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Co-Construction Concept Through Cloud-Based Social Network Platform Design, Implementation, and Evaluation

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Abstract

Today's learners can easily share their thoughts on their social networks, and this movement, undoubtedly, has been affecting their learning. However, learners in such an ad hoc social network environment need a deliberate design to support their idea sharing and concept exchange. Gaining insights into how to stimulate concept sharing in a social network helps learners learn. To this end, this study examined how to design a cloud-based concept construction platform, and analyzed the users' interaction behaviours on the platform. A cloud-based platform named CoCoing.info was implemented to achieve the aim. The platform has three major functions: (a) co-construction concept building, (b) social network organization, and (c) concept circulation among social networks. Seven hundred and twenty-six accounts registered on the platform. Users constructed 2,121 concepts using 20,049 nodes, and 1,618 files were established. The access statistics results indicated that the platform was used throughout the day, in which the ratio of in-class to after-class access was 0.59:0.41. Among the interactions, 31.24% belonged to concept construction and 68.76% were user responses. Meanwhile, the key player social networking analysis results indicated that teachers appear to play a crucial role in initiating concept construction and triggering social interaction within the type of concept construction social network.

Keywords: co-construction concept, social networking organization, cloud-based platform

Introduction

Social networking applications, such as Facebook, Line, Academia.edu, and ResearchGate, have become ubiquitous in everyday life, and their potential functions for learning and open education have begun to be considered (Lampe, Wohn, Vitak, Ellison, & Wash, 2011; Meishar-Tal & Pieterse, 2017). However, these social networking applications, commonly used in our day-to-day lives, may not be easy to use in education if they lack important functionalities that enable learning (Mnkandla & Minnaar, 2017). Currently, most of the social networking applications focus on encouraging users to be constantly aware of what their friends do or care about; rarely do they foster a persistent sense of idea or concept construction (Lewis, Pea, & Rosen, 2010). Providing users an online space exclusively may not assure their learning. Learners actually require some well-designed learning activities, such as concept construction and exchange, in order to learn successfully.

Technology, such as Web 2.0, knowledge building, and computer-supportive collaborative learning, indicates that users on the Internet are able to extensively collaborate and serve as active contributors (O'Reilly, 2005; Scardamalia & Bereiter, 2014; Wasson, Ludvigsen, & Hoppe, 2013). In particular, users who have similar interests can create their own knowledge and learn together rather than only discover knowledge. Such users' work is primarily valued for what it contributes to the group. More specifically, with the linking capacity and ability to integrate users' contributions, social networking applications have the potential to be useful in guiding people away from the popular "participation" framing model to a "co-creation" model (Lewis et al., 2010).

To this end, this study examines (a) how to support learners in taking the initiative to construct their concepts individually and collaboratively, and (b) how to help learners circulate their concepts in a social networking environment. In terms of supporting learners to construct their concepts, a concept map may be a useful tool because it is well established and widely used in many learning environments. In terms of circulating a learner's concept, a seamless cloud-based social networking platform can be an effective approach because it provides instant feedback to users anytime and anywhere. On the basis of the aforementioned arguments, this study investigated the effects of learners' co-construction concept and evaluated how learners can interact and learn from social networking platforms seamlessly and effectively.

Background

As mentioned above, the use of social networking applications has surged globally in recent years; however, a low percentage of students and instructors use social networking applications for educational purposes since using them for learning requires a deliberate learning design, either in formal or informal learning environments (Chen & Bryer, 2012). From the learning perspective, a social networking application combined with a concept map design can facilitate learners' social interaction and organization of concepts. Therefore, in this section, we elaborate upon Social Networking Enhanced Learning and Concept Map factors.

Social Networking Enhanced Learning

Social media and social networking applications demonstrate the potential for facilitating students' social interaction. By participating in an online social network, people who share common interests and goals can interact and exchange information and knowledge (Scardamalia & Bereiter, 2014). Such phenomenon is consistent with the results obtained by Al-Rahmi, Othman, and Yusuf (2015) that social media can facilitate collaborative learning and engagement. Social networking technology has additional affordances that may enable new forms of learning to be performed in online communities, such as massive open online courses (Sharples, Kloos, Dimitriadis, Garlatti, & Specht, 2015), and provide new opportunities for designing and implementing advanced learning environments (Hwang, Wang, & Lai, 2015). Students' social interactions in online communities have contributed to the development of new paradigms and methodologies in education (Putnik et al., 2016).

However, Gülbahar, Rapp, Kilis, and Sitnikova (2017) argued that social media and social networking applications cannot achieve educational purposes without a deliberate learning activity design. With a deliberate learning activity design, learners can achieve higher learning performance. For example, Mnkandla and Minnaar (2017) found that social media could adopt a conceptual framework for online collaborative learning (OCL) to facilitate deep learning and the creation of knowledge in e-learning at higher educational institutions. Gülbahar et al. (2017) also found that providing instructors with a social media toolkit served as a guide to steer the students' discussions in the appropriate direction. Such social media toolkit provides instructors with guidance regarding the effective selection and integration of social media into their courses. These findings indicate that the social networking technology is a promising tool for learning purposes; however, these findings also point out that deliberate learning activity designs are the most critical barriers to adopting social networking technology in online learning.

Concept Map

A concept map is regarded as a tool to construct complex knowledge through logical and systematic summarization and organization. In the presence of the sequence of concepts and the relation among structures and hierarchies, concept maps can thus promote meaningful learning (Novak, 1998). The concept map tool is widely used in various knowledge creation and modeling fields such as web-based information-seeking activities (Chu, Hwang, & Liang, 2014), instructional design (Hwang, Yang, & Wang, 2013), achievement and interests of learners (Chiou, 2008) and computer-based knowledge assessment (Weinerth, Koenig, Brunner, & Martin, 2014). Moreover, because of its connective ability, a concept map can be modified to encourage learners to organize their social networking organization, represent their knowledge, and circulate their knowledge among friends.

Most of a learner's knowledge is implicit, and a mechanism is required to lead the learner to organize and circulate his or her concepts in a learning activity (Sun & Chen, 2016). Specifically, certain learning activities, such as concept construction and exchange, should be merged into the social networking application design. Technology-enhanced concept maps help learners easily construct concepts, facilitate modification to enable the maps to manage large representations for a complex domain, and allow groups of people to participate in their creation (Cañas & Novak, 2008). Therefore, using cloud-based computing technology and a concept map design enables knowledge to be easily organized and transmitted. Digitalized concept maps, in particular, help learners to discuss their ideas with peers through their social networks.

Cloud-Based CoCoing.info Platform

To gain insights into how to stimulate concept-sharing in the social network, a platform named CoCoing.info was implemented. On the platform, learners could construct and share their personal concepts of themselves (for archiving), to their friends and groups (for peer-sharing), and to the public (for dissemination). As shown in Figure 1, the CoCoing.info has three main mechanisms: (a) co-construction concept building, (b) social network organization, and (c) concept circulation among social networks. The details of these functions are elaborated in the following paragraphs.

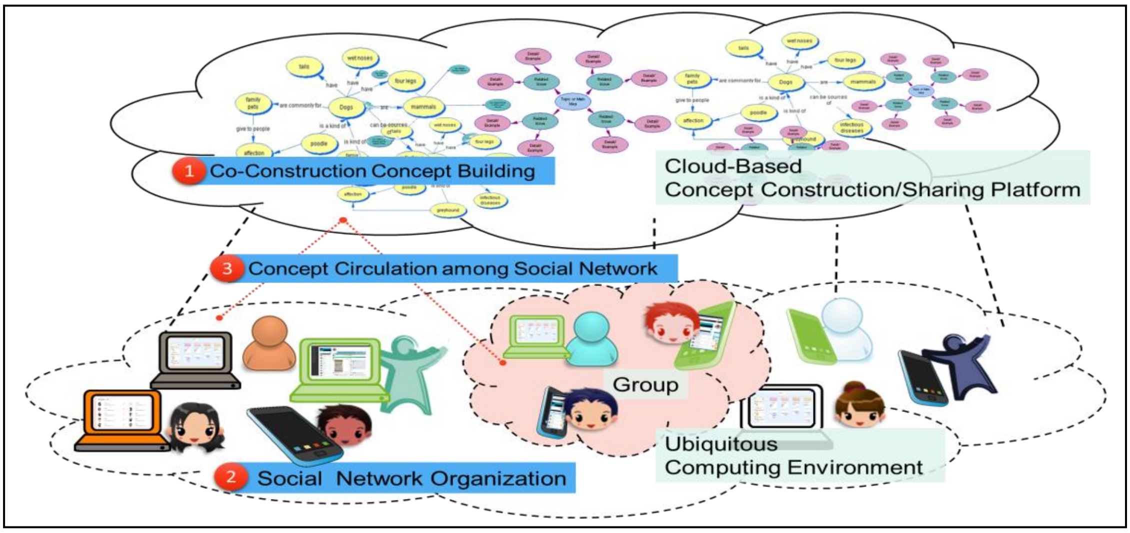

Figure 1. Cloud-based concept construction and sharing platform scenario.

Co-Construction Concept Building

To help learners represent and explicate their personal concepts systematically, the connective property of a concept map was applied. Specifically, the co-construction concept building function on the CoCoing.info platform allowed the learners to construct, edit, or share concepts in the cloud-based online environment individually or collaboratively. Learners could explicate their ideas by organizing their thoughts into a map that had creating, editing, and archiving functions on various devices (e.g., desktop computer, tablet computer, or mobile phone).

Figure 2 illustrates several concept construction functions, namely (a) adding a node, (b) deleting a node, (c) editing a node, (d) colouring a node, and (e) receiving peer responses.

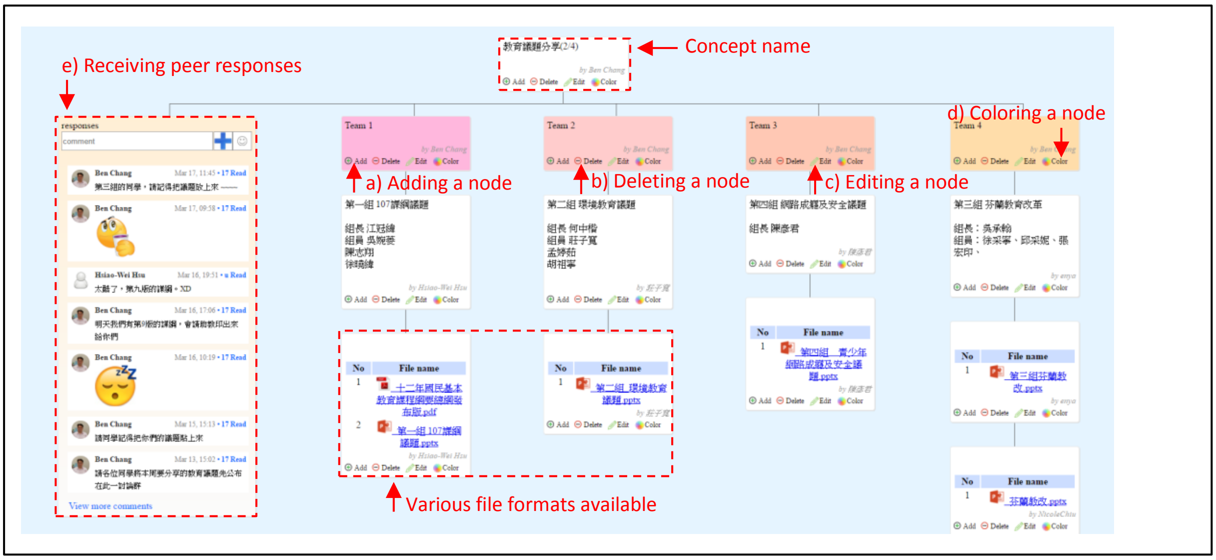

Figure 2. Co-construction concept building function interface.

The details of each function are elaborated as follows:

a) Adding a node: Upon clicking the “Add” button at any node, an associated child node was created. Learners could add more nodes by continuously clicking on the “Add a node” button.

b) Deleting a node: Upon clicking the “Delete” button at any node, the selected node was removed. With the “Add a node” and “Delete a node” functions, learners were able to draw the concept outline.

c) Editing a node: The abundance of Internet resources provides users with various integrated applications. To offer users a convenient method for editing a concept node in different data files, a concept node editing interface (Figure 3) was provided. Within the interface, a learner can:

1. insert a sentence to describe a concept node;
2. post a URL to link a concept to a resource on the Internet;
3. upload files, including Word, Excel, PowerPoint, PDF, and GIF files; and
4. share photos captured on mobile phones instantly.

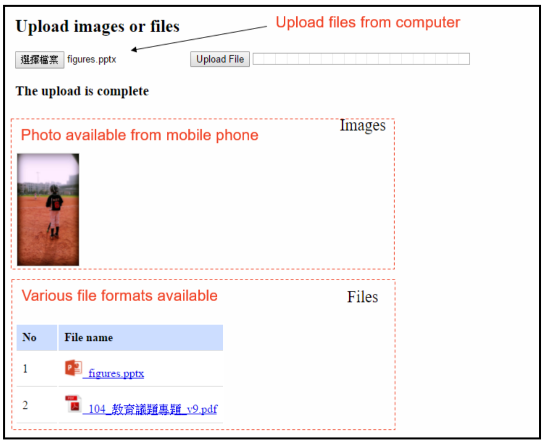

Figure 3. Concept node editing interface.

d) Colouring a node: A computer palette was provided so that users could change a node's colour according to their preference.

e) Receiving peer responses: Accompanying each created concept was a section called the "responses area," in which a learner's peers could provide feedback to the learner. To enable the learner's peers to provide their feedback rapidly and conveniently, response content in the form of either text or emoji icon was enabled, which allowed the peers to offer various and vivid responses.

Social Network Organization

On the CoCoing.info platform, learners could develop their owned social network by linking with their peers, and learners could also organize their friends into a common interest group. The platform also automatically recommended new friends to learners; learners only needed to click on a confirmation button to accept. As shown in Figure 4, the social network building interface has six subfunctions. They are:

a) Searching for people on the CoCoing.info platform: Learners could search for their peers on the CoCoing.info by providing either the peer's name or email address.

b) Searching for a group on the CoCoing.info platform: Similarly, learners could search for groups on the CoCoing.info by inputting the group name.

c) Adding a new friend: Learners could add their friends by inputting the friends' email addresses. Registered users could also invite their friends to join their social network by adding the friends' email addresses. Once an invited user approved the invitation, the invited friend was added to the user's social network.

d) Recommending friends: The CoCoing.info platform automatically recommended some friends to a learner based on the learner's social network analysis results. The guiding rule for recommending friends was that a friend's friends should also be the user's friends.

e) Group management: Learners could join common interest groups and share their idea through those established groups.

f) Seeing a user's friend list: All learners' friends were listed with their photo and email in the users' friend list.

Figure 4. Social network organization function interface.

Concept Circulation Among Social Networks

The circulation of users' created concepts among their social networks is crucial because circulating these concepts creates more value. On the CoCoing.info platform, learners showed their collected personal concept list, as depicted in Figure 5. The concept list source was derived from learners' peers who share ideas with them. More specifically, all of the structured concept maps created by learners and their peers were collected as a concept list (Figure 5); within the concepts list, learners could view all of the concept created by themselves or shared by their friends. Each concept was displayed as an idea block. Two colours, green and blue, were adopted to represent the concepts that had been created by learners or shared by their peers, respectively.

The details of the concept circulation among social networks subfunctions are:

a) Concept sharing with learners' peers: This function enabled learners to share their concepts with their friends or to a group of people.

b) Concept list: All concepts shared by peers were collected and listed in a concept list. Learners could select one of the nodes listed in a concept list to peruse the details of the concept. The details were listed on the right-hand side of a concepts list, which was divided into the content of the concept division and peers' responses on the concept division.

c) Concept operation utility: The utility features of a concept, including forward, share, collect, and edit, were also provided for learners. The concept construction interface presented in Figure 2 was displayed when a learner selected the edit button on the utility.

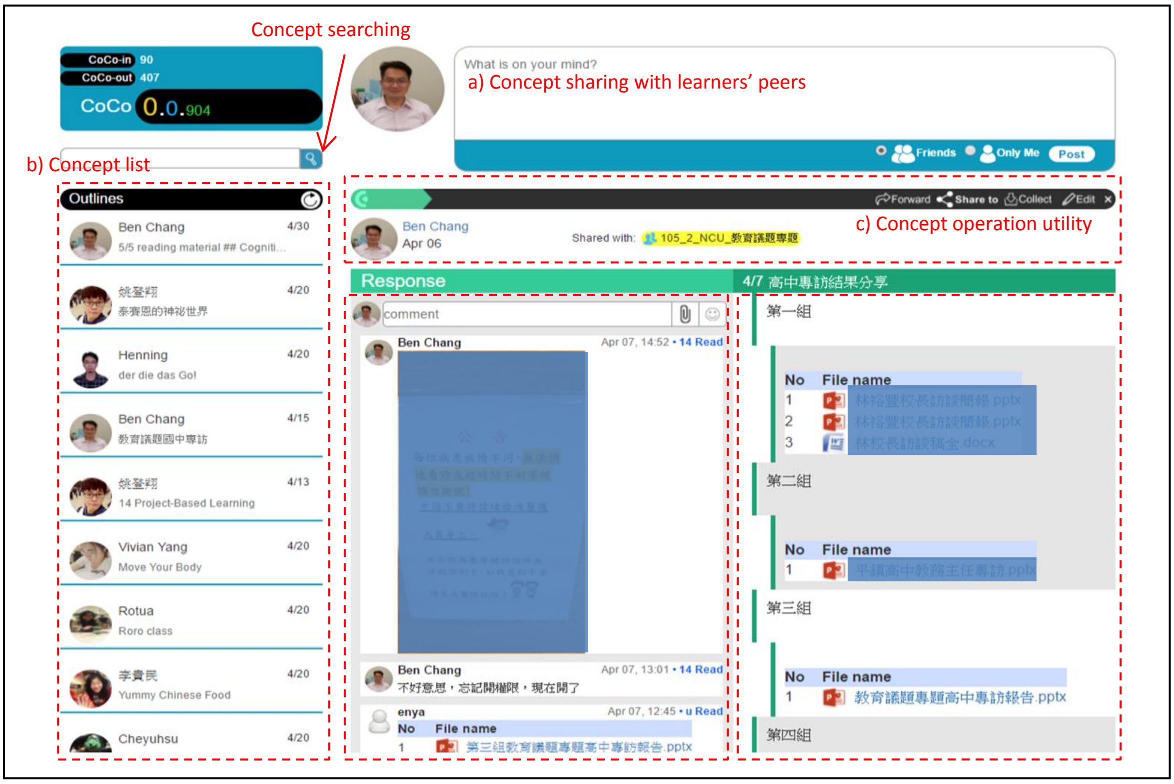

Figure 5. Concept list interface on a personal computer browser.

To enable learners to access the CoCoing.info platform on different devices, responsive web design (RWD) technology was adopted; this provided a different user interface for various devices. For example, Figure 5 shows a personal computer browser interface, and Figure 6 presents a mobile phone user interface.

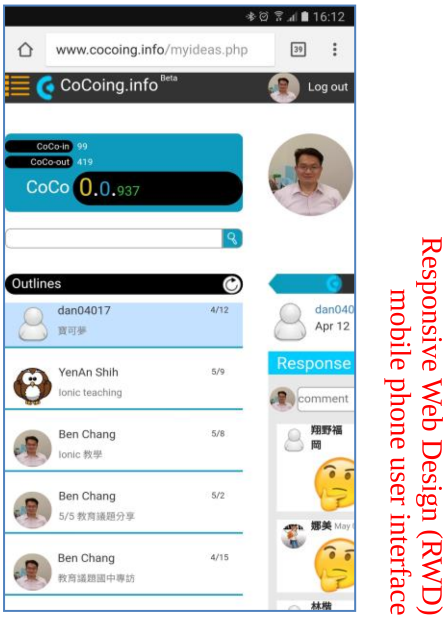

Figure 6. Concept list interface on a mobile phone browser.

Learners had four avenues through which to share their ideas:

a) Archive: Learners could only edit their own concepts and were able to archive these concepts to their personal collections on the CoCoing.info platform.

b) Share their concepts with selected friends: Learners select some friends with whom they wanted to share their thoughts.

c) Share their concepts with a group of friends: Learners could organize an unlimited number of groups and could share their thoughts with those groups.

d) Share their concepts with the public: Learners could share their ideas with the public so that anybody who has Internet access could view their ideas.

Results and Discussion

The CoCoing.info platform was available online on November 1, 2016. To evaluate the platform effects, the user data spanning from the launch date of the site to the end of April 2017 were obtained and analyzed. The current study was designed as a descriptive study to explain events and more thoroughly understand the platform. A series of evaluations covering Access Statistics, Concept Creation versus Responses, and Keyplayer Metrics were conducted to study learners' preferences toward those functions.

Access Statistics

The login information of all users was saved into the databases for analysis. Figure 7 displays the access statistics results, revealing that the CoCoing.info system was used throughout the day. The very high access rates were noted between 08:00 and 12:00 noon, and between 13:00 and 17:00, which are in-class times. The system also had high access rates after class. The ratio of in-class to after-class access was 0.59:0.41 (approximately 6:4). The comparing rate indicates that the system was used both during and after classes. This phenomenon could lead to a "breaking of the walls" of physical classrooms.

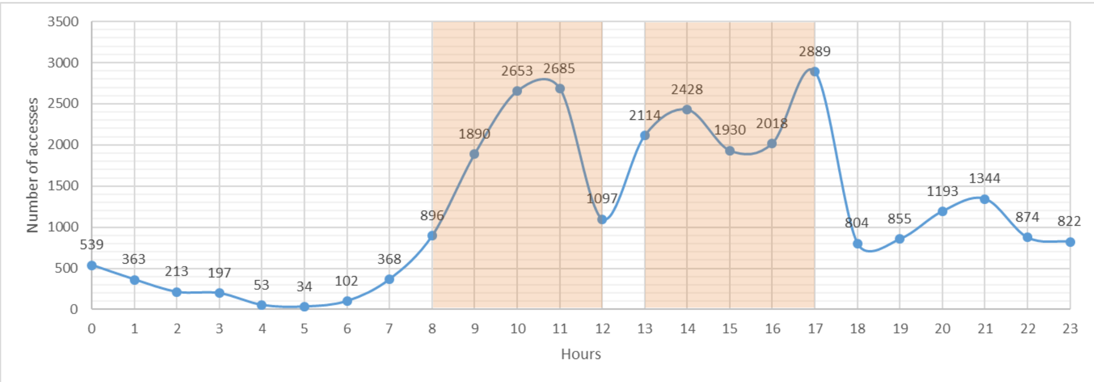

Figure 7. CoCoing.info platform users' access distribution.

Concept Creation vs. Responses

By the end of the study period, the data on the CoCoing.info platform revealed that 726 accounts had been registered and 2,121 concepts had been established. The established concepts were constructed using 20,049 nodes and 1,618 files, which indicated that each concept, on average, had 9.45 nodes (edited by concept owners) and 0.76 files uploaded. In addition, 4,663 user responses were posted to discuss those concepts. Of the total interactive activities on the CoCoing.info platform, 31.24% belonged to concept construction and 68.76% were user responses.

The result indicated that learners on the CoCoing.info platform did not only focus on participating in the learning activity but also on concept creation and peer responses. Such result reveals that learners create concepts and consume those concepts, which leads to the positive circulation of ideas on the CoCoing.info platform.

Key Player Metrics

A widely used tool, Ucinet, was adopted to analyze social network interaction data (Borgatti, Everett, & Freeman, 2002), and the Ucinet subfunction NetDraw helped visualize users' social interactions (Borgatti, 2002). Figure 8 shows the social network interaction result.

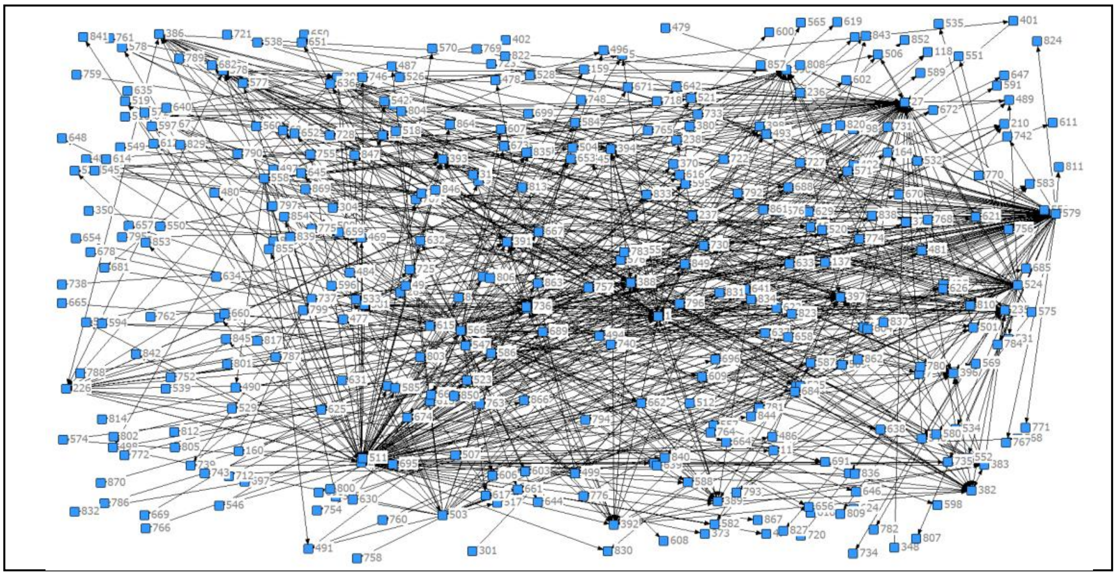

Figure 8. Original network interaction on the CoCoing.info.

However, Figure 8 is too complex to obtain useful information. Therefore, an interactive threshold value of five was set to filter less interactive users and to identify key players in the social network. Figure 9 presents the threshold-five network interaction on the CoCoing.info platform.

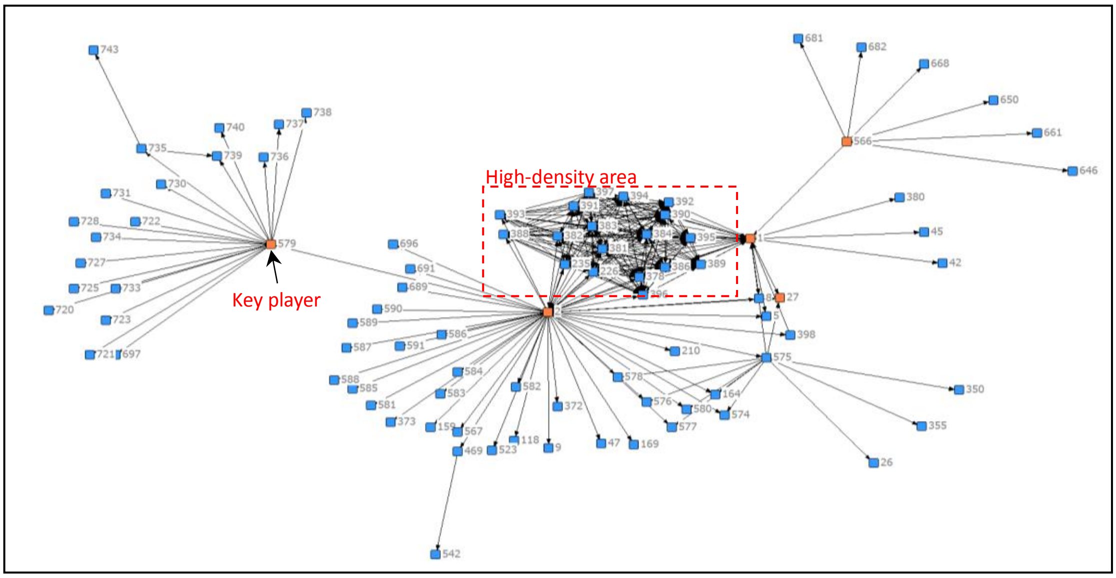

Figure 9. Threshold-five network interaction on the CoCoing.info.

Two notable results are showcased in Figure 9. First, the brown colour nodes represent key player roles. After reviewing the databases, those brown colour nodes were determined to be teachers, suggesting that teachers on the CoCoing.info had key player roles. In other words, teachers appear to play a crucial role in initiating concept construction and triggering social interaction, even within the type of concept construction social network. Second, a high-density area was identified within which a group of highly interactive classmates regularly used the CoCoing.info platform.

Although the access statistics indicated that learners accessed the website throughout the entire day, however, the key player metrics analysis revealed that teachers played the primary role in leading concept construction, concept circulation, sharing, and discussion activities. More specifically, teachers led these knowledge construction activities and provided clear guidelines and direction for students. Such guidelines and directions are supportive for students and encourage them to practice their platform activities. This finding is consistent with the work of de Lima and Zorrilla (2017), which indicates that social learning communities are built and continue only while the course is open and while the teachers are involved in fostering participation.

Conclusion

As social networking and social media technology approach maturity, they have become applicable to learning activities and online learning thereby facilitating learning interactions among teachers and students (Mnkandla & Minnaar, 2017). However, from a learning design perspective, social networking applications specifically designed for learning must be more functional than simply encouraging users to be constantly aware of what their friends do or care about. To achieve this goal, additional learning activities, such as concept construction and exchange, should be merged into the social networking application design. Therefore, a co-construction concept through a cloud-based social networking platform, namely CoCoing.info, was designed to perform an experimental study. In the platform, three major functions—co-construction concept building, social network organization, and concept circulation among social networks—were implemented.

The experimental results indicated that with accessibility to the Internet, users on the CoCoing.info platform can easily locate and interact with their friends through the social networking design. In addition, the platform can help integrate the concepts users have proposed in idea co-construction into a shared concept map. Moreover, the CoCoing.info platform enables users to link their concepts to resources on the Internet, including Web pages, images, video clip, and animations. These various online resources enriched the content of the concept maps created by users. It is noteworthy that learners on the platform focused not only on participating in learning activities but also on concept creation and peer responses, which lead to a positive circulation of ideas on the platform. Furthermore, teachers appear to play a crucial role in this type of social networking of concept construction.

Compared with commercial social networking applications, the data obtained in this study are limited. However, these data revealed several interesting findings, which help us to understand how such a learning-oriented social networking application can be designed, and how users behave on such a platform. Currently, the system is still in its developing stage. In the future, social networking study and users' analytics should be applied to more closely examine users' interactive data.

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