

The Impact of Case-Based Discussion Design on Students' Perceived Cognitive Presence and Learning in Online Courses

Ayesha Sadaf, Stella Y Kim, and Leonardo Herrera

This study examined the impact of online case-based discussions on students' perceived cognitive presence and learning outcomes and the design elements that contribute to students' learning. Eighty graduate students enrolled in an online instructional design course participated in the study. Data were collected through an online survey and course grades. The findings revealed that students reported high cognitive presence levels related to the "integration" and "resolution" phases. Additionally, the "exploration" phase was highly related to students' perceived learning from case discussions and course discussions and significantly related to



Ayesha Sadaf,
University of North Carolina Charlotte.
Email: asadaf@uncc.edu



Stella Y Kim,
University of North Carolina Charlotte.
Email: skim113@uncc.edu

the course grades. Open-ended survey data resulted in descriptions of five case-based discussion design elements, including (1) the nature of the discussion task, (2) initial question prompts, (3) embedded peer interaction, (4) the relevance of the topic, and (5) well-structured activities that contribute to students' cognitive presence and learning. The focus areas and suggestions for the online case-based discussion design proposed in the study constitute a contribution as an effective online instructional strategy that can facilitate students' cognitive presence and learning outcomes.

Keywords: online case-based discussion, cognitive presence, perceived learning, online case-based discussion design, learning outcomes

INTRODUCTION

To enhance the quality of online courses and to create a meaningful experience for students, it is essential to understand cognitive presence in online learning environments and strategies that can support the development of cognitive presence. According to Garrison (2017), cognitive presence represents the ways to support and sustain a purposeful learning community. It is a core element of the community of inquiry (CoI) framework

that guides the use of online learning environments through a social-constructivist approach to learning. Cognitive presence is operationalized through the practical inquiry (PI) based on four phases—triggering event, exploration, integration, and resolution—that provide a practical means to judge the nature and quality of critical reflection and discourse in a CoI (Garrison et al., 2001).

High-level learning occurs when instructors use effective strategies that require learners' cognitive collaboration, resulting in integrating, synthesizing, and evaluating ideas (Garrison, 2017). For this reason, researchers have been exploring different strategies to design and deliver online courses that demonstrate the evidence of the cognitive presence and achieving higher level learning (Chen et al., 2019; Galikyan & Admiraal, 2019; Ozogul et al., 2022; Sadaf & Kim, 2019; Sadaf & Olesova, 2017). One such strategy to promote cognitive presence is case-based discussions (Morueta et al., 2016; Sadaf & Kim, 2019; Sadaf & Olesova, 2017). Case-based discussions (CBD) involve cognitive activities among students to compare with high-level critical thinking activities. When instructors ask students to analyze the real case's issues, consider underlying principles, propose a solution, and reflect on the problem-solving process, this strategy makes the cognitive process more complex, and it can boost more high-level learning



Leonardo Herrera,
University of North Carolina Charlotte.
Email: lherrer4@uncc.edu

(Darabi et al., 2011; Morueta et al., 2016; Sadaf & Olesova, 2017). The CBD helps connect theory and practice within a collaborative critical discourse that involves rich discussions.

Although CBD can help facilitate high-level learning (Darabi et al., 2013; Ertmer & Koehler, 2014), research related to the design of online case-based discussions (OCBD) and its influence on students' cognitive presence and learning is still limited. In addition to understanding the relationship between cognitive presence and learning outcomes, understanding students' perceptions about the design elements of OCBD can provide possible actions to improve its implementation. Following Oh et al. (2018), this study considered learner perceptions and experiences in discussion activity to strengthen the understanding of the research findings. Participants' learning experiences in OCBD can inform online educators about practical pedagogical orientations when designing CBD in their online courses. Therefore, this study aimed to explore the impact of OCBD on students' cognitive presence, their learning in online courses, and students' perceptions and experiences of the design elements of OCBD that contribute to their learning in online courses.

LITERATURE REVIEW

COGNITIVE PRESENCE IN ONLINE DISCUSSIONS

Cognitive presence is "the extent to which learners can construct and confirm meaning through sustained reflection and discourse" (Garrison et al., 2001, p. 11). Cognitive presence is a vital element of the CoI framework that helps understand the dynamics of the collaborative process of learning (Garrison, 2017). Given the importance of cognitive presence in generating high-level learning, researchers have explored cognitive presence in online learning environments. For example, Galy-

kian and Admiraal (2019) explored the relationship between students' cognitive presence and academic performance and found cognitive presence in higher order levels, integration, and resolution. Similarly, Chen and Chang (2017) examined the correlation between student teachers' cognitive presence and learning using the flipped classroom. The results showed a positive effect of the flipped methodology on learning achievements and grades while finding evidence of cognitive presence at the exploration level. Although studies show different results in terms of the prevalence of cognitive presence at the different levels of the inquiry process, a systematic review on cognitive presence in online learning conducted by Sadaf et al. (2021) illustrated that the exploration and integration phases of cognitive presence are the predominant phases identified in the studies.

PERCEIVED LEARNING AND GRADES

Cognitive presence is one of the significant predictors of perceived learning and satisfaction (Sadaf et al., 2021). Caspi and Blau (2011) defined perceived learning as the set of beliefs and feelings learners have regarding their cognitive learning that has occurred. Perceived learning and satisfaction have been strongly associated with learners' feelings regarding their level of understanding in an instructional process, i.e., cognitive learning. Rovai and Barnum's (2003) study revealed that learners related their perceived learning and satisfaction to the quantity and quality of learning they experienced in online courses.

Sadaf et al. (2011) found a strong association between students' perceived learning and course grades. Grades are an objective mechanism to determine students' learning and constitute an important indicator of students' learning outcomes (Akyol & Garrison, 2011). Students' learning outcomes are also strongly related to their cognitive presence when

participating in online discussions, specifically case-based discussions. For example, the results of the Sadaf et al. (2021) study revealed that students perceived cognitive presence and learning were associated with discussion grades and final course grades. Similarly, Galikyan and Admiraal's (2019) found that three out of the four phases in cognitive presence—triggering event, integration, and resolution—had a significant positive relationship with students' final grades.

ONLINE CASE-BASED DISCUSSIONS

OCBD is an instructional strategy classified as "online case analysis" and "critical thinking activities" (Richardson & Ice, 2010, p. 52) within case-based instruction (CBI). CBI parallels problem-based learning (PBL) and problem-centered pedagogies (Ertmer & Koehler, 2014). CBI is centered on two elements: (1) narratives covering real-world situations and (2) collaborative discussions offering learners an opportunity to make sense of professional experiences (Ertmer et al., 2014).

The CBD has proved to be one of the most effective strategies for promoting cognitive presence (Morueta et al., 2016; Sadaf et al., 2021). Sadaf et al.'s (2021) findings confirmed the significant relationship between student participation in OCBD and perceived cognitive presence at the level of triggering and resolution. Richardson and Ice (2010) conducted a study to analyze the impact of three different discussion strategies (open-ended, debate, and case-based) on 196 undergraduates' cognitive presence levels in an educational technology course. Across the three discussion strategies, case-based discussion, which requires students to analyze the information in a typical case and explore the relevant information to solve real-life problems, generated the most coded responses at the highest stage of cognitive presence. OCBD has been associated with real-life scenarios, authentic problems,

higher order cognitive skills, critical thinking skills, interactions, reflection, collaboration, mediation, and knowledge construction (Choi & Lee, 2009; Dennis et al., 2008; Ertmer & Koehler, 2014 & 2018; Foo, 2019; Jonassen, 2011; Sadaf & Kim, 2019). Other research studies have also demonstrated the contribution of OCBD to learning in terms of developing higher order cognitive skills and critical thinking, among other aspects (Foo, 2019; Lee, 2007; Olesova et al., 2016; Richardson & Ice, 2010; Sadaf & Olesova, 2017).

ONLINE CASE-BASED DISCUSSION DESIGN

Following Jonassen's model (1997), Choi and Lee (2009) structured the following design for case-based learning: (1) understanding situations and contexts where multiple problems may exist, (2) identifying problems by considering multiple perspectives held by different stakeholders, (3) generating possible solutions, (4) choosing appropriate solutions along with a rationale, and (5) implementing and evaluating the solution (p. 103). There are two primary considerations in the design of case-based learning environments: (1) engaging learners in real-world case problems and (2) increasing the learner's role with graduated scaffolding and fading. As for the first consideration, real-world case problems or questions become the core of the learning activity. By being exposed to these questions or cases, learners gain ownership of meaningful learning and become motivated to solve ill-structured real-world situations. They usually need to set their goals upfront to become coconstructor of the learning process and not rely solely on the instructor's guidelines (Choi & Lee, 2009; Koehler et al., 2020).

Regarding the second consideration, the problem-solving process implies students' openness to multiple perspectives and the integration of theory and practice while

moving from activities that require scaffolding to activities learners can do more independently. In addition, studies found that the combination of the OCBD design elements, such as case authenticity, meaningful peer interactions, and engagement in multiple perspectives, served as suitable that help enhances student cognitive presence (Koehler et al., 2020; Sadaf & Olesova, 2017). However, instructors must consider different strategies to facilitate students' cognitive presence and motivate them to participate in the OCBD. For example, Lee's (2007) study found that using application and synthesis instructional strategies when analyzing the cases can contribute to and improve students' cognitive presence.

The study by Sadaf and Olesova (2017) shed light on the effectiveness of another effective strategy when designing OCBD. The authors proposed designing questions within the PIM framework to enhance students' cognitive presence in OCBD. Sadaf and Olesova (2017) found that online discussion questions designed using the PIM had a more positive effect than regular questions on cognitive presence in OCBD. Their findings also suggested that instructors play a vital role in the questioning and case analysis process, helping students move to higher levels of cognitive presence. Higher levels must be obtained by presenting authentic cases and eliciting the proposed solutions and their rationale. Sadaf and Olesova's study demonstrated that "resolution questions can lead to a high level of cognitive presence when students are asked to provide a rationale for their solutions to the problem or state a position" (p. 9). Similarly, Richardson and Ice (2010) found that OCBD showed the highest engagement in the levels of integration and resolution of the PIM.

Other OCBD design elements that help enhance cognitive presence are: require students to assume a stance in more authentic scenarios (Darabi et al., 2011);

expose students to higher level questions situated in case-based scenarios (Olesova et al., 2016; Sadaf & Olesova, 2017); design scenario-based open-ended discussion tasks that can lead to decision-making (Oh et al., 2018); implement creative tasks that demand the development of products (Morueta et al., 2016); and structure activities in which students have defined roles and responsibilities and can confront opinions with peers (Kanuka et al., 2007).

Even though the above design strategies illustrate the impact of OCBD on cognitive presence and learning, it is necessary to inquire about student perceptions of design elements that contribute to their cognitive presence and learning outcomes. As Sadaf and Olesova (2017) noted, "cognitive presence doesn't happen automatically; rather, instructors have to pay close attention to designing discussions that contribute to higher level learning" (p. 9). Therefore, to enhance the quality of online learning and to create a meaningful experience for students, it is essential to understand the students' cognitive presence in online discussions and instructional strategies that can support the development of cognitive presence to improve learning outcomes.

PURPOSE OF STUDY

The purpose of the study is to explore the impact of OCBD on students' cognitive presence and learning outcomes and to identify students' perceptions of the design elements of OCBD that contribute to their learning in online courses. The following research questions guided our study:

1. What is the impact of OCBD on students' perceived cognitive presence and learning?
2. What is the relationship between perceived cognitive presence, learning, and grades in OCBD?

3. What is the relationship between each indicator of perceived cognitive presence levels in OCBD and the course grade?
4. What are student perceptions of the design elements of OCBD that contribute to their cognitive presence and learning?

METHODS

PARTICIPANTS

A sample of 80 graduate students (60 females and 20 males) enrolled in an online course were selected to participate in this study. About half (43.75%, $n = 35$) of the students were more than 40 years old. Most participants (59%, $n = 47$) had taken more than three online courses. All participants rated themselves fairly or very comfortable with participating in online discussions. The study included the sample because students were enrolled in the online graduate course that comprised OCBD design. Although the OCBD were graded as part of the course, students were informed that they had the right to opt out by not signing consent to be included in the study. All students agreed to participate in the study and signed the online institutional review board (IRB) consent form.

CONTEXT OF THE STUDY

The online course—instructional design—was offered over a 15-week semester and delivered via a learning management system, Canvas. Students were required to engage in a week-long online discussion per week as part of their course grades. During the semester, students participated in 13 online discussions on various topics on instructional design—three CB discussions and 10 non-CB discussions. The CB discussions consisted of decision-making problems referred to by Jonassen (2010) as a rational choice model, in which

a group of students compare different options and rationally select the best solutions to the problem. Students were required to analyze the problem situations within the case, reflect on the concepts learned in the course, explore the relevant information, exchange opinions and ideas by responding to each other's posts and propose and justify a solution to the issues presented in the case study.

Following Sadaf and Olesova's (2017) OCBD design, the discussion task presented students' cases describing a specific instructional design issue or problem. The scenarios were based on primary instructional design competencies (e.g., ADDIE, Project management) acquired in this course. The cases were followed by question prompts representing four levels of the PIM model, i.e., triggering, exploration, integration, and resolution under two different threads. Students were required to respond to triggering and exploration questions the first half of the week—Monday to Thursday—within the first thread and comment on another student's post. The purpose of asking triggering and exploration questions during the first half of the week was to help students understand the nature of the problem by considering multiple perspectives and then exploring relevant information to generate possible solutions. During the second half of the week, students were required to respond to integration and resolution questions within the second thread during the second half of the week—Friday to Sunday—and comment on one other student's post. The purpose of asking questions at the integration and resolution phases was to help students build on their initial discussion responses to choose appropriate solutions along with a rationale. Students were required to make at least four posts for 1 week—two initial posts responding to the discussion questions and two comments on other students' posts.

DATA COLLECTION

Upon the conclusion of the course, students responded to the CoI survey questions with reflections on their OCB discussions experience at the end of the semester (see the Appendix). The CoI survey was developed to measure students' perceptions of cognitive presence, teaching presence, and social presence (Arbaugh et al., 2008). Since this study focuses on cognitive presence, only 12 items that measure cognitive presence were used from the CoI survey. Students' perceived learning was measured by adding one survey item at the end. The items employed a 5-point Likert-type scale, with 1 = *strongly disagree* and 5 = *strongly agree*. Demographic information was also collected, such as gender, age, and prior experience with online courses. In addition, qualitative data were sought using one open-ended question to explain further the design elements that influenced students learning. In addition, students' discussion grades and overall course grades were collected to measure.

DATA ANALYSIS

The quantitative data were analyzed using descriptive analysis with means and standard deviations. In addition, Pearson moment-product correlation was conducted to explore the relationships between perceived learning, cognitive presence, discussion grade, and final course grade in OCB. Assumptions required by the correlation analysis, such as normality, linearity, and homogeneity, were tested through visual inspection using a scatter plot and a histogram.

Qualitative data from the open-ended survey responses were analyzed using a constant comparative approach (Miles & Huberman, 1994). First, we coded the data by assigning labels to the open-ended survey responses. Then we categorized similar codes and developed themes. Once we had coded all of the items, we then reana-

lyzed each category to determine the relationships among the codes and to identify the themes that provided further explanation of the OCB design elements that students perceived to influence their learning. We combined both the qualitative and quantitative data during the results and discussions to help further explain the quantitative results of the study.

VALIDITY AND RELIABILITY

Two different strategies were used to maintain the validity and consistency of findings: (1) data triangulation by integrating multiple data sources from both quantitative survey instrument data and open-ended qualitative responses, and (2) investigator triangulation was maintained by using multiple coders for open-ended responses. To ensure the reliability of the coding process, a subset of data was coded and analyzed independently by two researchers, including the primary author and one graduate student. The responses were then compared for consensus in codes, and discrepancies were resolved through discussion. After validating the coding scheme, the researchers independently coded the rest of the data and frequently met to ensure consistency across all codes.

RESULTS

RQ1: The impact of OCB on students' perceived cognitive presence and learning

Results showed, in general, students reported high levels for all four phases of cognitive presence—triggering, exploration, integration, and resolution (see Table 1). Specifically, students had high perceptions of their cognitive presence related to both *integration* ($M = 4.19, SD = 0.71$) and *resolution* ($M = 4.29, SD = 0.67$) phases of cognitive presence on the 1–5 scale. These

Table 1. Students' Level of Cognitive Presence and Learning in OCBD ($n = 80$)

Levels of Cognitive Presence	Case-Based Discussions	
	Mean	SD
Triggering	4.17	0.62
Exploration	4.13	0.66
Integration	4.19	0.71
Resolution	4.29	0.67
Learning	4.15	0.80

Table 2. Pearson Correlation Coefficients Between Cognitive Presence, Learning, Discussion Grades, and Course Grade ($N = 80$)

	Triggering	Exploration	Integration	Resolution	Learning (Case Discussions)	Learning (All Discussions)	Discussion Grade
Exploration	0.691**						
Integration	0.705**	0.791**					
Resolution	0.558**	0.610**	0.725**				
Learning (case discussions)	0.680**	0.764**	0.793**	0.697**			
Learning (all discussions)	0.583**	0.757**	0.724**	0.479**	0.700**		
Discussion grade	0.112	0.079	0.065	0.011	0.000	0.020	
Course grade	0.142	0.226*	0.195	0.209	0.188	0.085	0.491**

Note: **Correlation is significant at the 0.01 level (two-tailed). *Correlation is significant at the 0.05 level (two-tailed).

were followed by *triggering* ($M = 4.17$, $SD = 0.62$) and *exploration* ($M = 4.13$, $SD = 0.66$). Additionally, students perceived to learn more ($M = 4.15$, $SD = 0.80$) from OCBD.

RQ2: Relationship between perceived cognitive presence and learning outcomes

The correlation analysis was performed to see if there was any significant relationship between students' perception of cog-

nitive presence, perceived learning, and grades. Note that there were two variables for perceived learning: one for the case-based discussions and the other for the course discussions. Also, students' learning performance was measured with two variables: a grade on the case-based discussions and a final course grade.

An examination of Table 2 shows that *exploration* yielded a relatively high correlation with students' perceived learning from case discussions ($r = .764$, $p < .01$) and overall course discussions ($r = .757$,

Table 3. Pearson Correlation Coefficients Between Course Grade and Each Indicator of Cognitive Presence

Outcome Variable	Indicators of Cognitive Presence	Pearson's <i>r</i>	<i>P</i> Value
Course grade	Triggering Event		
	• Problems posed in discussions increased my interest	0.106	0.351
	• Discussions piqued my curiosity	0.098	0.389
	• I felt motivated to explore content	0.167	0.138
	Exploration		
	• I utilized information sources to explore problems	0.181	0.108
	• Brainstorming & finding information helped me solve Problems	0.225*	0.044
	• Discussions helped me appreciate different perspective	0.153	0.176
	Integration		
	• Combining information helped me answer questions	0.115	0.311
	• Learning activities helped me construct explanations and solutions	0.218	0.052
	• Reflection on course content and discussions helped me understand concepts	0.186	0.098
	Resolution		
	• I can describe ways to test and apply knowledge	0.245*	0.029
	• I have developed solutions to practical problems	0.210	0.061
• I can apply knowledge to my work	0.110	0.333	

Note: *Correlation is significant at the 0.05 level (two-tailed).

$p < .01$), compared to other phases of cognitive presence. The phrase that revealed the second strongest relation to these variables was *integration*, followed by *triggering*. The last phase, *resolution*, was found to have the lowest correlation with students' perceived learning from the CBD ($r = .697$, $p < .01$) and the course discussions ($r = .479$, $p < .01$). Overall, students' perceived learning showed a similar level of association with cognitive presence across the four phases. Interestingly, only *exploration* was significantly related to the course grade ($r = .226$, $p < .05$).

RQ3: Relationship between each indicator of cognitive presence levels in OCBD and the course grade

The correlations between each indicator of the cognitive presence and the course grade were examined (Table 3). The analysis resulted in two significant correlations for "Brainstorming and finding information helped me solve problems" and "I can describe ways to test and apply knowledge," with the correlation value of 0.225 and 0.245, respectively, at the alpha level of 0.05. This finding suggests that students who utilized these two aspects of cognitive presence while engaging with the OCBD tend to get a higher final course grade.

RQ4: Student perceptions of OCBD design elements

The results of the survey (see Figure 1) showed that the most commonly

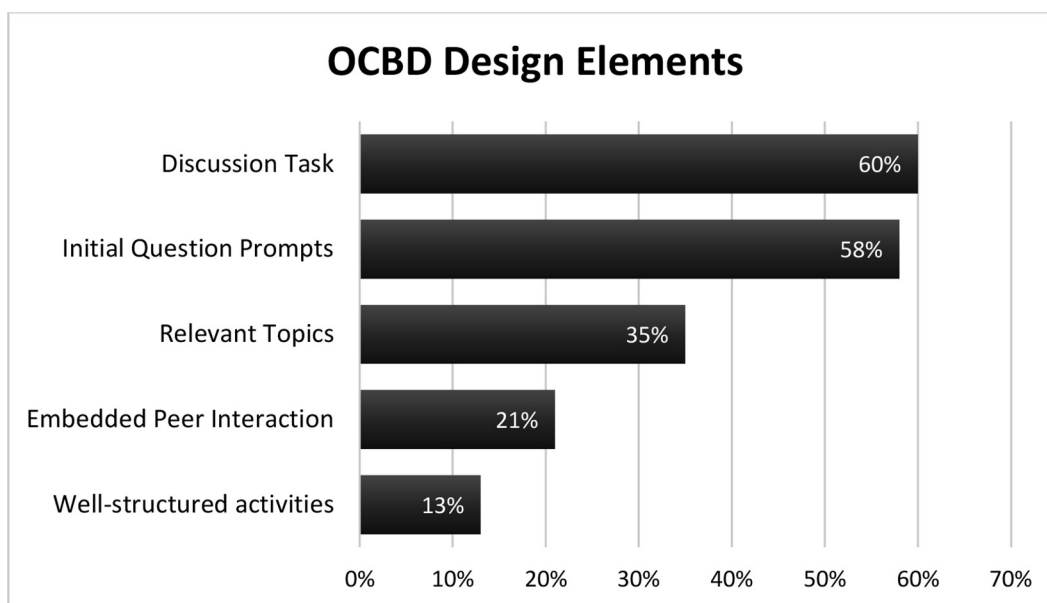


Figure 1. Online case-based discussion design elements that contribute to student learning.

Table 4. Subthemes of Students' Perceptions of Case-Based Discussion Design ($n = 80$)

Survey Categories	Survey Subthemes
Discussion task	<ul style="list-style-type: none"> • Explore problem to find solutions • Apply knowledge to practice
Initial question prompts	<ul style="list-style-type: none"> • Encourage problem-finding/solving • Construct explanations and solutions
Embedded peer interaction	<ul style="list-style-type: none"> • Learning from peers • Exchange different perspective
Relevant topic	<ul style="list-style-type: none"> • Reflect on professional experiences • Real-world applications
Well-structured activities	<ul style="list-style-type: none"> • Facilitate reflection and application • Problem-finding and problem-solving

expressed OCBD design elements that contributed to student cognitive presence and learning were discussion tasks (60%) and initial question prompts (58%). These were followed by relevant topics (35%), embedded peer interaction (21%), and structured activities (13%).

The content analysis of the open-ended survey data resulted in further descriptions of online CBD design elements (see

Table 4), and themes provided an in-depth understanding of how the design elements contributed to students' cognitive presence and learning in the online CBD.

DISCUSSION TASK

Discussion task refers to the nature of the activity that students are assigned in the online course and their learning out-

comes to this exercise. In OCBD, the discussion task presented the students with a case simulating an instructional design problem based on the competencies required in this course. The open-ended survey data highlighted three themes related to how discussion tasks helped students' cognitive presence and learning, including promoting engagement with the course content, exploring the problems to find solutions, and applying theory to practice.

The nature of the discussion tasks in OCBD promoted engagement with the course content and was reported as valuable for student learning in the survey responses. Students were motivated to engage in a deeper examination of the case problems. For example, one student stated, "given a case study, problem, scenario, and the use of textbook and research material to gather information to find an instructional design solution was highly effective for my learning." Similarly, another student reported, "Applying knowledge to problem-solving and what we've learned in the class to a potentially real-world issue was very helpful. I felt more engaged during the case-based discussions and enjoyed drawing on everything we'd learned in the course."

Additionally, students believed that discussion tasks allowed them to explore issues relevant to their professional goals. One participant indicated, "I aspire to become an excellent instructional designer, and the case studies presented me with potential problems that could surface in real-life situations. I really enjoyed reading the case studies and coming up with possible resolutions." Another student stated:

The cases underlying the discussions were well selected. The narratives/stories of the practitioners and situations in the cases create interest, and the open-ended questions asking us to give advice and critique the decisions of case participants are really good ways to apply knowledge. I also like that it helps move us a bit

beyond all the jargon of the ID field to thinking about the real frustrations inherent in doing the work!

Several students noted that discussion tasks allowed them to approach a scenario from different perspectives and apply the concepts they learned in the course. For example, one student said, "applying problem-solving and what we've learned in the class to a potentially real-world issue was very helpful," while another student said:

Case-based discussions provided the best opportunity to apply my knowledge and understanding of the course content. They challenged me to apply the course readings and my experience as an instructional technologist in higher ed. I liked the realistic problem-solving tasks of the case-based discussions.

INITIAL QUESTIONS

This theme refers to the role played by questions posed, followed by the discussion task. For OCBD, students were required to respond to four discussion questions representing four phases of the PIM model, that is, triggering, exploration, integration, and resolution within two different threads. The first thread focused on problem-finding questions (triggering and exploration), and the second was problem-solving questions (integration and resolution). The survey data revealed two sub-themes related to the effectiveness of the questions in facilitating cognitive presence and learning. Of the responses coded as focusing on initial questions: problem-finding/solving and constructing solutions along with a rationale.

Survey participants indicated that the two-part questions challenged them first to find the problems and then select the solution saying, "I felt the case-based questions were direct and effective as they required analysis of the case to find the problems and application to the real-world solutions." Another student noted, "discussion

questions helped contribute to the conversations and helped probe students to look deeper to identifying problems and then generating solutions.” In addition, participants indicated that questions that asked them to provide a rationale for their solutions encouraged them to use critical thinking. As one student explained, “The questions were effective because they not only asked us to analyze the case for solutions but to provide a rationale based on our readings and learning. This allowed us to make plenty of meaningful connections.” Another stated, “I liked leaving the questions really open-ended, what is your solution here, what should the design look like and why. I think backing up that foundational knowledge with open-ended application and interpretation allows for more creativity.”

EMBEDDED PEER INTERACTION

Peer interaction or collaboration was a frequently cited theme in the survey responses that contributed to students’ cognitive presence and learning. Our analysis of the survey results led us to subdivide the theme of peer interaction into two further subthemes—learning from peers and exchanging different perspectives.

The opportunity to discuss with peers was a frequently reported benefit of peer interaction in our survey responses. Students believed that OCBT enabled them to hear and learn from each other’s perspectives, focus on specific topics or areas of interest, and understand real-world applications of the content. A student stated peer collaboration “helped me see the cases from a different perspective that challenged my previous way of thinking.” Students believed that peer interaction helped trigger diverse perspectives. As one student noted, “we all were acquiring new skills and had different opinions, and I liked hearing what other people had to say and what other people’s perspectives were.”

Additionally, interaction with classmates was another factor cited by students as necessary concerning the initial question prompts. Survey responses highlighted the value of small group work, having enough time to read each other’s posts, and dealing with real-life scenarios to create interactive elements. Comparing their perspective to that of others and perhaps reevaluating their own beliefs were also touched upon by some respondents, who stated that “This helped me see the cases from a different perspective that challenged my previous way of thinking” and “I enjoyed looking at other’s perspectives and discussing similarities and differences.”

RELEVANT TOPIC

The relevance of the topic used in the OCBT was also shown by the survey data to play an essential role in contributing to their learning. Based on the data analysis, survey responses revealed two subthemes—relevant topics helped reflect on professional experiences and real-world applications.

Relevant topics that students can identify with provide more opportunities to reflect on professional experiences and real-world applications. Reflection on their learning was also an outcome reported in several student responses. One student noted that “the topics really got me thinking as an instructional designer” and “prompted us to reflect on our daily professional experiences.” Students indicated that they liked being able to apply what they were learning in the scenarios saying, “I find the case studies to be very relevant to the practice of instructional design because it helps me put the learning into context.” Students thought that the OCBT topics were an excellent way to expand their knowledge of different situations that were relevant to them. As one student noted, “I liked case study topics because they were the practical application of a

real-world situation that is more relatable. I could put myself in the situation and hence, felt more activated to research and find solutions to the problems.”

WELL-STRUCTURED ACTIVITIES

Our final theme for coding the survey responses was well-structured activities. Content analysis revealed two subthemes that show the structure of the case-based discussion tasks, including a small group format for reflection/application and problem-finding and problem-solving activities. Students indicated that they liked the small group format because it “made it easy to follow conversations and participate in discussions as well as learn from my peers.”

In addition, the OCBD was structured in two parts, problem-finding and problem-solving, which students noted as helpful in allowing more time to read and reflect on other students’ posts and focus on specific issues within the case study. As one student stated, “I felt the structure of activities were effective as they required reflection on the issues of the case and application of real-world solutions.” Another student said, “I liked that the cases were in two parts. It is important to allow part one to be reflective and allow the learner to go from conceptual to real world and part two to be hands-on or application-oriented based on the knowledge and understanding the learner expresses in part one.”

DISCUSSION

This study sought to explore the impact of OCBD on students’ perceived cognitive presence and the design elements that contribute to students’ cognitive presence and learning in online courses. Our findings revealed that students perceived OCBD as a favorable strategy for learning and one in which all levels of cognitive presence are evident (Galykian & Admi-

raal, 2019; Garrison, 2017). In alignment with previous studies, the “integration” and “resolution” phases were perceived as the highest levels of cognitive presence (Chen & Chang, 2017; Olesova et al., 2016; Sadaf & Kim, 2019; Sadaf & Olesova, 2017). The results of Sadaf and Olesova’s (2017) study support the idea that the nature of the task and the wording of initial questions can help design a thoughtful and meaningful dialogue to guide students through each level of critical discourse and reach high levels of cognitive presence that is integration and resolution.

Even though the relationship between perceived cognitive presence and perceived learning was similar across the four phases, the *exploration* phase showed a high correlation with perceived learning in both CBD and overall course discussions and a significant correlation with course grades. This finding suggests that exploring case-based problems can lead to high-level learning and high course grades. This finding is aligned with other studies where discussion grades in CBD were strongly related to the exploration phase of cognitive presence (Chen & Chang, 2017; Sadaf et al., 2021). Further, results revealed that learners could apply knowledge through brainstorming activities and finding information, leading to higher course and discussion grades. This finding is also supported by participants’ responses in the survey regarding the opportunities for peer interaction embedded within the CBD design. This finding suggests that embedded interaction and brainstorming activities in the CBD design that require learners to solve authentic problems through analysis of the issues using multiple perspectives, consideration of underlying theory and practice, and development of solutions can lead to high grades and learning. Sadaf et al. (2021) also found a strong association between exploration with CBD, concluding that this may be because the discussions are designed to require students to analyze the problems

and explore relevant information. Exchange ideas to propose solutions in the case studies.

Participants proposed five main CBD-design themes and corresponding sub-themes, adding to the design elements proposed in previous studies (Choi & Lee, 2009; Darabi et al., 2013; Ertmer & Koehler, 2017; Ferhman & Watson, 2020). The five themes proposed by students in this study suggest that students perform better when instructors carefully design the CBD tasks, develop initial discussion question prompts, embed peer interaction, and use relevant topics and well-structured activities. These five CBD design elements aim to enhance peer and group collaboration, develop problem-solving skills, foster close involvement with the content, understand others' perspectives, and apply their learning to real-world situations.

More than half of the sample perceived the structure of tasks and questions as facilitators of students' cognitive presence and learning outcomes. According to student survey responses, several participants revealed that discussion tasks, discussion questions, and embedded peer interaction encouraged them to explore problems to construct solutions and learn from peers by exchanging different perspectives. This result confirms Sadaf and Olesova's (2017) conclusion that tasks situated in cases accompanied with questions designed with the PIM play an important role in fostering cognitive presence and learning in online discussions. In addition, students perceived peer interaction and the exchange of different perspectives contributing to their cognitive presence and learning. In this regard, researchers suggest that instructors should intentionally choose the nature of the task and design the elements of social interaction within the course (Darabi et al., 2013; Sadaf & Olesova, 2017; Sadaf et al., 2021) to cultivate cognitive presence on online discussions. Darabi et al. (2011) suggested that exposure to multiple perspectives increases students' under-

standing of the problem and expands their cognitive presence for resolving the issues. Finally, relevant topics and well-structured activities provided students opportunity to reflect on their professional experiences that could impact real-world practices, implying that the students were able to apply the concepts learned in class to solve real-life problems while appreciating the multiple perspectives that arose during the discussions (Choi & Lee, 2009).

CONCLUSION AND IMPLICATIONS

This study contributes significantly to OCBD in terms of its perceived effects on perceived cognitive presence, learning, and elements that can guide its design. First, it provides evidence of OCBD as an instructional strategy that facilitates cognitive presence in all the phases of cognitive presence, with high indicators at the integration and resolution levels, confirming findings from previous studies (Chen & Chang, 2017; Galykian & Admiraal, 2019; Richardson & Ice, 2010; Sadaf & Olesova, 2017). Second, the exploration phase evidenced the highest relationship between learning and course grades. Searching for relevant information that helps students integrate ideas and arrive at the best solutions to the discussed cases may constitute momentum in the learning process, a factor educators should consider when using OCBD. Third, results revealed the possibility of brainstorming and finding information to solve problems—an indicator of cognitive presence at the exploration level—and describing ways to test and apply their knowledge—an indicator at the resolution level—helping students achieve higher learning outcomes in the form of course grades. These cognitive presence indicators may serve as valuable references for educators planning OCBD in their online courses to improve learning outcomes.

Finally, this study makes an important contribution to OCBD design by providing

a taxonomy with five main areas to enhance student learning. These areas are, in turn, comprised of different pedagogical and methodological elements. The first and second areas emphasize the importance of designing learning tasks and questions that facilitate meaningful peer interactions and the development of problem-solving behaviors. The design of learning tasks also allows students to apply new learnings to solving cases. Likewise, questions were regarded as a triggering mechanism of student engagement with case content. The third area emphasizes the importance of discussion design as an opportunity to learn from others and develop metacognitive skills. The fourth area suggests that the relevance of case discussion topics fosters engagement in multiple perspectives and real-world applications. The fifth area refers to the well-designed structure as favorable elements of OCBD design. Thus, the design of learning tasks, topics, and questions and the consideration of the multiple factors suggested by participants in this study can significantly contribute to students' cognitive presence and learning in online environments.

The case-based approach has great potential for engaging students in disciplinary content. Understanding how this approach in online courses impacts student cognitive presence and learning outcomes may inform the design of online courses. Instructors and course designers who consider using the CBD approach in their online courses may use this knowledge to design their discussions to foster cognitive presence, thus fostering online communities of inquiry.

LIMITATIONS AND FUTURE RESEARCH

The sample's nature (convenience) and size used in the study limit the generalizability of the results to other higher education settings or knowledge domains. Since

one of the purposes of this study was to shed light on OCBD design, future studies must use larger samples at different programs or schools that confirm, contradict, or expand on this study's findings and their implications. Likewise, given that a mixed-methods design was used, researchers may consider including student interviews to gain a deeper understanding of OCBD design elements and the relationship of OCBD with cognitive presence and learning outcomes, complementing the data obtained from the survey. Another potential limitation was the lack of research on students' perceptions of OCBD design, which could provide us with additional guiding elements and principles for our research analysis and discussion. Nonetheless, the results from this study, specifically on OCBD design, are expected to serve as a reference for future research efforts.

REFERENCES

- Akyol, Z., & Garrison, D. R. (2011). Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning. *British Journal of Educational Technology, 42*(2), 233–250. <https://doi.org/10.1111/j.1467-8535.2009.01029.x>
- Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., & Swan, K. P. (2008). Developing a community of inquiry instrument: Testing a measure of the community of inquiry framework using a multi-institutional sample. *The Internet and Higher Education, 11*(3–4), 133–136. <https://doi.org/10.1016/j.iheduc.2008.06.003>
- Caspi, A., & Blau, I. (2011). Collaboration and psychological ownership: How does the tension between the two influence perceived learning? *Social Psychology of Education, 14*(2), 283–298. <https://doi.org/10.1007/s11218-010-9141-z>
- Darabi, A., Arrastia, M. C., Nelson, D. W., Cornille, T., & Liang, X. (2011). Cognitive presence in asynchronous online learning: A comparison of four discussion strategies. *Journal of Computer Assisted Learning, 27*(3),

- 216–227. <https://doi.org/10.1111/j.1365-2729.2010.00392.x>
- Darabi, A., Liang, X., Suryavanshi, R., & Yurekli, H. (2013). Effectiveness of online discussion strategies: A meta-analysis. *American Journal of Distance Education, 27*(4), 228–241. <https://doi.org/10.1080/08923647.2013.837651>
- Ertmer, P. A., & Koehler, A. A. (2014). Online case-based discussions: Examining coverage of the afforded problem space. *Educational Technology Research and Development, 62*(5), 617–636. <https://doi.org/10.1007/s11423-014-9350-9>
- Ertmer, P. A., & Koehler, A. A. (2018). Facilitation strategies and problem space coverage: Comparing face-to-face and online case-based discussions. *Educational Technology Research and Development, 66*(3), 639–670. <https://doi.org/10.1007/s11423-017-9563-9>
- Galikyan, I., & Admiraal, W. (2019). Students' engagement in asynchronous online discussion: The relationship between cognitive presence, learner prominence, and academic performance. *The Internet and Higher Education, 43*, 100692. <https://doi.org/10.1016/j.iheduc.2019.100692>
- Garrison, D. R. (2017). *E-learning in the 21st century: A community of inquiry framework for research and practice* (3rd ed.). Routledge/Taylor & Francis.
- Garrison, D. R., & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough. *American Journal of Distance Education, 19*(3), 133–148. https://doi.org/10.1207/s15389286ajde1903_2
- Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education, 15*(1), 7–23. <https://doi.org/10.1080/08923640109527071>
- Chen, H.-L., & Chang, C.-Y. (2017). Integrating the SOP2 model into the flipped classroom to foster cognitive presence and learning achievements. *Educational Technology & Society, 20*(1), 274–291. https://www.jstor.org/stable/jeductechsoci.20.1.274?seq=1#metadata_info_tab_contents
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: qualitative, quantitative, and mixed methods approaches*. SAGE.
- Choi, I., & Lee, K. (2009). Designing and implementing a case-based learning environment for enhancing ill-structured problem solving: Classroom management problems for prospective teachers. *Educational Technology Research and Development, 57*(1), 99–129. <https://doi.org/10.1007/s11423-008-9089-2>
- Jonassen, D. H. (2010). *Learning to solve problems: A handbook for designing problem-solving learning environments*. Routledge.
- Kanuka, H., Rourke, L., & Laflamme, E. (2007). The influence of instructional methods on the quality of online discussion. *British Journal of Educational Technology, 38*(2), 260–271. <https://doi.org/10.1111/j.1467-8535.2006.00620.x>
- Koehler, A. A., Fiock, H., Janakiraman, S., Cheng, Z., & Wang, H. (2020). Asynchronous online discussions during case-based learning: A problem-solving process. *Online Learning, 24*(4), 64–92. <https://doi.org/10.24059/olj.v24i4.2332>
- Lee, K. (2007). Online collaborative case study learning. *Journal of College Reading and Learning, 37*(2), 82–100. <https://doi.org/10.1080/10790195.2007.10850199>
- Morueta, R.T., Maraver López, P., Gómez, Á. H., & Harris, V. W. (2016). Exploring social and cognitive presences in communities of inquiry to perform higher cognitive tasks. *The Internet and Higher Education, 31*, 122–131. <https://doi.org/10.1016/j.iheduc.2016.07.004>
- Oh, E. G., Huang, W.-H. D., Hedayati Mehdiabadi, A., & Ju, B. (2018). Facilitating critical thinking in asynchronous online discussion: Comparison between peer- and instructor-redirection. *Journal of Computing in Higher Education, 30*(3), 489–509. <https://doi.org/10.1007/s12528-018-9180-6>
- Olesova, L., Slavin, M., & Lim, J. (2016). Exploring the effect of scripted roles on cognitive presence in asynchronous online discussions. *Online Learning, 20*(4), 34. <https://doi.org/10.24059/olj.v20i4.1058>
- Richardson, J. C., & Ice, P. (2010). Investigating students' level of critical thinking across instructional strategies in online discussions. *The Internet and Higher Education, 13*(1–2), 52–59. <https://doi.org/10.1016/j.iheduc.2009.10.009>
- Rolim, V., Ferreira, R., Lins, R. D., & Găsević, D. (2019). A network-based analytic approach to uncovering the relationship between

- social and cognitive presences in communities of inquiry. *The Internet and Higher Education*, 42, 53–65. <https://doi.org/10.1016/j.iheduc.2019.05.001>
- Rovai, A. P., & Barnum, K. T. (2007). Online course effectiveness: An analysis of student interactions and perceptions of learning. *International Journal of E-Learning & Distance Education/Revue Internationale Du E-Learning Et La Formation à Distance*, 18(1), 57–73. <http://www.ijede.ca/index.php/jde/article/view/121>
- Sadaf, A., & Kim, S. Y. (2019). Examining the impact of online case-based discussions on students perceived cognitive presence, learning and satisfaction. In D. G. Sampson, D. Ifenthaler, P. Isaías, & M. L. Mascia, M. L. (Eds), *16th international conference on cognition and exploratory learning in digital age (CELDA) 2019* (pp. 421–424). Cagliari.
- Sadaf, A., Kim, S. Y., & Wang, Y. (2021). A comparison of cognitive presence, learning, satisfaction, and academic performance in case-based and non-case-based online discussions. *The American Journal of Distance Education*, 35(3), 214–227. <https://doi.org/10.1080/08923647.2021.1888667>
- Sadaf, A., & Olesova, L. (2017). Enhancing cognitive presence in online case discussions with questions based on the practical inquiry model. *American Journal of Distance Education*, 31(1), 56–69. <https://doi.org/10.1080/08923647.2017.1267525>
- Sadaf, A., Wu, T., & Martin, F. (2021). Cognitive presence in online learning: A systematic review of empirical research from 2000 to 2019. *Computers and Education Open*, 2, 100050.

APPENDIX: ONLINE SURVEY

Reflecting on your case-based discussions in the course, please answer the following questions:

	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
Problems posed increased my interest in course issues.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussions piqued my curiosity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt motivated to explore content related questions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I utilized a variety of information sources to explore problems posed in the discussions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brainstorming and finding relevant information helped me resolve content related questions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Online discussions were valuable in helping me appreciate different perspectives.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Combining new information helped me answer questions raised in course activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Learning activities helped me construct explanations/solutions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reflection on course content and discussions helped me understand fundamental concepts in this class.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can describe ways to test and apply the knowledge created in this course.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have developed solutions to course problems that can be applied in practice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I can apply the knowledge created in this course to my work or other non-class related activities.

Overall, I was satisfied with case-based discussions.

I learned much in the case-based discussions.

What aspects of the case-based discussions impacted your cognitive presence and learning in the course (i.e., question prompts, working with peers, cases, etc.)?

DEMOGRAPHIC QUESTIONS:

Your gender

- Male
- Female
- Other
- Prefer not to answer

Your age

- 21-25
- 26-30
- 31-35
- 36-40
- More than 40

What is your current student status?

- Master's student
- Doctoral student
- Graduate Certificate Student
- Other, please specify, _____

How many online courses have you completed prior to taking this course?

- 0
- 1
- 2
- 3
- 4 or more

Comfort level participating in online discussions.

- Not at all comfortable
- A little comfortable
- Fairly comfortable
- Very Comfortable