

# Cognitive Presence in Online Learning: A Systematic Review of Empirical Research from 2000 to 2019

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## ABSTRACT

This systematic review synthesized research on cognitive presence—the process of collaborative knowledge construction—in online learning to identify trends from two decades (2000 to 2019) of scholarship. A total of 30 articles on cognitive presence were analyzed to gain deeper understanding of the current state of research and identify the gaps in literature. The distribution of publishing years, countries, instructional setting, disciplines, research methods, data collection and data analysis methods, research topics and cognitive presence phases were reviewed. The review shows that the majority of the studies were carried out in higher education in the United States and Canada within the field of education. More than half of the studies used quantitative research methods, of which discussion transcripts were the prominent method for data collection and content analysis was used the most to analyze data. Research focus of these studies was mainly on instructional strategies and learning outcomes in the online courses. Among instructional strategies, reflection on practice, case-based learning, inquiry-based learning, and peer facilitation were most researched strategies. For learning outcomes, levels of cognitive presence (triggering, exploration, integration, and resolution), critical thinking, and interaction were examined the most. In addition, the frequency of students' contributions to online discussion were categorized using the Practical Inquiry Model and revealed that the highest contributions fell within the exploration and integration phases with a small percentage in triggering and resolution phases of cognitive presence. These results provide insights for educators, researchers, and instructional designers into the cognitive presence research trends to improve the quality of online learning.

## 1. Introduction

With an exponential increase in research and practice of online learning over the last two decades, there has been an increasing interest in the socio-cognitive views of learning and to facilitate collaborative interaction [1]. Cognitive presence is an important indicator of quality of an online learning experience since it consists of authentic approaches based on collaboratively constructing knowledge in an online environment [2]. It is the core element of the Community of Inquiry (CoI) framework to guide the use of online learning environments in support of social constructivist approach to learning. Garrison et al. [3] defined cognitive presence as “the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry” (p.11). Both reflection and discourse can deepen the meaning of learners' experiences and are, therefore, crucial component of an effective online educational experience. In this regard, cognitive presence can be used as a guided model to attain learning in a

constructive way [2]. The CoI framework describes the essential elements of a successful online learning experience rooted in Dewey's educational philosophy and social constructivism [4, 2]. Achieving such a CoI requires interaction of three interdependent elements: cognitive, social, and teaching presence. Cognitive presence focuses on the process of learning, teaching presence the facilitation of the inquiry, and social presence encourages the collaborative experience of learning.

In search of creating cognitive presence to maximize the quality of online learning, scholars have been studying cognitive presence from a variety of aspects. These include effective instructional strategies (Author, 2017; [5–8]), learning environments [9–11], student learning outcome [12–14], and relationship of cognitive presence with other presences [15–17]. As such, these research studies provide guidance in creating and assessing the quality of cognitive presence in online learning. Due to the growth in number of studies exploring different aspects of research on cognitive presence, there is a need to synthesize this existing research. Two main approaches commonly used to measure

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cognitive presence within the CoI is through discussion transcript coding and CoI survey instrument.

### 1.1. Measuring Cognitive Presence in Online Discussions

To explore learner communications and the process of knowledge construction through transcribed online discussions, Garrison et al. [18] developed the CoI framework. CoI is grounded in the Practical Inquiry Model (PIM), which involves four key phases of cognitive presence that can be observed in students' online discussion postings: (1) Triggering—becoming aware of a problem through initiating the inquiry process, (2) Exploration—exploring a problem by searching for relevant information, engaging in reflection, and sharing explanations (3) Integration—constructing meaning from various resources and offering possible solution, and (4) Resolution—applying or defending potential solutions with a new thought or idea. According to Schrire [19] the PIM is “most relevant to the analysis of the cognitive dimension and represents a clear picture of the knowledge building processes occurring in online discussions” (p. 491). PIM is the most extensively used framework to measure cognitive presence in online discussions [20] compared to other content analysis frameworks [21–23] for understanding cognitive development.

To operationalize the four phases of cognitive presence, Garrison et al. [3] developed a set of descriptors and indicators to guide the qualitative coding of the transcripts of students' discourse. In a CoI, discourse is the dialogue for inquiry that represents the cognitive presence dynamic and exploratory aspects of the PIM [2]. Therefore, PIM is used to analyze discourse in online discussions through transcript coding method guided by the coding scheme in which a unit of analysis (such as a message) is coded using the four phases of the cognitive presence: Triggering event, exploration, integration, and resolution. This is then followed by quantitative calculations, where the generated data is used to identify statistical insights of the discourse. Much of the research on the PIM investigating the distribution patterns of cognitive presence in online discussions [24, 25, 5, 6, 12, 26, 27, 7] have found resolution as less and exploration as the dominant phase during the inquiry process. Garrison et al. [3] concluded that students tend to stay in their comfort zone by not leaving the exploration phase since integration and resolution are more intellectually demanding.

### 1.2. Measuring cognitive presence through the CoI survey

To operationalize Garrison, Anderson and Archer's CoI framework, the CoI survey instrument was developed [28]. According to Garrison [2], the survey has made “a significant enhancement and proliferation of CoI research through more efficient data analysis and by making possible for large-scale studies across institutions, disciplines, demographic groups and technologies” (p. 165). The survey consists of 34 items that measure learner perceptions of the three presences including 12 cognitive presence items, 13 teaching presence items, and 9 social presence items. Among 12 cognitive presence items, three items each represent the four phases of cognitive presence. Responses to the survey items are provided on a five-point Likert type scale ranging from 1 “strongly agree” to 5 “strongly disagree.” The CoI survey instrument has expanded the opportunities for researchers to conduct quantitative research by providing a quantitative method to assess cognitive presence in online and blended contexts [29].

### 1.3. Systematic Reviews on Community of Inquiry

Although there are no systematic reviews that specifically examine cognitive presence in online learning, there have been two systematic reviews conducted on CoI framework on all three presences including studies on cognitive presence [29, 20]. These reviews provide a summary of research studies on teaching, social, and cognitive presences using the CoI survey instrument. Using the 103 empirical studies

(2008–2017), Stenbom [20] summarizes the purposes with which the CoI instrument has been used in studies: “to explore a single learning environment, to examine differences using the CoI survey, to observe relationships among the different elements of CoI and their relationships with other data, and to address the reliability and/or validity of data using the CoI survey” (p. 25). With regards to structural relationship between the CoI elements, he found that teaching presence predicts student perceptions of cognitive presence in online and blended learning. The second review was conducted by Redstone et al. [29], who reviewed 24 studies on the CoI instrument (2008–2017) to capture the types of research conducted in higher education settings. After reviewing the studies, they found 4 themes including (1) testing the instrument for validity and reliability; (2) measuring CoI presence in different environments; (3) examining causal relationships among the elements; and (4) exploring potential revisions to the model. They affirmed that cognitive presence has more influence on learning than other presences and teaching and social presence have a significant perceived influence on cognitive presence. Although these systematic reviews shed light on research about CoI survey instrument including relationship of cognitive presence with other presences, no systematic review specifically on cognitive presence has been published to look across contexts, disciplinary areas, research topics and cognitive presence phases in online learning. This study extends previous reviews on CoI framework by placing our emphases on cognitive presence studies to determine a current state of knowledge, synthesize published research with different perspectives and provide possible directions for the future of research about cognitive presence in online learning.

### 1.4. Purpose of Systematic Review

There are systematic reviews and meta-analyses conducted focusing on social presence [8, 30] and teaching presence [31], however, there is no systematic review specifically on cognitive presence. Although the importance of cognitive presence to generate high-level learning in online environments is well documented in literature, researchers suggest that it is the least researched of the three constructs of CoI framework and little progress has been made in understanding cognitive presence and higher-order thinking and learning effectiveness online [2, 15].

Since the design and delivery of online courses has shifted to establishing cognitive presence and achieving higher-level learning outcomes in recent years [1], it is important for researchers and educators to reflect on the topics, methods, and trends in cognitive presence research. According to Garrison [2], more research is needed to fully appreciate the inquiry process (cognitive presence) that occurs in shared learning environments. Thus, the purpose of this review is to gain a deeper understanding of the current research trends of cognitive presence in online learning by reviewing articles published from 2000 to 2019. In this review, the following questions guided our inquiry:

- 1 What are the publication trends of cognitive presence research in online learning? (Journals and years of publication, number of articles published, journals that publish cognitive presence research)
- 2 What is the context of published cognitive presence research? (Instructional setting, countries represented, and subject areas represented)
- 3 What research design, data collection and data analysis methods are used in the studies reviewed?
- 4 What is the focus of research on cognitive presence studies in online learning?
- 5 What cognitive presence phases are displayed in online courses?

## 2. Methods

In this study, we used the five-step systematic review process described in the U.S. Department of Education, Institute of Education

Sciences, What Works Clearinghouse Procedures and Standards Handbook, Version 4.1 [32]. The five steps included (a) developing the review protocol, (b) identifying relevant literature, (c) screening studies, (d) reviewing articles, and (e) reporting findings.

2.1. Data Sources and Search Strategies

Six databases were searched using the search terms ‘Cognitive Presence’ and ‘Online’ for published articles between the years 2000 and 2019 using both the Title, Keyword and Abstract search function. The five databases searched included Academic Search Complete, ERIC Library, Information Science & Technology Abstracts with Full Text, PsycINFO and Science Direct. The inclusion and exclusion criteria used in the screening and identification of articles is included in Table 1.

2.2. Inclusion and Exclusion Criteria

The initial search in the databases resulted in 295 articles. After removing the duplicates, 181 articles were screened at title and abstract level based on the inclusion and exclusion criteria (see Table 1). In total, 43 studies–18 at title level and 25 at abstract level–were excluded during this screening phase. The full text of the remaining 138 articles were read to identify whether the studies met the following inclusion criteria: 1) the articles were specifically focused on cognitive presence instead of on all three presences (e.g., teaching and social presence); 2) articles used CoI framework to measure cognitive presence. In total, 108 studies did not demonstrate a direct or specific focus on cognitive presence and therefore were excluded during this screening phase.

The final sample consisted of 30 articles, which were coded for the systematic review. The PRISMA flowchart (Figure 1), created by the Ottawa Methods Center for conducting systematic [33], was used to document the process flow of identifying the studies to include in this systematic review.

2.3. Data Coding and Analysis

A review protocol for coding was developed in Microsoft Excel. Table 2 includes items coded for article description, research methods and design, data collection methods, data analysis methods, research topic focus, and cognitive presence phase included in the review protocol. To increase validity, two graduate students reviewed and coded each of the articles independently, and then the first author verified the codes. Consensus was reached by resolving any disagreements over discussions.

**Table 1**  
Inclusion/Exclusion Criteria

Criteria	Inclusion	Exclusion
Publication date	2000 to 2019	Prior to 2000 and after 2019
Publication type	Scholarly articles of original research from peer reviewed journals representing high-quality empirical studies.	Book chapters, technical reports, dissertations, or proceedings.
Focus of the article	The research focused primarily on cognitive presence in online learning. Also, studies looking at cognitive presence using the CoI framework.	The article that did not have cognitive presence in online learning as the primary focus and articles that focused on three presences including social presence and teaching presence.
Research Method	Both quantitative and qualitative methods were included. However, this had to include an identifiable methods section and presentation of results.	Conceptual articles, opinion, or discussion papers that do not include a discussion of the procedures of the study or analysis of data.
Language	Journal article was written in English.	Other languages were not included.

Descriptive statistics were generated to show the patterns and frequency of the elements of interest. Narrative data for research focus were analyzed using content analysis to identify categorical themes.

3. Results

3.1. Publication Trends

Since 2000 to 2019, cognitive presence research studies were published in 17 journals. Table 3 shows the order of top journals according to the number of articles published in that journal. The largest percentage of articles on cognitive presence was published in *The Internet and Higher Education* (n = 8, 26.7%). This was followed by *American Journal of Distance Education* (n = 3, 10%), *Journal of Computing in Higher Education* (n = 3, 10%), *British Journal of Educational Technology* (n = 2, 6%), and *Online Learning* (n = 2, 6%). There were twelve other journals that published only one article on cognitive presence.

The analysis of the publications’ year showed that the most number (n = 3) of articles were published each year in 2014, 2016, 2017, and 2019. There were two articles on cognitive presence published each year in 2005, 2008, 2009, 2011, 2012 and 2015. For the year of 2004, 2006, 2007, 2010, 2013, 2018, there were only one article published each year. The number of the articles on cognitive presence has increased for every five years with 40% (n = 12) articles published from 2015-2019, followed by 30% (n = 9) articles published during 2010-2014 and 26% (n = 8) during 2005-2009 (see Figure 2).

3.2. Context of Published Cognitive Presence Research

3.2.1. Instructional Setting

Of the 30 articles, the majority of the studies were conducted in higher education (n = 27, 90%). Only two studies were conducted in K-12 and one in healthcare (see Figure 3).

Of the ten countries/regions represented in the 30 articles, most of them were carried out in the US (n = 10, 33.3%) and Canada (n = 9, 30%). About one to two articles were published in other countries/regions, including South Korea, Spain, UK, Australia, Mainland China, Iran, Netherlands, and Taiwan (see Figure 4).

3.2.2. Content Areas

The top five most common content areas included education (n = 9, 30%), engineering (n = 5, 16.7%), English (n = 4, 13.3%), medical/health (n = 3, 10%), and multiple subjects (n = 3, 10%). There were five other content areas, including extended studies program, human resource development, human sciences, research methods, and technology, that published only one article on cognitive presence, and one did not report the content area (see Table 4).

3.3. Research Methodology

3.3.1. Research Methods and Design

For research design, we categorized studies into three types, including quantitative, qualitative and mixed-method studies (see Figure 5). Out of 30 studies, most (n = 18, 60%) studies used quantitative research design followed by mixed-methods research (n = 9, 30%) and then qualitative (n = 3, 10%). Studies on cognitive presence and the corresponding research design and data resources are listed in Table 5.

Among the 18 quantitative studies, ten studies used content analysis and three studies used both content analysis and network analysis design. There were three studies that followed a quasi-experimental research design, one study each with a survey-based research, network analysis and correlational research design. Among the two qualitative studies, one used a qualitative research design, while the second one used a qualitative research design and content analysis. Among the nine mixed-method studies, four of the studies used an explanatory design and one study used an exploratory design.

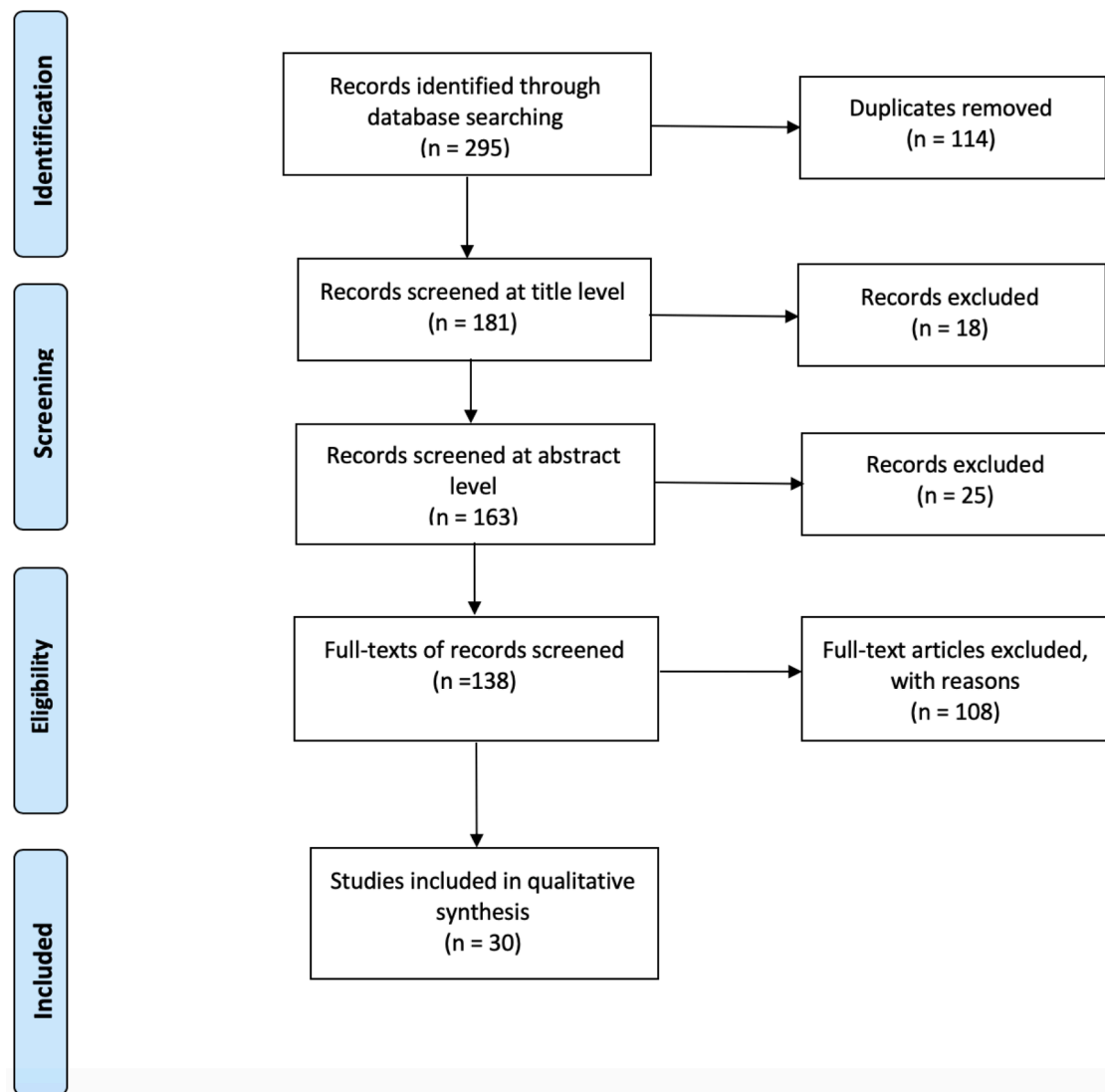


Figure 1. Prisma Flow Chart of the Cognitive Presence Systematic Review

### 3.3.2. Data Collection Methods

Out of the 30 studies, 73% of the studies ( $n = 22$ ) used one data collection method and 27% of the studies ( $n = 8$ ) used more than one data collection methods. Additionally, 16% of the studies ( $n = 5$ ) used two data collection methods and 10% of the studies ( $n = 3$ ) used three or more than three data collection methods.

Among the various data collection methods, online discussion forum was employed in 25 studies (83%). Among these studies, 17 studies used online discussion posts as the sole data collection method while eight studies combined online posts with other data collection methods. The second frequently used data collection method was survey/questionnaire ( $n = 5$ , 17%). Four out of the five studies used survey/questionnaire together with other data collection methods. Regarding the studies that employed interview as the data collection method ( $n = 5$ , 17%), about four studies combined interview with other data collection methods. Relatively less used data collection methods include observation, course grade, course materials, instructor reflection, and the process data collected from the online platform (see Figure 6).

### 3.3.3. Data Analysis Methods

The articles used a variety of data analysis methods. Content analysis of discussion transcripts was used the most ( $n = 25$ , 83%), followed by inferential statistics ( $n = 15$ , 50%), descriptive statistics ( $n = 11$ , 37%),

and network analysis ( $n = 5$ , 17%). Thematic analysis ( $n = 3$ , 10%), constant comparative analysis ( $n = 2$ , 7%), and behavior sequential analysis ( $n = 1$ , 3%) were least adopted data analysis methods. It should be pointed out that six studies (20%) employed more than one data analysis methods simultaneously including descriptive statistics, inferential statistics, and content analysis (see Figure 7).

### 3.4. Research Focus

The research focus was coded using inductive coding and was divided into four categories (see Table 6). About half of the studies focused on instructional strategies ( $n = 15$ , 50%) and some on learning outcomes ( $n = 7$ , 23%) in online courses. A few studies examined learning environments ( $n = 4$ , 13%) such as exploring aspects of an online course (e.g., blended learning or flipped classroom) or virtual platform, and some studies focused on the relationship between cognitive presence and teaching/social presence ( $n = 4$ , 13%) such as exploring relationship between the elements of social and cognitive presences in a community of inquiry.

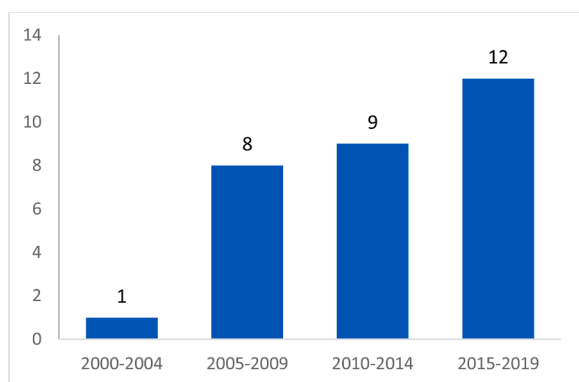
The authors of the primary studies used a variety of research methods to examine various research topics. Among studies on the impact of instructional strategies on cognitive presence, 11 of 15 studies used quantitative research methods, two used mixed-methods research

**Table 2**  
Description of the Coded Elements for Each Research Study

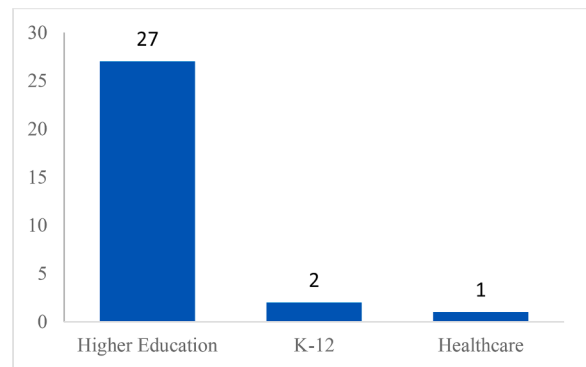
Element	Description
Article Description	Full reference including author(s), year of publication, article title, journal name.
Participant Demographic Information	Educational setting (higher education, K-12, or healthcare), content area, country/region.
Research Methods	Codes included mixed-methods, qualitative, and quantitative.
Research Design	Codes included correlational study, quasi-experimental study, survey research, content analysis, network analysis, triangulation, exploratory, explanatory, basic qualitative research
Data Collection Methods	Codes included interview, survey/questionnaire, discussion forum, observation, course grade, course materials, instructor reflection, and process data, data sources.
Data Analysis Methods	Codes included content analysis, descriptive statistics, inferential statistics, thematic analysis, constant comparative analysis, and behavior sequential analysis.
Primary Research Focus	Coded as an open-ended item. Themes were merged from the codes.
Specific Research Focus	Coded as an open-ended item. Subthemes were coded within each primary research focus.
Cognitive Presence Phase	Coded as triggering, exploration, integration and exploration

**Table 3**  
Journals of Cognitive Presence Publications (2000–2019)

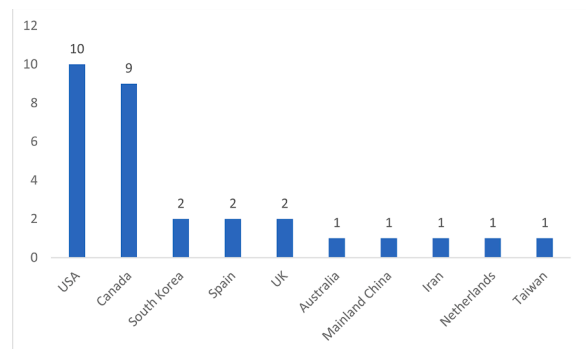
No.	Journal	Total
1	The Internet and Higher Education	8
2	Journal of Computing in Higher Education	3
3	American Journal of Distance Education	3
4	British Journal of Educational Technology	2
5	Online Learning	2
6	Computers & Education	1
7	E-Learning and Digital Media	1
8	Educational Media International	1
9	Interactive Learning Environments	1
10	Journal of Asynchronous Learning Networks	1
11	Journal of Computer Assisted Learning	1
12	Journal of Dental Hygiene	1
13	Journal of Distance Education	1
14	Journal of Educational Technology & Society	1
15	Journal of Educators Online	1
16	Journal of Interactive Online Learning	1
17	Language Learning & Technology	1



**Figure 2.** The Number of Articles Published from 2000 to 2019 by Every Five Years



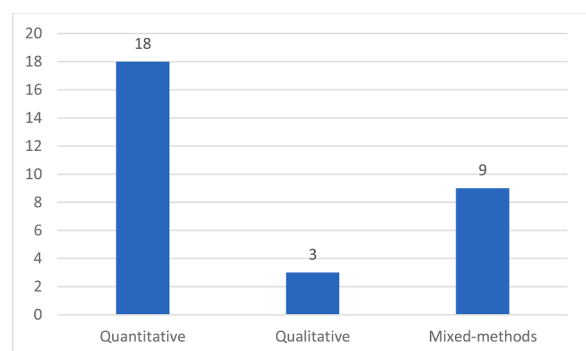
**Figure 3.** Instructional Setting of Published Cognitive Presence Research



**Figure 4.** Countries/Regions Represented in the Published Cognitive Presence Research

**Table 4**  
Frequency and Percentage of the Content Areas of Cognitive Presence Research

Content areas	F	%
Education	9	30.0
Engineering	5	16.7
English	4	13.3
Medical/Health	3	10.0
Multiple subjects	3	10.0
Extended Studies Program	1	3.3
Human Resource Development	1	3.3
Human Sciences	1	3.3
Research Methods	1	3.3
Technology	1	3.3
Did not report	1	3.3

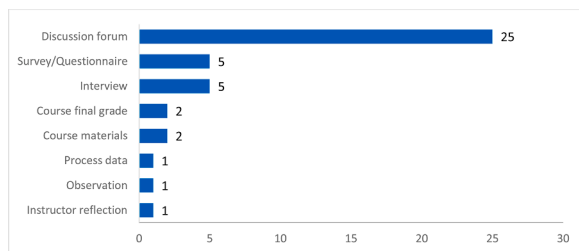


**Figure 5.** Research Design Used in Cognitive Presence Articles

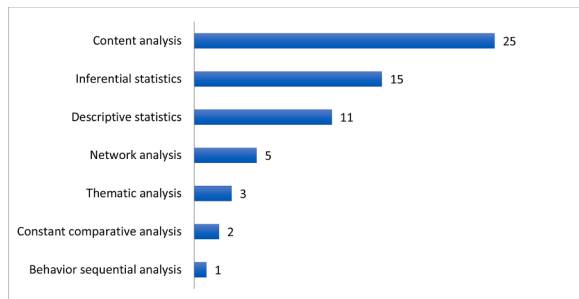


**Table 5**  
Primary Studies Organized by Research Methods and Data Sources

Research Design	Data Sources	Studies
Quantitative	Course/assignments grades (i. e., presentation, literature review paper, final projects, etc.), discussion transcripts, recorded discussion sessions, surveys, worksheets	Alavi & Taghizadeh [9], [24], [24], Chen & Chang [25], Chen et al. [5], Costley [6], Galikyan & Admiraal [12], Gašević et al. [27], Gibbs [11], Kanuka et al. [50], Kovanović et al. [51], Molnar & Kearney [7], Morueta et al. [39], Oh et al. [8], Olesova et al. [36], Oriogun & Cave [52], Oriogun [53], Rolim et al. [17], Wu et al. [14]
Qualitative	Discussion transcripts, interviews, recorded discussion sessions	Darabi et al. [42], Kanuka & Garrison [54], Vaughan & Garrison [55]
Mixed-Methods	Course/assignments grades, course materials, discussion transcripts, interviews, instructor's reflection, observations, surveys	Akyol & Garrison [44], Archibald [10], de Leng et al. [56], Garrison & Cleveland-Innes (2005), Gregori et al. [57], Hosler & Arend [15], Lee [16], Redmond [13], Wang & Chen [37]



**Figure 6.** Data Collection Methods Used in Cognitive Presence Studies



**Figure 7.** Data Analysis Methods Used in Cognitive Presence Studies

and two used qualitative research methods (see Table 6). In studies about learning outcomes, four studies used mixed methods, three studies used quantitative research method. Among studies focused on learning environments, two used quantitative research methods, only one used qualitative and one mixed-methods research methods. However, in studies focused on cognitive presence relationships, two studies used mixed methods and two employed quantitative method.

In terms of research topic focus (see Table 7), the most published research topics within instructional strategies were reflection on practice (n = 7), case-based learning (n = 5), inquiry-based learning (n = 5), and peer-facilitation (n = 5). On the other hand, least researched instructional strategies were article critique (n = 2), instructor facilitation (n = 2), and invited expert (n = 2). Within learning outcomes, most published research topics were cognitive presence levels (n = 6), critical thinking (n = 5), interaction (n = 5) and the least focus was on knowledge construction (n = 1).

**Table 6**  
Primary Research Focus of Cognitive Presence Studies

Research Focus	# of Participants	Research Methods	Specific Research Design	Study	
Instructional Strategies (15)	24	Quantitative	Content Analysis	[24]	
	31	Quantitative	Content Analysis	[25]	
	13	Quantitative	Content Analysis	[5]	
	219	Quantitative	Quasi-experimental	[6]	
	73	Qualitative	Content Analysis	[42]	
	8	Mixed-methods	Triangulation	[56]	
	82	Quantitative	Quasi-experimental	[27]	
	19	Quantitative	Content Analysis	[50]	
	19	Qualitative	Basic Qualitative Research	[54]	
	81	Quantitative	Correlational	[51]	
	15	Quantitative	Content Analysis	[7]	
	139	Quantitative	Quasi-experimental	[36]	
	27	Quantitative	Content Analysis & Network Analysis	[8]	
	11	Quantitative	Content Analysis	[52]	
	Not reported	Mixed-methods	Exploratory	[37]	
Learning Outcomes (7)	27	Mixed-methods	Triangulation	[44]	
	51	Quantitative	Content Analysis & Network Analysis	[12]	
	75	Mixed-methods	Explanatory & Survey Research	[58]	
	88	Mixed-methods	Triangulation	[57]	
	11	Quantitative	Content Analysis	[53]	
	36	Mixed-methods	Content Analysis & Basic Qualitative Analysis	[13]	
	123	Quantitative	Content Analysis & Network Analysis	[14]	
	107	Quantitative	Survey Research	[9]	
	Learning Environments (4)	189	Mixed-methods	Explanatory & Survey Research	[10]
		38	Quantitative	Content Analysis	[11]
12		Qualitative	Qualitative Research & Content Analysis	[55]	
208		Mixed-methods	Explanatory	[15]	
Relationship between cognitive and teaching/social Presence (4)	23	Mixed-methods	Explanatory	[16]	
	206	Quantitative	Content Analysis	[39]	
	81	Quantitative	Network Analysis	[17]	

### 3.5. Cognitive Presence Phases in Online Courses

Out of 30 studies, 25 studies used PIM with four phases of cognitive presence for content analysis of students' online discussions transcripts. However, two studies did not specify the percentage distribution of cognitive presence phases. When examining the range of cognitive presence in these studies, the majority of students' messages were classified as exploration (44 - 63%) and integration (29 - 74%), and smaller percentage as triggering (15 - 31%) and resolution (8 - 36%) (See Table 8). Eleven studies coded messages that didn't fit any of the four phases of cognitive presence as "other."

**Table 7**  
Research Topic Focus of Cognitive Presence Studies

Research Focus	Topics	Frequency count
Instructional Strategies	Reflection on Practice	7
	Case-based learning	5
	Inquiry-based learning	5
	Peer facilitation	5
	Debate	4
	Project-based learning	4
	Collaborative Learning	3
	Role Play	3
	Scaffolding	3
	Article critique	2
	Instructor facilitation	2
	Invited Expert	2
	Roles assignment	2
Learning Outcomes	Cognitive Presence Levels	6
	Critical Thinking	6
	Interaction	5
	Learning achievement	4
	Content knowledge	2
	Learning Process	2
	Quality of discussions	2
Learning Environments	Knowledge construction	1
	Blended learning	5
	Visual web-based application	2
	Flipped classroom	1
	Online Research Learning Resource	1
Relationships	Virtual Learning Centers	1
	Cognitive and Social Presence	3
	Cognitive and Teaching Presence	1

Note: Some studies used more than one instructional strategy

**Table 8**  
Percentage Distribution of Cognitive Presence Phases in Online Forums

	Triggering	Exploration	Integration	Resolution	Other
[24]	17	51	28	4	
[44]	7	19	50	7	17
[5]	11	54	29	1	5
[25]	11	58	22	1	8
[6]	21	52	26	1	
[42]	6	42	41	10	
[56]	16	41	27	8	8
[12]	14	38	43	5	
[27]	18	39	29	6	8
[11]	31	33	28	2	6
[15]	6	43	41	10	
[50]	11	53	26	10	
[51] (not included)	-	-	-	-	
[16]	13	67	16	4	
[7]	7	63	24	6	
[39]	21	52	26	1	
[8] (not included)	-	-	-	-	
[36]	2	22	74	2	
[53]	26	26	24	24	
[52]	23	21	17	19	20
[13]	3	49	15	33	
[17]	18	39	29	6	8
[55]	11	61	9	0	19
[37]	22	41	31	0	6
[14]	23	51	13	13	
Mean	15	44	29	8	5

## 4. Discussions

### 4.1. Need for More Studies Focusing on Cognitive Presence

The current study shows the publishing pattern of the articles on cognitive presence by examining the 30 articles that were collected from 2000 through 2019. It was found that the articles were published in multiple journals. About one-fourth of the studies were published in *The*

*Internet and Higher Education* whereas only one to three articles were published in the other 16 journals, indicating a need for other journals to pay attention to the topic of cognitive presence. Analysis revealed a steady growth of cognitive presence articles by every five years showing a positive trend in publishing cognitive presence research. This positive trend may be due to the need to design high quality learning in online courses that can provide deep and meaningful learning experiences in online courses. According to Garrison [34], "If a deep and meaningful learning outcome is the goal of an educational experience, then an understanding of cognitive presence is a priority" (p. 50). It seems like scholars are well aware of the importance of cognitive presence to facilitate high-level learning and exploring ways to effectively create it in their online courses. However, the number of articles published each year is relatively small where the maximum is three, suggesting that more scholars should further investigate cognitive presence. These findings support Hosler & Arend's (2012) conclusion that although the importance of cognitive presence to generate high-level learning in online environments is well documented in literature, it is the least researched of the three constructs of CoI framework.

Our analysis of the context revealed that most of the studies on cognitive presence were conducted in the United States and Canada whereas only less than one third of the articles study cognitive presence in countries/regions in Europe, Asia, and Australia. It is important for researchers to be aware of the unbalanced geographical publishing pattern, and more efforts should be spent in understanding cognitive presence in diverse cultural contexts [9]. Further analysis revealed that most (90%) of the articles on cognitive presence have been conducted in higher education context and only a small percent of the articles examined cognitive presence in K-12 and healthcare settings. Castellanos-Reyes [35] also noted a lack of research in K-12 and suggested that researchers are encouraged to build on developing work with K-12 and industry. It is possible that K-12 students demonstrate a different developing trajectory of cognitive presence compared to college students, which will benefit K-12 administrators and teachers in terms of managing their teaching practices. With respect to the content areas of cognitive presence articles, there is a good balance between the fields of arts and sciences. Although a variety of subject areas have been studied, there are still many important content areas need to be examined, such as business, laws, computer science, counseling, language classes, STEM, etc. [36, 17, 37].

### 4.2. Research Methods and Design for Cognitive Presence

In terms of research design, quantitative research methods were used the most with discussion forums as the main data source, which might be due to its easy access and being the primary space where cognitive presence is created and facilitated. Cognitive presence is facilitated through discourse and discussion forums can provide space to facilitate discourse for students. This corresponds to Shih et al. [38] results who noted that it is more convenient for researchers to carry out interpretative research in online environments because the online medium can keep records of the learners' learning processes including discourse and online interactions. Mixed-methods were the second most used methods, while qualitative research methods were least used. While some researchers suggest using both mixed-methods could help more accurately understand strategies to enhance cognitive presence in different learning modes [15, 39], others suggest a need for conducting more qualitative studies to develop an in-depth understanding of cognitive presence. Shea and Bidjerano [40] emphasized the importance of qualitative research saying that, "qualitative research that examines the nature of the discourse in online threaded discussions would shed light on the kinds of instructional conversations that lead to social and cognitive presence as well as those that result in lower levels of engagement and learning" (p. 552).

With respect to data analysis methods, findings reveal that content analysis was employed the most followed by inferential statistics and

descriptive statistics. This is possibly because most of the studies used discussion forum as the primary source of data collection methods. Galikyan and Admiraal [12] noted the importance of understanding cognitive presence through multilevel analysis saying that, “it would be interesting to apply multilevel analysis to investigate the impact of individual, group, and task variables on knowledge construction in computer-supported collaborative learning” (p. 7). However, few studies used network analysis, thematic analysis, constant comparative analysis, and behavior sequential analysis methods. Rolim et al. [17] suggested that a network analytic method can provide insights into the students’ interactions and a much richer understanding of the development of the students’ cognitive presence, going beyond simple message counts and statistical correlations.

#### 4.3. Research Focus in Cognitive Presence Research

The results of the study show that the most researched topic in cognitive presence studies is focused on instructional strategies. This is well aligned with Shih et al. [38] study that also found instructional approaches as the most published and most cited research topic of cognitive studies in the field of e learning. They concluded that this is because most studies focus on adapting tradition teaching and learning approaches into online environments. This result reinforces the importance of instructional strategies in online courses concluding that learners perform better when online activities are purposefully structured and strategically designed [41, 39]. This suggests that researchers have been exploring different instructional strategies to facilitate cognitive presence to maximize the quality of online learning experiences [24, 25, 5, 8]. More specifically, results revealed that researchers are mostly exploring instructional strategies focused on reflection on practice, case-based learning, inquiry-based learning, and peer facilitation. This is probably because all of these topics involve high-level learning such as analyzing the problem, constructing knowledge, and confirming meaning, which are the key elements of cognitive presence. Garrison [2] suggests that cognitive presence concerns the process of both reflection and discourse in the initiation, construction, and confirmation of meaningful learning outcomes.

The second most researched topic in cognitive presence studies is learning outcomes. Specifically, cognitive presence levels and critical thinking were the most commonly examined topics on learning outcomes. This is probably because cognitive presence assumes critical thinking as the goal of any educational experience [3]. If deep and meaningful learning is the goal of an online educational experience, then effective learning must take into consideration both the internal cognitive process (reflection) as well as the external contextual elements (collaboration) that precipitate and shape thinking [2]. This suggests that researchers are using practical inquiry model to explore both cognitive presence levels as well as critical thinking to improve higher-order learning outcomes in online environments.

Additionally, interaction was another frequently examined topic on learning outcomes in several studies. This is likely because interaction between instructor, students, and course content are the requisites for these collaborative learning environments requiring cognitive presence [8]. Therefore, researchers are interested in understanding how to bridge the communication gap between learners and instructors in online environments through exploring ways to design online courses to facilitate interaction. Darabi et al. [42] concluded that, “in order to generate higher-level learning in an online interactive environment, online discussions should demand cognitive collaboration of learners” (p. 217).

On the other hand, only ten studies explored learning environments. Although the focus of this review was on online learning, studies compared cognitive presence of different elements of an online course as well as tools used within an online environment. This resonates with the study conducted by Redstone et al. [29] that found that CoI survey is most commonly used to measure presences in different learning

environments as a way to compare different types courses, course elements in different settings, and to evaluate tools in online courses. Blended learning and visual web-based application were the most researched topic, however, more research on other learning environments such as video-based tools, collaborative platforms, learning management systems, virtual worlds, etc. may be valuable.

Although scholarly evidence confirms strong relationship between teaching presence and cognitive presence [15] as well as social presence and cognitive presence [35, 16, 39, 17], the number of published articles related to the relationship between cognitive presence and other presences are not many (4 of 30) in this study. This may be due to the fact that we excluded articles that focused on all three presences and only included studies that looked at the relationship of cognitive presence with either teaching presence or social presence. Since relationship between presences could play an important role in online learning, researchers suggest that more research is needed to help further our understanding and implementation of effective teaching presence in support of cognitive presence [15, 16, 39, 17]. This is a rich area of future research since cognitive presence requires strong teaching presence for learners to construct knowledge through discourse and reflection [29, 43]. Teaching presence is important to design appropriate online tasks and facilitate strategies that are essential to encourage learners toward a more advanced level of critical thinking and meaningful social construction of knowledge [44, 35]. Hosler and Arend [15] suggested that both qualitative and quantitative studies are needed to help further our understanding and implementation of effective teaching presence to promote cognitive presence in online courses.

#### 4.4. Cognitive Presence Phases in Online Forums

Cognitive presence is identified through frequency counts and percentages of four phases of discourse: triggering events, exploration, integration, and resolution. This review shows that the majority of cognitive presence messages fell into exploration and integration phases with a small percentage within triggering and resolution phases. This finding is aligned with previous studies that showed that exploration phase had the highest frequency of responses whereas resolution had the smallest frequency [26, 45]. This shows that when students participate in online discussions, they tend to spend more time exploring the problems through critical reflection and discourse to construct meaningful solutions or explanations during the integration phase. Garrison et al. [3] concluded that students tend to stay in their comfort zone by not leaving the exploration phase since integration and resolution are more intellectually demanding. Scholars have suggested that instructional design and strategies with a focus on facilitating integration and resolution phases play an important role in helping students attain higher level of cognitive presence [46, 2, 47]. Garrison & Arbaugh [48] suggested that the role of the facilitator is very important during the integration phase in probing ideas and encouraging participants to relate their ideas and concepts to real-world situations. The results provided evidence that to cultivate cognitive presence, teaching presence plays an important role in moving the discourse forward [2], therefore, instructors need to pay close attention to the nature of the task as well as designing the elements of social interaction within the course [24, 41, 49].

#### 5. Limitations

This study has few limitations. First, our review of literature focused on published articles in peer-reviewed journals. There may be some valuable information available on cognitive presence in book chapters, conference proceedings, dissertation and theses that were not included in this review. Additionally, this study was limited to the publications written in English so other relevant articles published in other languages on cognitive presence might have been excluded. We also reviewed only six databases so there is a possibility that this review may not have



included all articles published on cognitive presence.

## 6. Conclusion and Future Research

In this systematic review, we analyzed 30 journal articles on cognitive presence in online learning scholarship between 2000 and 2019. The review revealed several interesting trends that can inform scholarship on cognitive presence and promote reflection about where we are and where we need to go. First, despite the evidence that research on cognitive presence is growing, the number of articles published each year is relatively small. This underscores the need for more research on cognitive presence for effective online learning. Second, most of the studies were carried out in higher education in the U.S. and Canada within the field of education. Third, more than half of the studies used quantitative research design, of which discussion transcript was the most prominent method for data collection and content analysis was the most common method of analysis. Fourth, instructional strategies (reflection on practice, case-based, inquiry-based, and peer-facilitation) and learning outcomes (cognitive presence levels and critical thinking, and interaction) were the most researched topics. Finally, the majority of discussion posts are within exploration and integration phases of cognitive presence.

This review has implications for future researchers. By understanding the research gaps in existing research, researchers will be equipped to build upon and extend the research on cognitive presence to date addressing novel instructional strategies. Findings of this study not only highlight the need for more research investigating in online learning in higher education, but also how cognitive presence can be developed and facilitated in K-12 schools and in the field of healthcare. Researchers can use more qualitative studies utilizing more in-depth interviews and focus groups to develop an in-depth understanding of cognitive presence. Additionally, researchers should consider moving to more complex and sophisticated research including social network analysis and thematic analysis to understand effective implementation of cognitive presence in online courses. In addition, results of this study suggest the significant role of the instructor in cultivating cognitive presence and higher-level learning in regards to structuring the course content, implementing instructional strategies and facilitating collaborative learning. In this regard, researchers can focus on investigating interventions such as different aspects of course design, facilitation techniques, and instructional strategies to deliver online courses.

The findings also have implications for designers and instructors of online courses. They can better understand topics that are more extensively investigated (instructional strategies and learning outcomes) as well as the results of those that are insufficiently researched (learning environments and relationship of cognitive presence with other presences) to create cognitive presence capable of supporting high-level online learning. The findings reinforce the importance of including various strategies such as reflection on practice, case-based learning, inquiry-based learning, peer facilitation, debate, project-based learning, collaborative learning, role play, scaffolding, article critique, instructor facilitation, invited expert and roles assignment as instructional strategies to enhance cognitive presence in online courses.

The findings from this study also extend beyond entirely online courses to courses that include online components such as blended courses, flipped courses etc. Since online courses can provide interactive learning contexts, future studies can explore other learning environments such as video-based learning platforms, collaborative platforms, learning management systems, virtual worlds, etc. and how they impact cognitive presence.

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