Toward a Conceptual Model of Online Collaborative Learning: A Multi-Phased Investigation into Experiences and Perceptions of Online MLIS Students

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Even though online teaching and learning in the LIS field is not new, in-depth research efforts specifically addressing the relationship between social presence and its value to the success of online collaborative learning (OCL) for students in Master of Library and Information Science (MLIS) programs in the United States has seldom been conducted. This article focuses on the impact of demographic factors, technological skills, and past online experiences on OCL, as well as the affective and social variables that influence the success of OCL. In addition, the article reports on the participants' perceptions and experiences with regard to their OCL performance. Furthermore, it explores the opportunities and obstacles that participants identify as associated with the OCL experience in general. It was hypothesized that demographic factors, technological skills, and past experiences would have a significant impact on OCL performance and perception. The study employed a mixed-methods approach with a sequential explanatory design that involved two phases. While Phase I featured an online survey with 457 respondents from ALA-accredited MLIS programs, Phase II consisted of follow-up interviews with 29 respondents who completed their Phase I survey. Statistically significant differences were found among demographic variables, technology usage, and OCL experiences with respect to respondents' agreement ratings of performance/behavior and perception statements. The qualitative analysis uncovered constructs of group composition, group environment, and group collaboration. The triangulation of data resulted in an OCL conceptual model, which provides a comprehensive understanding of the role of social presence in the OCL process and offers guidance toward the operationalization of key factors that help to facilitate and enhance success and positive OCL experience among online learners.

Keywords: group assignments, OCL success, online collaborative learning (OCL), satisfaction, social presence

Over the past decade, MLIS programs have been enthusiastic adopters of online education. To date, 100% of the 64 ALA-accredited programs offer at least one online course (ALA, 2021). Forty-three (67%) provide a fully online program. Numerous publications and literature have outlined how co-learning and group-based cognition can help students learn more effectively, make them more confident, and develop or improve their social and leadership skills. "Learning collaboratively helps students," as declared by the National Education Association (Gates, 2018). The NEA further states, "Collaborative learning has been shown to not only develop higher-level thinking skills in students, but boost their confidence and self-esteem as well. Group projects can maximize educational experience by demonstrating the material, while improving social and interpersonal skills" (Gates, 2018, "Learning

Collaboratively Helps Students," para. 2). In spite of the popularity of online education in LIS and the amount of existing research that has examined and reported elements contributing to successful collaborative learning, there has not been a holistic investigation into the full range of factors involved in online collaborative learning (OCL) or how various factors interact with one another. Motivated by investigating collaborative learning exclusively in an online setting and presenting various dimensions and attributes in the entire realm of online collaborative learning, the present study employs relevant theories and constructs to analyze and examine MLS students' experience and perception of the OCL activities in their coursework. With a lack of conceptual models or theories outlining pertinent factors and their interactions in the OCL process, this study fills that gap in order to advance the conceptualization and scholarship in this area.

KEY POINTS:

- This mixed methods study on online collaborative learning (OCL) involves an online survey of 457 MLIS students and follow-up interviews with 29 respondents.
- Significant differences were found among demographic variables, technology usage, and OCL experiences with respect to respondents' agreement ratings of performance/behavior and perception statements.
- The triangulation of quantitative and qualitative data resulted in an OCL conceptual model, illustrating the role of social presence in OCL and outlining key factors that help to facilitate OCL success.

In this study, we view collaboration as any joint activity by two or more people or organizations that work together, helping one another to create a common value and attain a shared goal. This definition is based in part on definitions proposed by Castañer and Oliveira (2020). Furthermore, we define OCL as any online learning activities that involve a university student partnering or collaborating with one or more classmates to complete required assignments or projects for a course that they take. OCL thus includes any group work activities such as scheduling group meetings, distributing and assigning tasks among the members, exchanging emails/postings among team members, communicating with the instructor about the required group work, and coordinating or resolving any obstacles in group dynamics, as well as any other matters that involve "joint intellectual effort" (B. Smith & MacGregor, 1992) and the "co-construction of knowledge" (Brindley, Walti, & Blaschke, 2009) for the purposes of the assignments or projects. OCL would also involve team or group discussions using discussion forums or other means.

A number of research studies have explored online learning in LIS programs (e.g., Cooke, 2016; Haigh, 2007; Kazmer, 2007; G. Liu, 2012; Oguz, Chu, & Chow, 2015). However, very few studies have focused on online learners' experiences with collaboration. The present study included both a nationwide survey of 457 MLIS students from 45 ALA-accredited programs and follow-up interviews with 29 respondents. Through investigating MLIS students' online collaborative learning experiences, we developed a conceptual model articulating various factors affecting the success and satisfaction of online collaborative learning. Subsequently, suggestions were made to cultivate a sound online learning environment that enables successful collaboration and interaction.

Related research and theoretical framework

Collaboration and collaborative learning

Collaboration is defined in the *Macquarie International English Dictionary* as "the act of working together with one or more people in order to achieve something." There are four conditions for successful collaboration: diversity of opinion, independence, decentralization, and aggregation (Surowiecki, 2004). Diversity of opinion and independence enable each person's opinion to be respected. Decentralization, a state when people are able to specialize and draw from local knowledge, also values the individual's contribution to the collaboration. Aggregation turns individual judgments into a collective decision. Many research studies (e.g., Bell-Elkins, 2002; Metzler et al., 2003; Tseng, Wang, Ku, & Sun, 2009; Tseng & Yeh, 2013) identified common factors for successful collaborations: attention to trust and relationship building, sharing credit for the group's accomplishments, the need for leadership, the commitment of time for the collaborative process, equal sharing of decision making, and adequate resources.

According to B. Smith and MacGregor (1992), collaborative learning is "an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product" (p. 1). Collaborative learning is undertaken by equal partners who work jointly on the same problem, instead of on different parts of the problem (Brandon & Hollingshead, 1999). As indicated by Schrage (1990), students are engaged in a process of "shared creation," where two or more individuals interact to create a shared understanding that none of the participants could have come to on their own. Furthermore, collaborative learning leads to positive social and affective connections. Social learning, where learning takes place in groups through the interaction and transaction between people and their environments, helps students gain experience in collaboration and develop skills in the co-construction of knowledge (Brindley et al., 2009; Chi, 1996). A number of studies have focused specifically on the experiences and learning patterns of small-group collaboration (e.g., Bernier & Stenstrom, 2016; G. Smith et al., 2011). In their study, Bernier and Stenstrom (2016) found that "specific pedagogical interventions" and detailed/targeted guidelines tied to concrete learning outcomes would improve "small group functioning" (p. 64).

Meanwhile, several studies (Barkley, Cross, & Cross, 2014; Koh & Hill, 2009; Lee, Bonk, Magjuka, Su, & Liu, 2006; Lock & Redmond, 2021) examined the factors influencing the success of OCL, including past experience and technical, educational, and social affordances. Altınay (2017) found that past online learning experience mattered in students' attitudes toward online peer learning: Participants who took distance education courses were found to have more positive responses about the online learning process than those who did not take any distance education courses. Kirschner, Strijbos, Kreijns, and Beers (2004) suggested that the OCL process is contingent upon technological, educational, and social affordances present in the task environment. Meanwhile, Yoon (2006) identified the three most frequently performed behaviors in group activities: work, social, and management. It was found that at the beginning of teamwork, the social domain attributed to the

observed behavior, so successful collaborative learning must consider both the task and social aspects of an activity.

The Online Learning Environment (OLE) offers many advantages over traditional classroom-based in-person learning, but with notable challenges (Dringus & Terrell, 1999). Even though students were observed to enjoy group work and that collaboration increases satisfaction (Magen-Nagar & Shonfeld, 2018), they also experienced some difficulties in coordinating online discussions, balancing the task distribution, and making initial contacts with peers whom they had never met. Other drawbacks were the loss of student interaction and friendships, a high level of frustration due to difficulties in communication, lack of shared goals, imbalance in commitment, and lack of time (Appavoo, Sukon, Gokhool, & Gooria, 2019; Capdeferro & Romero, 2012; Dringus & Terrell, 1999; Hiltz, 1997; Margaliot, Gorev, & Vaisman, 2018). Relationship conflicts and poor problem-solving and decision-making skills were found to threaten the success of OCL (Korkmaz & Yesil, 2011).

Multiple studies on LIS online programs address the importance of social presence in online learning. For example, Luo (2010) found that about two-thirds of the study participants in an online MLIS program maintained social connections with their peers, and close to half of them use social networking websites to facilitate these connections. Haigh (2007) also discovered that online MLIS students were more comfortable in communicating electronically than face-to-face students. In reviewing the literature in Computer-Supported Collaborative Learning, Strauß and Rummel (2020) concluded, "incorporating collaborative learning into online courses benefits learners in terms of learning and social aspects such as social presence" (p. 251). In their meta-analysis of publications on using CSCL scripts for unguided collaborative learning, Radkowitsch, Vogel, and Fische (2020) also observed that online education not only fosters social presence but also promotes learning of new content and collaboration skills.

The dissatisfaction with group work, Kazmer (2007) found, emerged frequently because of the difficulty in building trust in the absence of lasting social and professional ties. Trust has been shown as a key factor for successful OCL, evidenced by results of multiple studies (e.g., McCollum et al., 2019; Waters & Napier, 2002). There was a tendency to blame group dysfunction on the online environment, as participants undertook online learning because they preferred to learn alone. The ability of individuals to "disappear" from electronic communication made it easy for group members to slack off. X. Liu, Liu, Lee, and Magjuka (2010) found that besides typical issues in group work such as social loafing, personality dominance, and member conflict, students collaborating on online coursework face additional difficulties in coordinating group activities due to time zone differences and, in some cases, cultural differences.

Among the studies we reviewed here, a majority of them involved graduate-level students as participants (e.g., Altınay, 2017; Capdeferro & Romero, 2012; Haigh, 2007; Kazmer, 2007; Koh & Hill, 2009; Lee et al., 2006; X. Liu et al., 2010; Yoon, 2006), with only a limited number studying undergraduate students (e.g., Hiltz, 1997; McCollum et al., 2019). Moreover, a good number of studies focused specifically on MLIS students (e.g., Haigh, 2007; Kazmer, 2007; Luo, 2010). The studies on MLIS students' collaborative learning were conducted mostly prior to 2010 and within specific institutions and programs. In the recent decade, there have been limited publications in this area even though online programs and

courses are becoming the most common format of delivery. The present study intends to update the scholarship by investigating the OCL activities and perceptions of MLIS students from all ALA-accredited programs in the Unitd States in recent years.

Theoretical frameworks pertinent to OCL

The present study was guided by a number of theoretical frameworks, including The Community of Inquiry (CoI), Social Cognitive Theory, Team Mental Models, and Social Interdependence Theory (SIT). Table 1 lists key constructs pertinent to this study.

The CoI framework consists of the constructs of social presence, cognitive presence, and teaching presence (Garrison & Arbaugh, 2007). Teaching presence is a determinant of student satisfaction, perceived learning, and sense of community (Shea, Li, & Pickett, 2006). Cognitive presence is the extent to which learners construct meaning through sustained reflection and discourse (Arbaugh et al., 2008), and it also helps to create a sense of community (Rovai, 2002). Social presence is the degree of feeling and perception and the reaction of

Table 1: Theories relevant to OCL

Theories	Components	Categories	Indicators
CoI (Garrison, Anderson, & Archer, 2000)	Social presence	Open communication Group cohesion Affective expression	Risk-free expression Encourage collaboration Emotions
	Teaching presence	Design & organization Facilitating discourse Direct instruction	Setting curriculum & methods Sharing personal meaning Focusing discussion
SCT (Bandura, 1986, 2002)	Behavioral factors	Skills Practice	Self-observation Self-evaluation Self-efficacy
	Environmental factors	Social norms Access in community	Self-reaction
Team Mental Model (Klimoski & Mohammed, 1994)	Individual's potential for performance Team size Team composition Resources available	Team capacity	Existence of TMM Leadership
Social interdependence (Johnson & Johnson, 1989)	Positive interdependence	Effective Positive interaction	Positive relationship Effort to achieve Psychological adjustment Social competence
	Negative interdependence	Bungling	Negative cathexis Non-substitutability Resistance

being connected in a learning process (Tu & McIsaac, 2002). Organically linked with online learning (Richardson, Maeda, Lv, & Caskurlu, 2017), social presence entails "an individual's ability to demonstrate his/her state of being in a virtual environment and so signal his/her availability for interpersonal transactions" (Kehrwald, 2008, p. 94). Social presence was found to influence a variety of factors in students' learning experiences: students' participation and motivation, course and instructor satisfaction, both actual and perceived learning, and even retention and intention to enroll in an online course (Richardson et al., 2017).

Parallel to social presence, Social Cognitive Theory (SCT) claims that an individual's knowledge acquisition can be directly related to observing others within the context of social interactions, experiences, and outside media influences. Behavior and environmental events all operate as interacting determinants that influence one another bi-directionally (Bandura, 1988; Nevid, 2009). Specifically pertaining to teamwork and collaboration, Klimoski and Mohammed's (1994) team process framework specifies components leading to team effectiveness. Both team size and composition contribute to team capacity, which helps with building a team mental model, which, in turn, is vital to the successful completion of team-based tasks.

Finally, Social Interdependence Theory (SIT) is another theory pertinent to collaborative learning. SIT is defined as "the ways in which participants' goals are structured determine how they interact, and the interaction pattern determines the outcomes of the situation" (Stanne, Johnson, & Johnson, 1999, p. 936). Positive social interdependence is a fundamental attribute in collaborative group learning approaches, as the outcomes of beneficial interdependence are associated with multiple effects on students' learning experiences (R. Johnson & Johnson, 2009). Without positive social interdependence, group learning would not yield higher achievement (Hwong, Caswell, Johnson, & Johnson, 1993) and/or productivity (Lew, Mesch, Johnson, & Johnson, 1986).

Research questions

The present study aims to answer the following research questions:

RQ1. What impact do demographic factors, technological skills, and past online experiences have on OCL?
RQ2. What factors, including affective and social variables, influence the success of OCL?
RQ3. What are participants' perceptions with regard to their OCL performance and to positive and negative experiences in their online collaborative assignments?
RQ4. What opportunities and obstacles do participants identify as associated with the OCL experience in general? What do they perceive as future directions of OCL?
RQ5. What would a comprehensive conceptual model of OCL consist of in terms of pertinent dimensions and elements and their relationships?

Methods

This study employs a sequential explanatory mixed methods design involving two phases: Phase I, an online survey with 457 MLIS students, and Phase II, follow-up interviews with 29 respondents. Survey participants were recruited from 45 ALA-accredited MLIS programs

based on the *ALISE Statistical Report* (ALISE, n.d.), which is a compilation and analysis of statistical data and information about graduate library and information science education programs. The study population was approximately 13,700 students from 45 schools who were enrolled in ALA-accredited Master's programs at the time of the study.

The Phase I survey was run from October 21 to November 30, 2016. The survey was distributed through sending an email request to instructors of online courses and online program coordinators of 45 institutions. The instructors and coordinators subsequently forwarded the email with the survey link to students in their programs. In the beginning of the survey, there were three filtering questions asking the respondents to confirm that they were in a Master's LIS program, that they are currently or were enrolled in online classes in the program, and that they have been involved in group assignments. Upon confirming all three questions, participants then proceeded to the formal questionnaire. The questionnaire consisted of 52 questions with a section of demographic and academic background questions, followed by a section on the online collaborative learning experience. Pertaining to OCL experience and perceptions, participants were asked to indicate their agreement level with both performance/behavior statements and perception statements using seven-point Likert scales. Examples of performance/behavior statements are "I perform better in a small-size group (5 students or less)" and "I managed my time better in online group assignments than if I was alone." Behavior-oriented statements such as "I actively exchanged my ideas with group members" and "I was able to develop problem-solving skills through group collaboration" were also included. A number of perception statements such as "I felt that I was a part of a learning community in my group" and "I felt comfortable expressing positive feelings" were also included in the questionnaire. The online survey was reviewed and pre-tested by multiple people prior to its distribution.

Using extreme case sampling, Phase II data were gathered through semi-structured follow-up interview sessions with 29 MLIS students via GoToMeeting between December 7, 2016, and January 2, 2017. All Phase I participants were asked whether they were interested in a follow-up interview and to leave their contact email once they expressed their willingness. The extreme case selection was made based on the participants who had the highest or lowest scores on performance/behavior and perception-related statements in their Phase I survey responses and also indicated they were willing to be interviewed. The 13 interview questions focused on recent online collaboration experiences that participants had by inquiring about the specifics of the group assignments and their collaborative processes. Participants were asked to reflect on the positive and negative experiences they had and further comment on their views on the future of online education and the role of collaborative learning.

Quantitative and qualitative data analysis was performed for Phase I and Phase II, respectively. For Phase I quantitative data, descriptive statistics included frequencies and proportions, central tendency measures such as mean, medians, and mode, and variation measures such as interquartile range and standard deviation. Inferential statistics involved correlational analysis and nonparametric testing such as the Mann-Whitney U test and the Kruskal-Wallis H test. For Phase II qualitative data, data processing was carried out to transcribe the recorded interview sessions. Qualitative content analysis was then performed

by examining and coding individual interviewees' responses, followed by thematic analyses through inspecting responses across cases and identifying and reporting common patterns. Qualitative data analysis formed a solid foundation for our development of the conceptual model of OCL.

Among the 457 Phase I participants, 448 (98%) were located in 45 different states in the United States, and nine (2%) were from seven countries outside the United States. The highest number of US respondents was from California (n = 83, 18.53%), followed by participants from Illinois (n = 42, 9.38%), New York (n = 37, 8.26%), Ohio (n = 28, 6.25%), and North Carolina (n = 26, 5.80%). Based on the locations, the study samples were representative of the ALA-accredited institutions. Close to 400 (n = 397, 87%) of the survey respondents were female and 60 (13%) were male. In terms of ethnicity, 86% were reported as White/Caucasian, 3% Asian, 3% Latino, 3% African-American, and 2% Mixed Race. More than half of the participants' undergraduate degrees were in Arts and Humanities (65%), with the remaining in Social Science (17%) and Science (16%). Over half of the participants (56%) were part-time students.

Phase II involved 29 participants (16 female and 13 male), who were in either a hybrid program (n = 3) or a 100% online program (n = 26). Of the 13 institutions that participants attended, both San Jose State University (n = 10, 34%) and Southern Mississippi University (n = 4, 14%) were well represented.

Results

Impact of demographic factors, technical skills, and online experiences on OCL

Participants indicated their agreement level with 15 performance-related statements and 13 perception-related statements on a seven-point Likert scale. The three highest-rated positive performance/behavior statements were "I actively exchanged my ideas with group members," selected by 407 (90%) participants; "I perform better in a small-size group (5 students or less)," selected by 385 (85%) participants; and "Before each virtual group meeting, I will always prepare myself and complete all necessary readings," selected by 348 (76%) participants. Due to the non-random nature of our study sample, nonparametric tests including the Mann-Whitney U test and Kruskal-Wallis H were performed.

Performance

Gender

Two significant differences between male and female participants were found concerning their agreement levels on performance-related statements. Male participants gave statistically significantly higher agreement to the statement "I perform better in mixed-gender group" than female participants (U = 9510.50, p = 0.004). Male participants also had a higher agreement level than female participants in indicating that they exchanged more ideas with their group members (U = 10001, p = 0.033).

Age group

The Kruskal-Wallis H tests revealed multiple significant differences among three different age groups (21–30, 31–40, and 41 and older) in participants' agreement levels to the

performance-related statements. The age group of 41 and older had a statistically higher agreement (H = 23.96, p = 0.000) than the other two age groups with the performance-related statement "Before each virtual group meeting, I will always prepare myself and complete all necessary readings." Meanwhile, the age group of 31–40 reported a significantly higher agreement than the other two age groups with the statement "Collaborative learning has helped me to learn to work effectively in groups" (H = 8.65, p = 0.013). The age group of 21–30 reported a higher level of agreement than the other two groups with regard to both the statement of managing their time better in online group assignment (H = 7.74, p = 0.021) and the statement "In my experience, it was easy to agree on group assignment decisions" (H = 6.54, p = 0.038).

Social media usage

Kruskal-Wallis H tests showed that participants who spent less than an hour daily on social media had a significantly higher level of agreement than other groups with the statement of being always prepared and completing all the necessary readings before each virtual meeting (H = 8.40, p = 0.015).

Number of online courses taken during LIS program

Participants who had taken more than three online courses during their MLIS program reported significantly higher levels of agreement with the statement "I achieved a higher grade because of collaboration" than those who took fewer online courses (U = 13251.50, p = 0.017).

Percentage of group collaboration

Five statistically significant differences were found between participants reporting that more than 25% (f = 300) of their assignment involved group collaboration (Group A) than those reporting equal to or less than 25% (Group B). Table 2 includes all the statements where there were significant group differences. The frequency of group assignments apparently serves as a good indicator for participants' perception of an increased quality of collaborative learning performance.

Group size

Twelve statistically significant differences were found across the performance-related statements among those participants with a preferred group size of more than three (Group A), those with a preferred group size of three (Group B), and those who preferred a two-person group (Group C). Table 3 lists the statements where there were significant differences and their statistical results.

Computer proficiency

Statistically significant differences were found in three performance-related statement ratings among participants' levels of computer proficiency. Participants who labeled themselves as an "Expert" (n = 412) showed a statistically significant higher rating than people who had "Some Experience" (n = 30) in the following statements: "I perform better in mixed-gender

Table 2: Significant differences between participants that had more than 25% group assignments (Group A) and those who had equal to or less than 25% (Group B)

Statement	Statistical Test Result[a]
I was able to develop new knowledge and skills by interacting with other members in my group	$U = 20484$, $p = 0.019$
Collaborative learning has helped me to learn to work effectively in groups	$U = 20393$, $p = 0.016$
I managed my time better in online group assignment than if I was alone	$U = 19819.50$, $p = 0.005$
I perform better when there is group collaboration involved	$U = 19653$, $p = 0.003$
In the future, I will register for courses with collaboration among the group members	$U = 19474.50$, $p = 0.002$

[a] In all cases, Group A had significantly higher levels of agreement than Group B.

Table 3: Significant differences between participants who preferred group size of more than 3 (Group A), those who preferred group size of 3 (Group B), and those who preferred group size of 2 (Group C)

Statement	Statistical test result[a]
In the future, I will register for courses with collaboration among the group members	$H = 62.76$, $p = 0.000$
I understand course materials better with the help of other group members	$H = 62.10$, $p = 0.000$
I perform better when there is group collaboration involved	$H = 61.86$, $p = 0.000$
Collaborative learning has helped me to learn to work effectively in groups	$H = 60.50$, $p = 0.000$
In my experience, I learn more from group collaboration than if I was alone	$H = 58.33$, $p = 0.000$
I was able to develop new knowledge and skills by interacting with other members in my group	$H = 44.50$, $p = 0.000$
I achieved a higher grade because of collaboration	$H = 40.33$, $p = 0.000$
I managed my time better in online group assignment than if I was alone	$H = 37.46$, $p = 0.000$
I was able to develop problem solving skills through group collaboration	$H = 36.35$, $p = 0.000$
Frequency and quality of my work were related to group awareness about my work	$H = 26.97$, $p = 0.000$
In my experience, it was easy to agree on group assignment decisions	$H = 25.1$, $p = 0.000$
I actively exchanged my ideas with group members	$H = 21.55$, $p = 0.000$

[a] In all cases, Group A had significantly higher levels of agreement than Group B and Group C

group" (U = 4634.50, p = 0.009); "In my experience, it was easy to agree on group assignment decisions" (U = 4883.50, p = 0.050); and "Collaborative learning has helped me to learn to work effectively in groups" (U = 4538.00, p = 0.013).

Perception

Respondents rated 13 perception-related statements such as "I feel satisfied with my online collaboration experience" and "I was able to appreciate the humor of members of the group." The three highest-rated statements were "I felt comfortable expressing positive feelings during group assignment" (n = 410, 90%), "I was able to appreciate the humor of members of the group" (n = 375, 82%), and "I felt comfortable expressing my humor in discussions related to the assignment" (n = 332, 73%).

Gender

Male participants had statistically significantly higher ratings than female participants (U = 9887.50, p = 0.028) in being comfortable expressing their humor in discussions related to their group assignments.

Age

Participants aged 21–30 gave significantly higher ratings to the statement "When the group assignment is hard, I either give up or choose the easiest parts" (H = 6.75, p = 0.034), than the rating given by participants who were in the age groups of 31–40 or 41 and older.

Number of enrolled online classes

Significant differences were found between those who took three or fewer online courses (n = 85) and those who took more than three online courses (n = 372) during their programs of study. Participants who enrolled in three or fewer courses had a significantly higher rating of "I felt that online collaboration process in my group was not time-consuming" (U = 13502.50, p = 0.032) and "The online collaboration was successful in my group" (U = 13467.50, p = 0.020) than the ratings given by respondents who took more than three online courses.

Percentage of group collaboration

Significant differences were found among those reporting that more than 25% (n = 300) of their assignment involved group collaboration and those reporting that 25% or less (n = 157) of their assignments involved group collaboration. Participants who had more group assignments gave significantly higher ratings to statements about feeling they were part of the learning community in their group (U = 20166.50, p = 0.010), "I felt comfortable expressing positive feelings (being happy/satisfied about something) during group assignment" (U = 20585, p = 0.018), and "I feel satisfied with my online collaboration experience" (U = 20167, p = 0.009).

Group size

Significant differences were found across 11 perception-related statements among those participants who preferred their group size of more than three people (n = 181) (Group A)

Table 4: Significant differences between participants who preferred group size of more than 3 (Group A), those who preferred group size of 3 (Group B), and those who preferred group size of 2 (Group C)

Statement	Statistical Test Result[a]
I enjoyed working collaboratively with my group	$H = 66.29$, $p = 0.000$
I felt that I was a part of a learning community in my group	$H = 62.35$, $p = 0.000$
I felt more confident about myself after each collaboration in my group	$H = 48.52$, $p = 0.000$
I felt comfortable expressing positive feelings (being happy/satisfied about something) during group assignment	$H = 39.02$, $p = 0.000$
I was able to appreciate the humor of members of the group	$H = 37.83$, $p = 0.000$
The online collaboration was successful in my group	$H = 35.93$, $p = 0.000$
I felt comfortable expressing my humor in discussions related to the assignment	$H = 35.28$, $p = 0.000$
I feel satisfied with my online collaboration experience	$H = 33.79$, $p = 0.000$
I felt that online collaboration process in my group was not time-consuming	$H = 22.37$, $p = 0.000$
I felt comfortable expressing negative feelings (being worried/concerned about something) with my group	$H = 19.57$, $p = 0.000$
Positive reactions from other group members to my work, usually influenced me to do more future work	$H = 17.31$, $p = 0.000$

[a] In all cases, Group A had significantly higher levels of agreement than Group B and Group C

and those who preferred smaller group sizes (Group B and Group C). Table 4 lists the statements where significant differences were found.

Level of computer proficiency

In terms of computer proficiency, participants ($n = 412$) who reported as an "Expert" gave statistically significant higher ratings than those participants with "Some Experience" for the following two statements: "I felt more confident about myself after each collaboration in my group" ($U = 4663.50$, $p = 0.021$) and "I usually find myself in the position of my group leader" ($U = 4689$, $p = 0.024$).

Level of Internet proficiency

Participants ($n = 428$) who self-rated as an "Expert" in their Internet proficiency gave statistically higher ratings in being in the position of the group leader ($U = 1792$, $p = 0.26$) than those participants ($n = 13$) who reported their Internet proficiency as "Some Experience." However, those who had "Some Experience" felt significantly more satisfied with their online collaboration experience than those who were an "Expert" ($U = 1534.50$, $p = 0.004$).

Influence of affective and social variables on the success of OCL

Spearman's rank-order correlation analyses were performed to examine the relationship between various affective and social variables, including confidence and satisfaction, and participants' self-reported performance/behavior level of OCL.

Performance/behavior correlations

Confidence and performance/behavior correlation

A significant positive correlation was found between 457 participants' confidence level ("I felt more confident about myself after each collaboration in my group") and their success with online collaboration ($r_s = 0.44$, $p = 0.000$).

Satisfaction and performance/behavior correlation

Significant positive correlations were found between respondents' satisfaction and 13 performance/behavior statements (see Table 5). The two top correlation coefficients were:

Table 5: Significant correlations among satisfaction and performance/behavior related statements

I feel satisfied with my online collaboration experience	Correlation coefficient	Sig. (2-tailed)
I perform better when there is group collaboration involved	0.758**	0.000
In my experience, I learn more from group collaboration than if I was alone	0.541**	0.000
In the future, I will register for courses with collaboration among the group members	0.493**	0.000
Collaborative learning has helped me to learn to work effectively in groups	0.487**	0.000
I achieved a higher grade because of collaboration	0.473**	0.000
I understand course materials better with the help of other group members	0.432**	0.000
I was able to develop problem solving skills through group collaboration	0.405**	0.000
I was able to develop new knowledge and skills by interacting with other members	0.379**	0.000
I managed my time better in online group assignment than if I was alone	0.345**	0.000
In my experience, it was easy to agree on group assignment decisions	0.328**	0.000
Frequency and quality of my work were related to group awareness about my work	0.318**	0.000
I perform better in small-size group (5 students or less)	0.164**	0.000
I perform better in mixed-gender group	0.146**	0.002

** Correlation is significant at the 0.01 level (2-tailed)

"I perform better when there is group collaboration involved" (r_s = 0.76, p = 0.000), and "In my experience, I learn more from group collaboration than if I was alone" (r_s = 0.54, p = 0.000).

Perception correlations

Satisfaction and perception correlation

Ten significantly positive correlations were found between participants' satisfaction score and their perception-related statements (see Table 6). The two highest correlation coefficients were "I enjoyed working collaboratively with my group" (r_s = 0.51, p = 0.000), and "I felt more confident about myself after each collaboration in my group" (r_s = 0.43, p = 0.000).

Success and social climate around the group

Significant positive correlations were found among social climate factors related to reported success, including positive or negative feeling expressions, humor appreciation, and group size (see Table 7). The two highest correlation coefficients were *"I felt comfortable expressing my humor in discussions related to the assignment"* (r_s = 0.234, p = 0.000) and "I was able to appreciate the humor of members of the group" (r_s = 0.233, p = 0.000).

Table 6: Correlation among satisfaction and perception relate statements

I feel satisfied with my online collaboration experience	Correlation coefficient	Sig. (2-tailed)
I enjoyed working collaboratively with my group	0.511**	0.000
I felt more confident about myself after each collaboration in my group	0.431**	0.000
I felt that I was a part of a learning community in my group	0.411**	0.000
I felt that online collaboration process in my group was not time-consuming	0.400**	0.000
Positive reactions from other group members to my work, influenced me to do more	0.344**	0.000
I felt comfortable expressing my humor in discussions related to the assignment	0.252**	0.000
I was able to appreciate the humor of members of the group	0.212**	0.000
I felt comfortable expressing negative feelings with my group	0.202**	0.000
I felt comfortable expressing positive feelings) during group assignment	0.196**	0.000
When the group assignment is hard, I either give up or choose the easiest part	0.117*	0.012

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Table 7: Success and social climate

The online collaboration was successful in my group	Correlation coefficient	Sig. (2-tailed)
I felt comfortable expressing my humor in discussions related to the assignment	0.234**	0.000
I was able to appreciate the humor of members of the group	0.233**	0.000
I felt comfortable expressing negative feelings with my group	0.182**	0.000
I felt comfortable expressing positive feelings during group assignment	0.164**	0.000
I perform better in small-size group (5 students or less)	0.106*	0.023

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Participants' perceptions and experience of OCL

Success factors for OCL

Phase II interviewees were asked to recall their most recent online collaborative experience. Participants provided multiple factors contributing to the success of their online collaboration, including accountability, dedication, mutual goal, constant communication, reliable group leader, clear roles, multiple deadlines, same time-zone, instructor's support, and group project awareness from the start of the semester.

Effective team leader

Five participants indicated the importance of an effective team leader. For example, PII_P04 believed that having "a great team leader" really helped her success in OCL: "We were agreed and determined to how we would communicate, how we would divide the roles, we kind of have a great project manager, she really did a good job of laying out the deadlines for the project."

Failed experience

Interviewees outlined multiple reasons for failed experience in OCL, including the lack of or limited participation from group members, large group sizes, lack of or limited involvement from instructors, students dropping out of the course, different work ethics, schedule conflicts, communication issues, no clear roles, and individuals' strong opinions. PII_P03's experience with a four-member group was that two barely contributed and the other asked questions without necessarily contributing to the original materials. She felt like she ended up doing a lot of work assigned to the group. Several interviewees pointed out that while every opinion mattered, online groups took a longer time to reach an agreement. PII_P05 commented, "I have had a lot of bad group experiences, where either somebody doesn't pull the weight, . . . then you just end up doing all the work yourself, anyway."

Opportunities, obstacles associated with the OCL experience and future directions of OCL in MLIS

Opportunities and benefits

Phase II interviewees explained the opportunities and obstacles associated with the general online collaborative experience. Opportunities of OCL were highlighted, including learning new technology, meeting people from around the world, sharing new ideas, adding motivation, managing time, and carrying out less work. PII_P02 stated that although there are parts of online collaboration she did not like, it is important in life and the profession. PII_P03 acknowledged that theoretically there were many benefits to group work, but in actual situations, students face a lot of challenges.

For two participants (PII_P09 and PII_P19), OCL helps to reduce stress when working on large assignments and increases opportunities to develop complementary skills. As explained by PII_P19, "Group members can have complementary skills in areas I am not familiar with, by distributing work, more quantity and complexity of projects can be accomplished."

Challenges

All Phase II participants discussed the challenges they faced in OCL. PII_P22 argued that the nature of an online program was that work was done at an individual's pace. PII_P03 mentioned that the majority of students in online programs had full-time jobs and family obligations, which may interfere with group timing and meetings. PII_03 observed passive aggression and negative feedback occurred as a result of misinterpreted comments due to the lack of body language or tone in communications. PII_P11 stated that communicating back and forth with her teammates was stressful, as she prefers working on her own: "it's just been a lot more relaxing . . . to know that I can just sit down for three hours and get it done in one sitting, rather than having to go back and forth with other group members."

Other challenges included scheduling in different time zones, lack of reliable Internet connection, unreliable task completion, no or less human factor, poorly designed assignments, and shared grades. Interviewees had different points of view regarding course grades. A majority argued that they wanted to be assigned individual grades, as they did not want to get the same grades as those students who slack, procrastinate, or do not participate at all. PII_P08 stated, "it makes me a little bit nervous to have my grade partially in the hands of someone else who may not be as motivated to do well as I am."

Future directions of OCL in LIS

When asked to discuss their opinion about the future of online collaborative learning, participants shared their suggestions in three main areas: (1) developing more effective platforms, (2) enhancing audio and video communications, and (3) creating more discussion board activities.

Designing effective platforms

Multiple interviewees indicated that academic institutions should invest in designing user-friendly platforms to facilitate online collaborative learning effectively and efficiently.

A number of collaborative tools such as Google Drive and Google Docs, as well as LMS platforms such as D2L or Moodle, were mentioned by the interviewees. PII_P04 commented, "I think that the platforms will probably become a little bit easier and more user friendly . . . I think as classes become more and more online; we will probably find ways to make those connections easier." PII_P10 thinks that "Facebook is a better platform to communicate, it offers a lot, you can form a private group, no limit to the length of your messages."

Enhancing audiovisual features

Although some of the platforms did include audio and video conference features, most of the students did not use those features because they were not required to use these technologies for their assignments. Interviewees argued that the instructor could have made this type of communication mandatory to complete the assignment, or their instructors could have included these technologies in the course description. The advantage of incorporating audiovisual features is that an individual's physical behavior, body language, and nonverbal cues can be interpreted by all group members. Interviewees also suggested adding Skype and Google Hangouts to the list of required assignments. As PII-P21 explained, "A lot of universities now have an online program and have the ability to . . . turn on your computer, plug your microphone, talk to somebody in a collaborative setting."

Several interviewees (e.g., PII_P08, PII_P22) felt that setting up a time to meet virtually was difficult. Participants noted that they faced obstacles of overlapping schedules and technical issues, which included difficulties with microphones, webcams, and Internet speed. Consequently, those interviewees did not include audiovisual technology in their OCL process.

Using discussion board as the primary OCL activity

Many interviewees preferred having discussion board activities. They also suggested that their assignments should consist of discussion board activities alone, instead of group assignments. PII_P12 felt that OCL should not require group assignments; instead, collaboration should take place through class discussions. He commented that group assignments did not necessarily produce the equivalent level of learning: "while I wouldn't recommend having no group projects, I would recommend minimizing their occurrence. I think we learn more from each other on [discussion boards] than doing a group project."

Future of online programs

In terms of the future of online programs, the most common directions suggested by participants were being transparent with students about the fully online or hybrid program, designing appropriate assignments, setting up a set of collaborative tools, setting standards for communication, enhancing the instructor's engagement in the OCL process, making group work optional or less frequent, and offering different tuition rates for in-state students. PII_P17 commented, "I think it's going to get more prevalent . . . because it's a way of bringing students, and it is relatively inexpensive or relatively low overhead, so it's cost-efficient."

Discussion

Development of OCL conceptual model

Based on the triangulations of the quantitative and qualitative results, and combined with findings from the existing literature, an OCL conceptual model (see Figure 1) was developed, outlining major dimensions essential to a successful OCL. This model captures the process of OCL on a continuum of steps, which move from the instructor's role to students' satisfaction.

Several dimensions emerged from our study findings as the defining factors or steps for the success of OCL. These key dimensions include the instructor's role, group composition, group environment, group collaboration, successful collaboration, and satisfaction. Specifically related to the "Instructor's Role," Phase II interviewees believed that close monitoring and support by the instructors facilitated group collaboration in OCL. Support from instructors included following up with group members or the group leader, having online office hours for students, collecting ongoing data on students' progress, and contacting those students who did not participate early in the group process. As PII_P10 indicated, "when the instructor is involved to a certain extent, it makes the group project for the whole class more successful."

Regarding the "Group Composition," both Phase I and II participants viewed the way in which an instructor organizes the group as having a major impact on the success of an online collaboration and their satisfaction. Furthermore, group size, gender diversity, and age differences of the group members were found to affect group work. Phase I survey

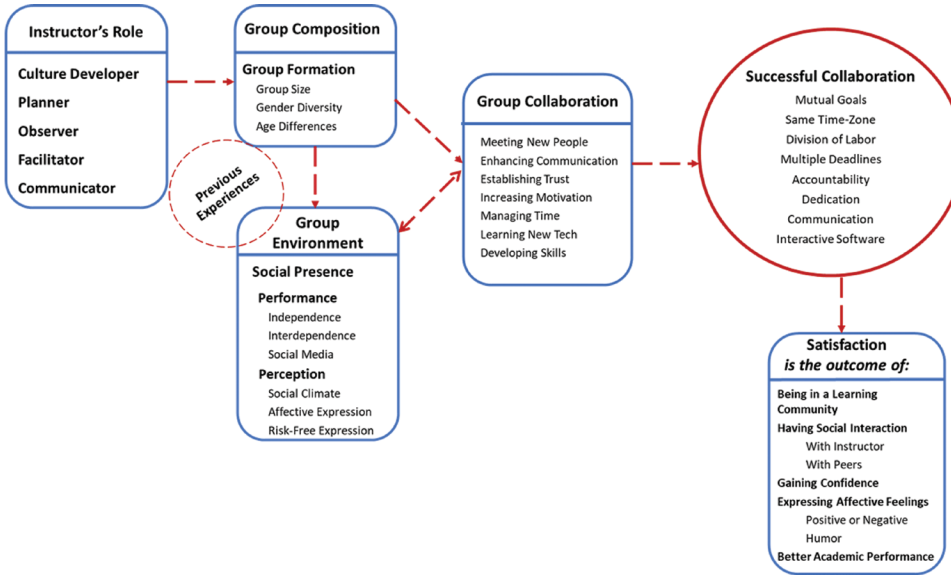

Figure 1: Conceptual Model of OCL

results showed that participants believed that they performed better in a mixed-gender group. There were also significant differences among respondents on varying sizes of groups (more than three, three-person, or two-person groups) in terms of their performance and perception. Phase II interviewees indicated that the ideal number of people in the group depended on the type of assignment. However, if there was good communication among team members, then group size did not matter. Significant differences in age groups were found in Phase I data in terms of performance and satisfaction of collaboration. Younger participants (ages 21–30) had the highest mean rank scores in most performance-related statements, including better time management, easy agreement in group decisions, achieving a higher grade because of collaboration, and more. The youngest group was more satisfied after each group collaboration and felt more successful about OCL. Phase II interviewees (e.g., PII_P10, PII_P15), on the other hand, commented on how older students in the group were more serious and easier to work with.

In terms of the "Group Environment," the Phase I results showed that participants with positive experiences tended to have more motivation and were more engaged in group activities. Participants enrolled in more than three online courses during their MLIS online program reported having higher grades. Factors that emerged from both phases regarding group performance in OCL included independence, interdependence, and social media. While some participants at times preferred independent work (independence) due to the desire of being in control of a specific work pace, having their own standards for the quality of work, and avoiding scheduling issues, others (e.g., PII_P13) reported better performance with group assignments. Having multiple deadlines, being accountable to others, and knowing that others relied on them for their grade forced them to put extra effort to perform better in a group setting (interdependence). With regard to social media, due to the similarities between the structure of social media platforms and participants' online collaborative tool, using social media tools for OCL added more comfortable interaction, higher confidence level, and ease of use to the members.

When it comes to the perception within the dimension of "Group Environment," participants discussed how the social climate of the group, affective expressions, and risk-free expressions play an important role in how they would feel about the group environment. The social climate in OCL is linked to both the relationship between the instructor and the students and the relationship among group members. Group relationships can be affected greatly by perception or mental models of individual group members about their group assignment and the tasks involved. Phase I participants (n = 151) believed that positive and frequent communication is key to a successful group assignment. Any miscommunication might create negative feelings and undermine the success of the group collaboration. Other factors such as equal participation, transparent flow of information, having a sense of humor, high interpersonal skills, a responsible leader, collaborative tools, and mutual goals also lead to successful OCL. Unable to express concerns and negative emotions may cause students to experience frustration, anxiety, and hesitation during their interaction with peers, which may lead to unsuccessful collaboration. In terms of affective expressions, a number of Phase II participants discussed their emotional journey during the OCL, signaled by frustration, stress, anxiety, lack of self-confidence, hesitation, insecurity, and being anxious in online

collaborative activities. It is important to acknowledge various affective experiences that would emerge during OCL. Being able to work through these emotional ups and downs together in a group assignment is crucial to the effective completion of the OCL tasks.

Nevertheless, participants also appreciated the social aspect of collaboration that makes them excited about group collaboration in anticipation of hearing new ideas and connecting with people from around the world. Furthermore, in a small learning community where each member had individual parts to contribute, everyone's ideas were valued, engendered positive feelings, and added great value to the OCL process. A sense of belonging and dedication inspires students to engage in group activities, share ideas, debate, and contribute to constructive learning.

The dimension of "Group Collaboration" is in part a result from previously mentioned dimensions of "Instructor's Role," "Group Composition," and "Group Outcome." Participants from both phases indicated that one of the benefits of group collaboration was that it leads to meeting new people. Efficient communication enables group members to build trust, which increases their motivation and confidence. When a trustworthy relationship is built, students tend to manage their time better and are eager to learn new skills and technologies.

The two final dimensions in our framework are "Successful Collaboration" and "Satisfaction." As discussed previously about factors contributing to a successful OCL, our study showed a number of essential factors such as communication, mutual goals, same time-zones, division of labors, and multiple deadlines as being important. With a successful OCL experience, learner satisfaction is achieved. Not only do they obtain a higher grade but they also get to be a part of the learning community, experience social interactions, express feelings, and gain confidence as long-term benefits from the OCL process.

As shown through the OCL model, the instructor holds multiple roles: a collaborative culture developer, a planner, an observer, a facilitator, and a communicator. These roles are connected with different ones playing at the center stage during different periods of the course's lifespan. To start with, the instructor needs to establish a collaborative culture, when they are the first person to interact with students. Next, the instructor leads students to interact with one another, for the purpose of building a collaborative learning community and setting clear communication norms among peers. Instructors help to resolve any communicational ambiguity among student groups, and they may assist with fostering the collaborative culture by showing examples of knowing the value of others' ideas and being sensitive to others' feelings.

As a planner, the instructor's role involves forming groups based on some logic, designing appropriate assignments for group collaboration, providing clear expectations for each group member, setting the course outcome from the beginning, and having guidelines, which make it easy to understand what needs to be done. The instructor should also be a keen observer by monitoring group discussion boards to identify students' participation from the beginning of the group work, contact students not participating in the group process, evaluate the quality of the posts, and collect ongoing data about students' progress.

Furthermore, instructors should act as a facilitator and provide access to an effective set of online collaborative tools that benefit students and their groups. By identifying tools that enable group members to co-create or edit their work, instructors can facilitate

collaboration and reduce confusion among group members. Being a communicator means allocating time to hold online office hours, following up with students, and providing constructive feedback.

"Group Composition" describes the overall mix of characteristics among the people in the group. As evidenced by the present study, the way in which an instructor organized the group had an impact on the success of OCL and students' satisfaction. Group size, gender diversity, and age differences also affect OCL significantly.

"Group Environment" is greatly influenced by previous OCL experiences. By forming a sense of community through communicating on a social rather than merely an informational level, interaction would move to a higher level and become collaborative. In the present study, participants with positive OCL experiences were more motivated and more engaged in group activities. Participants enrolled in more than three online courses reported having higher grades than those who took fewer online courses. Social presence was found to be associated with one's performance in the group, and perceptions of oneself and others. In particular, three major factors are connected with academic performance: independence, interdependence, and social media. Meanwhile, a number of participants also reported that they performed better on their own. They explained this was because they were self-conscious and self-motivated, they need to have control or power, they possess a specific work ethic and work pace, they have high standards, they prefer doing things independently, and they have a simpler schedule. In contrast, those participants who reported performing better in group collaboration indicated that being accountable to others and knowing that others relied on them for their grade motivated them to excel in group work.

The use of social media affected students' performance. The similarities between the structure of social media platforms and participants' online collaborative tool added more comfortable interaction, higher confidence levels, and ease of use.

Social presence was valued by participants, who had a relatively high level of agreement with statements concerning the social climate, affective expressions, and risk-free expressions. Affective expressions include various types of feelings such as frustration, stress, anxiety, hesitation, lack of self-confidence, insecurity, introversion, happiness, excitement, and a sense of belonging. Risk-free expressions were feelings associated with interviewees' different approaches in expressing their positive and negative concerns related to the assignment. Very few of the Phase II participants reported having a sense of belonging and being a member of a learning community.

"Group Collaboration" results from these specific processes: the instructor's role, group composition, and group environment. By developing a trustworthy relationship among members, students tend to manage their time better and are eager to learn new skills. On the top-right corner of the "group collaboration" square there is a list of factors contributing to or facilitating the potential of a successful collaboration. These factors range from the equal division of labor, members' location in the same time zone, members having mutual goals, setting multiple deadlines, accountability, dedication, constant and clear communication, and the use of interactive software.

The dimension of "Satisfaction" includes multiple factors, ranging from being part of the learning community, having social interaction among students and students with

instructors, gaining confidence, expressing feelings whether they are positive, negative, or humorous, to getting higher grades. While getting higher grades or gaining confidence are relevant in a face-to-face setting, they are especially crucial to the satisfaction of the student about the OCL.

In summary, the OCL conceptual model is a comprehensive reflection of various dimensions essential to OCL. This model is unique and valuable in that it captures a set of multifaceted dimensions with interconnected and embedded elements, which lead to the success and satisfaction of OCL. To our knowledge, this is one of the first models articulating these factors and their relationship in the OCL environment. The findings of this study, as well as the OCL model, contribute to teaching and learning in online courses and OCL activities and may be used to support educators and instructional designers alike to implement standards facilitating successful OCL. Specifically relevant to faculty who teach online LIS classes and use collaborative assignments, knowing the intricacies of the OCL dimensions, they could incorporate a number of considerations for their teaching strategies. Having groups of mixed genders and age groups with group sizes of 3–5 might be useful for collaboration. Focusing on communication between the instructor and the groups, as well as facilitating effective communications among group members is very important. The instructor should work with groups to build a sense of a learning community that has mutual respect and trust. By encouraging equal participation, sharing ideas, developing shared mental models of assignment tasks, expressing their feelings, using various collaborative tools, and learning from one another, the instructor can help the students to have a successful OCL.

Strengths and limitations

With a sample size of more than 450 respondents, and close to 30 interviewees, the present study has robust quantitative and qualitative samples. The multifaceted research design of a two-phased mixed-method study procedure afforded both the large pattern findings of multiple sets of quantitative relationships and an in-depth understanding of participants' qualitative OCL experience. The complementary nature of results from both phases makes the final findings cross-validated, comprehensive, and holistic.

The focus on social presence enabled a thorough examination of the relationship between collaborative learning outcomes, satisfaction, and social presence. The present study revealed that social-psychological factors such as social interaction, social climate, and trust are essential to the outcome of collaborative learning.

With our sample limited to LIS students taking online courses, the study sample lacked diversity and representation from the international student population as well as the OCL experience from a different field. The OCL experiences might vary if we included different fields of studies and if more international students were in the sample.

Conclusion

In this study, through a mixed-method design, we investigated factors relevant to OCL. One primary construct was social presence, which was found to be essential in multiple dimensions of the OCL process. Our OCL model serves to conceptualize the process of OCL on

a continuum of processes, moving from the instructor's role to students' satisfaction. This conceptual model presents not only significant theoretical advances to the OCL research but also provides useful practical implementation to help online educators to implement strategies for a successful OCL. However, our model is different from other collaboration frameworks such as the one presented by Saunders and Corning (2020), which focuses on barriers and enablers of collaboration in libraries. Elements included in constructs of our model such as group composition, group environment, and the resulting group collaboration and successful collaboration could be applicable to settings outside of OCL and transferable to all types of collaboration. Further research with an eye toward testing, solidifying, and enhancing the model might prove to be valuable.

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