DESIGN AND IMPLEMENTATION OF A COOPERATIVE LEARNING SYSTEM FOR DIGITAL CONTENT DESIGN CURRICULUM: INVESTIGATION ON LEARNING EFFECTIVENESS AND SOCIAL PRESENCE

Ming-Shang Huang
Department of Information Management
National Pingtung University of Science and Technology, Taiwan
mshuang@mail.npust.edu.tw

Wei-Hung Hsiao (Corresponding author)
Department of Information Management
National Chung Cheng University, Taiwan
miswhhsiao@gmail.com

Tsung-Sheng Chang
Department of Information Management
National Chung Cheng University, Taiwan
china@mis.ccu.edu.tw

Mei-Huei Hu
Information Center
President Group, Taiwan
qq0721@hotmail.com

ABSTRACT
The purpose of this paper is to investigate the learning effectiveness of cooperative learning system based on social presence theory. We develop a web-based cooperative learning system which contains personal module, admin module, course module, communication module, and learning records module to support the implementation of cooperative learning. An experiment was conducted to examine the learning effectiveness of the developed cooperative learning system for two groups' students (a self-form group and a random group). Results of the experiment indicate that students had consistently learning effectiveness in both of the heterogeneous groups, which verified the utility of the developed cooperative learning system and interactivity has significant difference, but social context and online communication has insignificant difference among three dimensions of social presence theory. Finally, research findings are discussed and future research directions are suggested.
Keywords: Cooperative Learning, Learning Effectiveness, Social Presence Theory, Digital Content, Cooperative Learning System

INTRODUCTION

In recent years, in the wake of rapid development in information technologies and organizational changes in business, the curriculum of professional education has started to diversify to meet the blossoming of the digital content industry. In this way, many universities have established related departments of digital content design which provides the courses such as information technology application, art design, project management, communications, and marketing, etc. The courses offered by these departments focus on the training of digital content generation, website building, online community creation, multimedia databases, and project management. The aforementioned courses strongly staked a claim to the creativity application and strengthening of media content skills. As a consequence, most students who graduated from the department of digital content design proactively thrive in the workplace due to their versatile knowledge and skills.

Generally speaking, students who are engaged into the study of digital content design should be familiar with advanced tools for digital content design. Thus, students are claimed to use multimedia tools, animation and graphic design software, game engine, virtual reality, scene and digital studios during the learning process. In addition, using e-Learning software to author e-learning courses is a major instructional method in digital content courses. In distance learning courses, students have to connect to e-learning systems via the Internet in order to eliminate restrictions of times and locations. Therefore, students can use e-learning systems to study the curriculum material and engage to discuss with their classmates.

In recent years, research topics on cooperative learning calls attention from academic researchers and practitioners (e.g. EL-Deghaidy & Nouby, 2008; Hutchinson, 2007; Hurtado & Guerrero, 2011). In cooperative learning, an individual's success depends on the performance of the entire group (Bölükbaş, Keskin, & Polat,

2011). The spirit of cooperative learning is encouraging students help each other and concentrated collaborations in teams, and realize common goals by accomplishing cooperatively the tasks they have been assigned. Apart from achieving goals, this approach can also boost the team's overall learning performance (Johnson & Johnson, 1999). Past literature has proposed various systems and applications supporting cooperative learning. Among the previous studies, McConnell (1994) suggested that cooperative learning system functions should include e-mail, bulletin boards, computer conferencing and sharing systems. It should be noted that current software technology makes the development of cooperative learning systems much easier. Jung (2009) designed a cooperative learning system meeting the needs of bloggers and gearing toward online information. Kienle (2009) designed a cooperative learning system supporting both synchronous and asynchronous communication environments. Furthermore, some other systems have been developed employing behavioral or learning theory. For example, Huang, Liu, and Shiu (2008) designed cooperative learning systems on the basis of learners' cognitive conflict; and Luo (2010) developed an online collaborative learning model from the constructivism learning theory. These studies developed practical collaborative learning systems on the basis of different perspectives or technologies, diversifying research on cooperative learning systems.

So far, application of cooperative learning systems in departments of digital content design has rarely been seen in previous studies. Courses of digital content design combine the aspects of business, arts, computer science, and their digital content courses allow students to use a wide variety of computer hardware and software (Lopez-Fernandez & Rodriguez-Illera, 2009). In addition, among their various instructional methods, the vast majority of digital content departments employ team projects, and the classes emphasize cooperation and discussion among students (Chickerur & Kumar, 2011).

In view of the above discussion, a cooperative learning system should provide necessary functions and well-prepared mechanism on supporting students' online cooperation such as assisting students in completing their assignments, the learning effectiveness then can be significantly enhanced. Furthermore, because students must maintain a high level of interaction with their classmates in digital content classes, investigating students' communication from the social presence perspective can shed light on the suitability of a cooperative learning system (Chou & Min, 2009; Järvelä, Volet, & Järvenoja, 2010). At present, Anderson (2004), Johnson, Johnson, and Smith (2007), and Kirschner, Paas, and Kirschner (2009) all believe that cooperative learning systems must be further examined by employing other theories or targets in order to respond to a wide range of varying educational objectives and environments. In view of this situation, the purposes of this study are: (1) to develop a web-based cooperative learning system to support digital content design curriculum; (2) to analyze student's learning effectiveness in terms of academic achievement and learning satisfaction; and (3) to examine whether individuals' perceived social presence can serve as an appropriate foundation for investigating communication in cooperative learning systems.

The rest of this paper is organized as follows. Section 2 reviews pertinent literature on cooperative learning and learning effectiveness, as well as social presence theory. Section 3 then presents the research design and process, and Section 4 describes the system architecture. Section 5 presents the experimental results, while Section 6 contains discussion on the findings. Finally, Section 7 addresses conclusions, limitations and directions for future research.

COOPERATIVE LEARNING AND LEARNING EFFECTIVENESS

Cooperative learning is a structured and systematic instructional strategy, which is suitable for any learning subject and grade. In general, students are assigned into heterogeneous groups according to different cultural backgrounds, abilities, and gender. Each heterogeneous group consists of two to four members, who will learn and work together to reach group goals (Nattiv, 1994; Slavin, 1989). Johnson and Johnson (1999) proposed five characteristics of cooperative learning: heterogeneous grouping, positive interdependence, personal responsibility, promotive interaction, social skills, and group processing. Currently, scholars have developed many methods for cooperative learning, such as student's team achievement division (Slavin, 1978), team-game-tournament (DeVries & Edwards, 1974), jigsaw I/II (Aronson et al., 1978; Slavin, 1986), group-investigation (Sharan & Hertz-Lazarowitz, 1980), cooperative integrated reading and composition (Slavin, 1990), and learning together (Johnson & Johnson, 1987). The above learning methods all have its own process, but the essence is to facilitate students to achieve cooperative learning. Thus, teachers can adopt different learning methods depending on the course content or special needs.

The outcomes of cooperative learning are focused on group performance. Thus, individual learning effectiveness is often affected by team performance. Generally speaking, learning effectiveness can be measured using two variables: academic achievement (e.g., semester grade) (Alavi et al., 1995; Shih et al., 2012) and learning satisfaction (Knowles, 1970; Marki et al., 2000; Piccoli et al., 2001). While Johnson, Aragon, and Shaik (2000)

regarded learning satisfaction as learners' sense of pleasure in learning activities, Piccoli, Ahmad, and Ives (2001) and Maki, Maki, Patterson, and Whittaker (2000) believed that learning satisfaction expresses learners' satisfaction derived from the learning process and learning results. Hence, learning satisfaction is a very suitable item for assessing learners' satisfaction with cooperative learning. In summary, we can obtain better understanding of a student's learning effectiveness according to both academic achievement and learning satisfaction. As a result, we take academic achievement and learning satisfaction as two important criteria for measuring student's learning effectiveness.

SOCIAL PRESENCE THEORY

Short, Williams, and Christie proposed the social presence theory in 1976. When people communicate, they will have different social presence depending on their purpose and the communicational medium. Social presence may be warm, cool, intimate, or distant, and these feelings all project degrees of individual social presence. Social presence theory is the subject of much in-depth discussion in research on computer-mediated communication (CMC). When people use CMC to express their ideas, it is often difficult to gauge their degree of intimacy, which can be expressed in face-to-face communication through eye contact, smiles, and tone of voice. Usually, speaking in a gentle tone will cause the level of intimacy to increase; conversely, if no intimacy can be detected in the communication process, the perceived level of social presence will also be low, and there will be a low level of interaction (Garramone, Harris, & Anderson, 1986). Generally speaking, a high level of CMC indicates a high level of class participation and system use frequency among students (Ritchie & Peters, 2001; Yamada & Akahori, 2007). Furthermore, Warschauer (1997) believes that CMC is an important link and indispensable factor in the academic field of cooperative learning. In view of the above discussion, the social presence theory can serve as an appropriate academic foundation for investigating communication in cooperative learning systems.

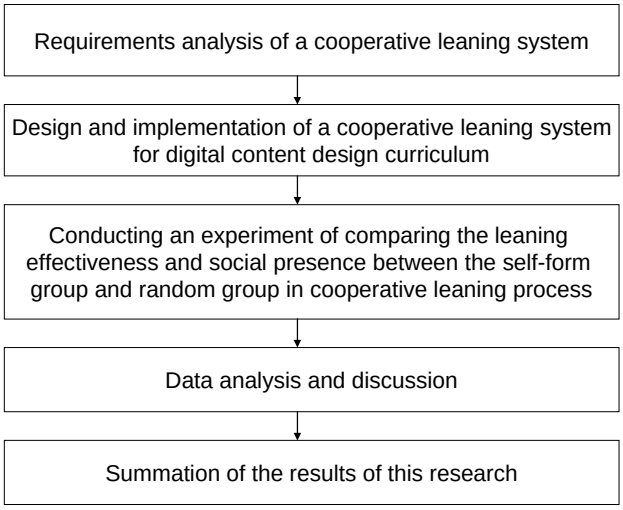
According to social presence theory proposed by Tu (2000), applications of online learning systems, three dimensions for assessing learners' perceived social presence are explained as follows: (1) Social Context: The degree of social presence of a learner using CMC. Learners will express different degrees of social presence in different social situations; for instance, task orientation, privacy, topics, recipients/social relationships, and social processes; (2) Online Communication: The language and methods used in online communication by learners using CMC. Online text is the most convenient of the different communication functions provided by CMC systems. If text-based communications in an online environment can provide an auxiliary language or emoticons, this can compensate for the absence of tone of voice in non-verbal communication (Garramone, Harris, & Anderson, 1986), and (3) Interactivity: Whether learners employing CMC interact frequently with each other. In the learning process, interactivity expresses whether learners engage in a high level of knowledge sharing and feedback. When students have a high level of interactivity, they will usually perceive a high degree of social presence. Tu (2002) also noted in a further study that CMC also involves the special environmental factor of privacy, which constitutes a special kind of social context. When people communicate with each other in an online system, the system's functions can be reached or controlled in order to determine individuals' communication privacy. For instance, individuals can choose to engage in anonymous or confidential communication. This is a special function provided by the computer environment. We believe that a cooperative learning environment should allow team members to get to know each other and share knowledge through mutual communication. Consequently, a system's privacy function should not be applied to communication between team members, which will allow members' contributions to be recognized. In addition, team members may also use other private means of communication, such as e-mail, MSN, or telephone, to communicate with other members in order to achieve a feeling of privacy, without resorting to the confidentiality provided by the cooperative learning system. As a result, the conditions of a learning environment may be difficult to control in practice, and a system that restricts students from using other means of communication to discuss their class work will not comply with the basic spirit of cooperative learning. However, this function is applicable to other situations, such as expression of views and decision-making behavior.

Furthermore, Tu and Yen (2007) also developed these dimensions into a means of assessing learners' perceived social presence in a CMC environment. However, there still remained a lack of confirmatory research involving system deployment and a class experiment. Although Tu (2002) has used a text-based CMC as a research environment to understand users' attitudes toward social presence in communication, neither the users' satisfaction nor the system architecture was explored in much depth. In this study, Tu's views concerning social presence theory were employed to investigate students' perceived social presence when using this system, which can provide a better understanding of students' communication.

RESEARCH METHOD

In order to investigate the learning effectiveness and social presence in cooperative learning process, a

web-based cooperative leaning system is developed. The subjects chosen in this study were college students in Taiwan enrolled in the department of digital content design. The name of the course was 'Designing web graphics and layouts' and its instructional content consisted of website design, layout, and basic hypertext markup language (HTML). The main objective of the digital content design course was to instruct students in learning the basic online presentation of image files, including such operations as image cropping, resolution, layout, and cascading style sheets (CSS). In addition, students were required to complete assignments in groups and present a team project (i.e., Web design) at the end of the semester. According to the above requirements of the course, the learning together method was suitable for cooperative learning on this course (Johnson & Johnson, 1987). Moreover, the learning together method emphasizes particularly the formation of groups and group processing. The research process is described in the following: (see Figure. 1).



(1) Requirements analysis of a cooperative learning system

Related papers on the design of a cooperative learning system were surveyed and interviews with the teachers and students in the department of digital content design were conducted. Then data model and functional model was formulated for systems design purposes.

(2) Design and implementation of design and implementation of a cooperative leaning system for digital content design curriculum

Fundamentally, a cooperative learning system can be used to support learners in learning and training processes of co-located and distributed groups (Pfister et al., 1998). In addition, Tu and Corry (2003) suggested providing online board and real-time chat to help students express their views and discuss academic issues. Thus, we develop a system to help students interact and communicate with their peers in the learning process so as to enhance learning satisfaction. According to the specification of requirements analysis, we proposed the system architecture of a cooperative learning system shown in Figure 2. Three components are consisted in the system framework described as follows:

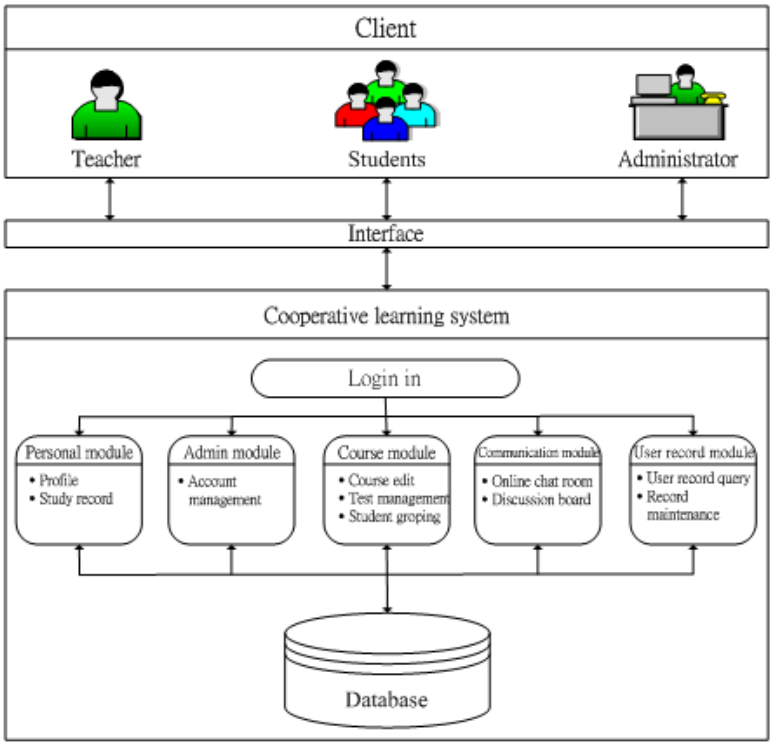


Figure 2: System architecture

A. Client

The client consists of teachers, students, and administrators. Users can log-on to the system via an Internet browser, and the system provides different functions and access rights corresponding to different roles. Students used the instructional materials provided by the system to engage in online learning, and employed online communication tools to cooperate and engage in discussions with their peers. The teacher established the course, managed online teaching materials, edited online test questions, assigned students to groups, and checked students' usage records. The major tasks of a system administrator include maintaining user accounts and learning records, while also maintaining the normal operation of the website system.

B. Cooperative learning system

The cooperative learning system is developed using web technology, and the web server employed the Microsoft®. Net framework architecture. The system was linked to a back-end database via open database connectivity (ODBC). The cooperative learning system provided numerous functions, but consisted of five modules, which are described as follows.

- Admin module

With regard to the administrator's exclusive functions in the management interface, only the system administrator possess the ability to maintain all members' basic information and perform system maintenance.

- Personal module

This module allows users to key-in and maintain their basic information. In addition, students can also query their own current usage, such as online records and messages, in order to understand their individual learning status. Due to the different needs from the admin module and the personal module, users will have individual menu interfaces (Figure 3).

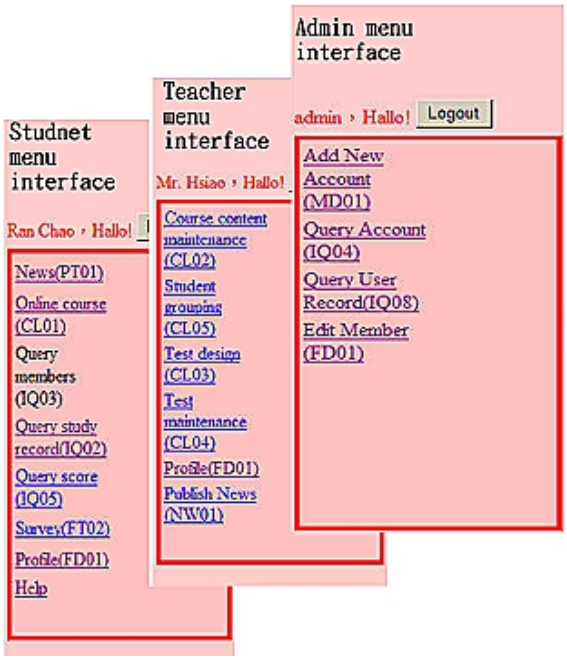


Figure 3: different user menu interface

- Course module

The teacher's platform comprises three sub-functions, which are course editing, test question management, and student grouping systems. The teacher can post and maintain online teaching materials and information needed for the course (Figure 4), and can post online test questions. The teacher can also change students' group assignments and group students so that they can complete their cooperative learning goals. All students in each group possess a communication platform for their own exclusive use.

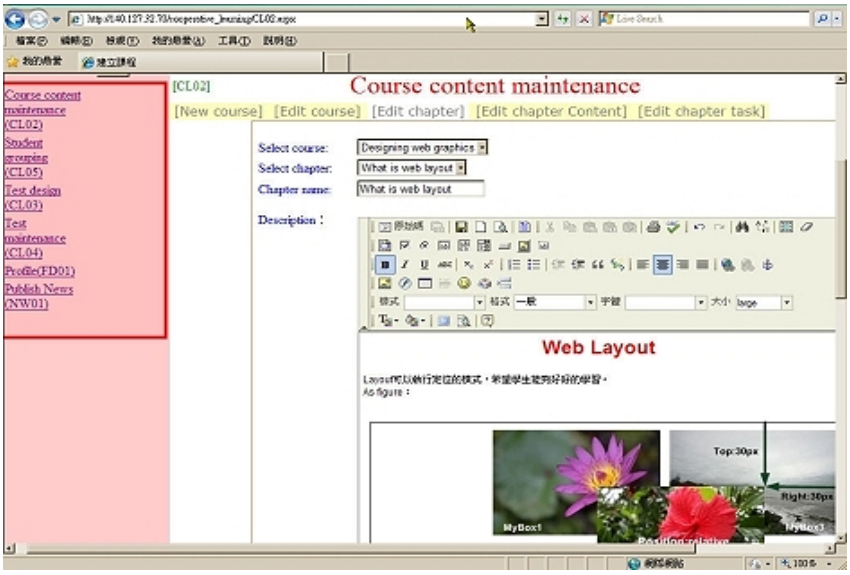


Figure 4: Online course content maintenance

- Communication module

Perry and Edwards (2010) contended that an online learning system must possess effective interaction mechanisms in order for students to be willing to express themselves. Mason and Weller (2000) and Thomas and Carswell (2000) suggested that interaction is a key factor influencing students' learning and satisfaction in online cooperative learning. We therefore established a real-time online communication platform consisting of a chat room; this platform allows students to interact with each other via the interface (Figure 5). Derks, Fischer, and

Bos (2008) pointed out that attention should be paid to whether transmitters and receivers can understand the nuances and feelings of messages when non-verbal communication tools are used. Hence, apart from developing a real-time online chat room, we also developed an online discussion board able to support non-real-time communication. By leaving conversational and discussion messages, students can give themselves plenty of time for thinking and coming up with responses. After the conclusion of the course, the students were able to upload their assignments and thereby achieve the coursework goals of cooperative learning (Figure 6).

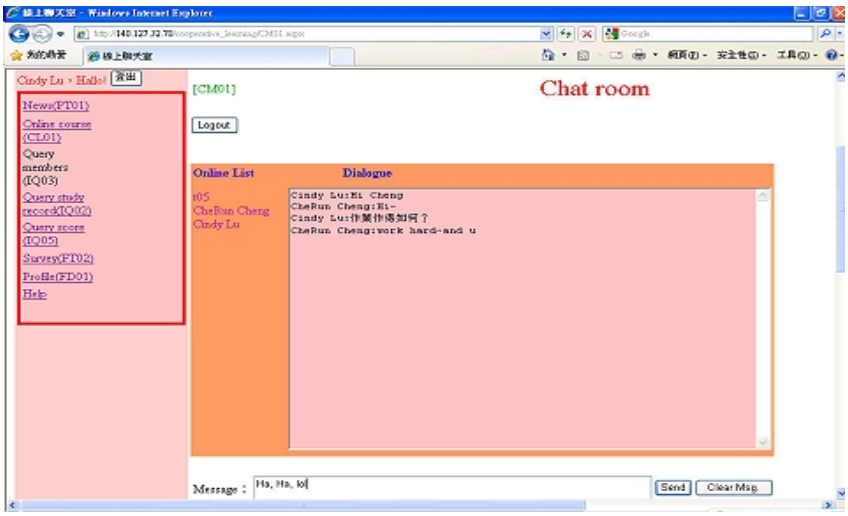


Figure 5: Online communication

Figure 6: Student work samples

- User records module

This module supports the teacher's queries of all current student usage records (Figure 7). The teacher can use the query system to understand students' learning and system usage. Apart from this, the module also allows the teacher to maintain the students' discussion forum and ensure that it continues to function as a normal knowledge-sharing space.

Figure 7: Records of student used the communication tools

The database stores users' basic information, instructional materials, and learning histories. We used unified modeling language (UML) as a graphic tool, serving as the blueprint and basis for design and planning work. UML is an object-oriented language used in visualization, and its graphic output facilitates representation of true design concepts. The relationships between the core tables in this study are displayed using an UML class diagram (Fig. 8).

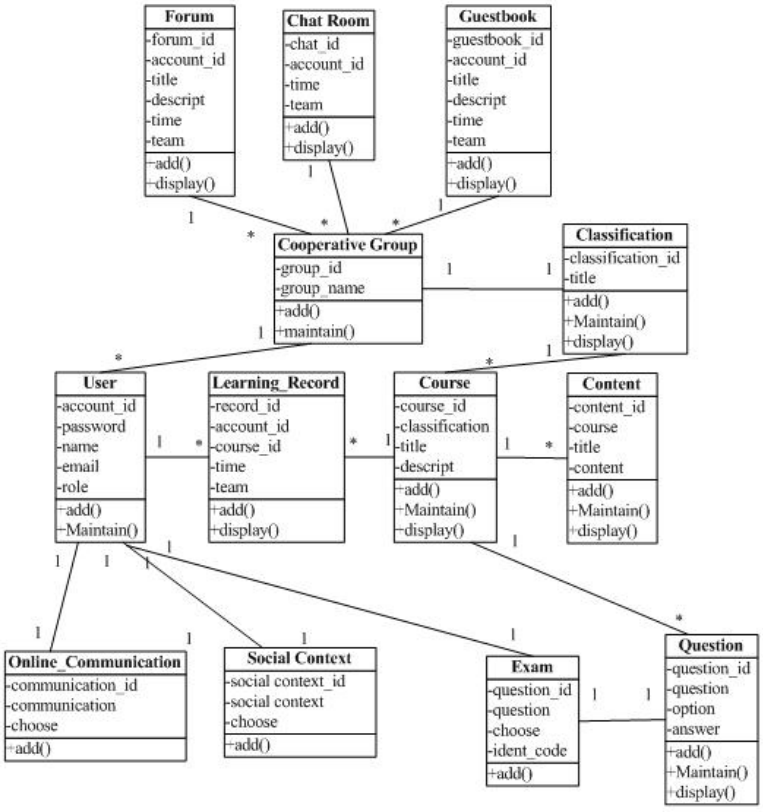


Figure 8: Relationships between core tables

C. Interface

Users can use internet browser to remote login-on the cooperative learning system using HTTP protocol. Only key-in data with correct accounts and passwords are allowed to enter the system. In addition, navigation

webpage are revoked to help novice users.

(3) Conducting an experiment of comparing the leaning effectiveness and social presence between the self-form group and random group in cooperative leaning process

We used a questionnaire to gauge the level of satisfaction and the social presence perceived by the students in the two classes. The Cronbach's alpha, representing the reliability value of the whole sample, was 0.94; indicating suitable internal consistency. The questionnaire could therefore be considered representative in explaining the students' learning satisfaction and perceived social presence. The experimental process is described in the following:

Step 1: Two different types of instructional environments were employed. One group was student teams made up of randomly assigned members, and the other group was self-formed teams with members selected by themselves (Students may form teams of their own with members they prefer). In order to shed light on the effect of students' use of the cooperative learning system on learning effectiveness in the two different instructional environments, we compared the students in the two classes, creating an self-formed group and random group containing 27 and 30 persons, respectively. Slavin, Madden, and Steven (1989) indicated that cooperative learning constitutes a structured and systematic teaching strategy. When teaching, teachers instruct students forming heterogeneous groups comprising students of different genders, cultural backgrounds, and levels of ability; each group typically contains two to four persons. The members of each group study, share knowledge, and receive rewards as a team. Thefore, we created both self-formed and random groups. This course lasted 18 weeks, and team assignments were given after the students had participated in the class for several weeks.

Step 2: We encouraged the students in the two groups to make frequent use of the cooperative system for online communication and learning.

Step 3: After the end of the course, the teacher will assess the academic achievement of each group. There are five levels of scores, namely A+, A, B, C, and D, which correspond to points five to one, respectively. In this course, when a team scores five points, all members get the same academic achievement. Furthermore, a questionnaire was employed to understand the students' learning satisfaction and perceived social presence, which verified the suitability of the system. Particularly, our assessment of learning satisfaction is based on the questions proposed by Ganawardena and Zittle (1997). In terms of perceived social presence, we chiefly employed the theoretical framework of social presence proposed by Yen and Tu (2008), the questions on our questionnaire reflect those developed by Tu and Yen (2007) and Yen and Tu (2008) to assess perceived social presence. Perceived social presence includes the three dimensions of social context, online communication, and interactivity. Although Yen and Tu (2008) also discussed the influence of privacy, we do not consider privacy an aspect needed to be considered in this study. Because cooperative learning should involve open communication, in practice it should also allow private communication, and should not restrict students from using other means of communication to discuss their coursework. Responses to all questions on the questionnaire are expressed using a five-point Likert scale, in which strongly disagree is one point and strongly agree is five points. The recovered questionnaires were analyzed using SPSS version 18.0 software. Furthermore, some slight adjustments were made to the wording of the questions to ensure that they would be understood by the Taiwanese students, enhancing the exhaustiveness and appropriateness of the scale and ensuring that the questionnaire possessed excellent content validity. All items are shown in Appendix-A.

Step 4: We further to analyze and discuss the results that obtained from the learning effectiveness and perceived social presence and to provide some insights into the findings of cooperative learning.

(4) Data analysis and discussion

Table 1 shows that the results of Levene's test. As can be seen, all results were statistically significant, and the sample variances in the two groups were identical. The results of the independent sample t-test showed that neither academic achievement (p = .962 > .05) nor learning satisfaction (p = .942 > .05) reached a level of statistical significance, indicating that there was no significant difference in academic achievement and learning satisfaction between the students in the two groups. Among the three dimensions of social presence, p = .753 > .05 and p = .680 > .05 for social context and online communication, respectively; indicating no significant differences in perceived social context and online communication among the students in the two groups. However, the results of interactivity testing were not statistically significant, revealing differing cognitive levels of interactivity among students in different groups.

Table 1: Summary of survey results from different groups

	Self-formed group (n = 27)		Random group (n = 30)		Levene's test for equality of variances		t-value
	Mean	SD	Mean	SD	*F*	Sig.	
Learning effectiveness							
Academic achievement	3.95	.544	3.94	.630	.206	.652	.047
Learning satisfaction	3.89	.507	3.88	.545	.032	.859	.073
Social presence							
Social context	3.82	.646	3.88	.756	.026	.872	-.316
Online communication	3.78	.531	3.84	.665	.390	.535	-.415
Interactivity	4.11	.684	3.68	.748	.066	.798	2.244*

Note: * $p < 0.05$

(5) Summation of the results of this research

We concluded the findings of this research and research papers were written. The contents of this paper addressed about research issues, research purposes, research method, experimental process and research findings and implications to both the academic and the practitioner.

DISCUSSION

The empirical analysis results reveal that the self-formed group had a mean score of 3.89 (Max: 5) for the average of responses concerning learning satisfaction, while the random group had a mean score of 3.88. Academic achievement also shows the same results. There is clearly little difference between these two scores. Moreover, there was no significant variance in academic achievement and learning satisfaction between students in the two groups, implying that the system is able to help students engage in online collaborative learning, and is therefore useful.

This study assessed students' perceived social presence in cooperative learning system in terms of social context, online communication, and interactivity. There was insignificant difference in social context and online communication between the two groups, and these consistent results indicated that the students encountered no significant obstacles when using the online communication function. The students uniformly felt that the online communication function provided by the system allowed them to clearly express their views when discussing coursework and also enabled them to maintain individual social relationships. The results verified that the communication module developed in this study is indeed useful. Online communication is an important function of e-learning. Students can use online communication tools (e.g., discussion board, online chat room) to meet the needs of knowledge sharing. Therefore, online communication tool is necessary in e-learning. We believe that online communication featuring emerging information technology can create better online communication system to improve people's interaction. Students' social context is consistent. Previous studies (Liaw et al., 2007; Weinstein, 1991) pointed out that students have a common goal in collaborative learning environment; they will share knowledge and exchange views. Thus, there is no significant difference in perceived social context between the two groups. In addition, the two groups had differing interactivity results, as evidenced by the fact that the mean total response score of the self-formed group was higher than that of the random group (mean 4.11 > 3.68). This is because self-formed groups often comprise familiar members, who would be more interactive than those in random groups. Nevertheless, interactive behavior is important in a cooperative learning environment.

The phenomenon appearing in this study is analyzed as follows: (1) design of interaction mechanisms: designing interaction mechanisms should not consist solely of the developing cooperative system with better interaction functions in using the computer systems. Instead, a range of interaction mechanisms connected with computer communication tools should be provided to stimulate students' willingness to use the system to interact with others. For instance, a system can record the number of times students interacted with each other, and have a cumulative incentive mechanism inducing students to actively seek to interact with their classmates. There will be no need to develop a new communication tool to achieve this function, but to make some slight modifications to the current computer program. The key point is to design appealing interaction mechanisms, and not appealing communication systems; (2) teacher participation in instruction: Even when using an effective system or function, students will not enjoy good interaction if the teacher does not express his or her views or participate at

appropriate times. Particularly in distance learning environments, maintenance of student-teacher relationships depends entirely upon the teacher, who should strive to lessen the distance with students. Shen and Liu (2011) also advocated that teachers should encourage students to engage in web-based self-learning. Although students who use a distance learning system may have little interaction with their teacher, teachers can participate in discussions or suggest topics that may arouse students' interest, and thus increase their interest in learning and interaction. We therefore conclude that teacher participation in instruction can help create an appropriate learning atmosphere. We recommend that, apart from students, teachers also personally use and participate in instructional systems, which will foster enthusiastic online class discussion. Furthermore, in order to maintain course quality, teachers should maintain appropriate content in online courses and discussion forums. From the perspective of system development, the system developed in this study consisted of five modules. We employed an object-oriented model in system design and development because some of the functions in these modules are intersecting, have object coupling, or use similar resources. The majority of functions are independent, which facilitates management. In addition, we used the Microsoft® .Net framework to edit online teaching materials and functions because it supports a wide array of multimedia tools; thus enabling teachers to upload images, draft forms, design font styles, and create the layout, and the interface is similar to that of Microsoft® Office. Teachers with experience using similar software were consequently able to master the system quite easily. An easy-to-use interface can greatly enhance users' willingness to use the system.

CONCLUSION AND FUTURE RESEARCH

In this paper, we developed a cooperative learning system for students in a department of digital content design in a college. In both self-formed and random groups, students demonstrate high levels of academic achievement and learning satisfaction, which verified the system's utility. The contributions of this research are summarized as follows: (1) this study verified three dimensions proposed by Tu to explain individuals' perceived social presence when using cooperative learning systems. It is found that interactivity has significant difference, but social context and online communication has insignificant difference among three dimensions of social presence theory; (2) a web-based cooperative learning system is developed. The system architecture proposed in this paper will provide useful references for practitioners in developing cooperative learning systems.

There are also limitations in this study. First, participants in this study are college students; and hence, results of this study can not be extended to other aspects. Second, the subject of experiment is "design web graphs and layouts', learning materials and times spent on the experiment are so limited. It is difficult to infer the phenomena appearing in this study are universal in another case. Therefore, two recommendations are suggested based on the experiences of this research. First, cooperative learning systems should contain better interaction mechanisms to support communication activities among teachers and students in cooperative learning process. Second, teachers should be active in involving in discussions with students to stimulate high levels of student interaction. Therefore, this study concludes that establishing n comprehensive cooperative leaning system and better interaction mechanisms will ensure higher levels of learning performance in cooperative learning process. Finally, future research directions are suggested: (1) a cooperative learning system can be enhanced using intelligent agents to provide integrated services and comprehensive functions in cooperative learning process, (2) integrating social cognition theory with social presence theory to investigate the learning performance of cooperative learning, and (3) investigating the learning effectiveness and social presence in using a cooperative system for a longer time span to ensure whether social presence theory can be extended to other learning aspects.

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Appendix A: Questionnaire

Note: CLS= Cooperative learning system

- **Perceived social presence (Tu & Yen, 2007; Yen & Tu, 2008)**

Social Context (SC)
SC1: CLS messages are social forms of communication.
SC2: CLS messages convey feelings and emotions.
SC3: CLS allows me to build more caring social relationship with others.
SC4: CLS permits the building of trust relationships.
Interactivity (IN)
IN1: Users of CLS normally respond to messages immediately.
IN2: I am comfortable participating in CLS, even I am not familiar with the topics.
IN3: I am comfortable with the communication styles employed by CLS users.
Online Communication (OC)
OC1: It is easy to express what I want to communicate through CLS.
OC2: My computer keyboard skills allow me to participate comfortably in CLS.

- **Learning satisfaction (LSAT) (Ganawardena & Zittle, 1997)**

LSAT1: I was able to learn through the medium of CLS.
LSAT2: I was able to learn from the discussion on the online course of designing web graphics and layouts.
LSAT3: I was stimulated to do additional reading or research on topics discussed on the online course of designing web graphics and layouts.
LSAT4: I learned to value others' points of view.
LSAT5: As a result of my experience with the online course of designing web graphics and layouts, I would like to participate in another online course in the future.
LSAT6: The online course was a useful learning experience.
LSAT7: The diversity of topics offered by the online course prompted me to participate in the discussion.
LSAT8: I devote a great deal of effort to learning the CLS so as to participate in the online course.