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The Development of Online Interactive Whiteboard for Supporting Collaboration Learning

Settachai Chaisanit, Apichai Trangansri and Luddawan Meeanan
Faculty of Information Technology, Sripatum University Chonburi Campus, Thailand

Abstract: Learning innovation was currently considered as the most popular for education among university students. The aim of this study was to investigate if university students consider innovative Internet technology as a useful, meaningful learning environment that could support and enhance their learning. However many students face problems and difficult to learn, practice and time consuming. This is because collaborative time and media are not enough for them. Online learning environment is a one thing for creates a variety of ways to deliver and provide electronic resources for the learner. It's includes many methods such as using system to deliver text, video chat and activity for learner. Thus, online learning environment is professionals cite benefits to the learner. The learner benefits from the opportunity to prepare them for increase their competitive in a globalization. Therefore the purposes of this research were: (1) to develop online interactive whiteboard for supporting collaboration learning based on PIDP development model, (2) to evaluation online interactive whiteboard for supporting collaboration learning. The samples of this study comprised of 40 students from Sripatum University, Chonburi Campus, Thailand. The sample was obtained by simple random sampling method, used control experimental group evaluation design. The results showed that: the satisfaction of the panel experts, the mean was 4.48 with the standard deviation was 0.36; the satisfaction was in the "High level". In part of Control/Experimental group evaluation has shown that: the experimental group score higher that control group score. In part of learner's satisfaction, the mean was 3.99 with the standard deviation was 0.54; the satisfaction was in the "High level". This can summarized that developed system be successful, various aspects of the online environment should be considered such as application domain knowledge, conceptual theory, user interface design and evaluation about the overall quality of the design environment.

Keywords: Collaborative learning, learning innovation, system applications

INTRODUCTION

The big advance in learning innovation has been widely applied for learning and instruction. Therefore, it would be great if we could apply the technology with collaborative learning. This may solve a problem of establishing a collaboration learning that learners must be together at the same place or nearby to work together. Collaborative learning, sharing opinion and supporting each other can give learners opportunities to develop their skills in learning. This would make learning complete and more effective (Spears, 1992; Wood, 1992; Johnson and Johnsin, 1996). When a learner is assigned to a piece of work and has to do in groups, they will be more motivated. There will also be a progress in thinking with fewer competitions among them. Differences between peers will be accepted and more personal skills can be shown, making them depend less on instructors. Collaboration learning may give learners more skills in learning and is considered the best instruction (Fontenot, 1995). However; there is a challenge to apply the technology to the collaboration learning. The problem is that everybody in the group must login to the virtual meeting before the meeting begins otherwise they may not get connected at a later time or may miss some information. The software at the present time cannot solve this problem, e.g. Net Meeting, Skype etc. Therefore, the objective of this work is to develop a system that supports or solves this problem so that collaboration learning through the Internet could be done seamlessly.

At present, the technology change can develop the quality of education innovation and technology. Education innovation is important factor in the rapid distribution of information. It has been adapted for study in various fields such as industry, business and education. Online collaboration learning is an interesting option to distribute knowledge and support learners with different backgrounds and learning skills. They can select the lesson that they want to learn and there is no limit in place and time. The features of online collaboration learning are application programs that have subjects and details of several lessons. Also has an exercise test to evaluate the efficiency of the student. Online collaboration learning is a one thing for creates a variety of ways to deliver and

Corresponding Author: Settachai Chaisanit, Faculty of Information Technology, Sripatum University Chonburi Campus, Thailand

provide electronic resources for learner (Pinkwart *et al*., 2003). Thus, online collaboration learning is professionals cite benefits to learner. The learner benefits from the opportunity to prepare themselves for greater ability and increase their competitive in a globalization. However, a big advantage is that the online collaboration learning also supports the delivery of multimedia elements, such as sound, video and interactive hypermedia (Lipman, 1991). In addition, Mobile learning can provide flexibility and convenience. It can overcome some traditional barriers such as time and place. Learners can access materials independently (Seppälä *et al*., 2002). In addition, online collaboration learning does not require extensive computer skills, although familiarity with smart phones and software does help to reduce the intimidation factor (Baker, 2000).

Therefore, this study presents research to develop the online interactive whiteboard for supporting collaboration learning. It is an online collaboration learning system that is used to supplement teaching by presentation learning activities, knowledge management and collaborative learning. This course provides for undergraduate accounting students. The researcher expects that this system can increase wisdom and development students and that knowledge can be applied successfully.

LITERATURE REVIEW

Collaborative learning: Collaborative learning is a situation or object which two or more students attempt or learn something together (Dillenbourg, 1999). Which differ from individual learning, people engaged in collaborative learning capitalize on one another's resources and skills (asking one another for information, ideas, monitoring and work) (Chiu, 2000; Chiu, 2008a). In particular, collaborative learning is depending on the model that knowledge can be created within the population where members actively interact with sharing experiences and take on role of asymmetry (Mitnik *et al*., 2009).. Put differently, collaborative learning refers to methodologies and environments in which students participate in a common task where each individual responsible and accountable to each other. These include both face-to-face conversations (Chiu, 2008b) and discussion of the computer (web board, online forums, chat rooms, etc.). (Chen and Chiu, 2008). Methods for examining collaborative learning processes include the process of learning together and statistical discourse analysis (Chiu and Khoo, 2005).

Computer-supported collaborative learning: Computer-Supported Collaborative Learning (CSCL) is a relatively new learning innovation paradigm within collaborative learning using technology in a learning environment that will enable a medium for communication and support groups. context of collaborative learning. Mitnik *et al*. (2009) Chen and Chiu (2008). CSCL systems use technology to Interact, control, monitor and mediate the acquisition of new knowledge. Recently, one study found that using robotics in the classroom to promote collaborative learning leading to an increase in efficiency of learning activities and an increase in the student's motivation. Mitnik *et al*. (2009) Researchers and practitioners in many disciplines, including cognitive sciences, sociology, computer engineering have begun to investigate CSCL, thus, it constitutes a new innovation and trans-disciplinary field.

Human computer interaction: The aim of human computer interaction design is, as mentioned, a product that is useful for every conceivable user, despite age, culture, ability, physique etc. The freedom to use the product according to preference is therefore an important principle. In terms of information systems this translates to overlapping user actions and use-case completions, multiple I/O devices and multi-modality (Rex Hartson and Deborah, 1989). The description of universal design indicates certain aspects that such a computer system should encompass, for example high degrees of flexibility and scalability, clearly defined interfaces and use of existing standards and guidelines.

In human computer interaction and usability testing, one of three main design principles is

- Learnability is the ease of which new users can efficiently interact. Learnability consists of: predictability (of the consequences of an action), synthetization (see the effect of previous actions), familiarity (previous knowledge can be re-used), generalization (knowledge from interactions can be generalized within and to other systems) and consistency (equivalent Input, Output (I/O) and behavior in similar situations and contexts).
- The second pillar of usability is flexibility and multiplicity of ways for user and system to interchange information-composed of: dialogue initiative (user preemptive: no artificial limitations on input), multi-threading (several concurrent/ interleaved user-interactions possible), task-migration (ability to transfer task control between system and user), substitution (equivalent I/O values may be randomly used) and customization (modification of interface by user (adaptability) or system (adaptively).
- The third vital principle is Robustness, including: observe ability (user ability to evaluate internal system state, includes brows ability (investigate without changing state), reachability)possibility for navigating through/to states(, persistence (length of effect of a communication) and use of defaults),

recoverability (forward (correct) and backward (regret) error recovering, tolerance of error, safety and reliability), responsiveness (feedback, instant and absolute) and task conformance (task completeness and task adequacy). Robustness is thus the degree of support given the user to determine success and evaluate completion of aims.

RESEARCH METHODOLOGY

This study presents the online interactive whiteboard for supporting collaboration learning. It was developed based on the Participatory Integrated Design Process (PIDP) (Settachai, 2011) consists of four design phases: needs analysis, conceptual design, development and evaluation each of which has its own design processes.

Phase 1: The Needs analysis was concerned with gathering, analysing and summarizing information necessary to build the learning environment prototype.

Phase 2: The conceptual design phase focused on four design processes that translate user requirements into a conceptual user interface and instructional information design, structure design and page design.

Phase 3: The Development phase was aimed to construct a high-fidelity prototype of the learning environment, based on results of the initial user evaluation on low-fidelity prototypes. This phase consisted of three design processes, which translate the conceptual user interface design into the high-fidelity prototype of the learning environment: low-fidelity prototyping, design walk-through and high-fidelity prototyping.

Phase 4: Evaluation process, this studies modified two steps of systematic design of instruction evaluation approach, Expert Review and Small Group Evaluation.

The approach: The purpose of this study was to determine the concept of an innovative procedure the online interactive whiteboard for supporting collaborative learning. However, this study can be successfully designed by considering the various aspects of the web-based environment such as technology, knowledge, conceptual theory, standard, human-computer interface design and system evaluation. The Participatory Integrated Design Process (PIDP) (Settachai, 2011) is development process framework which consisted of the needs analysis, conceptual design, development and summative evaluation phase (Fig.1). PIDP used for the online interactive whiteboard for supporting collaboration learning development.

Phase 1 needs analysis: This phase was concerned with gathering information about situations, problems, needs,

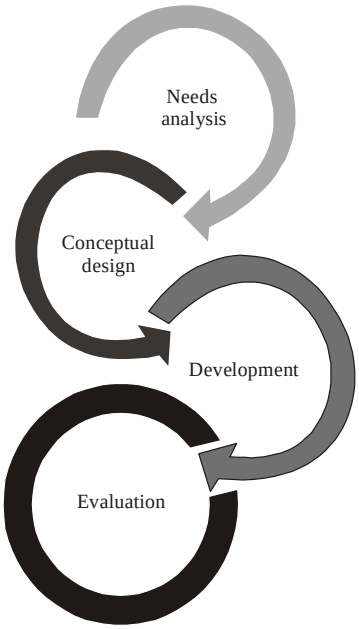

Fig. 1: The Participatory Integrated Design Process (PIDP)

and tendency that were necessary to build the prototype. It was aimed to specify the user and system related requirements while developing a full understanding of the target user group and its tasks.

Phase 2 conceptual design: This phase focused on an explicit construction of concepts involved with:

- What the components are?
- What the environment is?
- How it is intended to be used?

These were the basic idea of the distance collaboration system. In this phase, all the processes could be aligned to the user's requirements of a conceptual user interface and production. The output data of conceptual design could be used as an outline of the user interface and production system prototype. The prototype was used for rechecking collective testing in the participatory review phase before it was input to the developmental phase.

The basic idea of the distance collaborative system connectivity is done through the Internet in a client-server manner. All computers which have connected to the server could have an operation in an interactive way with each online computer using the interactive whiteboard system as a tool for collaborative learning. When learners have logged in to the network, they could discuss and express their opinions through the system by writing and drawing on the system. The system will store the data in a database automatically and when learners who have logged in after the meeting has started, they should be

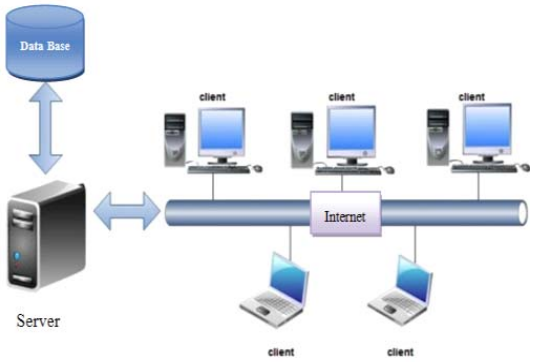

Fig. 2: The basic idea of the distance collaboration system connectivity

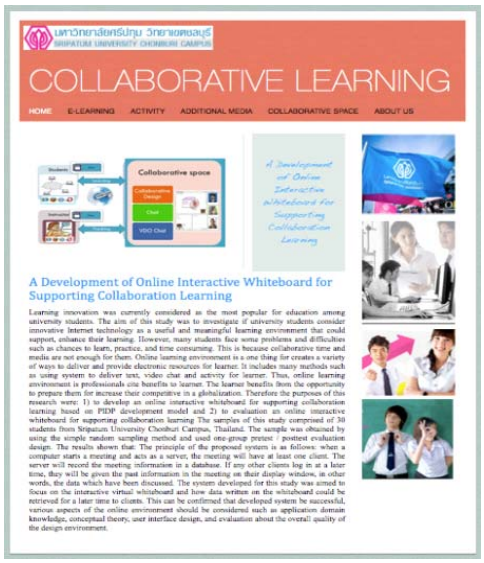

Fig. 3: Main page of the online interactive whiteboard for supporting collaboration learning

able to access to the previous discussion in order to catch up with the topics discussed and give their ideas if they need to.

The system adopted a Two-tier structure based on the client/server model. Two-tier client/server structure is formed by adding a Client Tier and a Data-Tier into the conventional Client/Server (C/S) structure model. As shown in the Fig. 2

Phase 3 development: This phase aimed at constructing a high-fidelity prototype based on the results of an initial user evaluation of the previous phase. The online interactive whiteboard that supports collaboration learning and allows a meeting in which there is no need for everybody to be in the meeting at the same time and to achieve the objective, the system must be worked in a client-server manner. The server will collect the

Fig. 4: The interactive whiteboard

information processed during the meeting as a database and the data will be sent to all clients in the meeting and clients which have just logged in at a later time.

The principle of the proposed system is as follows: when a computer starts a meeting and acts as a server, the meeting will have at least one client. The server will record the meeting information in a database. If any other clients log in at a later time, they will be given the past information in the meeting on their display window, in other words, the data which have been discussed. The system developed for this study was aimed to focus on the interactive virtual whiteboard and how data written on the whiteboard could be retrieved for a later time to clients.

Figure 3 shows the main page of the online interactive whiteboard for supporting collaboration learning. The Fig. 4 shown here is a drawing area of the interactive whiteboard which all learners can write or draw anything on it and the system will store the data to the system database. The learners who come later when other learners have discussed could access to the previous data in the database.

Phase 4 evaluation: The primary focus of the Summative evaluation phase was to identify current weaknesses in the whole OPDAISYS environmental prototype so that it can be revised. This study proposed a summative evaluation framework, which provided evaluation process, instruments to be used and evaluation criteria to systematically evaluate both the production system and the user interface system. This study used the two stages of evaluation created by Dick and Carey (1996) which the Expert Review and Field Experiment (Dick and Carey, 1996). The summative evaluation process is described in more detail in result.

EXPERIMENTAL RESULTS

The purpose of this study was to develop and to evaluate the online interactive whiteboard for supporting

Table 1: Means and standard deviations of expert review

Category	Mean	SD
Concepts	4.60	0.47
Suitability for the task	4.49	0.40
Suitability for learning	4.40	0.37
Suitability for individualization	4.35	0.39
Conformity with user expectations	4.59	0.30
Self-descriptiveness	4.29	0.38
Controllability	4.50	0.32
Error tolerance	4.60	0.28
Total	4.48	0.36

collaboration learning based on PIDP development model. An initial study was conducted at Sripatum University Chonburi Campus, Thailand. The sample groups of this study consisted of 30 undergraduate students and five experts for summative evaluation to improve the system environment prototype. As described in approach, this study used the two stages of evaluation created by Dick and Carey (1996) which the Expert Review and Field Experiment (Dick and Carey, 1996).

First expert review phase: Five experts with a high level of expertise in the research field reviewed the prototype version of system to identify any deficiencies or problems and provided recommend for its improvement. The evaluation criteria determined the overall quality of the software testing, its clarity and impact and followed ISO 9241-110 (2006). The criteria consisted of eight standards, namely suitability for the concepts, suitability for the task, suitability for learning, suitability for individualization, conformity with user expectations, self-descriptiveness, controllability and error tolerance (International Organization for Standardization, 2006). The surveys used a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). The experts' estimation provided a recommended design for the modification of the system. The overall quality of the system design was good and the degree of clarity of the system was rated higher than the target levels. The suitability of the concepts, the suitability for the task, suitability for learning, suitability for individualization, conformity with user expectations, the self-descriptiveness, controllability and error tolerance were shown to have means of 4.60 (SD = 0.47), 4.49 (SD = 0.40), 4.40 (SD = 0.37), 4.35 (SD = 0.39), 4.59 (SD = 0.30), 4.29 (SD = 0.38), 4.50 (SD = 0.32) and 4.60 (SD = 0.28), respectively (Table 1). According to the experts' suggestions, several designs were changed including a redesign of graphic figures and more options for editing messages.

Field experiment phase: An initial study was conducted at Sripatum University Chonburi Campus, Thailand. The sample groups of this study consisted of 40 undergraduatestudents, the system was evaluated by two subgroups: the control group (learning by traditional method) and the experimental group (learning with the system to supplement traditional teaching). Learning effectiveness was evaluated by comparing its learning results with the traditional method. The result of comparison between control group and experimental group in posttest evaluation show that score of posttest higher that pretest (Table 2).

Table 2: Comparison between control group and experimental group in posttest evaluation

Test	N	Max	Min	$\bar{x}$	SD
Control group	40	26.00	19.50	23.32	2.09
Experimental group	40	29.00	20.50	26.23	1.96

Table 3: The satisfaction of the system

Topics	Mean	S.D.
Course content	4.08	0.54
System presentation	3.98	0.55
System structure	3.93	0.54
Overall satisfaction	3.99	0.54

Learning effectiveness was evaluated by comparing its learning results with the traditional method and learning with the E-learning to supplement traditional teaching. Based on the result of posttest-only control group design, the experimental group had significantly learning mean was 26.23 (SD = 1.96) and the control group had significantly learning mean was 23.32 (SD = 2.09). This can be concluded that the developed system can be utilized for this course and suggested that future research should focus on the meaningfulness of system to students' learning experiences.

The result of the satisfaction of system. The data were collected by using questionnaires about the satisfaction of learning environment. Research methods were applied to collect quantitative data using questionnaires. The data were analyzed using basic statistical tools, frequency, mean (X) and Standard Deviation (SD). The levels of student' satisfaction was determined as 4.50-5.00 means definitely agree, 3.50-4.49 means strongly agree, 2.50-3.49 means quite agree, 1.50-2.49 means quite disagree and 1.00-1.49 means strongly disagree.

Form Table 3, the overall satisfaction of the system was also conducted to identify a way of evaluating the quality of students. The level of satisfaction was determined through three categories: Course content, System presentation and System structure. These showed means of 4.08 (SD = 0.54), 3.98 (SD = 0.55) and 3.93 (SD = 0.54). The overall quality of the system was estimated as good and the degree of clarity of system was rated higher than target levels.

This can be confirmed that developed system be successful, various aspects of the online environment should be considered such as application domain knowledge, conceptual theory, user interface design and evaluation about the overall quality of the design environment.

CONCLUSION

The system was implemented in a modular and integrated to learning environment as a module. The

online interactive whiteboard for supporting collaboration learning work together with proper. The system was completed and tested for a limited set of learning environment. The online interactive whiteboard for supporting collaborative learning was designed such that new innovative system for support learning. It test was done and fulfilled the objective, especially it can access any way any time any place. However, the system could work with more computers according to the performance of the server computer and network connectivity for the meeting. The strokes from writing and drawing could be stored as a Text File format which could be retrieved in the future by learners. For the further study, we plan to continue our research, looking for different technology and technique for develop innovative learning for learner such as m-learning, tablet and make multimedia to improve learner opportunity and education.

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