Does gender matter in online courses? A view through the lens of the community of inquiry

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The purpose of this study was to investigate whether gender differences exist in relationships between the three presences – teaching, cognitive and social – in the community of inquiry (CoI) model and online students' learning experiences measured with perceived learning and course satisfaction. Participants were 657 undergraduates taking online courses at a university in South Korea. Results showed significant differences in sub-elements of cognitive and social presence by gender. In addition, regression analyses revealed that sub-elements of the CoI predicted online students' perceived learning and course satisfaction differently by gender. A discussion explains gender differences in online courses in South Korea in which a prerecorded video was the principal modality of learning. Finally, practical implications to enhance diverse students' success are proposed from the perspective of the CoI model.

Implications for practice or policy:

- Despite the development of the CoI specifically for a discussion-based online course, it can still be used to predict students' learning experiences in video-based online learning.
- Considering gender difference when designing and developing an online course may enhance student learning experiences in online learning.
- Changing the way the videos are created may contribute to enhancing the three presences in the CoI model, which essentially improve online students' learning experiences.

Keywords: community of inquiry, gender difference, perceived learning, course satisfaction, video-based online learning

Introduction

Online learning is pervasive in higher education (G.-C. Kim & Gurvitch, 2020; Martin & Bolliger, 2018; Seaman et al., 2018; Stenbom, 2018). Even before COVID-19 outbreak, the number of students enrolled in at least one online course as of fall 2016 was 6,359,121, accounting for 31.6% of all enrolments in higher education in the United States of America (Seaman et al., 2018). During the pandemic, the number of students enrolled in an online course significantly increased because many in-person courses were replaced by online formats (Chiu, 2021).

With the increase in online courses, the issue of student learning experiences is important for researchers, instructors, and administrators (Chiu, 2021) because they are well known to be positively related to student academic performance and intention to take another online course. These are essentially related to students' completion of degree programmes and retention rates in a higher education (Martin & Bolliger, 2018); therefore, maintaining a high level of positive online learning experiences is critical.

Among the various models of online learning, the community of inquiry (CoI) is the framework most widely used to explain the student online learning process (G.-C. Kim & Gurvitch, 2020; Stenbom, 2018). The CoI explains a process that yields meaningful learning through the development of three interrelated presences: teaching, cognitive and social (Garrison et al., 1999). Although the CoI framework was initially

developed for asynchronous, text-based online learning, it has been applied to guide or explain the learning process in various online learning settings, including synchronous (Oyarzun et al., 2021), blended learning (Hilliard & Stewart, 2019), and virtual immersive or simulation environments (Zhang et al., 2020).

Despite its wide use, Stenbom (2018) found that the majority of CoI research has been conducted in North America. In a review of 103 empirical studies with the CoI as a research framework published between 2008 and 2017, Stenbom found that 66 studies were conducted in the United States of America and Canada. Fewer empirical studies were conducted in Asian countries. In addition, the fact that Asian students' learning culture differs from that of North American students is well known. Korean students respect authority (online teachers) and rarely ask questions or challenge their authority (Kang & Chang, 2016). In online discussions, Asian students avoid conflict with others and are less opinionated than their North American peers (Liu et al., 2010). Because the number of students enrolled in online courses in Asia has dramatically increased for the last several decades, more empirical research is necessary to enhance Asian online students' successful learning experiences (Bandalaria, 2018). Furthermore, online courses offered in Korea differ from those offered in North America in that an instructor-created videos are the main modality for online students' learning. Interestingly, the instructor-created video has emerged as a common online modality globally as numerous massive open online courses (MOOCs) were offered and as COVID-19 continued. Researchers (G.-C. Kim & Gurvitch, 2020; Stenbom, 2018) have called for more studies conducted in diverse online learning settings outside North America to make a more general claim for the CoI.

In this study, we examined how gender explains the three presences in the CoI model and its relation with learning experiences, measured with perceived learning and course satisfaction. Some academic areas, such as like teacher education, science, technology, engineering and mathematics and nursing tend towards dominance by a particular gender (Cheryan et al., 2017; Duan et al., 2018), making worthwhile the exploration of the gender differences in online learning settings. Although numerous researchers have suggested characteristics that distinguish the three presences of the CoI model in male and female students and influence their online learning experiences (Thayalan et al., 2012; Tsai et al., 2015), to the best of our knowledge, very little empirical research has involved all sub-elements of the CoI model in identifying gender differences in online learning environments. The purpose of this study was, therefore, to examine gender differences in the CoI presences and their predictive effects on learning experiences, specifically perceived learning and course satisfaction, in an Asian online learning setting.

Literature review

Using videos for online learning

Video has been widely adopted to deliver course content in online learning environments both informally (Guo et al., 2014; Y. Kim & Thayne, 2015; Lemay & Doleck, 2020) and formally (Cummins et al., 2016). In informal learning, MOOCs like those offered by edX and Coursera heavily depend on videos, particularly professionally filmed and edited short videos (usually less than 12 minutes) for audiences of diverse ages (Lemay & Doleck, 2020). Khan Academy has selected short instructional videos as its principal modality of learning, providing prerecorded video lectures for students, teachers, parents and school districts (Y. Kim & Thayne, 2015; Vidergor & Ben-Amram, 2020).

Videos are also prevalent in online courses and degree programmes, with instructors uploading them with written instructions or PowerPoint slides on a learning management system like Blackboard, Canvas, or Moodle. Because students can rewatch them and learn the content at their own pace asynchronously (Cummins et al., 2016; van der Meij & Böckmann, 2021), many instructors have chosen this format for learning (Belt & Lowenthal, 2021). More recently, videos have been used even in in-person formats like the flipped classroom (van der Meij & Böckmann, 2021), in which students watch prerecorded videos and learn content before coming to class. During class, the instructor can interact with students, engaging them in activities and providing more personalised learning experiences. Because of COVID-19, videos have increased in popularity in higher education.

CoI

Situated in social constructivist learning, the CoI model is most widely used in online learning and research to explain the student learning process (G.-C. Kim & Gurvitch, 2020; Stenbom, 2018). According to the CoI model, success can be achieved in online learning environments when three core elements – teaching, cognitive, and social presence – are balanced (Garrison, 2017; Garrison et al., 1999). Teaching presence, defined as "the design, facilitation, and direction of cognitive and social processes for the realization of personally meaningful and educationally worthwhile learning outcomes" (Anderson et al., 2001, p. 5), is an essential element for establishing and maintaining a CoI in online learning. Growing evidence has shown that teaching presence is a critical factor influencing learner satisfaction and perceived learning in online environments (Arbaugh, 2008; Caskurlu et al., 2020; Garrison, 2017; Lim & Richardson, 2021).

Cognitive presence is related to constructing knowledge through sustained communication and reflection (Arbaugh, 2008; Garrison, 2017). Researchers have suggested that cognitive presence is positively related to students' knowledge construction and critical-thinking abilities (Garrison, 2017; Kanuka & Garrison, 2004). It has also been shown to predict student satisfaction and achievement in online and hybrid courses (Galikyan & Admiraal, 2019; Giannousi & Kioumourtzoglou, 2016).

Social presence refers to "the ability of participants in the CoI to project their personal characteristics into the community, thereby representing themselves to the other participants as real people" (Garrison et al., 1999, p. 89). Researchers have demonstrated that social presence is closely related to learners' levels of satisfaction (Richardson et al., 2017; Zhan & Mei, 2013) and perceived learning (Caspi & Blau, 2008; Joksimović et al., 2015; Richardson et al., 2017).

Gender differences in online learning environments

Researchers studying gender differences in learning styles and patterns in online learning, including engagement and communication styles, have found that female students surpassed their male counterparts in the following areas: they are likely to prefer and to be engaged in online learning environments (Duan et al., 2018; Prinsen et al., 2007); they are satisfied with online courses and their performance (Johnson, 2011); they have positive perceptions of teacher support, student interaction and collaboration in online learning (Ashong & Commander, 2012); they have higher online learning readiness scores, which are measured by computer and Internet self-efficacy, self-directed learning, learner control in an online context, motivation for online learning and online communication self-efficacy (Firat & Bozkurt, 2020); and they transition easily from traditional face-to-face discussion to online discussion (Tsai et al., 2015). Female students showed no significant difference in their engagement and motivation in online and face-to-face discussions in the following four essential areas, but male students showed difference in all four: comprehension, interaction, elaboration and anxiety (Tsai et al., 2015).

Furthermore, researchers exploring gender differences in online communication style have found that in asynchronous computer-mediated communication, students in women-only groups showed higher levels of group development and more frequently used self-disclosure, coalition language and personal opinion statements than those in men-only groups (Savicki et al., 1996). In online learning environments, women showed more supportive, personal and emotional communication and interaction styles than men (Guiller & Durndell, 2007; Lee, 2007); by contrast, men tended to be more authoritative (Guiller & Durndell, 2007). In addition, after reviewing previous studies on gender differences in online learning, Gnanadass and Sanders (2018) concluded that female students are likely to differ to some extent from male students in their interaction and communication in online courses. Finding that differences in communication styles among men and women overall may contribute to important differences in their communication activities in online learning and thus in learning experiences in general, they further concluded that gender differences should be considered in designing and delivering effective courses that address the needs of all learners and support their success.

Although the studies noted above showed some degree of gender difference in online learning environments, new research efforts are necessary for at least two reasons. First, the bulk of the research on gender differences in online learning environments emerged around 2000, after which online learning became a course delivery format widely used in higher education; therefore, examining whether gender differences still exist in current online learning settings is important. Second, more comprehensive research

involving modern theories of online learning is necessary. Because the CoI is a comprehensive model often used in online learning to examine students' learning processes with three interrelated presences – social, cognitive, teaching presence – we chose it to examine its effect on students' learning experiences by gender in this study.

Gender differences in the CoI

To date, little empirical research has been conducted to examine the role of gender in the CoI framework. Some researchers have suggested gender as an important demographic factor influencing the presences (Khodabandelou et al., 2014; Shea, 2006). Others have found that gender may play a role in moderating the CoI presences and students' perceived learning (Rovai & Baker, 2005).

A significant difference in male and female students' awareness of social presence and sense of community is that female students are more conscious of the presence of other students and show a greater sense of community in online forums than male students (Thayalan et al., 2012). Female students have tended to be more coherently linked to one another, whereas male students are relatively isolated from others, rarely calling for learning support (Wang et al., 2021). Male and female groups have also shown significant differences in the relationships among the CoI presences, but the differences were insufficient to exert gender-related moderating effects on the relationship among the CoI presences in blended undergraduate courses (Khodabandelou et al., 2014). By contrast, Park and Kim (2020) revealed that gender has a moderating effect on the relationship between tool interactivity and social presence. Specifically, male students were more likely to benefit from tool interactivity in promoting social presence, which in turn improves satisfaction with online learning.

Contrary to research studies illustrating the possibility of gender difference in the presences in the CoI model, other studies have shown no gender effects. For example, one study showed no predictive effect of gender on online social presence and no statistically significant differences between male and female students in online social presence; but some aspects of social presence (social context, privacy, interactivity and online communication) differed slightly by gender (Tu et al., 2011). Another reported no significant difference in any of the CoI presences between male and female students in instructional media design online courses (Kazanidis et al., 2018). Still another showed no gender differences in social presence in collaborative virtual environments (Felnhofer et al., 2014). Recently, Park and Kim (2020) confirmed that gender has no moderating effect on the relationship between social presence and satisfaction in online learning.

In this literature review, we have cited a limited number of studies about gender differences and CoI presences, including some inconsistencies; however, contradictory results about gender effects on the CoI presences support the need for further research. To address the need, we focused on the differences in male and female students' sub-elements of teaching, cognitive and social presences and their effects on students' perceived learning and course satisfaction.

Research questions

The primary purpose of this study was to investigate whether significant gender difference exists in the relationships between the CoI and perceived learning and course satisfaction. The CoI was assessed in terms of the sub-elements of teaching, cognitive and social presence. The research questions follow:

(1) Are there any significant differences in the presences in the CoI model by gender?
(2) Do the presences in the CoI predict students' perceived learning differently by gender?
(3) Do the presences in the CoI predict students' course satisfaction differently by gender?

The corresponding research hypotheses were established as follows:

(1) Female students will show higher presences in CoI than male students.
(2) Both male and female students' CoI presences will predict their perceived learning.
(3) Both male and female students' CoI presences will predict their course satisfaction.

Method

Participants

Data were collected from 657 online students enrolled in 19 online courses at a university in South Korea (see Table 1). All students participating in the study were enrolled in at least one online course at the university by the time the research was conducted in 2019. They consisted of 174 men and 483 women, ranging in age from 19 to 26. The average ages of male and female students were 22.43 (*SD* = 1.74) and 22.54 (*SD* = 1.82), respectively. In addition, for male students, the number of freshmen, sophomores, juniors and seniors was 28 (16.1%), 59 (33.9%), 58 (33.3%) and 29 (16.7%), respectively. For female students, the number of freshmen, sophomores, juniors and seniors was 82 (17%), 143 (29.6%), 158 (32.7%) and 100 (20.7%), respectively.

Table 1
Number of participants across courses

Course	Participants
American Culture	4
Biology	4
Career Planning and Management	25
Computer Science and Music	36
English Literature and Film	17
European Culture and Society	120
German Language	33
Global Business Etiquette	9
Language and Culture	82
Latin and Rome Civilisation	16
Russian Culture	80
Russian Language	10
Siberian Railway	34
Social Media Marketing	3
Sociopsychology	9
Understanding Arts and Culture	45
Understanding Central Asia	50
Understanding Famous Paintings	43
Western Culture and History	37
Total	657

Context

The 16-week general online courses, all elective, were 100% asynchronous and delivered via Blackboard. Earning two credits for each, students logged into Blackboard, viewed one or two segments of a 60- to 70-minute recorded video lecture per week, submitted assignments and completed exams (e.g., mid-term and final) in an instructor-proctored classroom. The formats of the prerecorded videos were very similar across the courses although variants existed. Often, two types of video formats were used among the instructors: instructor headshot with PowerPoint presentation and instructor voice-over with a slide presentation. The instructors used either video-recording software distributed by the university or any video recording software they preferred. Once the instructor chose a video format, they tended to use that format for the entire semester.

Depending on instructors' pedagogy and the nature of the content, online discussions, pop quizzes, or other videos (e.g., YouTube) were used as supplements along with instructor-created videos. Interaction between students and instructors took place through an online forum, such as question and answer, weekly

announcements and emails. Although little interaction through online discussion among peers was designed by the instructors, students in the same majors often took elective courses together, meeting in person on-campus to share course information and discuss topics.

Measurements

Three measurements were used, one each on the CoI, perceived learning and course satisfaction. A 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), was used for all scales. Each scale is described below.

CoI
To assess the CoI, we adapted a CoI survey instrument (Arbaugh et al., 2008), comprising 34 items and covering the three presences: teaching (n = 13), cognitive (n = 12) and social (n = 9). Yu and Richardson (2015) reported high reliability and validity of the CoI instrument in online learning in South Korea. The three sub-elements of teaching presence were design and organisation (n = 4), facilitation (n = 6) and direct instruction (n = 3). The four sub-elements of cognitive presence were triggering event (n = 3), exploration (n = 3), integration (n = 3) and resolution (n = 3), and the three sub-elements of social presence were affective expression (n = 3), open communication (n = 3) and group cohesion (n = 3).

A sample item on teaching presence was "The instructor encouraged course participants to explore new concepts in this course" (facilitation); on cognitive presence, "Problems posed increased my interest in course issues" (triggering event); and on social presence, "I felt comfortable interacting with other course participants" (open communication). Cronbach's alphas for the teaching, cognitive and social presences were 0.94, 0.94 and 0.95 respectively.

Perceived learning
The extent of students' perceived learning in an online course was measured with four items adapted from Lin et al. (2008), for example, "I learned a lot in this course". Cronbach's alpha yielded an internal reliability of 0.91.

Course satisfaction
Course satisfaction was measured with three items adapted from Artino (2009), for example, "I am very satisfied with the course". Cronbach's alpha was 0.91.

Procedures

We gained approval from the Institutional Review Board on campus and permission from each course instructor to survey students. In the ninth week of the semester, the instructors posted a research-recruiting message along with the online survey on Blackboard and encouraged students to participate in the study. Once students agreed to participate and signed an online consent form, the survey was automatically administered. It remained open for 3 weeks, and neither reward nor extra points were provided to students. Participation in the study was 100% voluntary.

Results

Gender difference in communities of inquiry

To examine whether gender differences existed in presences of the CoI model, independent samples t tests were conducted (see Table 2). The results showed no significant gender differences in any sub-elements of teaching presence. Among sub-elements in cognitive presence, gender difference was found in only exploration. Male students (M = 3.41, SD = 1.00) reported significantly more positive exploration than female students (M = 3.20, SD = 0.89). The other sub-elements of cognitive presence were not significantly different between genders. Finally, for the sub-elements of social presence, male students showed significantly higher scores in all sub-elements of social presence than female students, differing from Hypothesis 1.

Table 2
Comparison of male and female students' teaching, cognitive and social presences

CoI	Variables	Male		Female		Difference	*t*	Sig.
		M	*SD*	*M*	*SD*			
Teaching presence	Design & organisation	3.70	0.99	3.77	0.87	-0.07	-0.95	.34
	Facilitation	3.17	1.06	3.04	0.90	0.13	1.49	.14
	Direct instruction	3.14	1.08	3.02	0.98	0.12	1.34	.18
Cognitive presence	Triggering event	3.49	1.11	3.43	1.00	0.06	0.64	.52
	Exploration	3.41	1.00	3.20	0.89	**0.21**	**2.59**	**.01**
	Integration	3.41	1.02	3.40	0.90	0.01	0.19	.85
	Resolution	3.36	1.01	3.33	0.94	0.03	0.36	.72
Social presence	Affective expression	2.93	1.16	2.72	1.03	**0.21**	**2.05**	**.04**
	Open communication	3.03	1.12	2.73	1.02	**0.30**	**3.33**	**.01**
	Group cohesion	3.00	1.10	2.78	0.92	**0.22**	**2.30**	**.02**

Perceived learning predicted by gender

Data from male and female students were divided for further analysis. Pearson correlations for male and female students were conducted separately to identify relationships among the sub-elements of teaching, cognitive and social presences, perceived learning and course satisfaction (see Table 3). Overall, results showed high correlations among each sub-element in all three presences, regardless of gender. More specifically, all the sub-elements in teaching presence highly and significantly correlated with perceived learning and course satisfaction for both male students, from $r = .63$ to $r = .74$, and female students, from $r = .60$ to $r = .72$, at a $p < .01$ level. In addition, all the sub-elements in cognitive presence highly and significantly correlated with perceived learning and course satisfaction for both male students, from $r = .69$ to $r = .78$, and female students, from $r = .59$ to $r = .75$, at a $p < .01$ level. Finally, all the sub-elements in social presence highly and significantly correlated with perceived learning and course satisfaction for both male students, from $r = .47$ to $r = .80$, and female students, from $r = .43$ to $r = .78$, at a $p < .01$ level.

Multiple regression was conducted for male and female students separately to determine the best linear combination of the sub-elements of the CoI for predicting their perceived learning (see Table 4). The results of regression for male students indicated that 69.6% of the variance was explained by all the sub-elements in teaching, cognitive and social presence (adjusted $R^2 = .696$, F (10, 163) = 40.55, $p < .001$). Among the CoI sub-elements, the triggering event ($\beta = .333$, $p < .01$), integration ($\beta = .320$, $p < .01$) and resolution ($\beta = .266$, $p < .01$) in cognitive presence significantly contributed to this model.

Another regression with female students indicated that 64.4% of the variance was explained by all sub-elements of teaching, cognitive and social presence (adjusted $R^2 = .644$, F (10, 472) = 80.06, $p < .001$). More specifically, design and organisation ($\beta = .146$, $p < .01$) in teaching presence, the triggering event ($\beta = .375$, $p < .01$) and resolution ($\beta = .306$, $p < .01$) in cognitive presence and affective expression ($\beta = .133$, $p < .05$) and group cohesion ($\beta = -.130$, $p < .05$) in social presence significantly contributed to the model (see Table 4).

Table 3
Correlations among CoI, perceived learning and course satisfaction by gender

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Design & organisation											
Male											
Female											
2. Facilitation											
Male	.76**										
Female	.67**										
3. Direct instruction											
Male	.74**	.88**									
Female	.64**	.87**									
4. Triggering event											
Male	.69**	.70**	.68**								
Female	.67**	.65**	.61**								
5. Exploration											
Male	.73**	.80**	.76**	.79**							
Female	.60**	.75**	.72**	.67**							
6. Integration											
Male	.82**	.82**	.81**	.79**	.84**						
Female	.76**	.77**	.76**	.78**	.81**						
7. Resolution											
Male	.62**	.68**	.66**	.79**	.75**	.74**					
Female	.66**	.68**	.65**	.81**	.70**	.78**					
8. Affective expression											
Male	.53**	.72**	.67**	.59**	.74**	.67**	.59**				
Female	.39**	.67**	.66**	.51**	.72**	.62**	.58**				
9. Open communication											
Male	.51**	.67**	.62**	.54**	.72**	.60**	.55**	.86**			
Female	.40**	.65**	.62**	.50**	.69**	.60**	.60**	.82**			
10. Group cohesion											
Male	.55**	.75**	.69**	.63**	.76**	.67**	.60**	.88**	.86**		
Female	.42**	.67**	.65**	.55**	.70**	.63**	.61**	.85**	.85**		
11. Perceived learning											
Male	.68**	.68**	.63**	.78**	.69**	.77**	.75**	.55**	.47**	.58**	
Female	.65**	.61**	.60**	.75**	.59**	.70**	.74**	.47**	.43**	.46**	
12. Course satisfaction											
Male	.74**	.74**	.72**	.74**	.71**	.75**	.68**	.59**	.52**	.60**	.80**
Female	.68**	.72**	.69**	.73**	.63**	.74**	.69**	.53**	.47**	.51**	.78**

Table 4
Regression analysis for CoI predicting perceived learning and course satisfaction by gender

CoI	Sub-elements	Learning experiences			
		Perceived learning		Course satisfaction	
		Male	Female	Male	Female
Teaching presence	Design & organisation	.115	**.146****	**.313****	**.162****
	Facilitation	.137	.024	.174	**.235****
	Direct instruction	-.169	.084	.084	**.129***
Cognitive presence	Triggering event	**.333****	**.357****	**.300****	**.301****
	Exploration	-.129	-.036	-.053	-.066
	Integration	**.320****	.059	-.023	.104
	Resolution	**.266****	**.306****	.092	.085
Social presence	Affective expression	.021	**.133***	.171	**.160****
	Open communication	-.150	-.066	-.105	**-.126***
	Group cohesion	.155	**-.130***	-.013	-.065
	Adjusted R^2	.696	.644	.672	.666

** $p < .01$, * $p < .05$

Course satisfaction predicted by gender

Separate sets of multiple regressions were conducted for male and female students to examine the best linear combination of sub-elements of the CoI for predicting students' course satisfaction (see Table 4). Regression analysis with male students showed that 67.2% of the variance was explained by sub-elements in teaching, cognitive and social presences (adjusted $R^2 = .672, F$ (10, 163) = 36.52, $p < .001$). In particular, design and organisation ($\beta = .313$, $p < .01$) in teaching presence and the triggering event ($\beta = .300$, $p < .01$) in cognitive presence significantly contributed to the model.

Another regression with female students revealed that 66.6% of the variance was explained by teaching, cognitive and social presences (adjusted $R^2 = .666, F$ (10, 472) = 97.10, $p < .001$). All the sub-elements in teaching presence, including design and organisation ($\beta = .162$, $p < .01$), facilitation ($\beta = .235$, $p < .01$) and direct instruction ($\beta = .129$, $p < .05$); the triggering event ($\beta = .301$, $p < .01$) in cognitive presence; and affective expression ($\beta = .160$, $p < .01$) and open communication ($\beta = -.126$, $p < .05$) in social presence significantly contributed to the model (see Table 4).

Discussion

This study reveals that male and female students had different levels of teaching, cognitive and social presence in online courses. Female students showed significantly lower level of all sub-elements of social presence than male students did. In addition, the sub-elements in the teaching, cognitive and social presences predicted students' perceived learning and course satisfaction differently, depending on gender. Overall, the results of the study imply that gender difference existed in teaching, cognitive and social presence; thus, online instructors need to consider gender differences in online course design and teaching.

None of the sub-elements of teaching presence were significant in predicting male students' perceived learning, but instructional design and organisation in teaching presence were significant in predicting it for female students. The other two sub-elements of teaching presence, however, were not significant in predicting female students' perceived learning (see Figure 1).

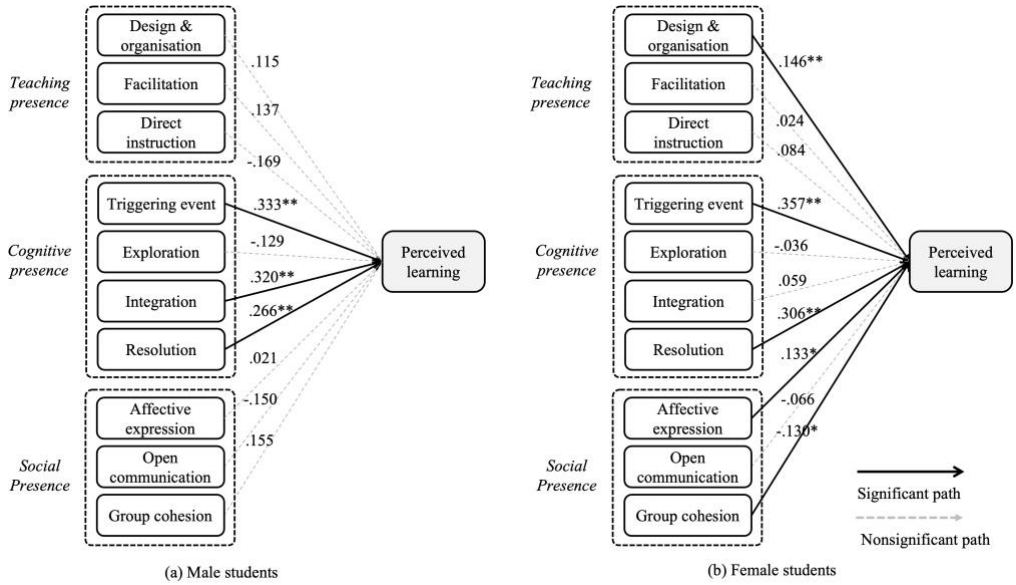

Figure 1. Relationships between sub-elements of the CoI and perceived learning by gender

Instructional design and organisation tend to be completed exclusively by the instructor before the course begins (Anderson et al., 2001; Fiock et al., 2021; Garrison & Arbaugh, 2007). More than males, female students may perceive learning as influenced by instructors' efforts to set course environment and to communicate more clearly about basic course information and curriculum. Results suggest the important role of teaching presence, in particular design and organisation in female-dominant online courses, such as nursing. Padilla and Krider (2018) reported applying the CoI practices in designing and developing an online clinical practice management course and that doing so enhanced students' engagement in online learning. Gaston and Lynch (2019) obtained similar results after comparing two types of online nursing courses: one developed with the Quality Matter (QM) rubric and the other without. Nursing students in the QM group were more engaged in online learning, viewing more learning materials and participating in online discussions more actively than the non-QM groups. Another of our findings is that all three sub-elements of teaching presence were significant predictors of female students' course satisfaction (see Figure 2).

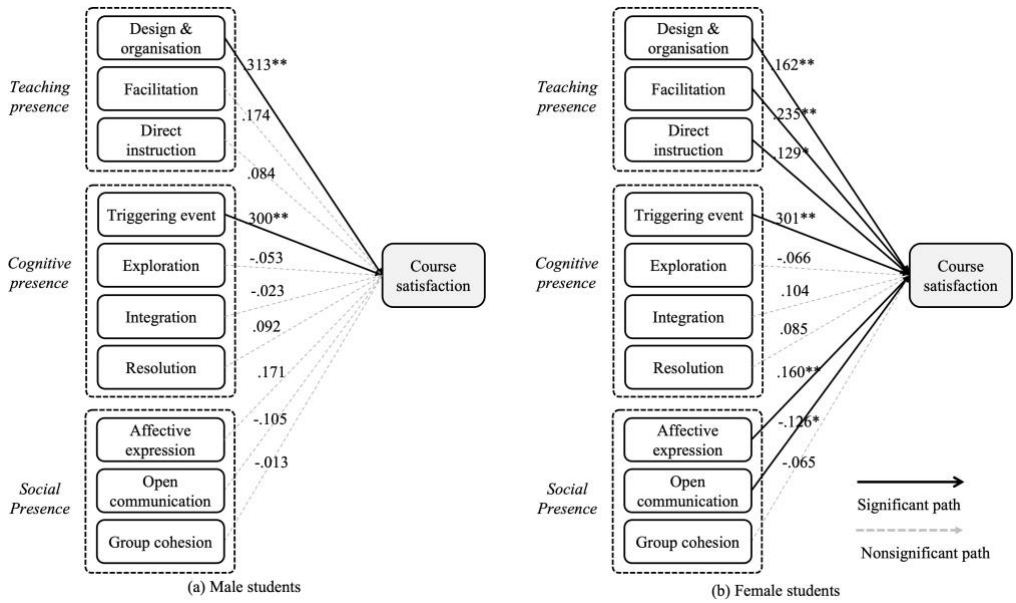

Figure 2. Relationships between sub-elements of the CoI and course satisfaction by gender

Cognitive presence seems to be important for both male and female online students to determine perceived learning and course satisfaction. We found cognitive presence particularly critical for male students because only this element predicted both perceived learning and course satisfaction. For male students, the triggering event, integration and resolution sub-elements in cognitive presence were most critical in predicting perceived learning (see Figure 1); and the triggering event in cognitive presence significantly predicted course satisfaction (see Figure 2). Perhaps male students valued cognitive presence more than any other presences in online courses.

No sub-elements of social presence were significantly related to male students' perceived learning and course satisfaction, but female students' affective expression in social presence predicted their perceived learning and course satisfaction. Specifically, constructing friendly relationships and developing social and emotional climates through social interaction were critical for female students' online learning experiences, aligning with previous studies (Diep et al., 2016; Wang et al., 2021).

Female students' group cohesion and open communication in social presence, however, negatively predicted perceived learning and course satisfaction, respectively. One possible explanation relates to the academic culture in South Korea, in which disagreement with others is uncommon and may be perceived as opposing others (Sum & Kwon, 2020). Even in a typical in-person classroom, students often feel uncomfortable asking questions and sharing opinions in South Korea (Tham & Tham, 2013). In online learning, in which students participate without seeing one another, interacting with other students can be even more challenging, perhaps negatively influencing South Korean female students' course satisfaction; however, male students' social presence did not predict any facets of the learning experience. Male students who care less about relationships with others may consider the course itself as content and may be less interested in engaging in a community (Rovai & Baker, 2005). Overall, our research demonstrates the effect of gender differences in the CoI on learning experiences.

Suggestions

We propose several suggestions for online instructors who use videos mainly as instructional tools in online environments like the one in which our study was conducted. Because our research findings suggest that the key concepts and principles of the CoI model can be applied to enhance student learning experiences in video-based online courses, we offer the following suggestions that may allow instructors to enhance student online learning experiences through videos.

Structure the sequence of videos to enhance teaching presence

According to Ou et al. (2019), instructors may present videos that include four principles to enhance teaching presence: preview of lesson, presentation and discussion of lesson topics, exercises and assignments and wrap-up and reflection, which students highly value. In addition, Belt and Lowenthal (2021) suggested enhancing teaching presence by creating orientation videos to welcome students, to explain how to use course management systems and to provide regular video announcements. Through watching instructor-created videos, students may feel connected to teachers.

Cultivate positive social atmosphere to enhance social presence

Researchers have suggested that videos promoting positive social atmosphere with warm welcoming messages, personal feeling and a conversational style of narration can make students feel more engaged or experience greater learning gains (Belt & Lowenthal, 2021; Guo et al., 2014). Y. Kim and Thayne (2015) compared undergraduate students' learning attitudes in an online statistics course. Videos in the experimental group featured relationship-building strategies, such as instructor as role model, approachable and socially and emotionally supportive, whereas the videos in the control group featured no relationship-building strategies. According to their results students in the experimental group showed significantly higher scores measuring learning in terms of how much they enjoyed the learning materials, how important the learning materials were and whether they would take another similar course. Thus, relationship-building strategies embedded in a video lecture can enhance social presence.

Create interactive videos to enhance students' cognitive presence

Instructors may use interactive quizzes to support students' cognitive presence. Cummins et al. (2016) found that interactive quizzes embedded in video lectures helped computer engineering students engage in learning programming. They embedded multiple-choice questions in 18 videos for two cohort groups of more than 80 students each. More than 80% of students watched the videos. Among those who viewed them, more than 70% of students attempted to answer the questions embedded in the videos. They also discovered the importance of question quality, finding that few students attempted to answer memorisation-based questions, whereas many students spent more than 8 minutes per challenging question. If the necessary technologies are not available for instructors to embed the quizzes, they may use verbal questions in a video, wait for a few moments so that students have time to think about the questions and then explain the content. Interactive videos can provide students with opportunities to engage in online learning cognitively.

Develop shorter videos

Guo et al. (2014) investigated video-watching patterns among MOOC students, analyzing 6.9 million video-watching sessions from four edX courses. They found that the shorter videos (0–3 minutes) promoted the highest engagement and that students watched less than half a video if longer than 9 minutes. Their empirical research demonstrated the importance of shorter videos to enhance students' video watching engagement in online courses. Most lecture videos in our study ran from at least a half-hour to 1 hour. Guo et al. empirically demonstrated the importance of shorter videos to enhance learning engagement in online settings.

Caveats

Readers may need to exercise caution when interpreting the results of this study. Some may find that the CoI survey may not best reveal the three presences in video-based online learning, but it was chosen because its reliability and validity in South Korea have been tested in pedagogical approaches similar to the current online research context (Yu & Richardson, 2015), it is the most widely used survey to measure online learning (Stenbom, 2018) and it facilitates relating the findings of this study to the ongoing dialogue in existing CoI studies, thus contributing to CoI literature. We employed a quantitative research design, but interviewing students in the courses could provide more detailed interpretations of their learning from the perspective of the CoI framework.

Significance of the study

Our study is significant in that it offers empirical evidence showing that providing differentiated course design and development as well as instruction to online students with attention to their gender is worthwhile in terms of their positive learning experiences. Our research contributes to CoI research in that we examined the CoI in online learning environments outside North America, where video-based online courses are typical. With our research results, the predictive nature of the CoI could be more generalised to diverse online learning contexts. More recently, during the COVID-19 pandemic, video-based online courses have become important alternatives in response to the closure of in-person classrooms (Muñoz-Najar et al., 2021). Administrators and instructors at educational institutions may consider offering more video-based online courses as the pandemic continues or as their comfort level with video-based online course increases. The findings of this research contribute to guiding instructors and instructional designers as they create more effective instructional videos for online courses dominated by particular genders.

Conclusion

We drew two important conclusions that could apply to online contexts. First, all three types of presences are significant in explaining students' learning experiences, represented with perceived learning and course satisfaction. For both male and female students, the amount of variance explained with the CoI in perceived learning and course satisfaction ranged from 64.4% to 69.6%, demonstrating the viability of the CoI as a framework for video-based online students' learning experiences. Second, gender played an important role in students' learning experiences when the sub-elements of teaching, cognitive and social presences were

applied as independent variables. Results suggest that course structure and the instructor's role are important; in particular, female students seemed more sensitive to social presence than male students with regard to perceived learning and course satisfaction. We call for more empirical research employing the CoI framework outside North America to examine online students' learning experiences by gender.

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