行政院國家科學委員會專題研究計畫 成果報告

基於普適媒體技術建構遊戲式之行動學習環境
研究成果報告(精簡版)

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附件一

行政院國家科學委員會補助專題研究計畫 ■ 成 果 報 告 □ 期中進度報告

基於普適媒體技術建構遊戲式之行動學習環境

計畫類別：■ 個別型計畫　　□ 整合型計畫
計畫編號：NSC　97－2511－S －032－006－
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成果報告類型(依經費核定清單規定繳交)：■精簡報告　□完整報告

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中　華　民　國　98 年　9 月　22 日

Developing the Immersive Learning Environment by Integrating the Interactive Video and Ubiquitous Technologies

中文摘要

資訊科技已經成為日常生活一部份並且提供許多實際應用，在電子化學習與遊戲式學習方面，希望透過學習這融入遊戲過程中學習。在本計劃中，我們運用互動影音多媒體技術、GPS、GIS 系統發展普適媒體技術建構遊戲式之行動學習環境，我們建構在歷史學科，透過學習者實際在現實生活的場景中，藉助高科技定位感知學習者位置，來呈現與學習者的互動。

Abstract.

Nowadays information technologies have becoming part of our daily life and provide lots of practical applications in various domains. E-Learning is one of the most significant IT products and brings us a flexible learning environment. But if we want to make it more practicable for people to do the learning activities anytime and anywhere, to integrate advanced ubiquitous technologies will be an essence to realize an immersive learning environment. Furthermore, with the gradual improvement of Game-Based Learning domain, it could provide more useful learning strategies with game elements in order to attract learners to enjoy the learning activities. Accordingly, in this paper, we utilized the technologies in interactive video, GPS (Global Positioning System) and GIS (Geographic Information System) to develop the Ubiquitous Video Game-Based Learning environment. Learners could utilize UMPC platform to do the game-based learning activities anytime and anywhere. And we also demonstrated an example “The historical of Tamkang University” course content to explain the gaming scenario in our learning environment. We hope the learning environment could be more practical for learners/instructors when using the game-based learning environment.

Keywords

Pervasive game, Ubiquitous Computing, GBL, Game Design

1. INTRODUCTION

In recent years, there are more and more advanced computer hardware and communication technologies to help us in dealing with lots of difficult problems in many domains. E-learning is one of the significant domains impacting our accustomed daily activities. However, e-learning still faces to some major challenges while considering the learning motivation and the practicability of learning activities. Fortunately, with the advanced mobile hardware and communication technologies supported, to overcome the shortcomings of e-learning will be more realizable. Accordingly, another learning platform, as known as the m-learning, has grown up and makes the learning activities available anytime and anywhere. Another point to consider is the essential learning element, called “Learning Motivation”. Many researchers are interested in such issues and claim that it will be helpful to improve learner’s learning efficiency by putting the learning content in game world appositely. In [1] and [2], the authors pointed out that gaming behavior is one of the learning activities in human’s learning mode. Gamers will learn something in gaming phase naturally. Game is also attractive to learners to keep continuing their gaming phase. They have to solve all obstacles themselves in game world. So, they have to learn all techniques, rules and related knowledge in order to keep themselves alive. Such issues help and materialize the difference on learning strategy of Game-Based learning field in recent years. As a reslut, we would like to integrate the advantage of above learning behaviors and related computer technologies to develop the Ubiquitous Video Game-Based Learning environment that provides a practical and alluring learning environment to learner and course designer. Due to the proposed learning environment, we hope that learners or instructors could enjoy their course learning activities by utilizing our proposed Ubiquitous Video Game-Based Learning system.

2. RELATED WORK

Nowadays, due to the advanced information technologies, it’s helpful for people to improve their quality of life, especially in education and entertainment domain. More and more research issues have pointed out that games have some advantages to attract and help learners to enjoy their learning activities. Marc Prensky mentioned that general knowledge concepts and learning abilities could be improved by game play behavior [3]. It is practical to integrate interactive game elements into learning activities to improve the learners' efficiency, performance and motivation of learning [4]. Instructors could utilize the game-based learning tool easily to develop the interactive game-based learning environment to let learners enjoy their immersion experience learning behavior [5]. Kuang-Cheng Feng proposed a one-on-one game-based learning environment by monitoring the learner's learning portfolio [6]. Ang Chee Siang tried to improve the learners' learning motivation and learning performance by integrating the behavior, cognitive and motivation factors into the course mission [7]. Magy Seif El-Nasr pointed out that learners could utilize the simulation game to develop their abilities on problem solving, information searching and analysis [8]. Learners could also practice their learned skills in this game environment. According to above game-based learning issues, one important conclusion is that game could effectively improve the learner’s learning motivation and encourage learners to enjoy the learning activities by themselves. But to design the game materials is difficult for common instructors. In order to reduce the content authoring loading, we consider utilizing the interactive video technologies to solve such a problem. Many technologies are widely applied to enhance the relationship between users and videos. There are many video systems, such as Hypervideo, interactive video and augmented video, including interactivity features proposed in recent years. The basic idea of interactive video is to provide more complex operations and feedback to users. Chang et al. [9] applied interactive video technologies to the mobile learning activities in campus. Several interaction types were defined and implemented. By integrating video content and interaction designs, more complicated scenarios can be constructed for educational purposes. As a result, how to design interaction in interactive video systems is a major issue to be considered. Champion et al. [10] and Muda et al. [11] indicated that it is really hard to design meaningful interactions without attendance of experts. They proposed several models and rules to help content providers to produce materials with meaningful interactions. These interactions are applied in 3D environment

which is not compatible with our proposed video-based platform. But even so, we can still design suitable interactions according these rules. Some articles focused on transferring and broadcasting interactive video contents. Cesar et al. [12] and Shim et al. [13] showed that to transfer video with interactive contents, additional data tags and designs are necessary. These systems provide additional functions for transferring tags of interactive video and collect users' feedback from clients. In our proposed system, servers only deliver interactive tags and collect information from users' operations. There are also various devices adopted for enhancing interactivity between systems and users. Bing et al. [14] demonstrated more complex interactions to users by using PDA, smart phone and tablet. The interactive video systems can be applied in various purposes like education, commerce, sports and entertainments as Zhang et al. [15] showed. Such systems have enhanced impression and interest of users. Users can acquire different experience by using these interactive systems. Concepts of hypermedia, dynamic objects and characters are proposed as Lumbreras et al. [16] showed. Hypermedia provides additional information to users with multimedia objects. Users can also make interactions to change properties of dynamic objects in a scenario. With theses dynamic objects, the whole learning environment may be changed over time. Characters in scenarios provide mission and conversations. Users may get assigns from characters and rewards after they completed missions. And with the advanced ubiquitous technologies, they could help us to develop various kinds of reality experience game-based learning environment. The game application of using ubiquitous technologies had started in Geocaching game. This game was proposed by Kenton O'Hara [17]. The author pointed out that Geocaching system could provide outdoor experience (Ex: To provide the outdoor learning activity and cooperative social environment) for learners and it also could promote character changing from learner to material constructor. Peter Kiefer et al. [18] proposed chessboard-based game which is based on geographic information service. This game system provided a wide scope on game location architecture definition on developing the Geocaching game. Daniel Spikol et al. [19] had integrated the traditional Geocaching game with related mobile technologies to develop the outdoor learning game system in Sweden. The system could provide the map navigation and interactive learning materials in order to develop the outdoor learning system to promote learners' learning motivation when doing their outdoor learning activities. John-Paul Bichard et al. [20] proposed team-based cooperative outdoor experience learning game system. This system had integrated AR, GPS technologies and real actors, to provide immersive outdoor game scenario to let learners enjoy their gameplay experience. Shelley Shwu-Ching Young et al. [21] proposed the Across Mobile Platform Learning System (AMPLe). This system had focused on developing the outdoor learning activities for elementary school learners. This system could provide the related learning courses to learner's mobile device by wireless communication. The system also provided the course authoring tool, and instructors could easily utilize this tool to design the user interface and related course content. In mobile learning course design, Marco Sá [22] proposed the TEST-IT framework to provide more reliable development architecture on developing the course content and related assessment rules. The learner also could utilize the mobile device to assess these courses and to do their online assessment activity. The mProducer system proposed in [23] aims at building the personal experience datasets by using the mobile device, GPS and video processing technologies. Another work stated in [24] introduced the location-aware concept gaming model by using the mobile device, wireless and GPS technologies. In [25], the authors proposed the TIP (Tourist Information Provider) system by using the mobile device and GPS system. It provides the travel related information to users. In [26], the authors proposed a prototype model of M-learning, including the functionalities for learning content design, learning portfolio design and learning target setting.

According to the abovementioned discussions, we would like to develop the ubiquitous video game-based learning (Uv-GBL) environment by integrating the ubiquitous and interactive video technologies. The remainder of this paper is organized as follows. In section 3, we will illustrate the design details, system architecture, system modules and related workflow of our proposed Uv-GBL system's environment. In section 4, we will introduce experiment result of the Uv-GBL system. Finally, the conclusion and the future work will be shown in section 5.

3. UV-GBL ENVIRONMENT

3.1 Uv-GBL System Architecture

While targeting at developing the Ubiquitous Video Game-Based Learning environment, the system architecture for supporting traditional desktops and modern mobile learning platforms should be considered carefully. The modern mobile learning platform could be a laptop or a UMPC (Ultra Mobile PC). The system architecture is comprised of three main components, including the ubiquitous interactive video learning content, the ubiquitous learning client, and most importantly, the backend game-based learning server. The interrelationship of our proposed system architecture is illustrated as Figure1.

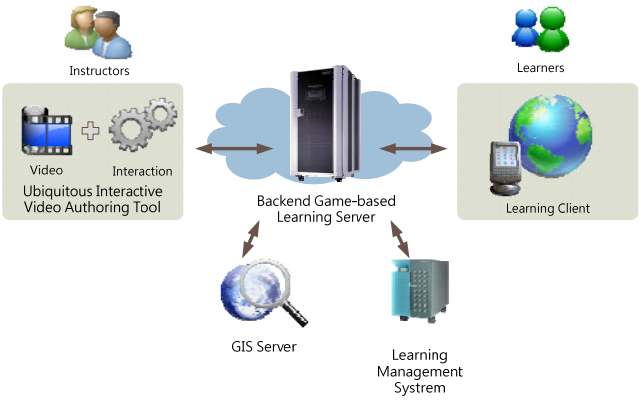

Figure 1. The Uv-GBL System Architecture

The ubiquitous interactive video learning content could be applied to provide the motivation, interaction, and attraction, which were not easily found in conventional learning content. Learners are able to perform the location-aware learning activities by using such ubiquitous interactive video learning content with various learning paths and strategies. In order to create those interactive video learning content, we developed an interactive video course authoring tool for serving this purpose. Instructors are able to use the authoring tool to design the interaction mode and assign various learning tasks in each learning unit. And after generating those video courses, instructors could upload them to the backend game-based learning server, and assign them to the registered learners.

In the ubiquitous learning environment, the learning client is consisted of the learners and the mobile learning devices. The most important things in learning client are on the presentation of ubiquitous learning content and the way of learning activities performed. Typically, the learning client should be easily augmented with other devices, such as GPS (Global Positioning

System) or RFID (Radio Frequency Identification) to support the location-aware learning activities, and in our experiment, we utilized the EeePc from ASUSTek Computer Inc. as the ubiquitous learning platform.

The backend game-based learning server includes the following components:

- Learning Management System: to manage the learning content, the learning activities, and the learning behavior.
- Gaming Server: to maintain the interrelationship of each interaction in the video courses, and deliver the corresponding quiz to the learners as a to-be-solved mission.
- GIS Server: to provide the location-aware information bounded to the interactive video courses for achieving the ubiquity.

After connecting to the backend game-based learning server, it will deliver applicable interactive video learning content to the learning client, and the corresponding services, such as the GIS (Geographic Information System) service and the gaming service, will be triggered to function and maintain the subsequent learning activities. From a functionality perspective, the services of the ubiquitous learning environment could be broken down into multiple functionalities as illustrated in Figure2.

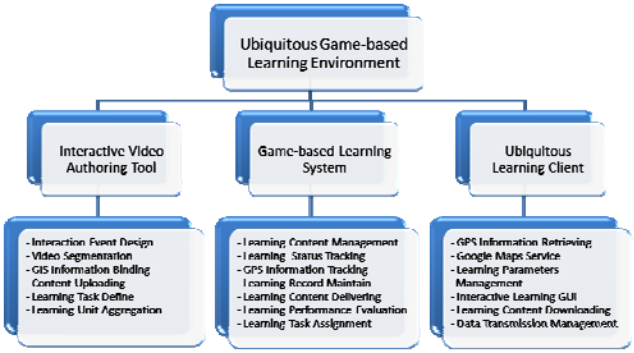

Figure 2. The Uv-GBL System Supported Functionalities

In next section, we would like to introduce the related modules and related workflow in our proposed Uv-GBL system.

3.2 The Uv-GBL System Modules – Server Side

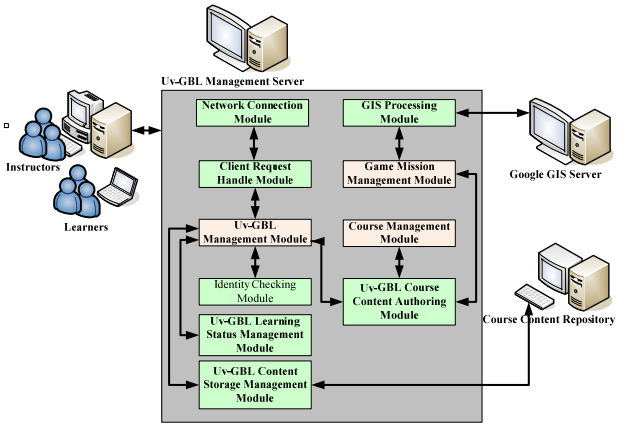

Figure 3. Uv-GBL Management Server modules and related data format design

In this section, we would like to introduce the Uv-GBL Management Server modules. The Uv-GBL Management Server modules are shown as Figure3. The Client Request Handle Module will manage all programs/processes requests and connection from client side. In Identity Checking Module, instructors and learners will utilize Member information table to store the related member information data. The table could record all basic properties and related operating process from instructors/learners. Action log will store the particular course ID or series course ID for the instructors/learners. In Uv-GBL course content design part, the content was divided into course content and game mission content. It will be in charge of Uv-GBL Course Content Authoring Module, Course Management Module and Game Mission Management Module. All existed game missions in repository could be individually share to other instructors when designing the game mission scenario. It could be useful for reducing the loading when instructors constructing other game scenarios. In game mission data format design part, the question and test data table may store the request properties of particular information of mission. The data would include related mission description, questions and corresponding answers. The above data management will be handled by Uv-GBL Content Storage Management Module. The Uv-GBL Learning Status Management Module will take charge of processing and recording related processing data from learner's learning progress. Instructors and learners could utilize related functionalities to review or to analysis the efficiency after finishing the related learning progress. The Uv-GBL Management Module will be responsible for coordinating and managing central information data.

3.3 The Uv-GBL System modules – Client side

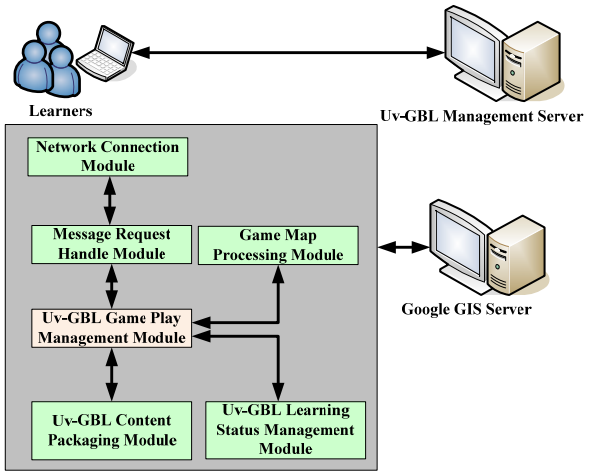

Figure 4. Uv-GBL Management Client modules and related data format design

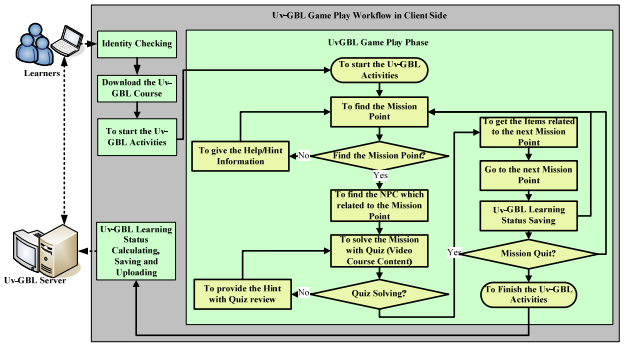

Figure 5. The Uv-GBL game play workflow

In this section, we would like to introduce the Uv-GBL Management Client modules. The Uv-GBL Management Client modules are shown in Figure4. The Message Request Handle Module will manage all programs/processes requests and connection from server side. When learner begins to do the Uv-GBL learning activity, they have to download the Uv-GBL course content package first. The Uv-GBL Content Packaging Module will take charge of content packaging/un-packaging. The Uv-GBL Game Play Management Module will set up the initial game environment with Game Map Processing Module according to the un-packaging Uv-GBL course content and to cooperate with Uv-GBL Learning Status Management Module to monitor and collect the current learning status data.

Figure 6. The Uv-GBL game play Interface

The Uv-GBL game play workflow and related interface has shown in Figure5 and Figure6. Learners could utilize the UMPC which cooperates with GPS/GIS functionalities to ensure the right gaming route. And when learners get in a particular position, they could ask the NPC (Non-player character) and to begin the particular game mission solving stage. When they finished all missions, the related game play status data will be sent to the Uv-GBL server. Then, they could see the result in game lobby by using the game result listing menu.

3.4 The Uv-GBL Course Content Authoring Tool

In this section, we would like to introduce the functionalities of the Uv-GBL Course Content Authoring Tool. The tool could help the instructor to build the course content, game scenario and related game parameters setting through web browser. The tool has two sub-tools. One is course content authoring tool, and the other is game scenario authoring tool. The course content authoring tool could help the instructor to develop the main course content with game style in interactive video form. The game scenario authoring tool could provide the experience game scenarios editing environment to help the instructor to put the learning content on the editing learning sequence as game scenario map style. The Uv-GBL course content authoring tool is developed in C# programming language to provide more complex interactive game elements and related help functionalities. In Uv-GBL game scenario authoring tool developing part, we use the AJAX-based (Asynchronous JavaScript And XML) technologies to design the operation interface. The game scenario authoring tool workflow, the course content authoring workflow and related tool interface are shown in Figure 7 and Figure 8.

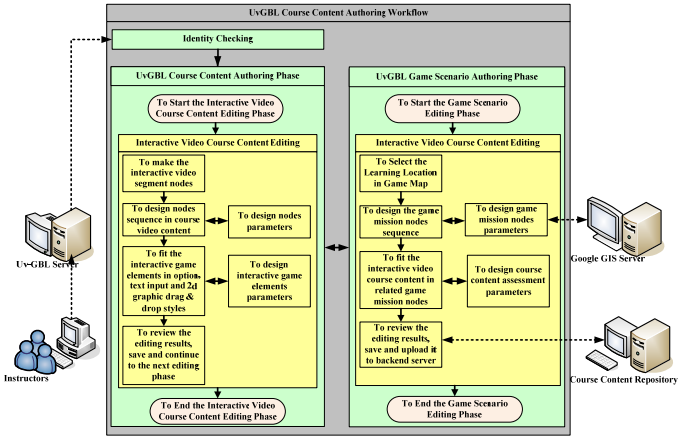

Figure 7. The Uv-GBL Course Content Authoring Workflow

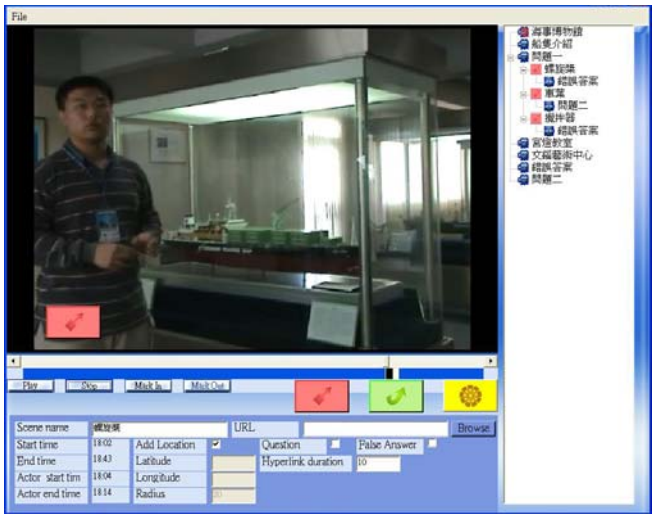

Figure 8. The Uv-GBL Course Content Authoring Tool Interface

3.5 The Uv-GBL System Learning and Assessment Strategy

In this section, we would like to explain our proposed Uv-GBL learning strategy. One of the learning efficiency effecting elements is "Learning Strategy". Mayer [27] had point out that "Learning Strategy" is an activity which utilized by improving the learner's learning efficiency. The learning strategy is an activity which has a system rule and planed decision activity. It is also an important element of meta-cognition abilities. Many research issues found that "Learning Strategy" has direct ratio to "Learning Efficiency" [27][28][29]. It means that the student who usually gets good grades knows about how to utilize the learning strategy to help himself/herself on doing an efficient learning. Otherwise, many issues show up that complex learning strategies will have the effective predicting on getting the student's learning grade [30]. So, many research points will be focused on student's efficiency learning strategy training. And most results show that it could be helpful on improving the student's learning course grade and his/her cognition abilities [28][29][30]. Thought the simulation game scenario, the learner has to do the quickly decision making, schedule planning, resources managing and immediately response returning. Each item will have a corresponding learning strategy. The learner could utilize the true simulation scenario and the full game play process to understand how many faults will be made according to his/her decision in game environment. Good game-based learning scenario could help the learner to learn the course content by game play experience. But the good game-based learning content could be developed by cooperation with game-based learning system developer and learning content designer to produce the suitable game-based learning content and related game environment for learners.

The research has pointed out that the learning strategy could classify into four parts [31]:

1. Information processing strategies: to utilize the learning technique to do the content organizing, and to elaborate the non-useful information into the meaningful information.
2. Active study strategies: to do the note-taking, previous test preparing in order to let the learner achieve their learning efficiency.
3. Support strategies: to utilize the learning technique to organize the learning time schedule, to manage the learning emotions and to handle the learning duty when doing it.
4. Meta-cognitive strategies: to realize the knowledge knowing levels, to monitor the new knowledge information getting status, and to do the learning efficiency assessment to realize what learning problems he/she has to solve.

Another research issue also has pointed out the classifying model [32], including:

1. Basic rehearsal strategies: to include the content reciting and relating remember content items.
2. Complex rehearsal strategies: to provide strategies of the content reciting repeating, transcribing and looking for the important key point of content.
3. Basic elaboration strategies: to construct the relationships of learning items, such as the image thinking links or keyword making.
4. Complex elaboration strategies: to emphasize the interaction between previous knowledge and learning content by content paraphrasing, abstracting, comparing, notebook making or asking the questions.
5. Basic organizational strategies: to put the individual learning item into strategy framework, such as the Sorting or Classify Strategy.
6. Complex organizational strategies: to construct the learning content items relationship link, including Outlining, Networking, lining up the article structure.
7. Comprehension monitoring strategies: to provide the meta-cognition.
8. Affective and motivational strategies: to include attention concentrating, anxiety reducing, and so on.

According to above discussion about the learning strategy classifying modes, we will include some pf them to provide the learning strategies options for instructors to design the relatives Uv-GBL course content.

In Uv-GBL learning assessment strategy design part, the research [33] had pointed out that learning portfolio has a clear goal on collecting the learner's learning works and to explaining the learner's learning accomplishments. The learning portfolio is a practical tool when doing the learning efficiency evaluating process. The items of learning portfolio could be divided into five parts. They are showcase portfolio, documentation portfolio, evaluation portfolio, process portfolio and composite portfolio [34]. We have designed the assessment items of the Uv-GBL learning portfolio as shown in Figure 9.

4. UV-GBL LEARNING EFFICIENCY ASSESSMENT RULES AND SYSTEM EFFICIENCY TESTING METHODOLOGIES

4.1 The Uv-GBL System and Learner's Learning Efficiency Assessment Items Design

In this paper, we utilized the learning portfolio to cooperate with system parameters to do the system's efficiency assessment and learner's learning efficiency assessment. The assessment items are shown as Figure 9. We utilized collected the system parameters to cooperate with assessment items to do the system efficiency assessment. The related learning content had changed in quiz form and it had included in the Uv-GBL system. So, the presentation style of learner's learning efficiency assessment will utilize the correct quiz answering

rate, score and related system parameters to calculate the assessment result. The system parameters are listed in Table 2.

4.2 The Uv-GBL System Usability Testing Items Design

In order to provide a user-friendly system for learners, we will utilize system usability testing method to analyze the efficiency of Uv-GBL system interface. The testing method is divided into two stages. One is expert testing, and the other is user testing. In expert testing stage, we would like to invite the expert of game interface design and system usability analysis, to do the expert assessment questionnaire. In user testing stage, we would like to design five game missions according to the learning content, and to invite ten learners who are not involved in this research. We aim at realizing the problems when doing the Uv-GBL learning activities.

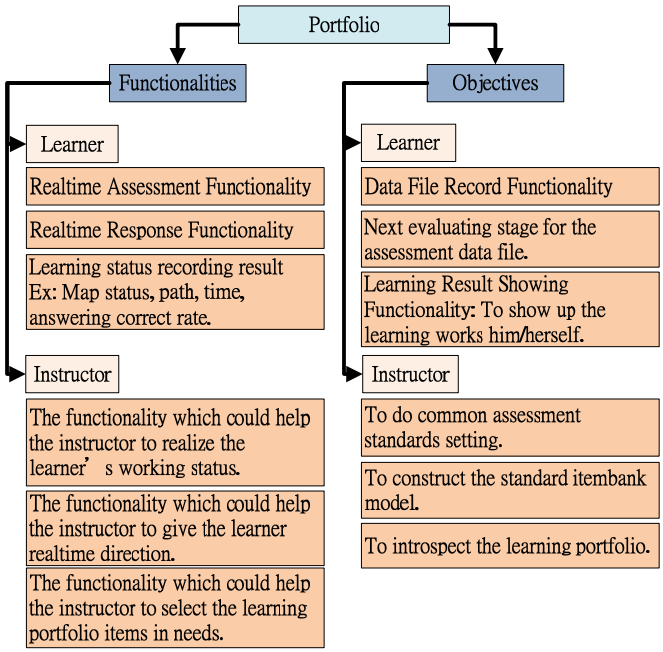

Figure 9. The structure of Uv-GBL learning portfolio.

Table 2. The Uv-GBL system related assessment parameters.

For the learner part:
● The number of times: Including the total login times, the total times for clicking the particular learning place, the total times of wrong question answer. ● Time: Including the total game play time, the total time which stay in particular learning place, working total time. ● Path: The sequence of game play path.
For the instructor part:
● The number of times: Including the total login times, the total times for clicking the particular learning places. ● Time: Including the total game play time, the total time which stay in particular learning place. ● Path: The sequence of game play path. ● Frequency: Representing the questions having the most wronging answer result, the total numbers of successful and un-successful learning places. The average of game play time and answering time, game mission accomplish total time.

Our research utilized two analysis methods to do above analysis, and they are task analysis and think aloud. The task analysis uses questionnaire to find the learner's working status when doing the questionnaire answering by video record. The testing subjects will be 5~8 people. The think aloud is that an observer who reads the items of questionnaire to the learner and the learner should answer the question. The learner has to operate the mouse and microphone to show his/her notion. According to the think aloud, it could be helpful to know clearly about the related problems when designing the Uv-GBL system interface. We also referred to the Technology Acceptance Model provide by Davis [35] to design the system efficiency assessment questionnaire.

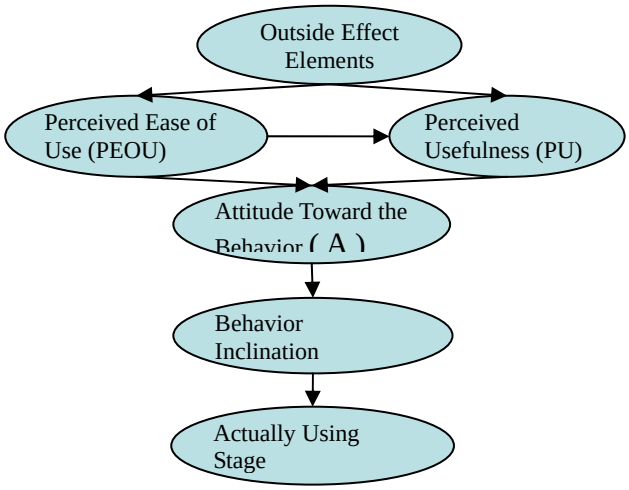

Figure 10. Technology Acceptance Model [27].

The Figure10 shows the relationship among related elements in Technology Acceptance Model. Perceived Usefulness (PU) indicates the degree that someone believes he/she could improve his/her working efficiency by using the particular system. Perceived Ease of Use (PEOU) means the degree that someone thinks the easy-to-use levels of the particular system. Behavior inclination (BI) will mainly affected by Attitude toward the Behavior (A). It will also be directly affected by PU. A will affected by PU and PEOU. PU will also be affected by PEOU.

5. CONCLUSION

In this paper, we proposed the Ubiquitous Video Game-Based Learning (Uv-GBL) environment based on the ubiquitous technologies. This Uv-GBL system aims at providing an attractive, convenient and immersive learning platform to both instructors and learners. By using the Uv-GBL system, not only the learning motivation but also learning efficiency was highly improved as discussed in the experimental results. The learning system also provides a user-friendly course materials authoring tool for instructors to construct the course materials and game scenario. And we also demonstrated the example of "The historical of Tamkang University" course content to show how to design the course content and assessment content in our Uv-GBL environment. At last, we hope this system could be an

important study case in the game-based learning domain.

6. ACKNOWLEDGMENTS

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7. REFERENCES

[1] Prensky, M. (2001), “Digital Game-based Learning”, New York: McGraw-Hill

[2] Gee, J. P.(2005), “Why Are Video Games Good For Learning?” This paper was, in part, inspired by reading Michael Zyda’s recent paper, “From visual simulation to virtual reality to games”, 2005, Computer 38.9: pp.25-32.

[3] M. Prensky, Digital Game-Based Learning, Computers in Entertainment, ACM, 2003

[4] H.S Kim and S.B Kim, “An Integrated Course Based on Educational Games”, Information Technology: Coding and Computing 2005, pp.436-441, 2005.

[5] H.C Yang, “A General Framework for Automatically Creating Games for Learning”, International Conference on Advanced Learning Technologies, pp.28-29, 2005.

[6] K.C Feng, B. Chang, C.H Lai and T.W Chan, ”Joyce: A Multi-Player Game on One-on-one Digital Classroom Environment for Practicing Fractions”, International Conference on Advanced Learning Technologies, pp.543-544, 2005.

[7] A.C Siang and R.K Rao, “Theories of Learning: A Computer Game Perspective”, Multimedia Software Engineering 2003, pp.239-245, 2004.

[8] M.S El-Nasr and B.K Smith, Learning Through Game Modding, Computers in Entertainment, ACM , 2006

[9] H.B. Chang, T.K. Shih, H.H. Hsu, C.C. Wang, An Interactive Video Course Platform with Authoring and Playback Systems, proceedings of the 22nd International Conference on Advanced Information Networking and Applications, March, GinoWan, Okinawa, Japan, 2008, pp. 1065-1070.

[10] E. Champion, Meaningful interaction in virtual learning environments, proceedings of the second Australasian conference on Interactive entertainment, November, Sydney, Australia, 2005, pp.41-44.

[11] Z. Muda, R.E.K. Mohamed, Adaptive User Interface Design in Multimedia Courseware, proceedings of the International Conference on Information and Communication Technologies, April, Omayyad Palace, Damascus, Syria, 2006, pp 196-199.

[12] P. Cesar, J. Vierinen, P. Vuorimaa, Open graphical framework for interactive TV, proceedings of the fifth International Symposium on Multimedia Software Engineering, December, Taichung, Taiwan, 2003, pp10-12 .

[13] S.S.Y. Shim, Y. J. Lee, Interactive TV: VoD meets the Internet, Computer, Volume 35, Issue 7, July, 2002, pp.108-190.

[14] J. Bing, J. Dubreuil, J. Espanol, L. Julia, M. Lee, M. Loyer, M. Serghine, MiTV: rethinking interactive TV, proceedings of the Seventh International Conference on Virtual Systems and Multimedia, October, Berkeley, USA, 2001, pp25-27.

[15] L.J. Zhang, J. Y. Chung, L. K. Liu, J.S. Lipscomb, Q. Zhou, An integrated live interactive content insertion system for digital TV commerce, proceedings of Fourth International Symposium on Multimedia Software Engineering, December, Newport Beach, California, USA, 2002, pp11-13.

[16] M. Lumbreras, J. Sanchez, Hyperstories: a model to specify and design interactive educational stories, proceedings of the XVII International Conference of the Chilean, November, Valparaiso , Chile, 1997, pp. 135-146.

[17] Kenton O’Hara, “Understanding Geocaching Practices and Motivations”, twenty-sixth annual SIGCHI conference on Human factors in computing systems, ACM, Florence, Italy, pp. 1177-1186, 2008.

[18] Peter Kiefer, Sebastian Matyas, and Christoph Schlieder, “Playing on a line: location-based games for linear trips”, international conference on Advances in computer entertainment technology, ACM, Salzburg, Austria, pp. 250-251, 2007.

[19] Spikol, D., and Milrad, M., “Combining Physical Activities and Mobile Games to Promote Novel Learning Practices”, Fifth IEEE International Conference on Wireless, Mobile, and Ubiquitous Technology in Education(WMUTE), IEEE, Beijing, pp. 31-38, 2008.

[20] John-Paul Bichard, and Annika Waern, “Pervasive play, immersion and story: designing interference”, 3rd international conference on Digital Interactive Media in Entertainment and Arts, ACM, Athens, Greece, pp. 10-17, 2008.

[21] Shelley Shwu-Ching Young, and Chia-hang Liang, “The Across Mobile Platform Learning system (AMPLe) Supporting Learner - Centered Knowledge Construction”, the International Conference on Networking, International Conference on Systems and International Conference on Mobile Communications and Learning Technologies(ICNICONSMCL), IEEE, pp. 206-211, 2006.

[22] Marco Sá, and Luís Carriço, “Handheld Devices for Cooperative Educational Activities”, ACM symposium on Applied computing, ACM, Dijon, France, pp. 1145-1149, 2006.

[23] Young, S.S.-C, Liang, E.C.-h, and Yi-Hsuan Wang, “Uses of the Across Mobile Platform Learning System (AMPLe) in supporting outdoor mobile learning scenarios”, Ubi-Media Computing, 2008 First IEEE International Conference on, IEEE, Beijing, pp. 290-295, 2008.

[24] Mansley, K., Scott, D., Tse, A., and Madhavapeddy, A. "Feedback, Latency, Accuracy: Exploring Tradeoffs in Location-Aware Gaming", SIGCOMM'04 Workshops, Portland, Oregon, USA (2004)

[25] Wu, I. N., Teng, C.-M. J., Chen, Y. C., Lin, T. Y., Chu, H. H., and Hsu, J. Y.-J. "Point-of-capture archiving and editing of personal experiences from a mobile device", Ubiquit Comput, pp.235-249(2007)

[26] Brown, R., Ryu, H. and Parsons, D. "Mobile Helper for University Students:A Design for a Mobile Learning Environment", OZCHI 2006, Sydney, Australia (2006)

[27] Mayer, R. E., "Educational psychology: A cognitive approach", Boston: Little, Brown and company.(1987)

[28] Gagne’, E. D., "The cognitive psychology of school learning", Boston: Little, Brown and Company.(1985)

[29] Weinstein, C. E., and Mayer, R. E., "The Teaching of learning strategies", In M. C. Wittrock (Ed.),Handbook of research on teaching (3rd ed.). New York: Macmillan.(1986)

[30] Schraw, G., and Brooks, D., "Improving college teaching using an interactive, compensatory model of learning", http://www.cci.unl.edu/Chau/CompMod.html. (2001)

[31] Weinstein, C. E. and Underwood, V. L., "Learning strategies: The how of learning", In J. W. Segal, S. F. Chiman, & R. Glaser (Eds.),Thinking and learning skills (Vol. 1)--- Relating instruction to research. Hillsdale: LEA. (1985)

[32] Weinstein, C. E., and Mayer, R. E., "The Teaching of learning strategies", In M. C. Wittrock (Ed.),Handbook of research on teaching (3rd ed.). pp.305-327, New York:

Macmillan. (1986)
[33] Arter, J.A. and Spandel, V., "Using portfolios of student work in instruction and assessment", Educational Measurement: Issues and Practice, 11(1), pp.36-44. (1992)
[34] Henderson, J., "An inside look at portfolio assessment", Paper presented at Interface 95, Lake Ozark,MO. (1995)
[35] Davis, F. D., "Perceived usefulness, perceived ease of use, and user acceptance of information technologies," MIS Quarterly, 13(3), pp.319-339.(1989)

目前已發表之國科會研究成果

期刊論文

[1] Jui-Hung Chen, Te-Hua Wang, Wen-Chih Chang, Louis R. Chao, and Timothy K. Shih, “"Developing an Interactive Video Game-Based Learning Environment," Journal of Software, Vol.4, Issue.2, pp.132-139, 2009. (EI index)

國際研討會論文

[1] Jui-Hung Chen,Han-Bin Chang,Chun-Yi Shen,Te-Hua Wang,Wen-Chih Chang, "Developing the Immersive Learning Environment by Integrating the Interactive Video and Ubiquitous Technologies" MTDL2009 (in press)

[2] Jui-Hung Chen, Te-Hua Wang, Wen-Chih Chang, Louis R. Chao: Developing the Historical Culture Course by Using the Ubiquitous Game-Based Learning Environment. ICWL 2008, pp.241-252, 2008.

[3] Jing-Yao Tang, Jui-Hung Chen, David Tawei Ku, Louis R. Chao, Timothy K. Shih, Martin M. Weng, “Constructing the 2D Adventure Game-Based Assessment System”. ICWL 2009, pp.376-385, 2009.

[4] Kuang-Min Huang, Jui-Hung Chen, Chun-Yi Shen, Louis R. Chao, Timothy K. Shih, “Developing the 3D Adventure Game-Based Assessment System with Wii Remote Interaction”. ICWL 2009, pp.192-195, 2009.