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Design of Collaborative Learning on Mobile Environment

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Abstract

The purpose of this research is for the establishment of Collaborative learning based mobile factors. We focus on three aspects, computer-supported collaborative learning, learning process module, and student learning mode. In this paper, student-focused lecture module, student interface module, teacher interface module, learner module, solution problem module, curriculum module, control module, and diagnose module are designed. This system allows students to be supported with an real time mode, non-real time mode, mixture mode. The devices used include smart phone, PDAs, mobile devices, portable computers and tablet PDAs. This system is to become a more capable student learning environment so that student can get student's learning done more efficiently. The development of a collaborative learning combines the advantages of an adaptive learning environment with the benefits of mobile telecommunication and the flexibility of mobile devices.

Keywords: *collaborative learning, mobile environment, real time mode, non-real time mode, mixture mode, lecture module, interface module, learner module, diagnose module*

1. Introduction

In recent years, rapidly increased mobile telecommunication and mobile devices use are extended and educational modes are pursued to open education through integrated multimedia tele-learning system in cyberspace. The rapid mobile technological development and the wider accessibility of high-quality telecommunications are benefit to bring about a significant change in e-learning. The development of learning lecture based on such technology as graphics, image, voice, and video has become the media for collaborative learning. Collaborative learning plays an important role of within the mobile learning, so collaborative learning system must be designed to satisfy several key requirements. These key requirements are derived from multimedia application development platform base which is interfaced with CSCW (Computer-Supported Cooperative Work) technology, and education engineering[12].

M-learning is often thought of as a form of e-learning, but it would be more correctly defined as a part, or sub-level, of e-learning. M-learning is a new stage in the progress of e-learning and that it resides within its boundaries[9]. M-learning is not only wireless or Internet based e-learning but should include the anytime/any place concept without permanent connection to physical networks. The advantages of m-learning compared to e-learning include: flexibility, cost, size, ease of use and timely application. The devices used include smart phone, PDAs, mobile phones, portable computers and tablet PDAs[9]. The

components of the mobile learning environment are mobile microprocessors, server module, mobile telecommunication, mobile sensors.

M-learning is more than just the latest educational idea or method. Learning occurs not just in classrooms, but in the home, the workplace, the playground, the library, museum, and in our daily interactions with others[2]. A student is free to start a class at any time within a specified time frame. This system is to become a more capable student learning environment so that student can get student's learning done more efficiently. In collaborative learning, there are three modes; in case of a real-time mode, this system designed to include audio/video/chatting control to conduct m-learning. The primary aim of real-time mode is to provide students with an interactive environment to supplement classroom experience. In case of non real-time mode, the system is designed to include a lecture editor to conduct collaborative learning.

We focus on three aspects, computer-supported collaborative learning, learning process module, and student learning mode. This collaborative learning develops a lecture module, student interface module, teacher interface module, learner module, solution problem module, curriculum module, control module, and diagnose module to develop a inspecting and participating technology in an learning environment. Indeed it seeks to enhance it by providing the audio/video/chatting for non-real time and on-going interaction. It needs to be properly guided or monitored in order to produce the preferred results.

2. Configuration of Mobile Environment

M-learning is a learning environment supporting student education using digital media in a geographically distributed environment. This system is defined with the following elements: content producer, service provider, and wire-less network. Various devices such as PDA and smart phones are equipped with different hardware and software constraints. Hardware constraints can be used to describe device hardware capabilities such as platform, cpu speed, memory size, screen size and resolution. Software constraints can be used to describe device software capabilities such as operating system, browser, playable media type and resolution[17].

2.1. Components of the mobile environment

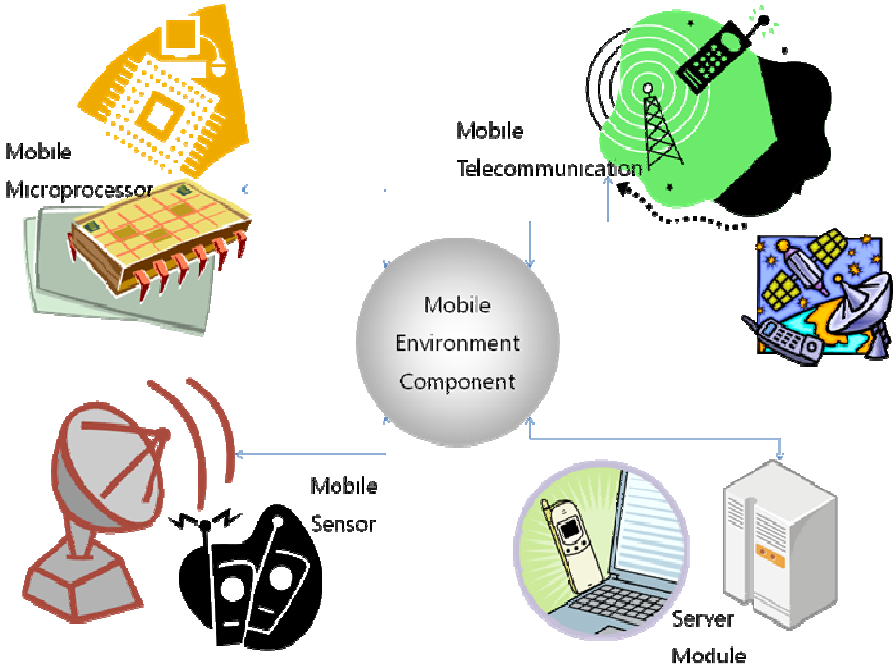
Figure 1 shows the components of the mobile learning environment. Components of the mobile learning environment include[3][9]. Mobile microprocessors with memory will be embedded in every object and device. The information each microprocessor will be hold about the object. When a student approaches, the sensor detects their presence and will start relaying information to the student's PDA and smart phone.

Server module will include the server, the educational strategies unit and a Database. The server manages the network resources. The educational strategies unit allows for the application of strategies to reinforce and aid student understanding through interaction and feedback. It analyses student responses to short quiz questions and returns more information or information in a different form when needed. DB stores all the data about the objects/devices, the users and the interactions that occur.

Mobile telecommunication technology will be in the form of Bluetooth and WiFi. The Bluetooth has weak signal strength, uses little power and covers a relatively short distance. Its low power consumption and ability to communicate with many devices is extremely beneficial when using handheld devices. The WiFi has a range and speed which surpasses

that of Bluetooth. It is compatible with any brand of Access Point and client hardware built to the WiFi standard.

Mobile sensors will be used to detect any changes in surroundings. These will be placed adjacent to the objects/devices and will be used to recognize the presence of students. The sensors used will include proximity, to detect movement, and light, to detect changes in light intensity. The module tracks and locates each student within the m-space by the use of sensors. When a student approaches an object, sensors wirelessly access the intranet and mobile learning environment and transmit information about the object.



"Figure 1. Components of the mobile learning environment"

2.2. Configuration

Mobile Learning is defined with the following elements[3]: content producer, service provider, and wire-less network. Content producer presents information in an interactive and informative way. The development of learning content based on such technology as graphics, image, voice, and video has become the resource for student learning service. Content producer provides a various function: creating and modifying a database structure, and adding, editing, deleting, and retrieving records through querying, and, working with multiple tables.

Content producer also includes generating links, creating tables, capturing data. Structured presentation of lecture note is determined by teacher. The instructional objectives, process, and methodologies are used to the lecture note. A lecture note is highly refined student-centered a lecture note methodology ensures understanding of subject concepts and features. The teacher prepares a lecture note using the various tools to create, edit and format a

document and a lecture note is kept in the server. Content producer also provides an editor form make anyone facilitating. It is possible to compose lecture material using the document editor. In case of non-real time, content producer provides a subject learning content, feedback, and learning phase on demand from the student. Proper links has to be provided as the reference materials. Links and references to internal and external sites can also be provided.

Service provider consists of various modes: real time learning mode, non-real time learning mode, and mixture learning mode. Service provider proposed the implementation of student learning system between student and teacher in mobile environment. Service provider supports the creation and deletion of the service object for media use, media sharing between remote students. Media Services limit the service by hardware constraint. In lecture time, the system supports audio/video/chatting control for effective communication of the students with the teacher.

Wire-less network is in charge of data transportation among mobile devices in distributed environment. Wire-less network creates the network connection, which altogether form a collaboration work, destroys and performs the functions controlling the QOS by detaching the network load. Wire-less network simulates multiple-point connection using stream and multiple applications share the same network connection.

2.3. Factors of mobile learning

In this paper, we will focus on mobile learning, mobile devices-supported student learning phase. The main factors of mobile learning are shown as follows[3][23].

Constancy : Students can never lose their study unless it is purposefully deleted. In addition, all the learning processes are recorded continuously.

Convenience : Students have access to their documents, data, or videos from anywhere. This information is provided based on their requests. Therefore, the learning involved is self-directed adult learner.

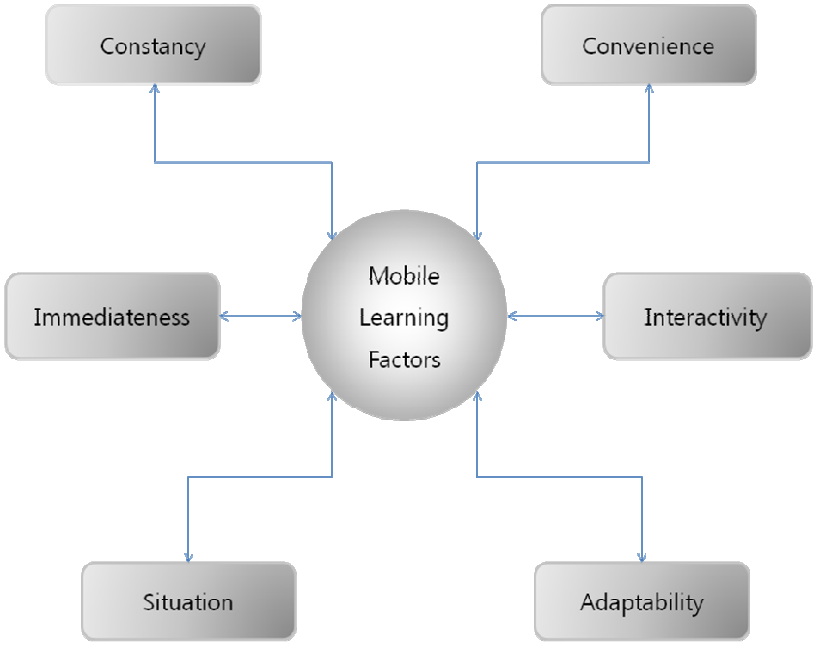
Immediateness : Wherever students are, they can get any information immediately. Therefore students can solve problems quickly. Otherwise, the student may record the questions and look for the answer later.

Interactivity: Students can interact with experts, teachers, or peers in the form of synchronous or asynchronous communication. Hence, the teachers are more reachable and the knowledge is more available.

Situation : The learning could be embedded in our daily life. The problems encountered as well as the knowledge required are all presented in the nature and authentic forms. It helps students notice the features of problem situations that make particular actions relevant.

Adaptability : Students can get the right information at the right place with the right way. Moreover, mobile learning can be CSCW environments that focus on the social knowledge building and sharing.

Figure 2 shows the main factors of mobile learning.



"Figure 2. The main factors of mobile learning"

3. Collaborative Learning

Collaborative learning is a variety of approaches in education that involve joint intellectual effort by students or students and teachers. Collaborative learning refers to methodologies and environments in which students engage in a common lecture in which each individual depends on and is accountable to each other. Groups of students study together in searching for understanding, meaning or solutions of their learning such as a product. The approach is closely related to cooperative learning. Collaborative learning activities can include collaborative writing, group projects, and other activities. Collaborative learning has taken on many configurations[25]. The first is collaborative learning for the self-directed adult learner, youth directed collaboration, another configuration of self-directed organizing. Computer-supported collaborative learning has emerged as a new educational paradigm among researchers and practitioners in several fields, including cognitive sciences, sociology, computer engineering. Collaborative Learning also has a particular meaning in the context of LMS(Learning Management Systems). In this context, collaborative learning refers to a collection of tools which learners can use to assist, or be assisted by others. Such tools include chat, discussion threads, and application sharing among many others. Specifically relevant to e-learning where developers can share and build knowledge into courses in a collaborative environment. Knowledge of a single subject can be pulled together from remote locations using software systems.

3.1. Kind of Collaborative Learning

Irregular learning groups are clustering of students within a single class session. We can also form groups of five to solve a problem or pose a question. Irregular groups organize at any time in a class of any size to check on students' understanding of the material, to give students an opportunity to apply what they are learning, or to provide a change of pace. Regular learning groups are teams established to complete a specific task, such as perform a class experiment, write a report, carries out a project. These groups may complete their work in a single class session or over several weeks. Typically, students work together until the task is finished, and their project is graded. Class teams are long-term with stable membership whose primary responsibility is to provide members with support, encouragement, and assistance in completing course requirements and assignments. Class teams also inform their members about lectures and assignments when student has missed a session. The larger the class and the more complex the subject matter, the more valuable class teams can be. The suggestions below are designed to help you set up irregular learning groups and class teams[25][26].

3.2. Module of Collaborative Learning

Mainly student interface module monitors the student's actions, notifying other agents when needed and giving access to system resources. This module controls the access to the learner model and brings to the learner information about the whole learning environment.

Lecture module proposes the most suitable problem/situation to the student, including learning goals and the level of learning. Also the tutoring agent decides on a specific strategy. Furthermore, its didactical decisions are based on students' conceptions. To accomplish tutoring goals it is able to launch the lower-level module whenever a diagnosis is needed and, once diagnosis phase is over, it plans interactions with other learners.

Teacher interface module is an agent associated with the teacher's interface. This module controls the access to the teacher's KB and brings to the learner information about the whole learning environment. This module mediates interface modules related to: communication with other teachers, update of new activities to the students, distribution of such activities to students, and supervision of work done by students. Information KB is responsible for retrieving and filtering information from specified sources that can range from the learning materials and experiences available in the system to the entire Web. The communication module controls the communication with other agents, including determining message, sending out messages, and receiving and interpreting messages.

In Control Module, learners choose operators, validate actions, and validate the final result. Control elements are perceptive when attached to the fact that the learner makes assertions based on something on the screen and uses this information to take and validate decisions.

Diagnose Module is responsible for answering other module' queries. The strategy module considers complete solution paths and offers advice only when the student completes the problem. The most obvious issue that arises when tutoring agent exists in a system is what to do when the tutoring agent disagrees. In the modules presented here, we might have a situation where teacher strategy module wants to present a message at the same time.

Learner module is aims to meet the needs of the learner. The learner model is also used to see if the information has already been taught to the learner.

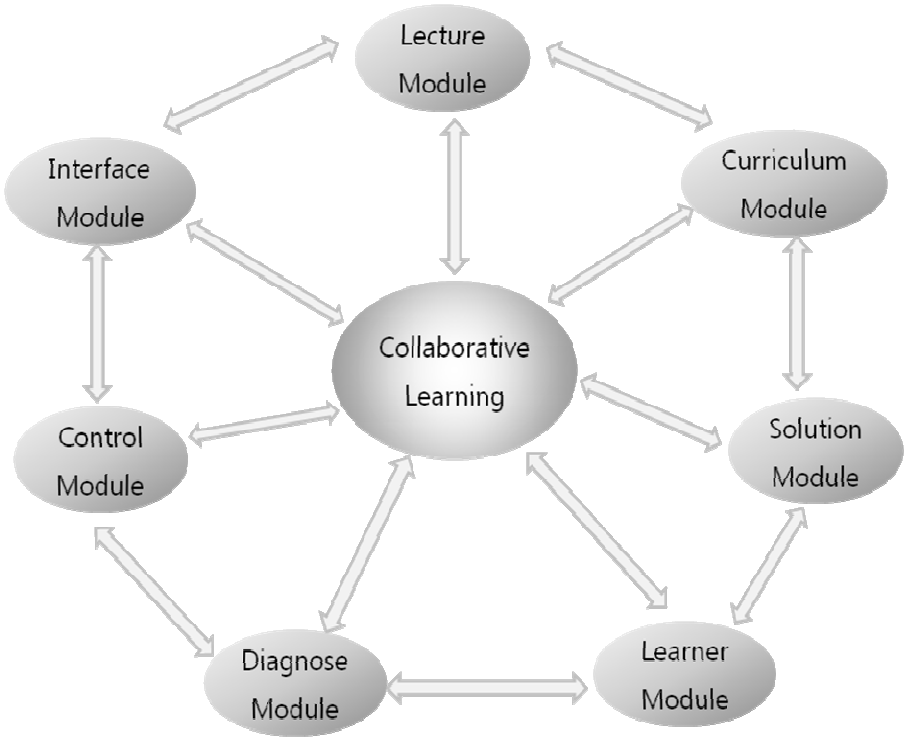
Learner DB includes a management component which is responsible for managing the learners, for example assigning login names and passwords, and managing two databases existing in the system, namely the learner's history database and the database with the recorded learning experiences. A third database contains the learning profile of the students, but this database is accessed by the learner modules of each learner.

KB includes a realistic knowledge base and associated exercises to enable an effective evaluation of the potential use of the system within a curriculum. Each tutor has its own specific tutor's knowledge base and also inherits global knowledge from a common knowledge.

Solution Problem module becomes satisfied when the category of problems it represents is present in the environment. The combination of the different values these didactical variables could take, leads to more or less complex problems, allowing to focus on different aspects of the learning of reflection and most important, allowing the expression of different conceptions.

Curriculum module has a curriculum information which represents the target skill and its constituent sub-skills, and depicts how they are related. The teacher's general strategy is to present instruction, ask questions, and evaluate answers. It creates and updates a student model based on an learning of the learner's natural language answers to assessment questions.

Figure 3 shows the module of collaborative learning[4][8].



"Figure 3 shows the module of collaborative learning"

4. Mode of Collaborative Learning

4.1. Real Time Mode

Real-Time Learning consists of m-learning server, teacher client, and student client. Two client applications run under Symbian, Palm, iOS, Android, Windowphone7 on smart phone connected to the server. Client environment consists of four modules for student real-time learning services[3]: Teacher test information manager, Teacher test monitor, Student information searcher, and Student test manager.

Lecture manager: The teacher prepares a lecture using the various a lecture note is kept in the server. There is the lecture manager that five buttons of top are lecture frame, model lecture frame, lecture registration, lecture delete and lecture start button. The list box of center is registered learning subject list. This window means that the system is intuitive and easy for students to use.

Device Manager: This module controls the use of audio and video resource to recognize teacher/ students and also assigns who is the turn of speak, decides and manages appropriate resource assignment according to request of resources. In device manager, explanation of each module is as follows: Floor module controls the floor among participants, and it consists of video image windows as many as the number of students who participate in the learning session. Video module is used for monitoring the video of remote participants, and it displays the video image of the participant who has the floor controls. Shared module is a window shared by all the participants, and the delivery carried out by the teacher is notified to every participant.

Searcher Manager: There is the student information searcher that two buttons of top are test connection and test wait button. First, after input the server site, press the test connection button. The list box of center is a list of registered learning subject. Secondly, after select the desiring subject list, press the test wait button.

Class manager: Students progress phase will be stored in a database to show student progress and adequate completion. This manager has the lecture note, which is distributed at the beginning. Lecture note is shared and each participant draws.

4.2. Non- Real Time Mode

Non- real time learning would contribute to change PDAs/ smart phone with their major areas in stand-alone mode and non-interactive application. Non- real time learning is an adaptation of the concept of demand on lecture. Critical attributes of non- real time learning environments are time and place independence and the asynchronous nature of the PDA/smart phone-mediated communication[3][20].

These attributes mean that students and teachers need not be online at the same time or place in order to be able to communicate with one another. Thus, smart phone-based student learning could be made available to students during specific time periods for students to complete at their leisure. With easy network access, students could complete the learning from a laboratory, or remotely from their home or place of work. Paper form was presented with an additional form containing radio-button questions.

4.3. Mixture Mode

In order to develop an effective mixture learning that accomplishes the goals of providing learning over the Web, it is necessary to understand key instructional features that will contribute to the development. It also uses the principles of cooperative learning to allow student to share in the negotiation of meaning derived from their quiz of content and practical testing. It also enables both teachers and students to interact in real-time or non-real-time in remote sites for interactive hypermedia-based learning. After the non-real time learning phase, students will be able to ask questions, via an audio channel, turn taking being controlled by the teacher client. Student will also learn to use toolbar to connect to the smart phone and browse Web sites of relate. Using mixture learning technology, student will learn to enrich references by creating live links to a related file or Web site[3].

5. Conclusion

Collaborative learning is an educational approach to teaching and learning that involves groups of students learning together to solve a problem, complete a task, or create a product. It is through the talk that learning occurs[25]. There are many approaches to collaborative learning. A set of assumptions about the learning process underlies them all: Learning is an active process whereby students assimilate the information and relate this new knowledge to a framework of prior knowledge. Learning requires a challenge that opens the door for the learner to actively engage his/her peers, and to process and synthesize information rather than simply memorize and regurgitate it. Learners benefit when exposed to diverse viewpoints from people with varied backgrounds. Learning flourishes in a social environment where conversation between learners takes place. During this intellectual gymnastics, the learner creates a framework and meaning to the discourse. In the collaborative learning environment, the learners are challenged both socially and emotionally as they listen to different perspectives, and are required to articulate and defend their ideas. In so doing, the learners begin to create their own unique conceptual frameworks and not rely solely on an expert's or a text's framework. Thus, in a collaborative learning setting, learners have the opportunity to converse with peers, present and defend ideas, exchange diverse beliefs, question other conceptual frameworks, and be actively engaged. In this paper, we describe the development of a collaborative learning model that uses mobile environment and the concept of m-learning. We focus on collaborative learning as an application domain of learning. The students with PDA store and share the useful expressions that are linked to any place in everyday life. Then, the system provides each student the right expressions at the right place. Each student interacts with many embedded devices. Students move around u-space and interact with the various devices. A ubiquitous computing environment enables people learning at any time and any place. But the fundamental issue is how to provide students right information at the right time in the right way. This paper tackles the issues of right time and right place learning in a mobile computing environment. Learning is an aspect of living not of place. We have always been able to learn in diverse settings other than the formal classroom, and often in a more pleasant, memorable, and useful way. Nevertheless, mobile learning serves to remind us of the need to continually re-examine how learning occurs and to attend to the affordances of new technologies[24]. The purpose of this research is for the establishment of mobile learning environment based real-time, non-real time and mixture mode. This paper proposed the implementation of learning between student and teacher of service provider in u-space, which is not limited to traditional learning system.

As a number of classroom with network drops continue to increase, m-learning system becomes the most viable solution. This system is suitable for distributed multimedia learning environment because it provides of audio and video functioning. The system have a various communication type, a question and an answer, multi-learning session, high degree of efficiency, high degree of cooperative, low degree of periodical cost and time constraint. This system allows students to be supported with a constancy, convenience, immediateness, interactivity, situation, adaptability. The system is to provide an easy to use interface, so that the students are motivated to use it for their learning. We also developed a set of requirements that supported by lecture module, student interface module, teacher interface module, learner module, solution problem module, curriculum module, control module, and diagnose module in order to perform an effective student collaborative learning. Also, the systems has many other advantages, which enable learning, PDA/smart phone service, high degree of data management, real time, non-real time, mixture mode and management of attendance[8]. We considered our m-learning system, usability and applicability, and concluded that it can be used for the multimedia PDA/smart phone in m-learning environment. We are also arguing for a better match between theoretical frameworks and methodology in m-learning research. While these are certainly important considerations, we believed that long-term penetration would be achieved by the potential of offering real time learning that are free from time and place constraints[11][12]. The development of a collaborative learning combines the advantages of an adaptive learning environment with the benefits of ubiquitous computing and the flexibility of mobile devices[3]. Students have the freedom to learn within a learning environment which offers adaptability to their individual needs and learning styles, as well as the flexibility of pervasive and unobtrusive computer systems. An ongoing version of this research was evaluated and would be tailed to the student's perspectives to come up with the enhanced version of this system. Collaborative learning processes can be incorporated into a typical 50-minute class in a variety of ways. Some require a thorough preparation, such as a long-term project, while others require less preparation, such as posing a question during lecture and asking students to discuss their ideas with their neighbors. Regardless of the specific approach taken or how much of the ubiquitous lecture-based course is replaced, the goal is the same: to shift learning from a teacher-centered to a student-centered model. This system is to become a more capable student collaborative learning environment so that student can get student's learning done more efficiently.

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