

*Social Factors that Facilitate the Online Collaborative Activities of
Global Distributed Teams*

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The European Conference on Education 2023
Official Conference Proceedings

Abstract

With the ever-growing presence of online collaborative learning spaces, research on how to develop international global environments to facilitate learning has become increasingly important. Unfortunately, quantitative research is somewhat limited in exploring which specific factors contribute to student satisfaction with international collaboration online learning activities (ICOLAs). The issues of this gap in the literature are a lack of clarity on how students engage with ICOLAs and which specific factors predict student satisfaction outcomes. This study explores the relationships between common constructs identified from prior research and satisfaction with ICOLAs. Trust, cohesion, commitment, and social presence measures were completed by 35 students in separate educational technology courses facilitated by two separate universities located in different countries—collection occurred over the span of three semesters. Results of a Bayesian multiple regression analysis revealed that about 66% of the student variability in satisfaction with online learning environments is accounted for by the trust, cohesion, commitment, and social presence variables along with age and gender. Cohesion and commitment both increased satisfaction with ICOLAs with a posterior probability greater than 97.5%. These findings illuminate the importance of building trust between interaction partners in ICOLAs, which suggests that international program partnerships should focus on creating friendships, increasing immediacy in online interactions, and building social presence.

Keywords: Online International Collaboration, Global Distributed Teams, Online Learning, Trust, Cohesion, Commitment, Social Presence, Satisfaction

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Introduction

Today's universities operate in extended ecosystems that are no longer constrained to the on-campus physical landscape. Instead, university administrative services, instructions, courses, and entire programs, are increasingly located in the internet cloud. Given this, students and faculty are becoming more experienced with collaborative work, and scholarship increasingly relies on worldwide access to knowledge. Consequently, the success of university students is increasingly dependent on their ability to navigate, access, evaluate and analyze the internet's information landscape.

As higher education becomes increasingly immersed in cloud-based information and learning, new opportunities are emerging for understanding and benefiting from national and international perspectives. Educators are also looking at ways eLearning (a term used for online learning practices) can advance student's cultural understanding and global perspective. In describing strategies for developing a new generation of world class learners with these attributes, Yong Zhao (2010) identifies four primary challenges for educators: 1) understanding and harnessing entrepreneurial spirit, 2) fostering student autonomy and leadership, 3) championing inventive learners, and 4) developing global partnership and resources. The social-psychological factors within these challenges are where much research needs to focus for further development.

The current investigation addresses Zhao's fourth challenge for developing international partnerships and resources. More specifically, we seek to understand students' experiences with online collaboration international learning activities, as well as to understand the social factors that contribute to students' satisfaction with successful online collaborations between international educational institutions. We draw on a review of relevant literature on what factors make successful face-to-face collaborations as well as personal experience in applying information technologies to international collaborative activities with students.

While the evolving technologies provide increasing flexibility and affordances, we have found that the underlying factors that contribute most to the success of the collaborations are social, psychological, and pedagogical. Amongst these factors, which are explicated further below, are trust, commitment, cohesion, and social presence. The current analysis seeks to explore the unique contributions of these factors to student's experiences with international collaboration online learning activities, with the goal that the findings will illuminate guidelines for institutions on where to focus their program development efforts.

The General Development and Importance of Institutional Partnerships

One of the first considerations in developing an international collaboration among students within similar courses is to establish effective institutional collaborations (Campana et al., 2019; Crites et al., 2022). In an investigation of successful international partnerships and relationships, Heffernan and Poole (2005) found that the most critical success factors are 1) the development of effective communication structures, 2) building mutual trust and encouragement, and 3) a demonstrated commitment by the partners—these findings are substantiated by more recent research as well (see Cerver Romero et al., 2021). Further practices that contribute to successful partnerships were identified in a report by the American Council on Education (2015) as: 1) establishing transparency and accountability, 2) encouraging faculty engagement, and 3) maintaining quality and institutional leadership and support.

Leveraging and expanding international relationships has been mandatory for higher education institutions—in order to compete in the global arena, institutions must have the capacity for international collaboration. In the United States and globally, institutional higher education partnerships have been the focus of several pioneer organizations, such as the American Council on Education (Insights, 2015). Researchers such as Altbach and Knight (2007) and Berchin et al. (2021) state that internationalization, the expansion of institutions toward international outreach, is a “central force” of higher education institutions. Moreover, several higher education institutions have set forth efforts to increase and expand the diversity of their student population and increase international popularity —using strategic planning which involves a greater focus on international marketing and partnerships with private education companies, institutions have sought to increase the number of international students (Alanazi, 2016a; Bruhn-Zass, 2022). The growth of advanced technology and collaborative strategies is impacting educational institutions and, internationalization is being positively affected by human and relational capital (Hitt et al., 2006; Huang et al., 2022).

As a final note on the general approach of international collaboration, it is important to consider that structural barriers may play a role in preempting beneficial international collaboration in educational settings. For example, international collaborations are especially influenced by temporal communication affordances because participants are often in different time zones and on different schedules, requiring adjustments in reference to using synchronous or asynchronous communication. Although learning in a synchronous environment has several advantages, the time zone disadvantage is frequently noted in this area (Vutborg et al., 2011). While asynchronous communication allows learners with different native languages and cultures to be more reflective (Ellis, 2001) and generate responses at their own pace (Holmberg et al., 2005), yet Mackay (1988) and Soucek and Moser (2010) argue that asynchronous communications can often result in “information overload,” creating its own set of issues. Finally, given the shift in technology usage over the past twenty years, one must consider that access to media rich technologies can dramatically enhance the international collaboration format. Learners can create and analyze imagery much faster than words (Galloway, 2017), so development of image-based social media, such as WhatsApp, can encourage image-based learning in international collaborative activities.

Social Learning Theory: The Value of Study Groups

Upon the development of international collaboration between institutions, if technological and structural barriers are surpassed, it becomes critical to understand what unifies students at the course level. Broadly speaking, Thomas and Brown (2011) claim that educational theories have long been limited by remnants of a Cartesian view of learning where “higher authority” teachers pour knowledge into the minds of “lower authority” students. These direct instruction approaches are beginning to give way to more constructivist views of learning, although some “flipped classroom” designs still utilize a teacher-centric model where knowledge is “poured” into student through videotape lectures (Akçayır & Akçayır, 2018; Divjak et al., 2022; Senali et al, 2022; Sointu et al., 2023). In essence, constructivist theories describe learning as an interactive process with students gathering information from a wide range of sources, organizing, analyzing and formulating hypotheses throughout the process. Bandura’s Social Learning Theory (Bandura, 2015) and Vgotsky’s Social Development Theory (Vygotsky, 1978) extend constructivist notions by including other individuals in the social environment in the active learning process (Alanazi, 2016b). Thus, learning, under constructivist models, is facilitated when a group collaborates via observation, imitation, and modeling, allowing learners to collaborate in the co-construction of meaning (Roschelle,

1992). With advances in technology, constructivist approaches use a similar approach, albeit through different technological means. For example, as a means to the co-constructed meaning, constructivists have suggested that modern learners engage in Digital Storytelling activities (Stargatt et al., 2022). During Digital Storytelling, the learners create knowledge artifacts that can be expressed using a variety of digital multimedia, such as images, audio, and video educational tools (Addone et al., 2022). These artifacts serve as culminating reflections on what all group members have learned.

Brown and Adler (2008) point out that the idea of forming effective study groups is critical to academic success. They draw on the seminal work of Richard Light (2004) who, after 10 years of investigating the factors that contributed to success in Harvard university students, found that one of the strongest determinants for success in higher education was the students' ability to "form and participate in small study groups." Light found that students who study in groups are happier, learn more efficiently and perform better than students who study alone. In addition to facilitating learning, a vast majority of the Harvard undergraduates saw diversity as a positive benefit of learning groups. Whether the diversity was geographic, ethnic, political, religious, or economic, it was noted that this had a highly positive effect on their university experience. Although some researchers found that diversity could interfere with communication and coordination (Gibson & Gibbs, 2006; Krumm et al., 2013), diversity is often portrayed as having a positive influence on such factors as group effectiveness, team performance, and decision making (Gibson & Gibbs, 2006; Shachaf, 2008; Staples & Zhao, 2006; Krumm et al., 2013; Han & Beyerlein, 2016).

Social-Psychological Factors that Influence Positive Team Building

Group Cohesiveness. In understanding the factors which contribute to positive team building, one of the first considerations will be the cohesiveness of the group of interest. Mello and Delise (2015) measure group cohesion by the degree to which group members identify with one another and with their group as a whole (Carron et al., 1985; Lin et al., 2008). The more cohesive the group is, the greater the degree of knowledge sharing (Aubke et al., 2014; George & Bettenhausen, 1990; Wojciechowska-Dzięcielak, 2020). We can expect cohesive groups to demonstrate a higher degree of communication, interpersonal understanding, and creativity, which may be disrupted if group sizes are too large for facilitating effective interaction (Valacich et al., 1992). In cohesive groups, participants establish positive support networks, they negotiate meaning, identify complementary skills, learn to lead and follow, and are supportive of all members (Housel, 2002).

Cohesion may be strongly influenced by the extent to which members feel their goals and ideas overlap. In fact, collaborative partnerships are more effective when team members agree on the communication strategies, goals, and purpose of their collaboration. Groups often begin by deciding how often and how long they will communicate and the primary forms of communication that they will use. Team members often determine how often they will communicate (e.g., twice a week) by their individual schedule or time zone differences. How long the groups communicate (e.g., 3-4 months) is more likely to be determined by institutional policy and administrative schedules. For example, Latin universities often end their semester in March whereas university semesters in the U.S. often end in June. The success of collaborative partnerships is influenced by the team's ability to focus on common goals and their clear purpose (Tarricone & Luca, 2002). Suchan and Hayzak (2001) and Powell et al. (2004) state that designing and setting goals, assigning responsibility to team members, and clearly articulating goals help advance team performance and effectiveness.

Kayworth and Leidner (2000) report that effective project leaders of online teams were perceived as more effective than their counterparts who did not articulate goals or assign and plan the team tasks in advance.

Establishing Trust. Trust can play an important role in online learning environments (Shea et al., 2022), especially when constructing agreements, developing friendships, and assigning tasks in collaborative groups (Han & Beyerlein, 2016). In face-to-face communications, group members develop trust primarily through social presence and emotional processes. In online communication trust is also influenced by the communication media (Bradley & Vozikis, 2004; Coutu, 1998; De Vries et al., 2018; Han, & Beyerlein, 2016). While trust is more easily fostered in face-to-face settings (Oertig & Buegri, 2006) trust can also be established in online environments through regular communication, increasing immediacy, intimacy and interacting on a consistent basis. Whether developed in face-to-face or online settings, trust is often fragile and temporary (Armstrong et al., 2022; Abruzzo et al., 2019; Jarvenpaa & Leidner, 1998; Maznevski & Chudoba, 2000).

Group Commitment. The group members' commitment to teams' goals contributes to overall satisfaction in online teams (Lin et al., 2008). Commitment is considered as one of the components of the satisfaction construct in online teams (Lin et al., 2008) and is one of the critical factors for collaboration in learning environments (Brandon & Hollingshead, 1999). It is also one of the main two necessary characteristics for a collaborative group when building a sense of community (Dholakia et al., 2004). Group members need to be committed to their individual tasks to accomplish the group goals and objectives. It is expected that higher commitment among group members leads to higher performance and satisfaction throughout the collaboration process, as performance and satisfaction are positively associated elements in online learning environments (Alanazi et al., 2020). Commitment is established when a group of learners divide their work and assign tasks to each individual in order to achieve project goals. Even though online teams have a variety of challenges to enhance their performance, commitment is required by all team members to navigate through difficulties successfully (Heller et al., 2010). Commitment is also a necessary characteristic in building a sense of community (Dholakia et al., 2004) and is critical to success in collaborative groups (Brandon & Hollingshead, 1999). Commitment is more likely to occur when a group of learners divides their work and assigns specific tasks to each individual. Online teams will face a variety of challenges in reaching their goals and the commitment of all team members to their specific tasks will greatly increase their likelihood of success (Heller et al., 2010).

Social Presence in Online Groups. Short et al. (1976) originated the term *social presence* in the context of higher education, which they defined as “the degree of salience of the other person in the interaction and the consequent salience of interpersonal relationships.” With the advent of computer mediated communications, social presence has become a pivotal concept in advancing online learning collaborations (Alanazi, 2019; Whiteside et al., 2017). Picciano (2002) believes that online collaborative learning environments should incorporate solutions that give learners a sense of belonging to their distributed groups. Other investigators (Oztok et al., 2015; Tsiotakis & Jimoyiannis, 2016; Morueta et al., 2016; Thomas et al., 2017) have identified several technologies and strategies for advancing social presence in collaborative eLearning: these include teleconferencing and sharing some personal information with participating members. While these approaches are useful in online settings in general, social presence is particularly critical in international settings for a few reasons. International collaboration often includes vast differences in cultural and language background between those communicating. Since social presence is especially critical in international settings

because of the cultural and language differences, it is harder to get to really know other members of the group when their customs, holidays, food, values, and language are vastly different. Given this, effective and comprehensive development of social presence becomes critical.

Research Questions:

1. Is there a relationship between the trust in an international collaborative team and satisfaction with the activity?
2. Is there a relationship between the cohesion of an international collaborative team and satisfaction with the activity?
3. Is there a relationship between commitment to an international collaborative team and the satisfaction with the activity?
4. Is there a relationship between social presence and the satisfaction with the activity?
5. Are there associations between trust, group cohesion, commitment, social presence, and with satisfaction?

Methods

Participants

The sample for this study comprised students enrolled in two different face-to-face educational technology courses facilitated through a partnership between two universities. A combined total of 47 students completed the courses, 35 (74.5%) of whom responded to the questionnaire. Of the 35 participants, 29 (82.85%) were females and six were males (17.14%). Most of these participants were undergraduate students, most of whom were pre-service teachers. The mean age of the participants was 21.19 years (SD = 3.781). Table 1 details the students’ gender as well as academic affiliation.

Table 1. Participants’ Demographic data.

Dichotomous Variable Descriptive		
Gender	Frequency	Percent
Male	5	14.3%
Female	27	77.1%
Total	35	100.0%
Name of Institution	Frequency	Percent
U.S. University	18	51.42%
Latin University	17	48.57%
Total	35	100.0%

Instrumentation

To collect data for our study, a questionnaire was distributed on the final day of the classes via e-mail to each student using the Qualtrics platform. The survey responses were Qualtrics then imported to R for statistical analysis. The scales measured responses using a five-point Likert scale with 20 items that ranged from one (1 - Strongly Disagree) to five (5 - Strongly Agree).

Findings

Reliability Estimates for Subscales

The survey was designed to measure five constructs: four items each for trust, commitment, and social presence, three items for cohesion; and five items for satisfaction. This scale was found to be reliable and internally consistent with a Cronbach's coefficient alpha value at .934, based on the sample described earlier. Using the Pearson correlation, reliability was estimated as follows for each variable: Trust $\alpha = .840$, Cohesion $\alpha = .844$, Commitment $\alpha = .929$, Social Presence $\alpha = .721$, and Satisfaction $\alpha = .837$. Table 2 shows satisfactory alpha estimate coefficients obtained on all five scales. The overall reliability estimate (0.934) for the whole instrument indicates a strong internal consistency. This reliability coefficient indicates that the scale developed in this study is reliable to measure students' satisfaction with international collaborative online learning activities (ICOLAs), *see Table 2 below*.

Table 2. Reliability Estimates for the Scales

Construct Scales	α	Number of Items
Trust	.840	4
Cohesion	.844	3
Commitment	.929	4
Social Presence	.721	4
Satisfaction	.837	5

Correlation Analysis Results

Pearson's correlation coefficients were calculated to examine relationships among all four predictors (trust, cohesion, commitment, social presence) and students' satisfaction with ICOLAs. For the correlation analyses, the author found that there is a positive moderate-to-strong correlation between satisfaction with ICOLAs and: trust, cohesion, commitment as well as social presence with values of ($r(33) = .568, p < .01$; $r(33) = .724, p < .01$; $r(33) = .735, p < .01$; $r(33) = .553, p < .01$), respectively. In addition, trust, cohesion, and social presence are moderate-to-strongly positively and significantly ($p < .01$) correlated with each other. *See the correlation matrix in Table 3 below for full details.*

Table 3. Pearson Correlations among Variables

	Satisfaction	Trust	Cohesion	Commitment	Social Presence
Satisfaction	-				
Trust	.568**	-			
Cohesion	.724**	.645**	-		
Commitment	.735**	.600**	.814**	-	
Social Presence	.553**	.543**	.442**	.667**	-

** $p < 0.01$.

Data Analysis

A Bayesian Markov chain Monte Carlo model (MCMC) was developed using the function *brm* from the R package *brms* (Bürkner, 2021) to estimate how the linear variables of trust, cohesion, commitment, social presence, age and a dummy variable for female gender would impact satisfaction. A normal distribution with mean of 0 and a standard deviation of 0.5 was

used as the prior on all coefficient estimates to model the starting views of a conservative observer. Satisfaction was modeled using a Student's t-distribution with the degrees of freedom ν given a starting prior of the gamma distribution ($k = 2, \theta = 0.1$) to account for possible outliers in the data. The model was run for 3,000 iterations on four chains using the default NUTS sampler from the Stan statistical programming language, and the last 2,000 iterations from each chain were obtained as the model fit. Using a Bayesian model here provides several benefits including results that are more easily interpretable as posterior beliefs about the impact of coefficients on satisfaction, easy implementation of shrinkage towards zero on coefficient estimates which should provide better performance on out of sample data, and handling of outliers with the T distribution on the response.

Results

The table below shows the resulting parameter estimates of the model along with their standard errors and 95% credible intervals. A credible interval is the Bayesian analogue of a frequentist 95% confidence interval and is defined as the interval such that there is a 2.5% chance the true parameter estimate is below it and a 2.5% chance the true parameter estimate is above it. Cohesion and Commitment both show strong evidence of positively impacting satisfaction with credible intervals entirely at or above zero and estimates of 0.40 and 0.31 respectively. Social presence also shows some weak evidence of positively impacting satisfaction, with the same 0.31 coefficient estimate as for commitment, but a wider credible interval that does not provide much certainty, *See Table 4 below.*

Table 4. Results of the Bayesian model.

Parameter	Estimate	Standard Error	95% Credible Interval Lower	95% Credible Interval Upper
Intercept	0.22	1.02	-1.77	2.26
Trust	-0.00	0.19	-0.37	0.37
Cohesion	0.40	0.18	0.06	0.75
Commitment	0.31	0.16	0.00	0.62
Social Presence	0.31	0.19	-0.08	0.68
Age	-0.02	0.03	-0.08	0.03
Female	0.21	0.24	-0.27	0.69

Traceplots for these estimates showing good mixing and convergence of the model. The R^2 for this model, which is the proportion of variation in satisfaction explained by these variables, had a mean estimate of 0.66 with a 95% credible interval between 0.51 and 0.74. Bayesian models produce a lower R^2 than frequentist as coefficient estimates are shrunk towards zero and are not the least squares minimizing fit, but should be more accurate for predicting future test data.

Discussion and Conclusion

Prior research has suggested the importance of developing particular social-psychological factors in the context of ICOLAs. However, little research has been done which empirically assesses the important factors which uniquely contribute to ICOLA satisfaction. The current research tested if certain widely discussed factors in the online education literature (trust, cohesion, commitment, and social presence) might contribute to ICOLA satisfaction. Cronbach's alpha values indicate that these variables should have good reliability, and the correlation values show that these variables also indicate good correlation estimates. Results

from Bayesian multiple regression analyses showed that cohesion and commitment served as unique predictors of satisfaction, while social presence may also increase satisfaction but was not statistically significant within this dataset. These findings suggest that developing a sense of cohesion with the group and garnering a level of commitment may be critical to the ICOLA forum.

One of the implications of these findings is that, to increase students' satisfaction with ICOLAs, instructors may need to focus on the factors that foster the group cohesion of the learners, the more rigid the cohesion of the group members, and the more salient the individuals of the group members are, the greater the satisfaction the learners will derive from their participation in ICOLAs. As noted by Bravo et al. (2019), some ways to improve cohesion within the group are to establish collaborative work tasks, while also minimizing the heavy workload in the group setting. In the ICOLA context, this may mean establishing smaller, easy-to-achieve goals such as weekly collaborative write-ups that require a collaborative approach to the relationship. Considering the possibility that social presence factors may help feed into group cohesion and commitment, it is possible that considerable variability is captured by the cohesion and commitment measures, which could explain the lack of statistical significance of the social presence variable in the current research.

Commitment was also a primary predictor of satisfaction in ICOLAs. Although commitment likely leads to greater cohesion, it is important to note that commitment is a separate construct from that of cohesion. As noted by Li (2022), commitment is significantly correlated with motivation and performance factors. It also may be best facilitated in this context by not only assigning collaborative goals, but also ensuring clear communication between team members. With ICOLAs, the importance of commitment can often be undermined by schedule differences, time zones, and other structural barriers which prevent synchronous/effective communication. Therefore, although a separate issue often viewed as distinct from the social-psychological factors contributing to satisfaction, structural barriers may actually be a necessary first step to ensuring communication and, subsequently, commitment in ICOLA contexts. Although setting deadlines may increase submitting assignments on time and increase completion rate, other studies have found that commitment does not increase completion rate (Bisin & Hyndman, 2020). Thus, future research may focus on the factors that indirectly affect commitment and satisfaction.

Contrary to some studies stated in the literature, trust was not a significant predictor of student satisfaction in online collaborative environments. However, as noted by Cheng et al. (2013), trust is a complex construct which is often difficult to conceptualize—in their work, trust was developed differently by each of the teams investigated, which suggests that there is no one uniform way to approach trust development. In the context of ICOLAs, it may not be that trust is unimportant, but rather that individuals have a more transient conception of what trust looks like in online groups. It may also be that only very low levels of trust lead to reduced satisfaction, no subjects in this study had a trust value below 2.5. Future work should consider a broader investigation into how trust can be accurately conceptualized across various learning contexts.

One clear limitation of the current work is that findings are limited to a relatively small sample size. Although the naturally occurring nature of ICOLAs often only allow researchers to access small populations, future work should seek to validate and replicate the current study's findings. Furthermore, these findings are situated in a U.S.-Latin relationship context. One might consider if these factors would fluctuate in their importance, or if new factors

would emerge altogether, in distinct contexts, such as U.S.-Asian relationships, or Latin-Middle Eastern relationships, for example. This, once again, creates a need for replication of the current study's findings in different research contexts.

Overall, we feel the current research provides a necessary first step into quantifying the experiences of those in ICOLA contexts. More specifically, these findings help to illuminate the need for efforts of teachers and program coordinators to develop cohesion, commitment, and perhaps social presence, in order to increase satisfaction in these settings. If done effectively, ICOLAs can become a more commonplace and fruitful education context in the ever-expanding world of online education and learning systems.

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