DESIGN OF MOBILE E-BOOK LEARNING SYSTEM SUPPORTING COOPERATIVE LEARNING ACTIVITIES

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Abstract- This study implemented the collaborative mobile e-book reading and learning system (CMELS), allowing learners to use any mobile device to learn at any time and place. Considering that learners use different mobile devices, the screen size of the mobile device would show different operational interfaces on the page. The system includes reading of the learning content, showing messages in the reading process, recording and asking of questions. There are also three interactive models in the learning process: single interaction model, peer interaction model, and multiple interaction model. The results are as follows: (1) the learning effectiveness of the experimental group using CMELS is superior to that of the control group using it; (2) the learning effectiveness of learners with high frequency of learning interactions is superior to that of those with a low frequency of learning interactions.

Keywords- Cooperative Learning, E-book Reading,Mobile Learning.

I. INTRODUCTION

The advance and development of internet has changed people's learning environment. Through computer-based internet, people are able to obtain a lot of learning content and knowledge. Internet-based education is a resource-based learning environment where teachers' role is changed from the past instructor only to the current learning facilitator to guide learners to learn. Teaching resources have also been transformed from paper-based textbooks to various forms of digital teaching materials and media. After Apple Corps Ltd. put iPhone and iPad into the market, the learning trend of use of tablet computer has gradually attracted attention, and people have started to learn new knowledge at anyplace and anytime through wireless environment, which has changed the past model of internet-based education and triggered another trend of mobile cooperative learning. The suggested that the maximum advantage of mobile learning is its potential to enhance learning potential. Because learners can use mobile devices to engage in learning at anyplace and anytime, mobile devices provide them with more opportunities of instantaneous learning. The objective of mobile cooperative learning is to help learners discuss and share with classmates or teachers about the insurmountable obstacles they encountered and jointly create knowledge during learning process through internet-based learning platform.

Although mobile devices provide learners with learning convenience and create ubiquitous learning environment, current E-readers or mobile devices mainly simply provide the function of reading of e-document and cannot provide annotation to record reading or instantaneously share with other learners the information and knowledge obtained during reading process to engage in learning interactions. However, if there is a lack of interaction with others, share of knowledge and exchange of messages during learning process, learners may easily get tired of learning and lost their motivation, and learning effectiveness cannot be improved. Therefore, this study intends to upload e-documents to the webpage platform which can provide the function of instantaneous messaging to enable learners to share with other learners about the records of the document-related feedback or comments.

In recent years, the rise of social network enables users to more rapidly and closely contact one another, as well as leads to another new developmental trend of internet activities. The use of personal computer as learning platform of e-learning is limited to the portability and mobility. Therefore, users cannot look up information at anyplace and anytime, and neither can they instantaneously share information. Although the mobile learning of use of mobile devices to engage in learning has become a current new trend of learning and mobile devices have also improved the convenience of mobile learning and led to the rapid and close contacts among learners of social network, there has not been a platform providing the learning mechanism of instantaneous sharing of reading feedback. Therefore, this study took the advantages of the popularity of mobile devises and the significance of cooperative learning to effectiveness to develop a cooperative mobile learning e-book reading and learning system platform. This platform uses the mode of operation of instantaneous publishing of reading feedback to increase learners' learning motivation, and provides them with a learning platform of instantaneous multi-user interactive learning to engage in reading-based learning.

Based on the above research motivations, this study integrated the model of cooperative learning with cooperative mobile e-book reading and learning system where instantaneous sharing of personal

reading feedback and browsing of other learners' reading feedback are used to improve learning effectiveness. The three research purposes are described as follows: (1) to put into practice the cooperative mobile e-book reading and learning system,

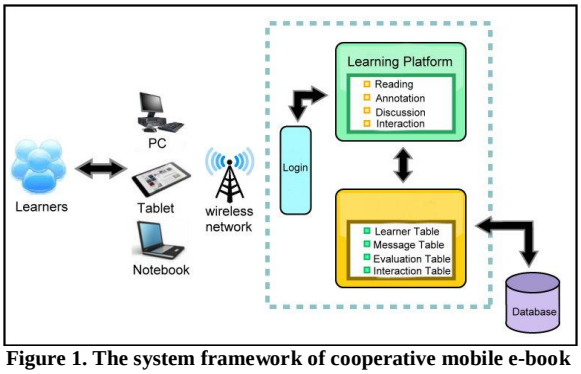


Figure 1. The system framework of cooperative mobile e-book learning system

which mainly useswebpage as master record and dynamically and instantaneously updates learning content; (2) to put into practice different learning interaction models in cooperative e-book reading and learning platform; (3) to investigate the difference in learning achievement between traditional e-book reading and cooperative mobile e-book reading.

II. LITERATURE REVIEW

A. Mobile Learning and Cooperative Learning

The learning achievement of cooperative learning has always been a main concern in education. Many studies have verified that, the use of cooperative learning-based teaching indeed can improve students' academic performance. Some studies indicated that the main reason why cooperative learning approach can improve cooperative learning is: during the discussion process, higher level of cognition can be provided, and more in-depth knowledge can be organized. Moreover, through the mutual interaction and discussions among team members, learners can look at a problem from more diversified perspectives, and their learning motivations can also be enhanced. The reason why cooperative learning enhances learning motivation is that it intends to enable learners to become more engrosses in learning activities and further improve learning effectiveness. In cooperative learning activities, learners' learning intention and willingness to affirm their own abilities can be better improved. Therefore, a study pointed out that, compared with general teaching activities, cooperative learning-based teaching can better enhance learners' learning motivation.

B. E-Book Learning and Interactive Theory

Interactions are a very important part in learning process. The suggested that ideal interactions should include: encouraging, correcting errors, pointing out learners' difficulties, informing teachers or teaching material designers of relevant information, and allowing learners and teachers to jointly adjust teaching directions. The indicated that the conversations between teachers and students can help teachers convey knowledge; on the other hand, they can help students inspect their process of understanding, reorganization, and transformation of concepts.

Therefore, teaching interactions are meaningful to the cultivation of learning efficiency and thinking ability. In traditional teaching, learners engage in learning in a classroom, and the interaction model is quite direct. However, when learning model has evolved from e-learning to mobile learning, learners become unable to interact with peers in learning. In learning process, the presences of interactions and the quality of interactions will directly affect the effectiveness of mobile learning. Although the interactions among learners in mobile learning are different from those in the past traditional teaching, the concept of interactions has always been regarded as one of the important factors affecting the effectiveness of distance learning.

III. SYSTEM DESIGN AND EVALUATION

This study intended to investigate the difference in learning effectiveness of students using cooperative mobile e-book reading and learning platform. This study used Nonequivalent Pretest-Posttest Design as the research method.

The research subjects were sophomores of information-related departments. There were 16 subjects in the experimental group, and 15 subjects in the control group, with a total of 31 subjects. Before the course began, the students in both the experimental group and control group received the pretest of computer course learning, which was used to test students' understanding of the content of section before the course began.

The experimental group used cooperative mobile e-book reading and learning platform to engage in learning, while the control group used traditional e-book reading to engage in learning. After the course was ended, the posttest on computer course learning was performed.

This study used ANCOVA to perform statistical analyses on the test results, in order to understand the influence of use of cooperative mobile e-book reading and learning platform on students' learning effectiveness.

This study developed a cooperative mobile e-book reading and learning platform, and provided learners with mobile devices to engage in learning at anyplace and

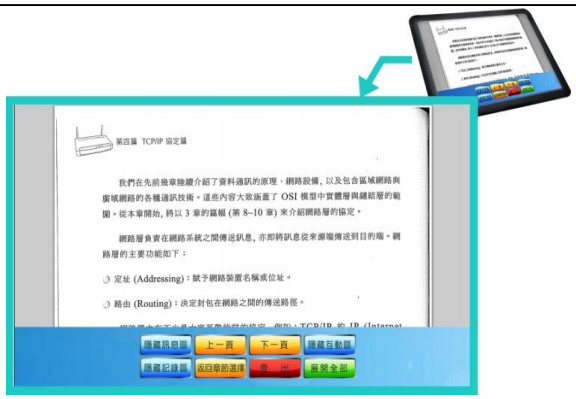


Figure 2. Interface design of CMELS system

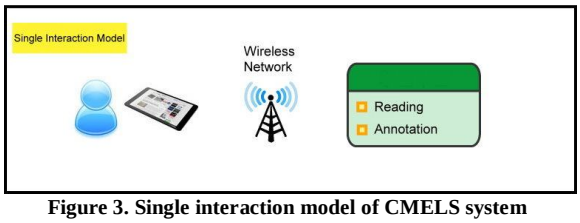


Figure 3. Single interaction model of CMELS system

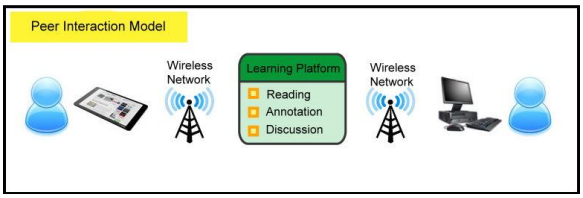


Figure 4. Peer interaction model of CMELS sytem

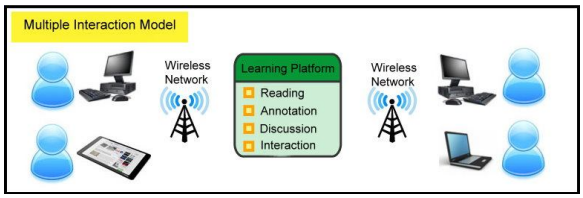


Figure 5. Multiple interaction Model of CMELS system anytime.

Figure 1 is the system structure of this system. Learners could use any mobile device to link to internet and access the learning system via either online or offline means. After learners logged in the system, the learning platform would present the learning content from back-end database according to the learners' registration data and choices of functions. Considering that thescreen size of the mobile devices used by learners were different, the display of webpages was also adjusted according to the screen size of mobile devices. When learners used mobile devices of different screen sizes to access the system, the system would judge the screen size of mobile devices used by learners first, and then display the webpages according to the screen size. If learners used tablet computer with smaller screen size to access learning system, the system would only display reading area and menu area to enable them to read the content comfortably, as shown in Figure 2.The paper used the interaction model enabling learners to engage in learning in museums through mobile devices proposed by the as the basis. Interactive learning model was classified into three categories, including single-user learning model, peer interactive learning model, and multi-user interactive learning model. When learners used single-user learning model, they mainly engaged in the reading of e-documents. Learners could add annotations to reading annotation area at any time during reading process. The types of annotations included questions, supplementary information, feedback, summarization of key points, and others. Learners could also use reading annotation area to raise questions andexchange or interact with other learners. They could even share relevant website addresses with other learners as shown in Figure 3. Peer interactive learning model was learners' browsing of other learners' reading feedback in

Table 1. Summary of covariance analysis of the posttest results

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	1172.554	1	1172.554	9.654	.004
Error	3400.836	28	121.458		

Table 2. Summary of covariance analysis of the posttest results

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	39.090	1	39.090	0.372	.552
Error	1364.608	13	104.970		

Table 3. Adjusted Means for different strong intelligences

Source	Adjusted Mean	S.D.	95% Confidence Interval	
			Lower Bound	Upper Bound
low learning ability	70.465[(a)]	5.503	58.576	82.354
high learning ability	76.410[(a)]	5.878	64.521	88.299

[a] Covariates appearing in the model are evaluated at the following values: pretest = 28.437.

Table 4. Summary of covariance analysis of the posttest results

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	655.514	1	655.514	11.033	.009
Error	534.736	9	59.415		

Reading annotation area or checking of questions about the webpage content raised by other learners to further reflect on whether they had the same problem. If they were able to solve the problem, they could reply to this reading annotation as shown in Figure 4.

Multi-user interactive learning model was that the system would directly lead users reading the same e-documents to interaction and discussion area after they clicked the e-document. When learners encountered any difficulty or question in e-document reading, they could directly discuss with other learners to avoid that they neglected the problems and obstacles they encountered as shown in Figure 5.

IV. ANALYSIS AND RESULT

This study used SPSS statistics software to analyze data. Part 1 was the analysis on the learning effectiveness of the experimental group and control group using the cooperative mobile e-book reading and learning platform. Part 2 was the analysis on learning effectiveness of low achievers and high achievers in the experimental group. Part 3 was the analysis on the learning effectiveness of low achievers and high achievers in the experimental group. Table 1 is the summary table of results of ANCOVA. After the influence of covariate (pretest score) on dependent variable (posttest score) was the excluded, the result showed that the independent variable (two different learning methods) had a significant experimental treatment effect on the dependent variable (computer internet test). The F value of the test on between group variable was 9.654, and the significant probability value p was .004 <.05, which reached the significance of .05. Therefore, posttest score was affected by the experimental treatment (independent variable) of samples. Therefore, there was a significant difference in posttest score. This study then analyzed the learning effectiveness of low achievers and high achievers in the experimental group. This study divided the subjects into low achievers and high achievers in order to understand whether there was a significant difference in learning effectiveness of posttest between low achievers and high achievers, who were divided according to the pretest score. As shown in Table 2, F value was .372, and the significant probability value p was .552 > .05, which did not reach significance of .05. Therefore, posttest score was not significantly affected by the use of learning platform. As shown in Table 3, the progress in high achievers was more significant than that in low achievers. In the end, this study analyzed the learning effectiveness of low achievers and high achievers in the experimental group according to learners' interaction frequency in learning platform, including number of logging in, message discussion, and number of replies. The objective was to test whether the frequency of use of learning platform affects learners' learning effectiveness. As shown in Table 4, F value was 11.033, and the significant probability value p was .009 < .05, which did not reach the significance of .05. Therefore, posttest score was affected by the interactions of learners in learning platform.

CONCLUSIONS

This study referred to literature investigation and analysis as theoretical basis to develop a cooperative learning-based cooperative mobile e-book reading and learning platform. This study used Nonequivalent Pretest-Posttest Design as the research method to conduct a learning experiment of computer internet course on experimental group and control group. The conclusions were reached according to the analyses, and relevant suggestions were provided. The research results are as follows: (1) the learning effectiveness of the experimental group using cooperative mobile e-book reading and learning platform is superior to that of the control group using it; (2) this learning platform is applicable to both high achievers and low achievers. The progress in learning effectiveness of high achievers is more than that in low achievers; (3) the learning effectiveness of learners with high frequency of learning interactions is superior to that of those with a low frequency of learning interactions.

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