

Effects of online presence on learning performance in a blog-based online course



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ABSTRACT

This study investigated how learners' perceived online presence contributed to their learning performance while participating in a blog-based university course. Although the literature evidently highlights that there is a necessity for online presence in online courses, concrete design approaches and empirical evaluation of the impact of online presence on learning performance in blog-based courses are lacking. An empirical study was therefore conducted to understand the relationship between individuals' perceptions of online presence, in terms of teaching, social and cognitive presences, and their learning performance, in terms of subjective and objective learning outcomes. Research questions were tested and data were analyzed using regression analysis. The results indicate that online presence has a significant influence on learning performance. A subsequent analysis found that cognitive presence played the most important role in blog-based online learning performance. This study also identified a significant relationship in learning performance between students' subjective and objective learning outcomes.

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1. Introduction

Driven by the rising need for cost-effective education offered to a broad audience, and enabled by the advancements in Internet and communication technologies applied to educational purposes, a growing portion of higher education is taking place in online contexts such as on the Web or in virtual learning communities (Dabbagh & Kitsantas, 2012). A prominent characteristic of online learning is a temporal and spatial separation among teachers and learners. While independence from a fixed schedule and physical location when attending online courses allows learners much convenience and flexibility (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015), the absence of a social context may present an important issue related to a sense of disconnectedness or isolation (Kruger-Ross & Waters, 2013; Wei, Chen, & Kinshuk, 2012), which is detrimental to the learners' cognitive development from a socio-cognitive perspective (Cunningham, 2015; Ellwardt, Aartsen, Deeg, & Steverink, 2013).

To provide online learners with a sense of presence similar to that in face-to-face instruction, it is crucial to offer interpersonal communication opportunities for students to socially engage with the teacher and peers. In fact, the importance of online presence has been highlighted by numerous studies (Garrison & Cleveland-Innes, 2005), and pedagogical practices capitalizing on interactive communication technologies

are well documented in the literature (Cunningham, 2015). Many online courses integrate social media into their delivery, while others incorporate a wide range of asynchronous facilities such as online discussion forums, wiki, and blog systems (Dabbagh & Kitsantas, 2012; Ke, 2010).

While social communication and interaction are essential for students to feel connected and to form interpersonal relationships, interaction alone does not guarantee student engagement in the process of cognitive inquiry, nor does it guarantee that cognitive presence is automatically in place (Garrison & Cleveland-Innes, 2005). Socio-cognitive approaches to online learning posit that online presence is a complex construct comprising a multitude of elements in different dimensions, including teaching presence and cognitive presence, in addition to social presence. Furthermore, these elements do not function independently, but rather, there is an interplay among them which forms many intersectional categories that function concurrently to form an integral whole to achieve the full potential of online learning outcomes (Akyol & Garrison, 2008; Garrison & Arbaugh, 2007; Garrison & Cleveland-Innes, 2005). The relationship of these intersectional categories is described by Garrison (2007) in a framework known as the model of Community of Inquiry (Col). A Col integrates social, cognitive, and teaching presence at the core of online learning experience. Based on this model, the success of blog-based online learning depends not on any single element of social interaction, but rather on the co-work of these elements interacting with one another. For a blog system to be cognitively effective, active dialog among peer participants must be fostered to articulate ideas and elaborate understanding. On the other

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hand, learners' reflective experiences should be stimulated to help them internalize the knowledge they have acquired so as to promote deep learning. With regard to teaching presence in learning courses, a considerable body of research agrees on a positive relationship between interaction with the teacher and perceived learning and satisfaction with the course (Swan, 2001). The role of the teacher goes beyond being a content provider and discussion moderator. Garrison and Akyol (2013) argued that participants in a learning community assume the role of both learners and teachers, in the sense that each participant not only constructs personal meaning but also facilitates and directs that process individually and collaboratively.

While online presence is widely accepted as one of the key factors determining learner experiences in online learning (Garrison, Anderson, & Archer, 2003), empirical evidence of the impact of blog systems on students' learning experience remains inconclusive. Conversely, the effectiveness of online courses facilitated by blog systems is at times subject to skepticism on various grounds that online environments are unable to provide interaction equivalent to face-to-face instruction (Kohlmeyer, Seese, & Sincich, 2011). Furthermore, given the complexity of interaction emergent from the many intersectional categories of CoI, the role of each of the constituent elements remains under-explored, and requires further clarification on the basis of actual implementation of blog-based online courses. To this end, we specifically designed a blog system named the Learners' Digest Blog (LDB) as the chief source of learning for a graduate level course "Digital Learning," in which the students were required to initiate discussion on specific topics relevant to the subject of inquiry, construct knowledge, respond to and rate others' posts, and interact with the instructor through Q&A. The design of the LDB strives to foster active group discussion, stimulate critical discourse, motivate participation, construct or co-construct knowledge, deepen understanding, and form a supportive learning atmosphere in the virtual environment. These learning activities on the LDB may enhance students' learning performance, which considered in this study in terms of the learners' subjective and objective learning outcomes. The former was assessed as the learners' perceptions of their learning performance and satisfaction while participating in the blog-based online course, whereas the latter was evaluated as the learners' blog-based course activities throughout the semester. We aimed to investigate both the cognitive and communicative aspects of students' learning through the use of the blog system over a semester of course participation. In attempting to better understand the role of various elements of online presence in students' learning performance attained from the blog-based learning environment through the lens of the CoI framework, we formulated the following research questions:

1. How do learners' perceptions of online presences (i.e., teaching, social and cognitive presences) affect their learning performance in a blog-based online course?
2. Which online presence among teaching, social and cognitive presences is the most important factor for learning performance?
3. Are there any differences between learners' subjective and objective learning outcomes?

2. Literature review

Research on online learning can be traced back to earlier distance education and telecommunication endeavors (Moore & Anderson, 2003). Many of these efforts were however heavily technically oriented, concerning practical issues of the development and implementation of the online learning environments (Sun, Sun, Odell, & Sundberg, 2003).

In parallel to these studies are socio-cognitive approaches that focus more on cognitive development in social contexts. Research and practice along this line commonly maintain that the essence of successful educational experience, no matter face-to-face, online, or hybrid, lies in the interplay of three core elements: teaching presence, social

presence, and cognitive presence (Garrison & Arbaugh, 2007). Garrison et al. (2003) argued that interactive and collaborative learning experiences enabled by recent developments in communication technologies are what distinguish online learning from previous paradigms of distance education prior to the advent of web-based social media tools. Research on online learning indicates that for online learning to be successful, the development of a supportive learning community is essential (Garrison & Akyol, 2013). In a collectively formed learning community, the teacher and learners could co-construct and share knowledge, respond to others' posts, reflect and comment on others' opinions, and elaborate on topics of mutual interest. In other words, learners in a learning community could perceive a sense of "presence" that is conducive to interaction among various entities involved in the learning process, including peer learners, the teacher, content, and technology.

2.1. The CoI framework

The CoI framework was initially constructed by Garrison et al. (2003) on the precept that effective online learning requires the development of community, in which higher order learning occurs when the students combine their personal experience with shared worlds of experience through interaction with the instructor and peers. Based on this framework, online presence is conceptualized as a composite construct that comprises three highly interdependent elements, namely teaching presence, social presence, and cognitive presence. The framework aims at establishing an online environment that goes beyond a social community for general social exchange and low-level cognitive interactions, and emphasizes the cultivation of higher-level learning (Akyol & Garrison, 2008; Garrison & Akyol, 2013). At the operational level, a CoI integrates the instructor's role in course design and facilitation, the learners' sense of community and belonging, and their cognitive engagement with the course content (Garrison et al., 2003). It could therefore be used as a theoretical guide to assess different educational approaches and strategies in facilitating a community of inquiry (Akyol et al., 2009).

Continued efforts on CoI research have sought to enhance the framework. Drawing on evidence from an ongoing project recording students' behaviors in CoI, Shea et al. (2012) contended that the existing framework may not have adequately represented the full range of instructional efforts involved in online learning. In particular, they identified learner discourse as a reliable construct that is not taken into account in most prior studies. Consequently, they suggested learner presence as an addition to the framework to reflect students' self-regulatory behaviors. Such a position, however, is rebutted as a violation of the fundamental assumptions of the CoI framework, since CoI environments built on collaborative-constructivist approaches are inherently inclusive of both individual (self-regulated) and distributed (co-regulated) experiences (Garrison & Akyol, 2013). In recognition of a recent movement in metacognition theory that has undergone a transition from individualistic models to a more socially situated orientation, Akyol and Garrison (2011) and Garrison and Akyol (2013) seek to incorporate a metacognitive perspective into the CoI framework. Based on evidence derived from the analysis of online discussion transcripts, they proposed a metacognitive construct which consists of three dimensions, including knowledge, monitoring, and regulation of cognition (Akyol & Garrison, 2011; Garrison & Akyol, 2013).

2.2. Online presences of the CoI framework

2.2.1. Teaching presence

Teaching presence, also known as instructor presence, plays an important role in building a learning community for students to co-construct and share knowledge. Anderson, Rourke, Garrison, and Archer (2001) defined teaching presence as the design, facilitation, and direction of cognitive and social processes for the realization of

personally meaningful and educationally worthwhile learning outcomes. According to this definition, teaching presence is inherently aimed at enhancing cognitive and social presence in online learning. The importance of teaching presence is highlighted as the “binding element in creating a Col” (Garrison, Anderson, & Archer, 1999, p. 96) which brings social and cognitive presences together (Akyol & Garrison, 2011). Elaborating on this definition, Garrison and Akyol (2013) explained that teaching presence is not necessarily the sole responsibility of instructors, because all participants involved in the online learning experience, including the instructors and the students, may assume the role of teaching presence because each participant not only constructs personal meaning, but also dynamically directs the way in which collaborative meanings are negotiated and constructed in the community.

Based on a quantitative content analysis of postings obtained from asynchronous discussion forums, Anderson et al. (2001) identified three categories of indicators of teaching presence – instructional design and organization, facilitation of discourse, and direct instruction. Using these indicators, researchers can measure the level of the teacher's presence in virtual classrooms. A substantial body of evidence has demonstrated strong correlations between quality of teaching presence and both student satisfaction and perceived learning (Moore & Anderson, 2003; Picciano, 2002; Swan, 2001, 2004). Swan (2001) suggested that interaction with instructors has a much larger effect on satisfaction and perceived learning than interaction with peers. Akyol and Garrison (2011) reported that specific forms of teaching presence, such as instructional leadership in facilitation, direct instruction, and appropriate course structure, have a positive effect on the promotion of deep approaches to learning, thus establishing and sustaining high levels of cognitive presence. Concerning learning outcomes, Szeto (2015) reported findings from case studies which indicated that the attainment of learning outcomes is more reliant on teaching presence than on the other two presences.

In this study, we designed a blog learning system as the main vehicle for communication, content delivery, and discourse facilitation. As instructional design and content preparation are performed by the instructor prior to the outset of the course, the teacher's efforts in these aspects are invisible to the learners once the course materials are uploaded to the learning system, and therefore cannot be fully examined using quantitative data collected from blog comments and Q&A logs. In recognition of this pitfall of quantitative methods, this study specifically constructed a survey to elicit learners' perceptions of the teacher's role in the full range of course activities.

2.2.2. Social presence

Social presence is arguably one of the most studied constructs in online learning. Based on the definitions of Tu and McIsaac (2002) and Tu (2002), social presence is the degree of feeling, perception, and reaction to another intellectual entity in computer-mediated communication environments. Within the Col framework, social presence is regarded as the ability of learners to project themselves socially and emotionally, thereby representing themselves as “real” people in a friendly and learning supportive environment (Garrison & Arbaugh, 2007). Social presence can be seen as functional in making cognitive presence more effective, as it provides learners with a relationship-fostering environment for meaning negotiation, collaborative knowledge construction, and critical thinking (Caspi & Blau, 2008; Garrison, Cleveland-Innes, & Fung, 2010; Kozan & Richardson, 2014; Szeto, 2015). As a measure of the feeling of the community with which learners identify themselves in online environments, social presence can be analyzed from three aspects, including affective expression, open communication, and group cohesion (Akyol & Garrison, 2008).

Social cognitive theory (Bandura, 1989) posits that an individual self-initiates and regulates his/her learning to achieve desirable learning outcomes. Interaction with peers and the situated environment contributes to the development of one's cognition, affect, and behavior. Social

learning through the use of new technologies and co-curricular activities has increasingly been adopted as a pedagogical strategy in higher education to harness the emancipatory power of space and interactions outside the formal curriculum (Ryan & Tilbury, 2013). While the dynamic nature of social presence is difficult to capture, studies have highlighted the importance of affective expression in establishing a climate for learning before open communication and group cohesion could develop (Akyol & Garrison, 2008). When provided with a trusting environment, learners can develop interpersonal relationships with other members of the community (Garrison et al., 2010), in which knowledge is socially constructed rather than transmitted or discovered, because increased opportunities for peer learning and interaction allow for the development of rich and elaborate thinking and knowing, which in turn contributes to students' learning at a deeper level (Bransford, Brown, & Cocking, 2000).

The role of social presence in establishing a trusting climate was confirmed by Caspi and Blau's (2008), which examined the three categories of social presence and their relations to perceived learning. Their analysis indicated that social presence affords learning by creating a convenient climate. Regarding the relationship between social presence and perceived learning, the study reported that social presence contributes to perceived learning more as a socioemotional source, while leaving cognitive source unaffected. Richardson and Swan (2003) examined the role of social presence in an online course by analyzing the relationships among students' perceived social presence, learning, and satisfaction. Their results indicated that learning activities involving group discussion or collaboration (e.g., class discussion and group projects) are perceived to be highly correlated with students' learning, as opposed to activities that could be completed individually. Armellini and De Stefani (in press) explored the roles each presence of the Col framework plays in a blended learning environment for teacher's professional development. Their findings highlight the central role of social presence in the teaching and cognitive presence discourse, suggesting that characteristics of “sociality” are so embedded in both teaching and cognitive presence that social presence can hardly operate as a stand-alone construct. Similarly, Kozan and Richardson (2014) reported a large and positive correlation between social presence and teaching presence, and a strong positive correlation between social presence and cognitive presence.

2.2.3. Cognitive presence

In resonance with Dewey's (1933) work on reflective thinking, Garrison (2007) defined cognitive presence as the extent to which learners in a Col are able to gain understanding and construct meaning through collaboration and reflection. Based on this definition, the concept of cognitive presence emphasizes the importance of collaboration in addition to reflective participation in the course of knowledge construction. Furthermore, cognitive presence also taps into the development of higher psychological processes, allowing students to integrate new meanings into their existing knowledge structure by acquiring analytical competence and critical reflection (Swan, Garrison, & Richardson, 2009).

Based on the Col framework, cognitive presence consists of four phases of practical inquiry (Swan et al., 2009). In a study examining online discussion-based inquiries, however, participants rarely went beyond the exploration stage, and most of their activities were concentrated on information sharing and brainstorming (Garrison & Arbaugh, 2007). Other studies also reported fewer cases of reaching the resolution and integration stages in comparison with those reaching the exploration stages (Kozan & Richardson, 2014; Rourke & Kanuka, 2009). Kovanović, Gašević, Joksimović, Hatala, and Adesope (2015) studied the effects of technology use profiles on students' level of cognitive presence within a Col, and their analysis yielded six profiles of technology use. The results indicated that each profile corresponds to a different phase of cognitive presence, suggesting that the level of cognitive presence varies in relation to patterns of technology use. Akyol and

Garrison (2011) and Garrison and Akyol (2013) examined learning processes and outcomes within a CoI. Their results indicated that high levels of cognitive presence can be attained and sustained by students in both online and blended courses, suggesting that cognitive presence in CoIs is associated with perceived and actual learning outcomes.

Examined from the perspective that considers the presences as an integral whole, cognitive presence has been found to have a strong and positive correlation with teaching and social presences. A recent study examining the interrelationships between and among the three presences indicated that the relationship between cognitive presence and social presence, and that between cognitive and teaching presence, remain positively strong when the third presence is controlled for; by contrast, the relationship between teaching presence and social presence may disappear when cognitive presence is controlled for (Kozan & Richardson, 2014).

2.3. Learning performance

Learning performance in online learning can be assessed from a number of aspects. For example, in the case of collaborative learning in social networks, learners have access to information, knowledge, and social support (Cho, Gay, Davidson, & Ingrassia, 2007). Therefore, social resource, that is, the availability of assistance and social support, is necessary for better performance. As Sparrowe, Liden, and Kraimer (2001) found in their study, social network has the most direct influence on students' final grade performance. Moreover, Russo and Benson (2005) investigated student perceptions of online presence and their relationships to cognitive and affective learning outcomes, indicating significant correlations between students' perceptions of online presence, their scores on an attitudes scale, and their satisfaction with their learning performance.

Ekwunife-Orakwue and Teng (2014) examined the impact of student interactions in online and blended learning environments on student learning outcomes, as measured by student grades and satisfaction. In this study, learning performance was measured in terms of learners' subjective and objective learning outcomes. Subjective learning outcomes are assessed as learners' performance and their satisfaction while participating in the blog-based course. It is measured on the basis of their perceptions of reading the contents of the blog, interacting with other learners, and engaging in the activities within the blog context, which can enhance knowledge (Quadir & Chen,

2015). Conversely, satisfaction has been widely used to evaluate learning outcomes (Abdous & Yen, 2010). Moreover, it has been suggested that the higher the students' satisfaction, the better the learning outcomes (Palmer & Holt, 2009). In this study, learners' satisfaction is measured through observation of variables such as pleasure and success during the learning process on the blog. On the other hand, objective learning outcomes are evaluated by learners' blog-based course activities such as posting content, commenting on others' posts, assignments, as well as their midterm report, final report, and presentation.

3. Design of online presence in a blog-based learning system

The LDB was used for a graduate level course "Digital Learning" in a renowned university in northern Taiwan. This course comprised six topics including game-based learning, social sites learning, computer-based learning, mobile learning, multimedia learning and synchronous learning. The content of this blog-based course followed most recent books related to those topics. The duration of this course was one semester. The blog integrated several learning features which may effectively facilitate online presence. For example, it provided weekly-based course content, a user-friendly context, and an interactive platform. A snapshot of the LDB is shown in Fig. 1.

In the course using the LDB, the learners gained an understanding of the course material through reading course content and each learner's posts, which gave them advanced insights into certain issues and thus enhanced their knowledge of the course content (Wang, Huang, Jeng, & Wang, 2008). Table 1 describes the LDB learning system which facilitated the teaching, social and cognitive presences.

In each post, learners' reactions and comments option allowed them to express their feelings, perceptions and reactions, as shown in Fig. 2. Examples of activities supporting cognitive presence included the discussion group, where the instructor raised meaningful questions for learners to think about and apply into actual use, as shown in Fig. 3.

The content performance of the blog is tracked by Google Analytics because several researchers (Plaza, 2012) have applied it and assessed its usefulness as a web analytics tool. Fig. 4 shows the number of comments compared with the number of weeks of course content in the LDB. As the number of weekly posts increases, the more self-expression/comments from learners are found. Fig. 5 shows the students' reactions regarding their classmates' posts.

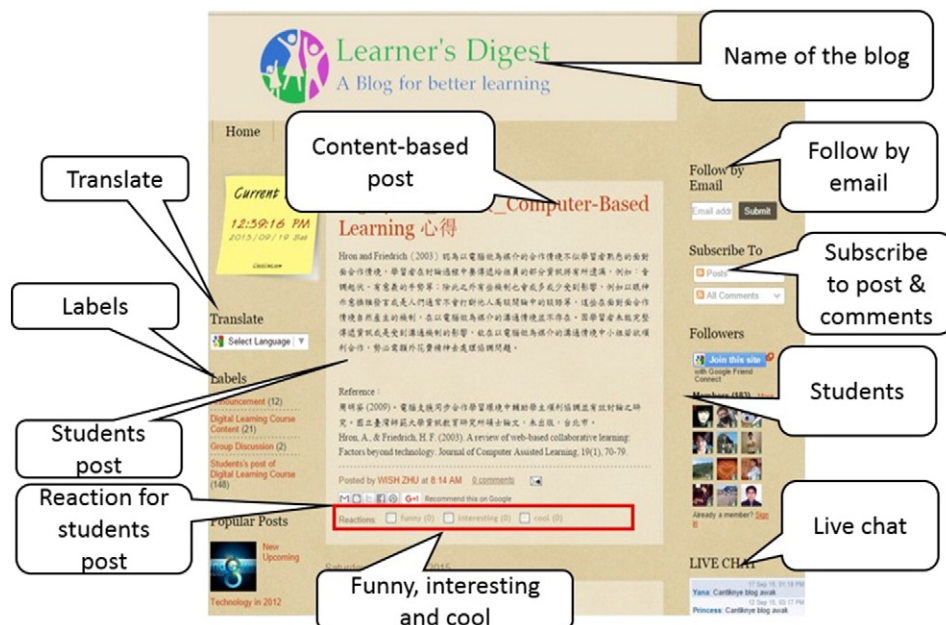


Fig. 1. A snapshot of the LDB.

Table 1

The LDB learning system facilitated the teaching, social and cognitive presences.

Elements	Categories	Indicators	Related with the LDB
Teaching presence	Instructional management	Defining and initiating	The LDB provided learning modules including precise learning objectives, assignments (i.e., multiple choice questions, group projects), instructional materials, learning activities, discussion forum, live chat, assessment criteria.
	Building understanding Direct instruction	Discussion topics Sharing personal meaning, focusing discussions	The LDB provided content related discussion topics to the course learners. The LDB shared learners' presentations and questions, focusing the discussion on content related issues, concrete discussion and understanding, etc.
Social presence	Emotional expression	Emotions	The LDB included a learners' reaction option from which they could choose funny, interesting or cool, for every post.
	Open communication	Risk-free expression	The LDB provided synchronous discussions via live chat providing the instructor with the opportunity to assess and read learners' emotions instantly.
	Group cohesion	Encouraging collaboration	By providing a separate discussion forum for each group, group members can discuss and contribute to their project work.
Cognitive presence	Triggering event	Sense of puzzlement	The course provided informative content related topics including game-based learning, social sites learning, computer-based learning, mobile learning, multimedia learning and synchronous learning. Learners were required to post at least two posts from each topic.
	Exploration	Information exchange	The LDB was constructed in a minimalist style, so that the learners would give as much feedback as possible. Comments and live chat facilities were also applied to facilitate queries from the instructor and students at any time. In the blog, posts were displayed in reverse chronological order to allow learners to easily identify the most recent posts.
	Integration	Connecting ideas	For each post, learners' reactions (such as funny, interesting or cool) and comments option allowed them to express their feelings, perceptions and reactions, as shown in Fig. 2. Examples of activities supporting cognitive presence included the discussion group, where the instructor raised meaningful questions for learners to think about and apply into actual use, as shown in Fig. 3.
	Resolution	Applying new knowledge	Learners were required to participate in reflective activities in which they discussed and wrote about what they had learned in class. Fig. 4 shows the number of comments vs. the number of weeks. As the weeks progressed, the self-expression/comments of the learners also increased. Fig. 5 shows the learners' reactions to their classmates' posts. Reflective activities such as learners creating slide presentations, blog posts at the end of each topic describing the content related ideas they had learned from the class and how the new knowledge can be applied in the real world.

Each student was required to post at least two posts on the lecture-related topic and update information after the lectures. Then, they could express how they felt about the comments by choosing the options of funny, interesting or cool. The current study included these three reaction options because it made the learning environment amusing and interactive to enhance the learners' social presence; these options were chosen with reference to some popular social networking sites. The interface for the three reaction options was designed as checkboxes so that the learners could easily choose the options based on their feelings. If learners did not find the post to be funny, interesting or cool, then they just

skipped it. In this way, they not only maintained good communication with their classmates, but also enhanced their learning performance.

4. Methods

A questionnaire was employed to examine online presences (i.e., teaching, social and cognitive presences) and learning performance (i.e., subjective and objective learning outcomes). The questionnaire is divided into four sections to specifically address the research questions formulated in this study. Section one includes three questions for capturing the respondents' demographic information such as age, gender and education. Section two consists of three questions for capturing their adoption time of computers and the Internet, and their experience of blog usage. Section three was used for identifying online presences including teaching presence, social presence and cognitive presence with ten, eight and eleven items respectively. The question items of the online presence construct were adapted from recognized scholars (Garrison et al., 2010; Shea & Bidjerano, 2010; Swan et al., 2008), and have already been used in formal research. The items were slightly modified to fit the context of the current study (a blog-based online course). Section four consists of six items that were used for identifying learners' subjective learning outcomes. These items were adapted from Authors (2014), Ducate and Lomicka (2008); Hsu and Lin (2008), and Lai and Chen (2011) and were slightly modified to fit the context of the current study. Each item in the online presence and subjective learning outcomes constructs was rated on a five-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). For assessing objective learning outcomes, the blog-based course activities such as posting content, commenting on others' posts, and assignments constituted 20% of the final score, while the midterm report, final report, and presentation constituted 15%, 35% and 30%, respectively. Details of the course activities and the grading policy of the blog-based course are shown in Table 2.

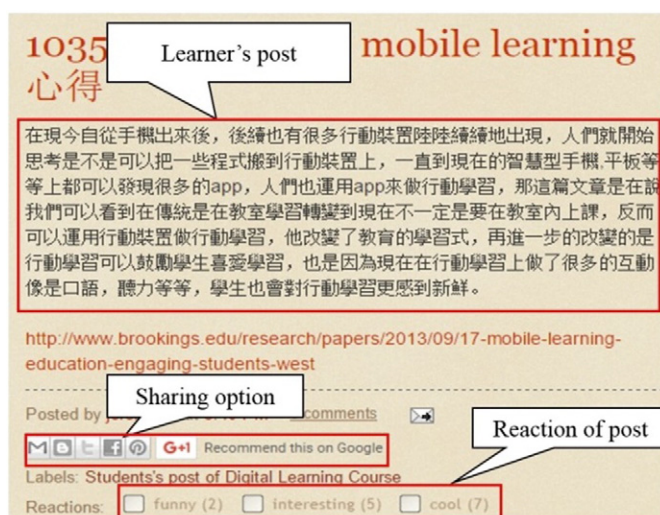


Fig. 2. Learners' feelings, perceptions, and reactions in the LDB interface.

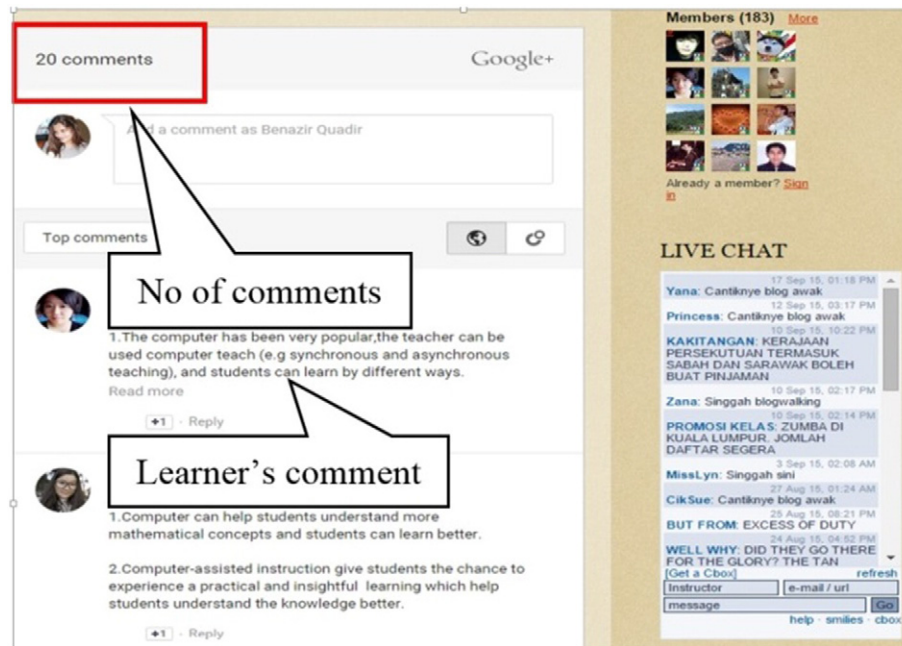


Fig. 3. Discussion group and reflective activities in the LDB interface.

In this study, Cronbach's alpha reliability was employed to judge the consistency of each item in the online presence and subjective learning outcomes constructs. The Cronbach's alpha for teaching presence, social presence, cognitive presence, and subjective learning outcomes was .851, .833, .861, and .811, respectively. All cases have good reliability (>0.7) (Nunnally, 1978). The internal consistency for all constructs was decided according to Cronbach's alpha. With the range of alpha scores between .811 and .861 obtained in this study, we conclude that the constructs are reliable and that the data are suitable for analysis. To achieve construct validity, the data were examined using principal component analysis as the extraction technique and varimax as the method of rotation. With a cut-off loading of .50 and an eigenvalue greater than 1.0, two of the items were dropped. The results of the exploratory factor analysis revealed that the factor loading of items varied from 0.527 to 0.884. The Cronbach's alpha values for each factor, the factor loadings of the items, and the descriptive statistics results of online presence and the subjective learning outcomes constructs are presented in Appendices A and B.

A total of 26 graduate students who took the digital learning course participated in this study. The demographic information of the participants is shown in Table 3. There were 15 (57.7%) males and 11 (42.3%) females, 21 (80%) were less than 25 years old, and 20 (76.9%) were master students. The majority of participants had computer and Internet experience of more than 10 years, but had blog experience of less than 10 years.

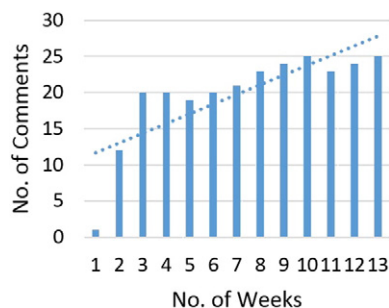


Fig. 4. No. of comments vs. no. of weeks of course content in the LDB.

5. Results

5.1. The effect of online presence on the objective learning outcomes of the blog-based online course

A regression analysis was used, with the measure of online presence as the independent variable and that of objective learning outcomes as the dependent variable. The results of the regression analysis are presented in Table 4. Online presences (teaching, cognitive and social presences) are a significant predictor of the objective learning outcomes of the blog-based online course ($F[1, 24] = 5.29, p < .05$). It was found that online presence significantly predicted students' objective learning outcomes ($\beta = .425, p < .05$). The squared multiple correlation coefficient, R^2 , was 18.1%, which means the online presence factor could account for 18.1% of the objective learning outcomes of the blog-based online course.

Table 5 shows that the teaching presence alone does not significantly predict the objective learning outcomes of the blog-based online course ($F[1, 24] = 2.731, p > .05$). For teaching presence, the squared multiple correlation coefficient, R^2 , was 10.2%, which means the teaching presence factor could account for 10.2% of the objective learning outcomes. On the other hand, the social and cognitive presences are significant predictors of the objective learning outcomes of the course ($F[1, 24] = 4.329, p < .05$) and ($F[1, 24] = 5.89, p < .05$), respectively. It was found that the social and cognitive presences significantly predicted the objective learning outcomes ($\beta = .444, p < .05$), ($\beta = .915$,

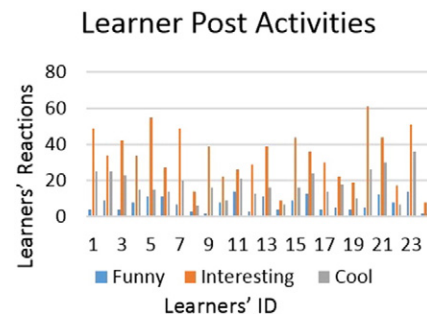


Fig. 5. Learners' reactions to peers' posts in the LDB.

Table 2
Course activities and grading policy.

Course activities	Weight	Explanation	Grading policy
Posting, commenting, and assignments	12%	Students were assigned six different topics related to digital learning course content. Each student was required to publish at least two posts on every topic studied. Moreover, each student was required to make a constructive comment on other students' posts (at least one comment on each topic).	• Posts 6% ($6 \times 2 \times .5 = 6$)
Midterm report	8% 15%	In total, each student was assigned eight questions by the instructor. • Group project • At least four students in a group • The instructor assigned a topic for each group. • Students were required to submit a research proposal including introduction, literature review and proposed methods.	• Constructive comments 6% ($6 \times 1 \times 1 = 6$) • Assignments 8% ($8 \times 1 = 8$) • Introduction 5% • Literature review 5% • Proposed methods 5%
Final report	35%	• Group project • Students were required to complete the research report including results, discussion and conclusion.	• Results 10% • Discussion 5% • Conclusion 5% • Report quality 10% • Writing and formatting style 5% • Content and completeness 15% • Presentation skills 10% • PPT flow and formatting style 5%
Individual presentation	30%	• Individual • Assigned an article to each student by the instructor • Required to present and upload a PowerPoint (PPT) file in the blog	
Total	100%		

$p < .05$). For social and cognitive presences, the squared multiple correlation coefficient, R^2 , was 15.8% and 19.7%, respectively, indicating that they could account for 15.8% and 19.7% of the objective learning outcomes of the blog-based online course, respectively.

5.2. The effect of online presence on the subjective learning outcomes of the blog-based online course

A regression analysis was used, with the measure of online presence as the independent variable and that of subjective learning outcomes as the dependent variable. The results of the regression analysis are presented in Table 6. Online presences (teaching, cognitive and social presences) are a significant predictor of the subjective learning outcomes ($F[1, 24] = 43.404$, $p < .000$). It was found that online presence significantly predicted subjective learning outcomes ($\beta = .802$, $p < .000$). The squared multiple correlation coefficient, R^2 , was 64.4%, meaning that the online presence factor could account for 64.4% of the subjective learning outcomes of the blog-based online course.

Table 7 shows that the teaching, social and cognitive presences are significant predictors of subjective learning outcomes ($F[1, 24] =$

15.04, $p < .000$), ($F[1, 24] = 26.63$, $p < .000$) and ($F[1, 24] = 54.78$, $p < .000$). It was found that the teaching, social and cognitive presences all significantly predicted the subjective learning outcomes ($\beta = .663$, $p < .000$), ($\beta = .707$, $p < .000$), ($\beta = .915$, $p < .000$). For the teaching, social and cognitive presences, the squared multiple correlation coefficient, R^2 , was respectively 38.5%, 52.6% and 70%, meaning that they could account for 38.5%, 52.6% and 70% of the subjective learning outcomes of the blog-based online course.

5.3. The relationship between learning performance of subjective and objective learning outcomes in the blog-based online course

Table 8 shows that there was a positive correlation between objective learning outcomes ($M = 81.06$, $SD = 5.91$) and subjective learning outcomes ($M = 4.173$, $SD = .53$), $r = .40$, $p < .05$.

6. Discussion and conclusions

This study explored the relationship between learners' online presences (i.e., teaching, social and cognitive presences) and learning performance in a blog-based learning environment. The results of this study indicate that online presence plays a significant role in predicting learners' learning performance. This study also further investigated the importance of online presence for learning performance, including both subjective and objective learning outcomes.

The present study found that teaching presence explained 10.2% of the variance of the objective learning outcomes, though at a marginally significant level. On the other hand, teaching presence explained 38.5% of the variance of the subjective learning outcomes and was statistically significant. More specifically, student perception of teaching presence has a moderately inverse but not statistically significant relationship to performance on the examination of objective outcomes, while student perceptions of teaching presence demonstrate a positive and

Table 3
Demographic profiles and descriptive statistics of the participants.

Characteristics	Categories	Frequency	Percentage (%)
Gender	Male	15	57.7%
	Female	11	42.3%
	Total	26	100%
Age	Less than 25	21	80%
	25 to 35	4	16%
	More than 35	1	4%
	Total	26	100%
Education	Master students	20	76.9%
	Doctoral students	6	23.1%
	Total	26	100%
Computer usage experience	More than 15	11	42.30%
	10 to 15	11	42.30%
	Less than 10	4	15.38%
Internet usage experience	More than 15	8	30.76%
	10 to 15	11	42.30%
	Less than 10	7	26.92%
Blog usage experience	More than 15	4	15.38%
	10 to 15	8	30.76%
	Less than 10	14	53.84%

Table 4
The results of regression of online presence on objective learning outcomes.

Model	SS	Df	MS	F	Sig.
Regression	158.28	1	158.28	5.29	.030
Residual	716.90	24	29.87		
Total	875.19	25			

IV = online presence and DV = objective learning outcomes.

Table 5

The regression results of teaching, cognitive and social presences on objective learning outcomes.

Model	SS	Df	MS	F	Sig.
<i>IV = Teaching presence and DV = objective learning outcomes</i>					
Regression	89.422	1	89.422	2.731	.111
Residual	785.773	24	32.741		
Total	875.19	25			
<i>IV = Social presence and DV = objective learning outcomes</i>					
Regression	133.74	1	133.74	4.329	.048
Residual	741.44	24	30.89		
Total	875.19	25			
<i>IV = Cognitive presence and DV = objective learning outcomes</i>					
Regression	172.644	1	172.644	5.89	.023
Residual	702.55	24	29.27		
Total	875.19	25			

statistically significant relationship to subjective outcomes. This result is quite similar to the subjective perspective of Swan's (2004) study, which found that teaching presence explained 38% of the variance of perceived learning in summer 2002 and 43% of the variance of perceived learning in spring 2003. Moreover, the results found a similar concept to that proposed in Akyol and Garrison's (2008) study of subjective output, which mentioned teaching presence as a significant determinant of student perceived learning and satisfaction. However, the results from Arbaugh's (2005) study supported a different concept of learning output, finding that teaching presence is a significant determinant of student objective learning output. The reason for this may be that it is the first attempt to provide a course on a blog-based learning platform for the participants. If the proposed course work had been repeated multiple times, the instructor would have rectified the course materials and methods. The consistency of the instructional design and organization indicates the important role of formatting consistent course content and discussion, which is important for achieving learning outcomes (Hiltz & Shea, 2005).

The students' perceptions of social and cognitive presence demonstrated a strong positive and statistically significant relationship with both subjective and objective outcomes. Social presences explained 52.6% of the variance in subjective and 15.8% of the variance in objective learning outcomes in the blog-based course. As shown in Fig. 4, over a period of several weeks, the students had posted more than 20 comments, indicating the presence of strong social interaction. In a physical classroom, students may feel shy to ask questions. They may also hesitate to judge or show their real reactions to their classmates' writing. However, the proposed blog-based learning system implemented in this study makes it easy for students to react to others' posts. One of the students in this course received 43 cool, 80 interesting, and 11 funny reactions from his classmates. The results of Richardson and Swan (2003) support the same concept of perceived learning as their study found that students with high overall perceptions of social presence also scored high in terms of perceived learning. On the other hand, the results from Picciano's (2002) study supported a different concept regarding performance on the examination, finding that students' perceptions of social presence had a small inverse but not statistically significant relationship with performance on the examination.

Table 6

The results of regression of online presence on subjective learning outcomes.

Model	SS	Df	MS	F	Sig.
Regression	4.59	1	4.59	43.404	.000
Residual	2.54	24	.106		
Total	7.13	25			

IV = online presence and DV = subjective learning outcomes.

Table 7

The regression results of teaching, cognitive and social presences on subjective learning outcomes.

Model	SS	Df	MS	F	Sig.
<i>IV = Teaching presence and DV = subjective learning outcomes</i>					
Regression	2.75	1	2.75	15.04	.000
Residual	4.38	24	.183		
Total	7.13	25			
<i>IV = Social presence and DV = subjective learning outcomes</i>					
Regression	3.75	1	3.75	26.63	.000
Residual	3.38	24	.141		
Total	7.13	25			
<i>IV = Cognitive presence and DV = subjective learning outcomes</i>					
Regression	4.96	1	4.96	54.78	.000
Residual	2.17	24	.091		
Total	7.13	25			

Moreover, this study found that cognitive presence played the most important role in the blog-based learning course. The results of Akyol and Garrison (2011) supported the same concept of perceived and actual learning outcomes, finding that cognitive presence is associated with perceived and actual learning outcomes. In the current study, cognitive presence explained 70% of the variance in the subjective learning outcomes and 19.7% of the variance in the objective learning outcomes. The reason could be that the most effective learning features included in this blog-based system such as the discussion forums allowed for the discussion of meaningful and thought-provoking questions and helped the students to think about and apply the course content. For example, the course instructor monitored and provided guidelines to the students for effective and reflective learning. Reflective learning activities could be as simple as students creating a slide presentation, blog post, or forum posting at the end of the course describing the critical things they learned from the class, how the class might have changed their thinking, and/or how they will apply the new knowledge beyond the class. Moreover, the students were divided into teams and were required to analyze a topic and present their findings in the form of a presentation and final report. The instructor provided questions and sought students' opinions. Students provided their opinions in a live chat environment. This can be effective, as it encourages students to appreciate diversity, and to acknowledge others' perspectives and points of view which differ from their own.

Future studies should consider adequate strategies for the indicators of design, facilitation of discourse, and direct instruction. For example, both formal and informal feedback from the instructor is important in order to enhance learning outcomes. Thus, more engagement may enhance students' expected feedback. Therefore, use of engagement tools such as live chat, discussion forum, or a weekly Google Hangouts meeting should be considered. These tools may enhance teaching presence as well as learning outcomes. In addition, future studies should provide options for voice recording and screen casting tools by the instructor. Moreover, intonation and voice tone both help to convey emotional expressions, which in turn help to create cognitive presence.

Table 8

The results of Pearson correlation between learning performance of subjective and objective outcomes in the blog-based online course (N = 26).

	Objective learning outcomes	Subjective learning outcomes
Objective learning outcomes	Pearson correlation Sig. (2-tailed)	1 .397*
Subjective learning outcomes	Pearson correlation Sig. (2-tailed)	1 .045

* $p < .05$.

Embedding content sharing options such as YouTube and Wiki may facilitate cognitive presence as well as enhance learning outcomes. Furthermore, integrating with social network tools such as Facebook and Twitter may enhance the social presence of learners as well as enhance their learning outcomes. Enhancing social presence by providing Google Hangouts or Skype meetings in developing effective collaboration strategies (Traphagan et al., 2010) could also enhance learning performance. Finally, future studies need to be undertaken with more representative online courses using the LDB to provide additional evidence.

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Appendix A. Reliability coefficients, descriptive statistics and factor loadings of the online presence constructs (adapted from Swan et al., 2008; Shea & Bidjerano, 2010; Garrison et al., 2010).

Item	Description	Mean	SD	Factor loading
<i>Teaching presence (Standardized Cronbach's $\alpha = .851$)</i>				
TP 1	The teacher clearly communicated important course goals on the blog.	4.38	.697	.527
TP 2	The teacher provided clear instructions on how to participate in the course learning activities on the blog.	4.15	.732	.646
TP 3	The teacher clearly communicated important due dates/timeframes for the learning activities on the blog.	4.31	.788	.680
TP 4	The teacher clearly communicated the important course topics on the blog.	4.27	.604	.706
TP 5	The teacher was helpful in identifying areas of agreement and disagreement on course topics.	4.00	.849	.662
TP 6	The teacher was helpful in guiding the class towards understanding the topic in a way which clarified my thinking.	4.12	.588	.659
TP 7	The teacher helped to keep the course participants engaged and participating in productive dialog on the blog.	3.96	.720	.739
TP 8	The teacher encouraged the course participants to explore new concepts in this course on the blog.	4.04	.916	.601
TP 9	The teacher's guidance reinforced the development of a sense of community among course participants.	3.92	.796	.783
TP 10	The teacher's intervention helped facilitate the flow of the course on the blog.	4.00	.894	.582
<i>Social presence (Standardized Cronbach's $\alpha = .833$)</i>				
SP 1	Getting to know other course participants on the blog gave me a sense of belonging in the course.	4.04	.824	.864
SP 2	The blog-based learning environment provided adequate tools for social interaction.	4.27	.724	.819
SP 3	I felt comfortable communicating through the tools provided in the blog.	4.08	.845	.884
SP 4	I felt comfortable participating in the course discussions on the blog.	4.15	.784	.528
SP 5	I felt comfortable interacting with other course participants on the blog.	4.04	.720	.710
SP 6	I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.	3.88	.816	.588
SP 7	I felt that my point of view was acknowledged by other course participants.	3.77	.863	.722
SP 8	Discussions on the blog with other course participants helped me to develop a sense of collaboration.	3.88	.864	.724
<i>Cognitive presence (Standardized Cronbach's $\alpha = .861$)</i>				
CP 1	Problems posed by other course participants	3.88	.796	.797

(continued)

Item	Description	Mean	SD	Factor loading
CP 2	increased my interest in course issues on the blog.			
CP 2	I felt motivated to explore content-related questions on the blog.	3.92	.999	.784
CP 3	The teachers' instructions are thought-provoking.	4.04	.720	.689
CP 4	I utilized a variety of information sources to explore problems or assignments posed on the blog.	3.96	.871	.659
CP 5	Brainstorming and finding relevant information helped me resolve content-related questions on the blog.	4.04	.675	.556
CP 6	Commenting on the blog was valuable in helping me appreciate different perspectives.	4.15	.849	.781
CP 7	I was able to combine information learned from different topics to answer questions raised in activities on the blog.	4.19	.675	.709
CP 8	Learning activities on the blog helped me construct explanations/solutions for the posted questions.	4.35	.634	N/A
CP 9	I was able to reflect on the feedback, comments and discussions to understand the critical concepts of the course content.	4.15	.562	.718
CP 10	I can describe ways to apply the knowledge shared in e-learning practices.	3.85	.675	N/A
CP 11	I have developed solutions to course assignments that can be applied in real practices.	4.00	.834	.530

Appendix B. Reliability coefficients, descriptive statistics and factor loadings of the subjective learning outcomes constructs (adapted from Ducate & Lomicka, 2008; Hsu & Lin, 2008; Lai & Chen, 2011; Quadir & Chen, 2015).

Item	Description	Mean	SD	Factor loading
<i>Subjective learning outcomes (Standardized Cronbach's $\alpha = .811$)</i>				
LP 1	Using the "Learner's Digest" blog improved my knowledge of digital learning courses including different digital learning topics.	4.42	.578	.848
LP 2	I acquired some useful knowledge through interacting with other users on the "Learner's Digest" blog.	4.19	.694	.836
LP 3	Engaging in the activities within the blog context enhanced my skills of using Web 2.0 applications.	3.96	.774	.778
SA 1	I was very satisfied with the "Learner's Digest" blog.	4.12	.766	.817
SA 2	While participating in the blog, I experienced a sense of pleasure.	4.12	.864	.623
SA 3	It is worth participating in the "Learner's Digest" blog.	4.23	.765	.807

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