posts to give students ideas and model the expected post quality. However, due to AI's limitations in accuracy and ethical judgments (Marr, 2023; Mattas, 2023), instructors must approve AI-generated post examples before sharing them with students. It is also likely that this AI model will take a lot of training and retraining to become efficient in different subjects. Another more achievable approach is to have the AI agent read all course posts, then recommend high-quality ones to students, especially the ones who need extra help to reach the equivalent level.
- Agency and Autonomy: As mentioned above, the GPT-based AI agent could participate in course discussions. This will enable it to be a good discussion facilitator, for example, commenting on a student's post to ask a critical question or inviting the student to articulate an idea, which will stimulate cognitive engagement. The agent could also recommend learning resources, give learning tips, and cheer up students. Again, due to AI's current limitations, the CN team should consider restricting its' comments to certain scopes, for example, not allowing the AI agent to express opinions on topics. Students should also be educated to receive Rumi-generated comments with a critical mind (Halaweh, 2023) and give feedback to the system. As for how the AI agent may be utilized to develop student agency, the student leads may receive advice and assistance in their moderation work.
- Techniques: Since techniques are granular and context-specific, it seems more appropriate for instructors to implement these techniques. The AI agent could

recommend techniques to instructors by analyzing a large set of instructional techniques against a wide range of variables (e.g., course subjects, course level, faculty experience, current engagement, feature usage) and mapping the course data to any given model. It could also analyze dynamic course data and suggest real-time changes.

While AI is going to open many possibilities, what is worth noting is that the technology proposed above only intends to facilitate instructors and students. By no means the CN team or faculty users should use Rumi or other AI agents to replace the instructor and the interactions among course members (Mhlanga, 2023). After all, the purpose of an online social platform is to build a learning community. The growth of the community relies on the connections and interactions among its real members.

Conclusion

Summary

This study aimed to explore faculty scaffolding practices that increase student engagement in CN, an academic social networking platform. To achieve this goal, a mixed method approach was employed, which involved querying and analyzing platform usage data from 11,215 courses, and specifically studying 12 of the most active courses through course site observations, faculty interviews, social network analysis, and teaching artifact analysis.

The study's findings showed that while post features were the most used features on CN, course Anar Seeds goals, instructor-suggested hashtags, and instructor-awarded badges were associated with higher student engagement. However, these three unique features were underutilized in most courses. Evidence of technical, metacognitive, strategic, conceptual, and social scaffolding was found among the 12 selected courses. However, only one faculty intentionally faded the scaffolded assistance by implementing intense assistance and monitoring at the start of the course. The rest of the faculty either did not think about fading their scaffolding or did not see it applicable. The biggest challenge faced by the faculty was the lack of participation of some students. Faculty also expressed interest in receiving regular support materials through email newsletters or having them directly pushed to them while they are on the platform.

Based on the findings, the study recommends that instructors increase the use of unique CN features to enhance learning engagement. Specifically, instructors should set up a clear course Anar Seeds goal, suggest hashtags, and award badges as an incentive and recognition of students' learning efforts. The study also suggests a TREAT model that instructors can follow to conceptualize and execute scaffolded strategies and tactics in CN. The TREAT model highlights technical scaffolding at the beginning of the course, clear participating requirements and community rules announced from the start, ample and detailed post examples and resources, developing student agency and autonomy over time, and innovative techniques to address specific issues.

The study's findings and recommendations can be incorporated into future faculty training and support materials by the CN team. The team may also circulate these findings and recommendations through email newsletters and push them out to faculty users on the platform as Rumi Tips. Additionally, the CN team should explore ways to leverage the growing power of AI to deliver some effective scaffolding, such as answering students' technical questions, reminding students of participation rules, and facilitating discussions.

Limitations

Although this dissertation has addressed some limitations of previous studies on SNS for learning in the higher education setting, it itself presents several limitations. First, the researcher is a member of the CN team and had supported most of the faculty participants before the study. The insider role inherently brought in bias and preconceived notions, such as some distinctive CN features, like instructor-suggested hashtags, are easy to set up, social learning approaches are inclined to boosted engagement, and more educators should incorporate academic SNSs. Furthermore, the researcher's position as an insider and her connection to most of the faculty participants might have affected the process of data collection. Specifically, the faculty participants might have shared more positive experiences and perspectives than they would have shared if the study were conducted by a non-CN affiliated person. Second, this study examined 12 most active courses, with the last one ranking 829 among the 11,215 queried courses. While these active courses contributed to the understanding of effective scaffolding practices, they might have hindered the elicitation of challenges and supports needed to address these challenges. Third, only faculty participants were involved; students' voices on how they would like to be assisted and guided in the social learning environment were not heard. Finally, regarding the validity of the qualitative data analysis, even though this study implemented member checking on initially analyzed course data, three faculty did not respond to provide their confirmation. In addition, there were no other coders assisting with the thematic analysis.

Recommendations for Future Studies

First, the effectiveness of the proposed TREAT model needs to be assessed, with a focus on increased student engagement and improved learning outcomes. Comparing courses that have implemented the model to those that have not will provide insight into what works and what needs improvements. Faculty and student feedback should also be collected to deepen our understanding of the model's strengths and weaknesses. While the potential exists for this model to be applied to other social learning platforms, its effectiveness with each platform must be assessed separately.

Second, since this study only included faculty participants, students' experiences and opinions are to be studied. Surveys and interviews with students can help identify what kind of faculty assistance is needed and favored by students to keep them engaged in CN. Additionally, reaching out to disengaged students can provide direct and valuable insights into the reasons for their disengagement and how to address this issue.

Third, as the sociocultural approaches emphasize learning through interactions (Vygotsky, 1978; Wenger, 1998) and connectivism stresses learning in social networks via connections (Siemens, 2005), peer scaffolding can be an important source of support (Chun & Cennamo, 2022) and an interesting study topic with academic SNSs. While this study has focused on instructor scaffolding, future research could explore how scaffolding from more capable peers affects learning engagement in the CN environment. Specifically, questions about whether and how peer scaffolding occurs, what effective peer scaffolding practices entail, and how to facilitate peer scaffolding are all important questions for further studies.

Finally, utilizing AI to assist both students and faculty is a promising trend that is likely to shape the future of online learning technology. This dissertation has suggested several possibilities of using AI to facilitate social discussion, which require prototype development and small-scale applications as the first step to reveal its impacts and potential issues. A plethora of new studies are yet to emerge in this process, which will guide the development of AI features that could truly benefit student learning. Exciting opportunities lie ahead for researchers, educators, and developers to collaborate in creating innovative AI technologies that will bring learning in academic SNSs to the next level.

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APPENDICES

Appendix A

Faculty Participant Invitation Email Message

Hi <faculty name >:

My name is Alice Zhao. I am the associate director of R&D for the IUPUI CyberLab and CourseNetworking (CN). I am also an EdD (Doctoral in Education) candidate in the Instructional Systems Technology program in the School of Education at IU Bloomington.

I am sending this email to invite you to be a participant in my dissertation, which studies how higher education instructors support their students' use of CN to increase learning engagement. Your participation will consist of the following:

1. Give me permission to observe your CN course site <course name> taught in <time>.
2. Participate in a 45-60 minute interview **via Zoom at a time of your selection in October-November of this year**.
3. Bring a teaching artifact to the interview that demonstrates how **you guided or supported student learning in CN**. This artifact can be a CN tutorial video, an etiquette lesson, assignment descriptions, a sample post or comment from you, the course syllabus, etc.
4. Review the analysis of your interview and course observation data. You will do this review on your own and provide feedback, indicating that I have recorded and interpreted the data correctly. This process should not take more than 30 minutes and is optional. Your review will help ensure the validity and credibility of this study.

In order to protect the privacy of you and your students, pseudonyms will be used when recording data and discussing you and your work in the dissertation. No identifiable information, such as people's names, course names, or institution names, will be disclosed.

For more information about this study, please view the attached Study Information Sheet.

Please respond to this email by <date> if you are willing to participate and **let me know your preferred interview time in the upcoming weeks**. I am happy to answer any questions you have. I hope to hear from you. Thank you!

Appendix B

Course Site Observation Sheet

Name of the course: Instructor(s): Start Date: End Date: Number of Members:		Examples **(Identifiable info erased or recorded using pseudonyms)**	Researcher Notes
Features used	• Anar Seeds goal and modification of Anar Seeds table • Instructor recommended hashtags • Badges • Polls • Other features • External tools and resources (social annotation tools, OER, etc.)		
Student engagement	Motivation: • Activity Analytics: course visits, posts, reflections over the period of the course time • Course Anar Seeds champion (recorded in pseudonym) • Number of students who exceeded the course Anar Seeds goal • Number received badges • Motivation expressed through emotions and tones in posts Active Learning: • Multimedia embedded in posts and reflections (amount and types) • Length of posts and reflections • Depth of conversations (average number and level of reflections on a post) • Discussion Topics Word Cloud – popular discussion topics and their relevance to the course • Posts that provide evidence of cognitive engagement (i.e., making sense of new knowledge by connecting to their existing understanding, asking deep questions,		

	synthesizing and analyzing data, articulating their thinking process, reflecting, and monitoring their learning progress and outcomes)		
Faculty involvement	• Course visits over time • Number and length of posts • Number and length of reflections • Posted topics and examples (post and reflection examples) • Signs of transfer of responsibilities (post and reflection examples)		
Scaffolding strategies	Different scaffolding strategies and examples • Through posts and reflections (examples) • Through other tools, such as Tasks, badges, Anar Seeds (examples)		
Issues and challenges	What I see as ineffective ways of using CN or scaffolding strategies to engage students		

Appendix C

Semi-structured Faculty Interview Guiding Questions

Note, some questions were tweaked or removed in each specific interview based on findings from preceding course site observation and SNA.

1. Briefly introduce yourself. How long have you been teaching <course name>? How long have you been using CN?
2. Why did you choose to use CN for <course name>? Was your goal met?
3. Which CN features do you find most effective in engaging your students?
4. What support, guidance, or use the learning psychology term "scaffolding" do you provide to your students to foster learning engagement? (May prompt the strategies found through literature review to see if the interviewee has implemented and how).
5. What support/guidance/scaffolding artifact did you bring to today's interview? How did it help you engage students? May I receive a copy of it if you haven't shared it with me?
6. Anything else? Any other scaffolding or support practices have you used to engage students in CN?
7. How much do you usually involve in CN activities? Do you intentionally fade your involvement and support as your class goes on?
8. What are some effective tactics that you have utilized to transfer responsibilities to students and develop their agency over time?
9. What do you experience or perceive as barriers and challenges when using CN to engage students? How do you think these challenges can be addressed?
10. What resources would you need or suggest the CN Team provide to faculty to help them better engage their students on the platform?

Appendix D

Self-created Guide by Instructor, Norm, for His Intro to Global Literature Course

Finding and Fixing Missing CN Posts

If the CN Gradebook shows a 0 for your grade on a post, one of two things has happened:

1. You did not submit a post for that day. Solution: submit it, using the correct link in the daily assignment for that day.
2. You have posted your post in the wrong place. This document tells you how to fix it. Most likely you have used the post button at the top of the course page instead of the link in the daily assignment for that day. But you might also have posted using the wrong link. Only the last grade will appear for the day on which you actually posted using a post link for a specific day (so if there are two posts there, only one, the most recent, has a grade in the gradebook).

Here is how you move a CN post to where it belongs.

Note: I strongly recommend that you follow this procedure on a computer. The phone apps put things in different places. These instructions assume you are using a computer.

1. Be sure you are in the course on CN, not on the general CN screen.
2. Go to the course ROSTER, near the bottom of the course menu on the left of the course screen.
3. Find your name.
4. To the right of your name are numbers. The first number is the number of your posts in the course. Click on the number. That opens all of your posts in the course, both those correctly posted and those incorrectly posted (either posted using the post button at the top of the page or posted using the wrong link in the daily assignments).

5. Scroll to a post that has a grade of 0 in the gradebook. (You won't see the grade when you open the post through roster, so you need to know what post you are looking for.)

6. Highlight and copy the text of that post.

7. Open the task and subtask of the day the post was due.

8. Find the day the assignment was due in the subtask. Go to the post link for that day.

9. Click on that post link for the day to open it.

10. Paste the contents of the post into that window. I recommend that you add "Repost" at the top so that I will know you posted it earlier.

11. Submit that post.
12. Repeat these steps as needed for other posts in the wrong place.

Your grade for that post will not change automatically. When I grade posts, I first grade posts for the current day. At least once a week I grade all posts, which means posts submitted for any day. So, your new grade may not appear for a few days.

Appendix E

Andy's One-page Guide That Clarifies Expectations and Rules

CN is a great way for us to exchange information about all kinds of things. It is really easy to use, but I wanted to give you just a few pointers that will make CN the most useful for all of us. As always in this class, the goal is for everyone to succeed.

Help!

1. Help each other out with physics. CN is a great place to discuss physics ideas (which are tough for everyone). If you are unsure what some new idea is all about, post a question. If you can answer someone else's question, please help them out!

2. Help each other with school. CN is also a great place to set up study sessions, share tips on exam prep or homework strategy, and share other resources.

3. Help each other with the homework, but please don't "give away answers." People need to learn from the HW, so answers that amount to "just do this" aren't truly helpful. Give hints and explanations, not procedures and formulas.

4. Help each other out as people. School can be hard, frustrating, depressing, etc., but we are all in it together. Please support each others' goals, interests, and efforts.

Tools

1. The "task tool" is the green bar on the upper left. Click it to reveal all of the course tasks (which mostly go by week).

2. CN uses #hashtags! I have included a pretty long list. Use them in your questions and answers for easy searching.

3. You can also create your own hashtags but be careful. If you type “I need help with #3 on the homework,” you will create a hashtag of the number three, and it won’t be very helpful next week.

4. Following: You can follow the instructors or anyone else. See https://support.thecn.com/hc/en-us/articles/115001856714-Follow-Other-CN-Members

What else to post

1. There is no need to limit your discussions to the chapter we are studying. All of physics is fair game. If you find something cool, share a link, a photo, a video, etc.

2. Local events are also good. No need to limit it just to physics. ANYTHING you think will be of interest to a significant number of classmates is fine.

What NOT to post

1. Don’t post “junk” just to get anar seeds. That is a waste of everyone else's time, and makes CN less useful for people trying to learn.

2. This is a professional setting. Absolutely no personal/political/social attacks. Respect for one another is essential.

Appendix F

Resources Adam Recommended to His Students

Communications Law Resources

Here's a list of some good outside resources in communication law, which make good places to start to find interesting readings to share with classmates via Course Networking (CN Post):

- **Companion website from the publisher of the Law of journalism and mass communication book.** Click on pages for individual chapters, then look under "links to professional resources."
- **Student Press Law Center** — This is a legal resource for student journalists, such as college and high school journalists.
- **Reporters Committee for Freedom of the Press** — A resource for information on legal issues relevant to journalists. They have particularly amazing resources for open records law.
- **The Oyez Project** — Here you can read summaries of cases and hear oral arguments from many U.S. Supreme Court cases.
- **SCOTUSblog** — A blog about U.S. Supreme Court issues, cases, and news
- **Columbia Journalism Review articles by Jonathan Peters** — Dr. Peters is a media law professor at the University of Georgia who writes a regular column for the Columbia Journalism Review on media law issues.
- Some social media accounts to follow:
  - **Jon Peters** (mentioned above), attorney and media law professor at the University of Georgia
  - **Chip Stewart**, attorney and media law professor at Texas Christian University
- Academic Journals (you may not be able to access these without connecting first to the journal through the library, but you should be able to at least read some abstracts)
  - **Journal of Media Law**
  - **Communication Law & Policy**
  - **Federal Communications Law Journal**
- **Communication Law Research Guide** from the Georgetown Law Library
  - Pay special attention to the News and Current Awareness section

Appendix G

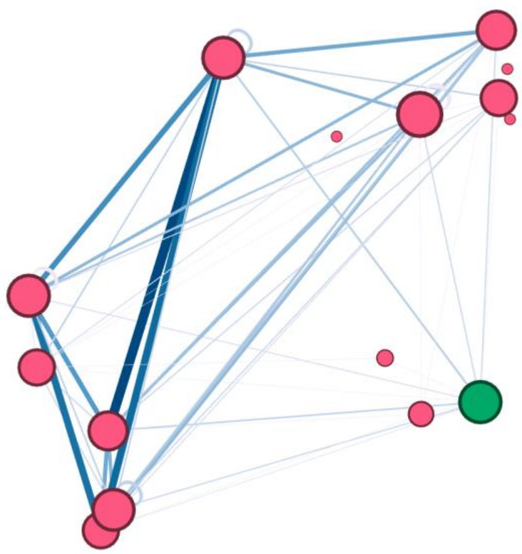
SNA Graphs of All Courses

Below are the SNA graphs of the 1st, 2nd, and 3rd phases of each course. Green nodes represent course instructors. Pink nodes are students. The graphs were generated using Gephi, a free SNA application.

Business Ethics

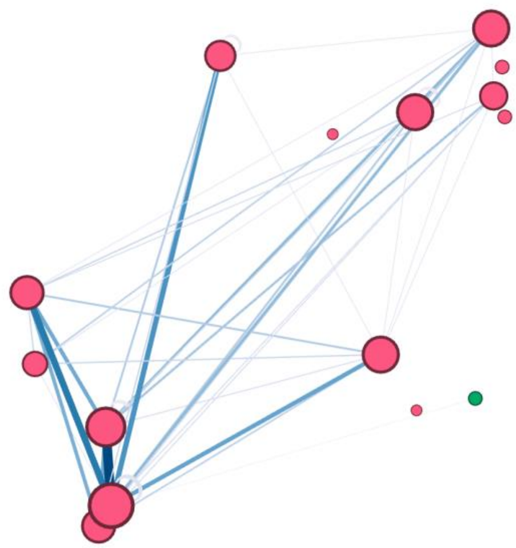
1st third

Instructor Eigenvector Centrality: 0.92

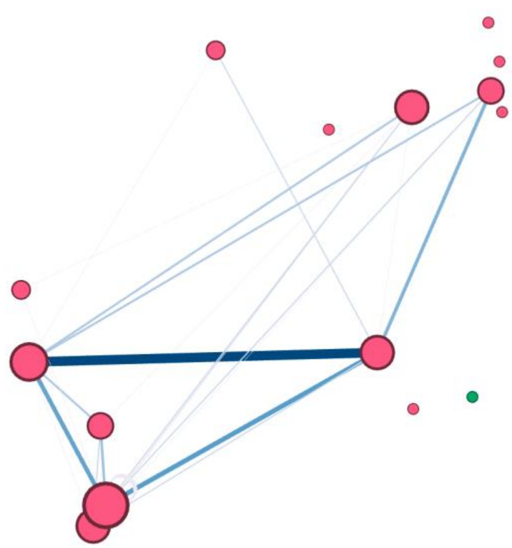


2nd third

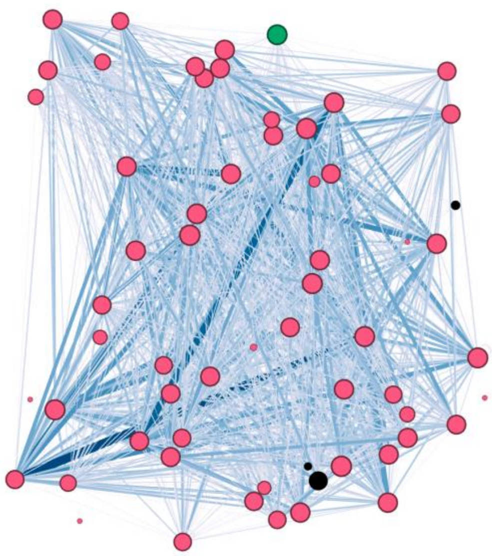
Instructor Eigenvector Centrality: 0.12



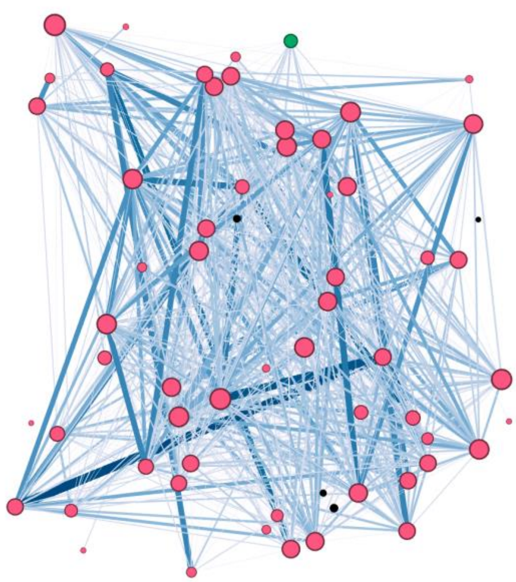
3rd third
Instructor Eigenvector Centrality: 0.0



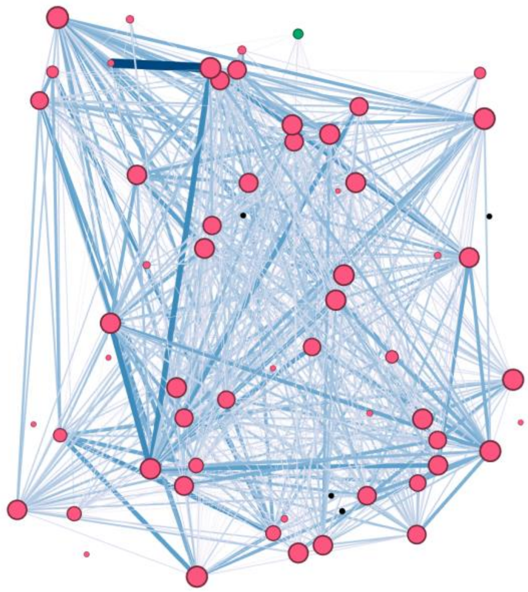
Intro to Global Literature
1st third
Instructor Eigenvector Centrality:0.94



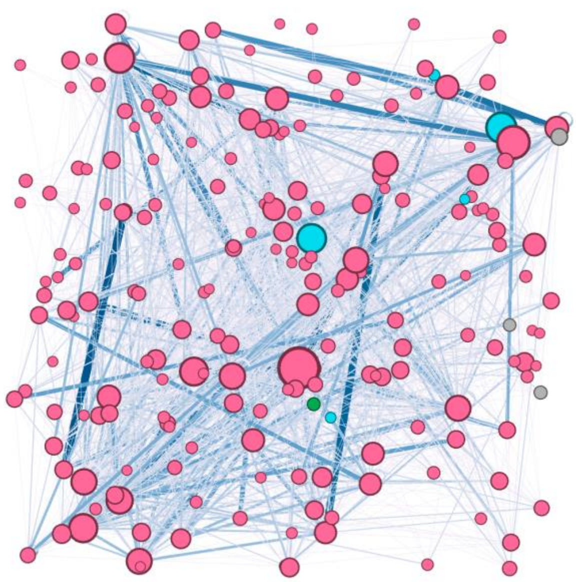
2nd third
Instructor Eigenvector Centrality: 0.51



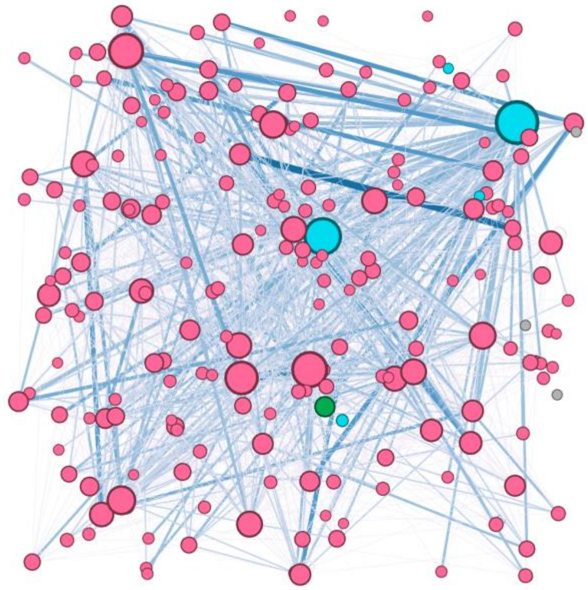
3rd third
Instructor Eigenvector Centrality: 0.25



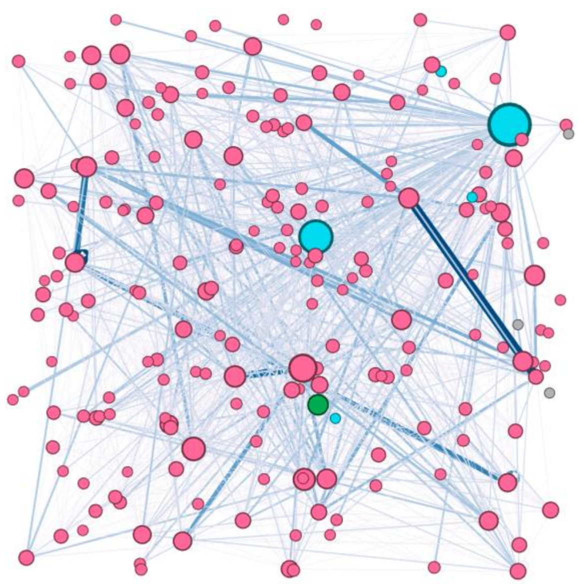
Physics 200
1st third
Instructor Eigenvector Centrality: 0.12



2nd third
Instructor Eigenvector Centrality: 0.31



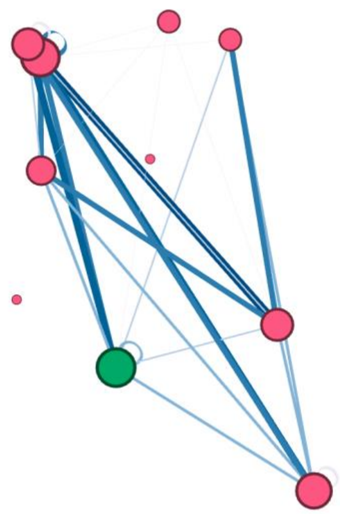
3rd third
Instructor Eigenvector Centrality: 0.50



Mycology and Parasitology

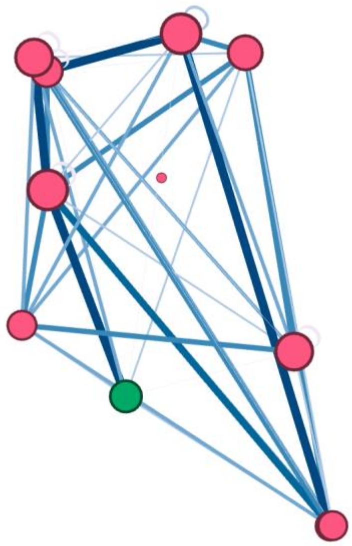
1st third

Instructor Eigenvector Centrality:1.0

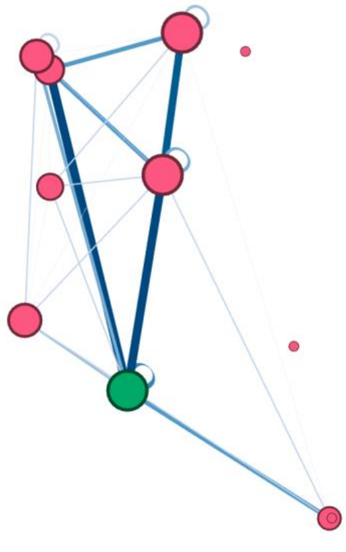


2nd third

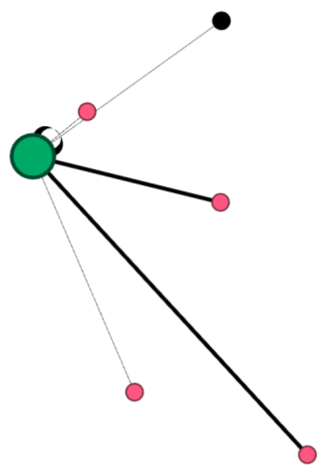
Instructor Eigenvector Centrality: 0.81



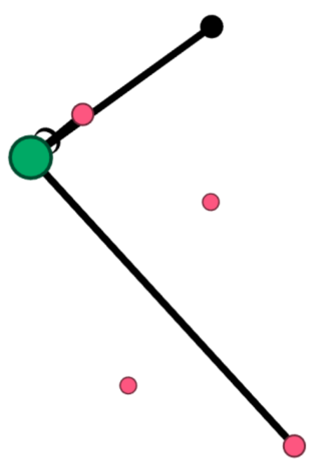
3rd third
Instructor Eigenvector Centrality:1.0



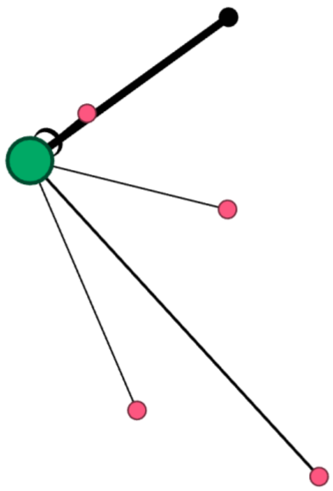
Strategic Marketing
1st third
Instructor Eigenvector Centrality: 1.0



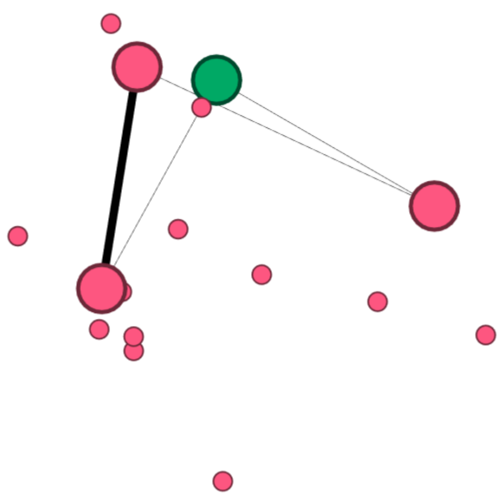
2nd third
Instructor Eigenvector Centrality: 1.0



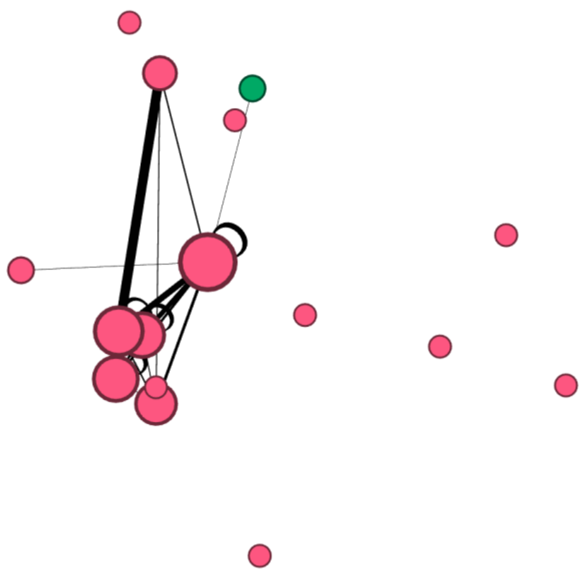
3rd third
Instructor Eigenvector Centrality: 1.0



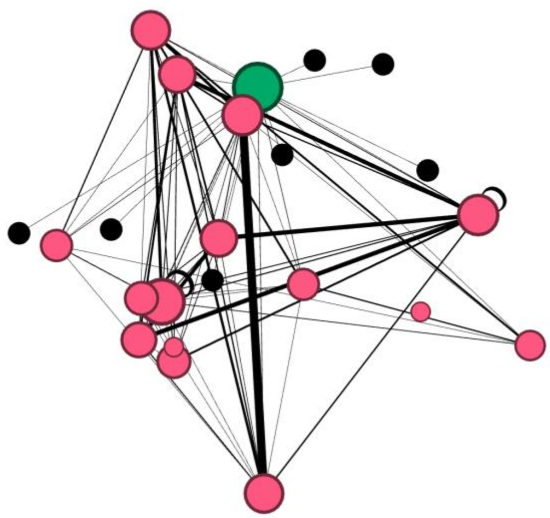
Interior Design
1st third
Instructor Eigenvector Centrality:1.0



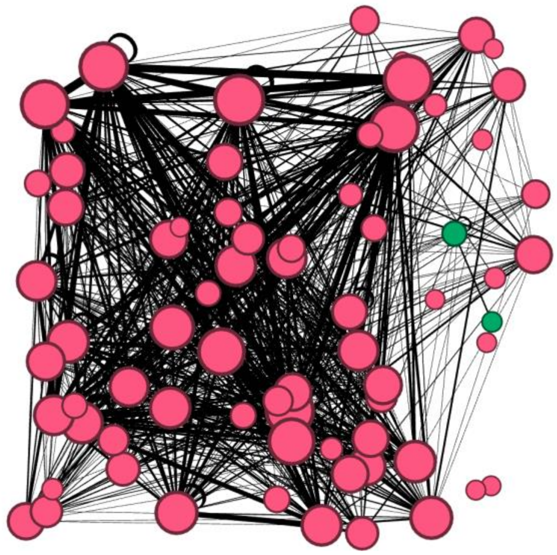
2nd third
Instructor Eigenvector Centrality: 0.19



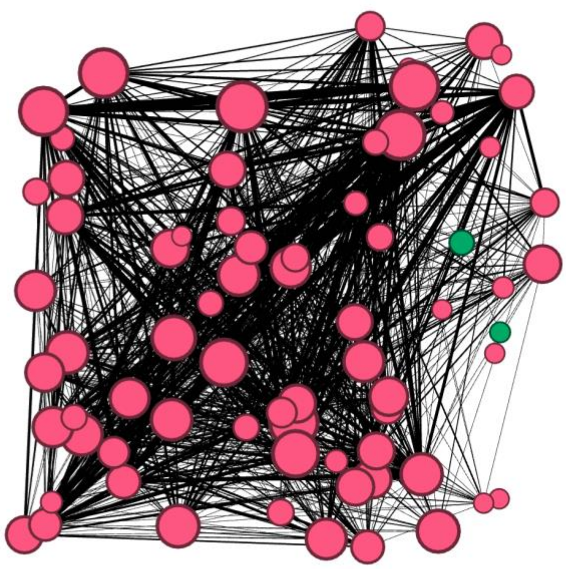
3rd third
Instructor Eigenvector Centrality: 0.79



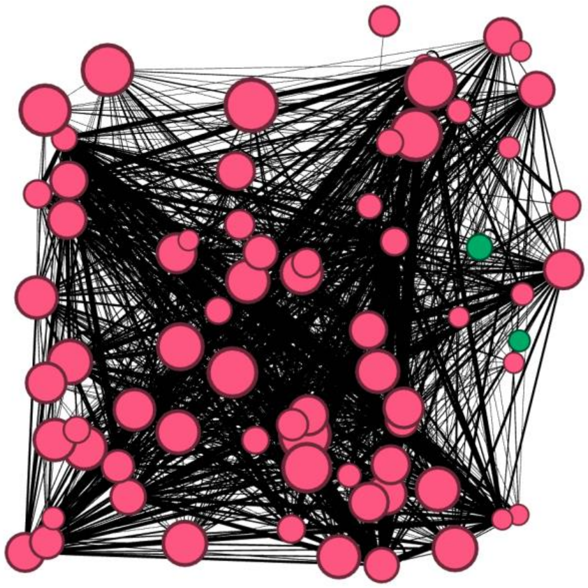
Cultural Virtual Exchange
1st third
Instructor (Fu) Eigenvector Centrality: 0.005



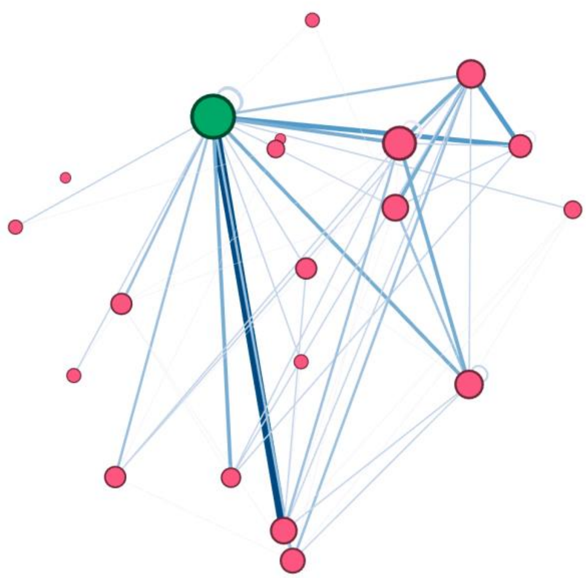
2nd third
Instructor (Fu) Eigenvector Centrality: 0.0007



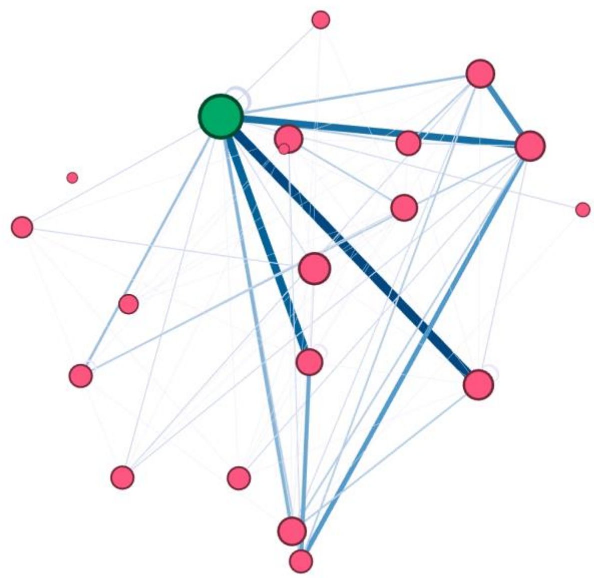
3rd third
Instructor (Fu) Eigenvector Centrality: 0.02



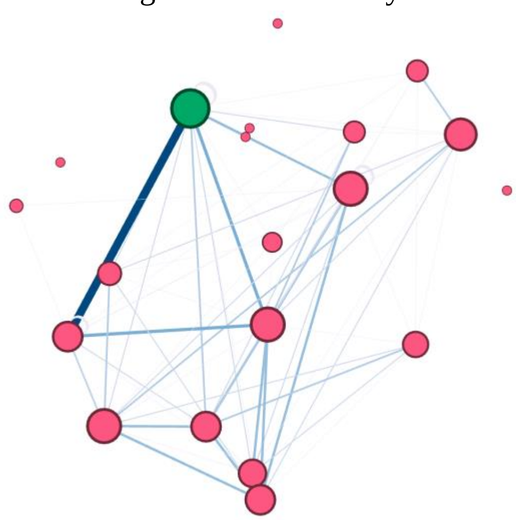
Communications Law
1st third
Instructor Eigenvector Centrality:1.0



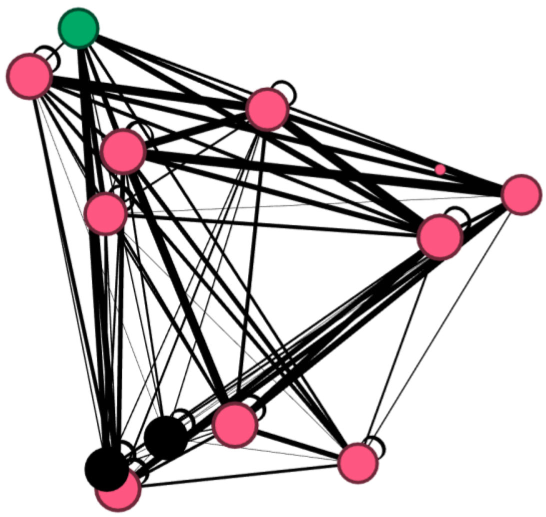
2nd third
Instructor Eigenvector Centrality: 1.0



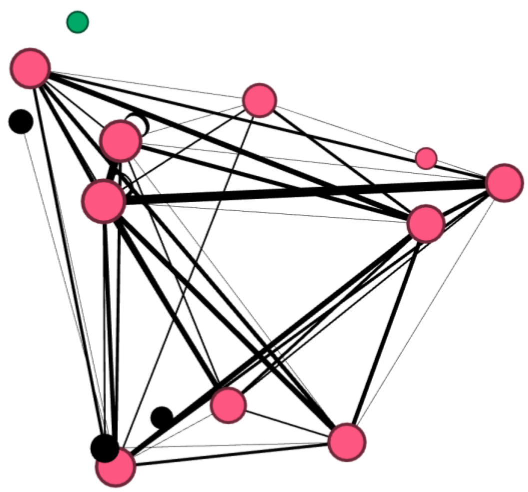
3rd third
Instructor Eigenvector Centrality: 1.0



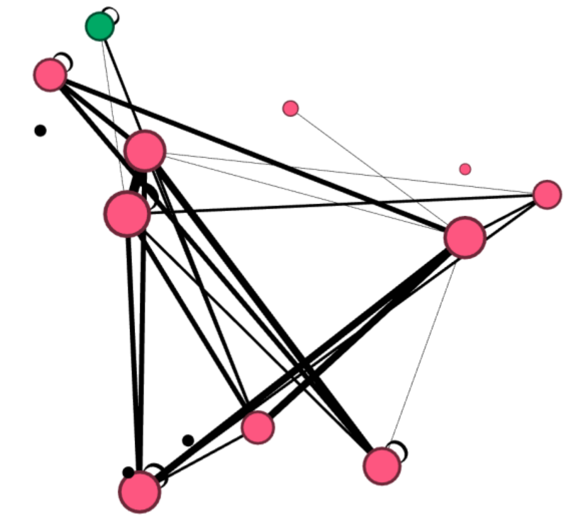
Teacher Education Globalization
1st third
Instructor Eigenvector Centrality: 0.92



2nd third
Instructor Eigenvector Centrality: 0.0



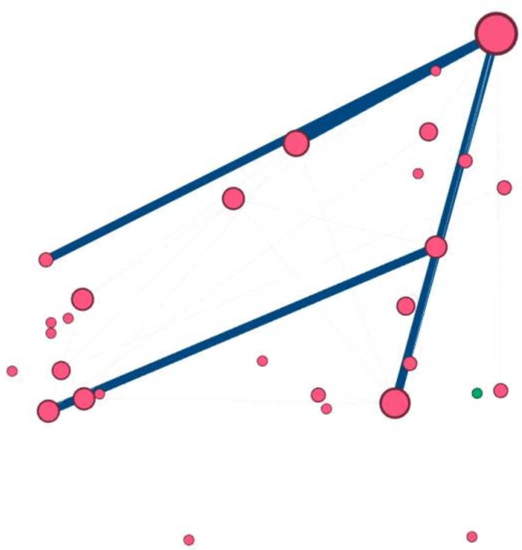
3rd third
Instructor Eigenvector Centrality: 0.38



Japanese Culture

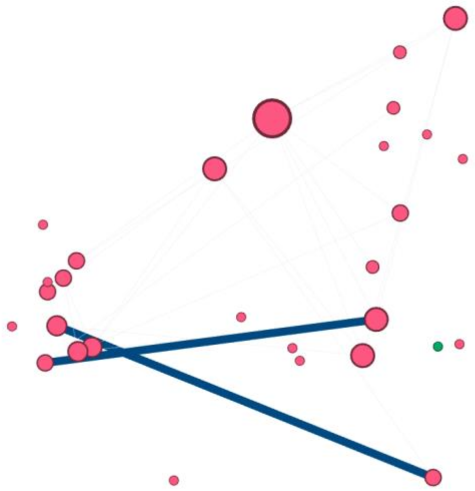
1st third

Instructor Eigenvector Centrality: 0.0

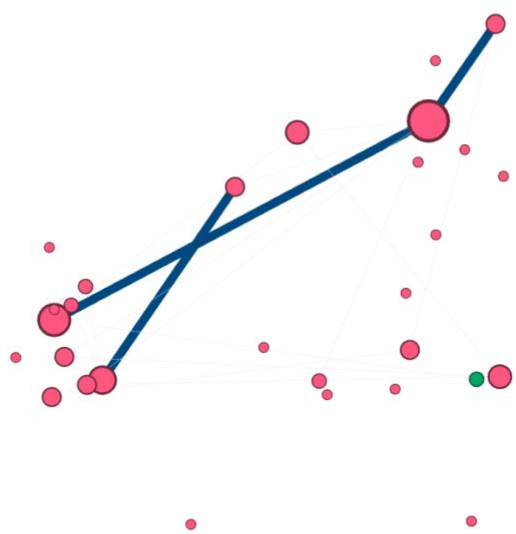


2nd third

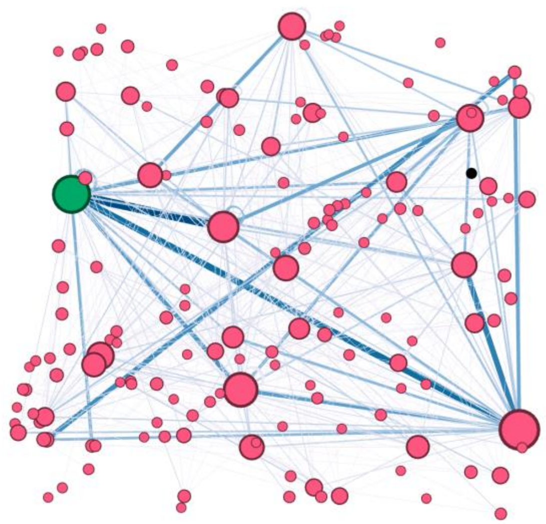
Instructor Eigenvector Centrality: 0.0



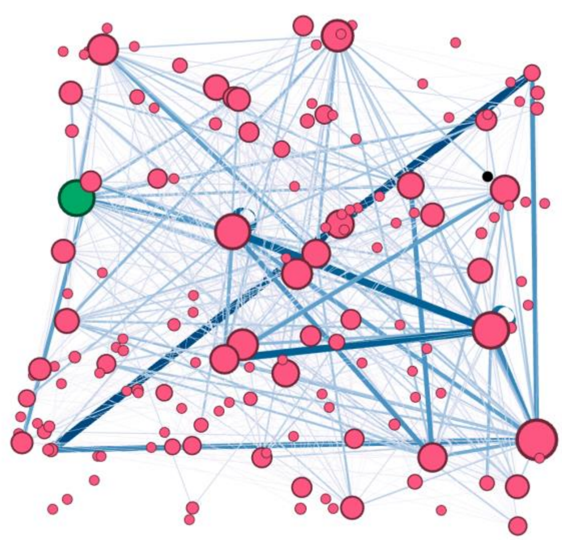
3rd third
Instructor Eigenvector Centrality: 0.23



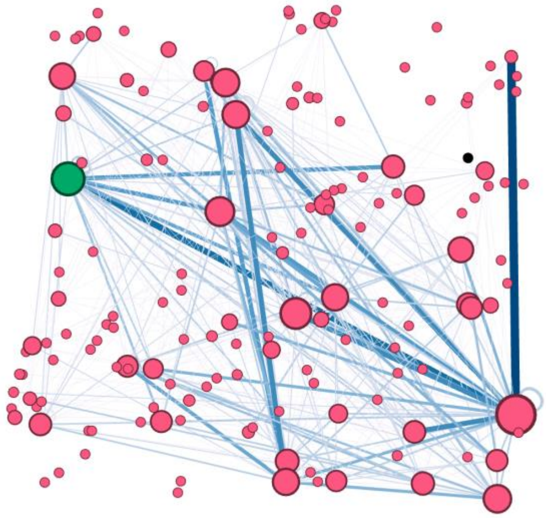
Mechanics
1st third
Instructor Eigenvector Centrality: 0.88



2nd third
Instructor Eigenvector Centrality: 0.90



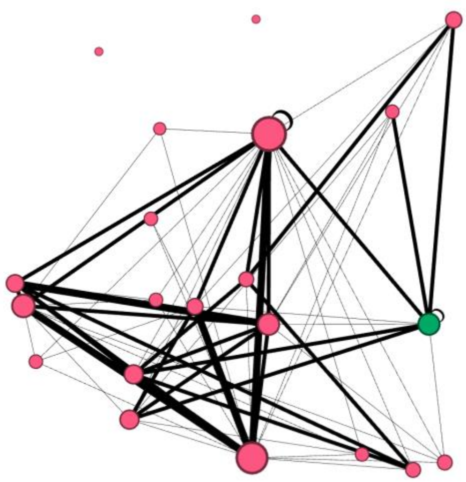
3rd third
Instructor Eigenvector Centrality: 0.86



Communication Skills

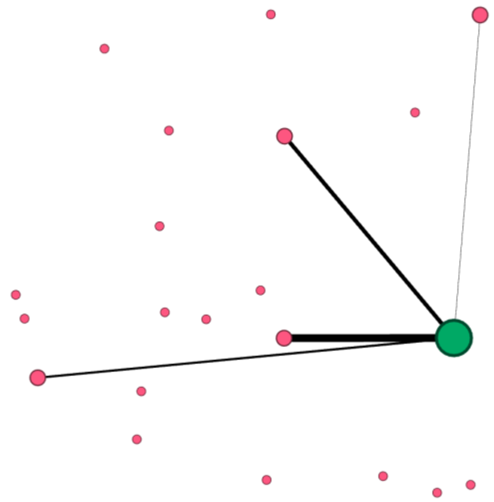
1st third

Instructor (Fu) Eigenvector Centrality: 0.54

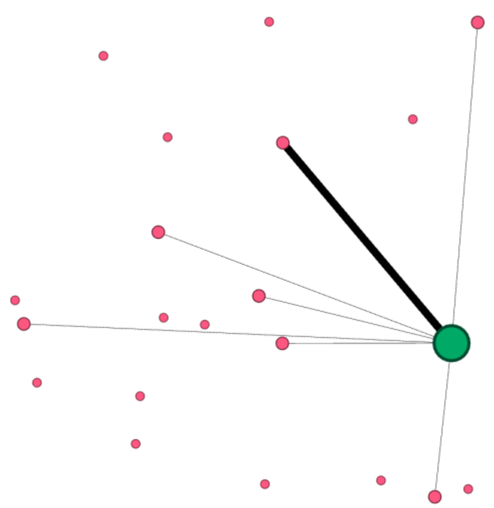


2nd third

Instructor (Fu) Eigenvector Centrality: 1.0



3rd third
Instructor (Fu) Eigenvector Centrality:1.0



CURRICULUM VITA

Mengyuan Zhao

EDUCATION

Doctor of Education in Instructional Systems Technology (minor in Learning Sciences), Indiana University-Bloomington. 2015-2023

Master of Science in Instructional Systems Technology, Indiana University-Bloomington. 2010-2012

Bachelor of Arts in language Education, Beijing Normal University. 2004-2008

PROFESSIONAL EXPERIENCE

Associate Director of Research and Development
IUPUI CyberLab and CourseNetworking LLC, Indianapolis, Indiana. Nov 2015-present

- Lead an 8-people software design and development team in designing and developing a wide range of learning products and features on thecn.com: Classic and Pathway LMSs, CN Post social discussion tools, badge and certificate engines, CN ePortfolio, integrations with third-party tools and platforms, CN Channel admin portal, CN Premium Account, CN mobile responsive website. As of today, the CN platform has near 300,000 users from over 160 countries.
    - Analyze user needs and competitor products on the market
    - Work with UX designers on prototype design and write design documents
    - Manage software development timeline
    - Oversee software testing and release
- Design and deliver pedagogical training, create suggested platform implementation plans, provide instructional design consultation to licensed institutions.
- Create user training and support materials: product demonstration and tutorial videos (such as https://youtu.be/wzP4NYq7s1k), 100+ help articles on support.thecn.com, and free courses (such public course Intro to CN ePortfolio thecn.com/1150756)
- Supervise student interns and graduate research fellows working on graphic/UX design, website accessibility, software security, quality assurance and testing, mobile app development, social media and marketing, and applied research.

- Lead and support research projects at the lab: grant applications, user surveys, data analysis, and conference presentations and publications.

Project Coordinator and Research Associate
IUPUI CyberLab/CourseNetworking LLC, Indianapolis, Indiana. Jan 2013-Nov 2015

- Delivered product demo to potential clients
- Conducted online training webinars and face-to-face workshops to both instructors and students on how to use thecn.com.
- Provided instructional design and pedagogical support to instructors in delivering online courses, for example, the first two MOOC courses offered at IUPUI: Music for the Listener MOOC (thecn.com/mooc100), Gaza 2050 A Visioning Exercise (thecn.com/mooc101)
- Organized client and user meetings to give CN development updates, share product implementation best practices, and receive feedback
- Built and maintain the lab website cyberlab.iupui.edu
- Designed and delivered user questionnaires, analyzed data, and created visual presentations of the results

Educational Evaluation Specialist
Rockman et al., Bloomington, Indiana. May 2012—Dec 2012

- Conducted literature review relevant to evaluation projects.
- Designed evaluation instruments such as questionnaires and interview questions.
- Collected and analyzed data in various learning environments using both qualitative and quantitative methods.
- Explored using video as a means of data presentation. Created two videos to document K-12 extra-curriculum programs.
- Compared different survey platforms and proposed a new purchasing plan to the team.

5th Grade Teacher
Fangxinyuan Elementary School, Beijing, China. Aug 2009--Jul 2010

- Taught 5th-grade language and social science
- Managed a class of 38 fifth graders. The class won the first place at the annual school athletic event and achieved the first academic performance ranking among all four 5th-grade classes at the school

Education Book Editor
Hanzhangxingwen Publishing Co., Beijing, China. Nov 2008 -- Jun 2009

- Edited and put two series of educational books onto the market within seven months. One of the series, Ancient Indian and Chinese Math, became best sellers for several consecutive years. It is still being sold on the market.

TEACHING EXPERIENCES

Lead Instructor, Fall 2022
Personal Branding and ePortfolio, undergraduate course for Computer Information Technology majors, IUPUI

Co-Instructor, Fall 2022
IUPUI-UNESWA: SDG Virtual Connection, Honors College, IUPUI

PRESENTATIONS

Co-presented with Sibel Crum and Chen Meng (Apr 2023), *Effective Instructional Design and Assessment Practices to Support Inclusive Online Social and Collaborative Second Language Learning, 2023 Statewide IT Conference, Bloomington*

Co-presented with Ali Jafari and John Ittelson (Oct 2020), *Discussion on the Next-Generation of Learning Technology for Learning Effectiveness in the 'New Normal' Era*, 2020 Assessment Institute, Indianapolis

Co-presented with Ian McIntosh (Oct 2020), *Make Virtual Exchange and Online Global Learning Happen with Innovative Learning Technology*, 2020 Assessment Institute, Indianapolis

Co-presented with Ali Jafari (Oct 2019), *Next Generation of ePortfolios*: *Global Networking, Competency Assessment, and Artificial Intelligence.* 2019 Assessment Institute, Indianapolis

Co-presented with Yaoyi Fu (Nov 2016), *Use Global Class Feature to Connect Your Students with the World*, Plater Institute on the Future of Learning: Educating for a Global Community, Indianapolis

Add Social Engagement to your Course or Educational Programs by Using the CN (Jul 2015), Summer Institute on Distance Learning and Instructional Technology 2015, Kansas City

Poster presentation (Apr 2014), *CyberLab Engages Student Interns in Educational Technology Innovation*, IUPUI Research Day, Indianapolis

Co-presented with Beth Lewis Samuelson and Sarah Zike (Feb 2014), *Engage Students in Collaborative and Global Learning through CN*, 2014 IUPUI Advance Learning with Technology Symposium, Indianapolis

Co-presented with Debbie Runshe (Aug 2013), *Social Pedagogies: The Intersection of ePortfolios and Academic Social Networking*, 2013 AAEEBL Conference, Boston

PUBLICATIONS

Padmanandam, K., Sunitha, K., Jafari, B.M., Jafari, A., Zhao, M., & Pitla, N. (In press). Customized named entity recognition using Bert for the social learning management system platform, CoursenetWorking. *Journal of Computer Science.*

Jafari, B.M., Zhao, M. & Jafari, A. (2022) Rumi: An intelligent agent enhancing learning management systems using machine learning techniques. *Journal of Software Engineering and Applications*, *15* (09), 325-343. https://doi.org/10.4236/jsea.2022.159019

Cooney, E. M., Freije, E. & Zhao, M. (2020). Using ePortfolios to facilitate transfer student success [Paper presentation]. *ASEE's Virtual Conference*. https://peer.asee.org/35463