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Towards Higher Educational M-Learning Platform for Conceptual STEAM Environment

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Abstract

Nowadays, the progress of information and communications technology and information of society has made wire/wireless-based communications become a popular approach, being a widely used methodology for delivering various educational programs and organizational business situations, such as continuous education, online academic lecture, distant private trainings in companies, and other similar cases. Graduate students and company employees are continuously in need to learn more advanced knowledge, but oftentimes have limited opportunities due to time, location, and cost limitations involved in traditional learning. Distance education by means of a Mobile Learning Environment (MLE) is strongly requested to solve these problems. Such systems could help in organizing a meeting comfortably via the network environment. This highly technological innovation is used to link multiple users to join from any place to meet in a virtual environment. It also brings change in education-based communication by reducing the operational administrative costs and can make educational content competition stronger. Occasionally, the social communication demand for internationalized educational program is continuously increasing. Hence, the role of universities is to change the direction of the learning environment from the traditional classroom into wire/wireless-based communications for learning. Accordingly, these higher educational institutions are expected to spearhead that change direction with distant learning, or distant lecture technologies. In this paper, we present the policy and target of higher educational models using STEAM.

Keywords*: STEAM, Higher Education Model, Mobile Learning Environment*

1. Introduction

Recently, higher education and life-long human resource development are urgent issues in supporting the sustainable development of global society [1-3]. The conventional methods of education are not enough to support global demands because of limitations in technology, geographical location, and time zone-based resources. Therefore, a suitable use of advanced ICT in education is needed to meet these social demands, especially for developing countries where high-quality Internet service is not available and there is a prevalent lack of educational resources. It is well recognized that in the future, developing countries would play a key role in sustainable development more than before when opportunities on higher education were limited [4-6]. Therefore, a suitable use of advanced ICT in education is needed to meet the social demands, especially for developing countries where high-quality Internet service is not available and the prevalent lack of educational resources. It is well recognized that in the future developing countries would play a key role in sustainable development more than before where opportunities on higher education were limited. The features of m-Communication for higher education should be also different from those of the undergraduate education. Based on the

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requirements and demands of higher education, the goals of this research are defined as follows: 1) To remove the obstacles of both time and place to post-secondary education for individuals and corporations by developing and demonstrating innovative, cost-effective approaches in delivering education through the use of rapidly evolving advanced technology [7]. 2) To provide a means for learners to obtain formal recognition of the skills and knowledge obtained outside the traditional higher education context and/or from multiple providers through the assessment and certification of competency. 3) To encourage joint development of new learning and assessment materials among universities in the global scale, and technology standards that ensure connectivity. Trends and methodologies of m-Learning service have been changing, and nowadays are virtual conference-based, so called video conferencing, or streaming-based contents are being sought out. The new technology brings courses alive by allowing online learners to use their visual and auditory senses. Authoring tools for virtual conference-based content is needed to support this new trend and methodology. The tool should give the opportunity to reuse contents or archives, which can be shared to learners. For m-Meeting service, stability of the meeting operation in the unreliable network environment is very important. To preserve the meeting operation, the system should perform automatic reconnection for intermittent network, especially in areas with low-speed Internet [8-10]. A lot of requirements from the business sector need to be addressed, *e.g.*, content privacy and system management issues. In the m-Meeting section, a meeting management system for controlling member groups and contents were implemented. The author designed a simple new group-based structure for easier management. The system can manage the contents of each group by limiting the number of content, limiting the number of concurrent access, and controlling the behavior of logging-in members. The author also proposed the automatic reconnection network to help the participants who use unreliable networks by preserving the quality of online conference operation for the best distant meeting. After all, a usual computer with usual operating systems such as Windows, Linux and Mac operating systems is enough for use.

2. M-Learning System for STEAM

Distance education has been utilized to provide instructional access to adult students living in remote areas where traditional education is not available. An m-Learning system is a popular technology for distance education. The m-Learning education system is based on the web-oriented models conventional in-person education by providing equivalent virtual access to classes, contents, and other resources. It is also a social space where students and teachers can interact through threaded discussions or chat, as shown in Figure 1. There is a variety of benefits in using the m-Learning system. A learner who has limitations of time and location can learn by themselves with the distant-learning system via Internet technology at a lower cost and higher quality in the global scale [11]. M-Learning system can be integrated with a physical learning environment, which may be referred to as blended learning. It can take place synchronously or asynchronously. In synchronous systems, participants meet in "real-time" and teachers conduct live classes in virtual classrooms. Students can communicate through a microphone, chat rights, or by writing on the board. In asynchronous learning, which is sometimes called "self-virtual environment" learning, students are expected to complete lessons and assignments independently through the system. Asynchronous courses have deadlines just as synchronous courses do, but each student is learning at their own pace [12-15].

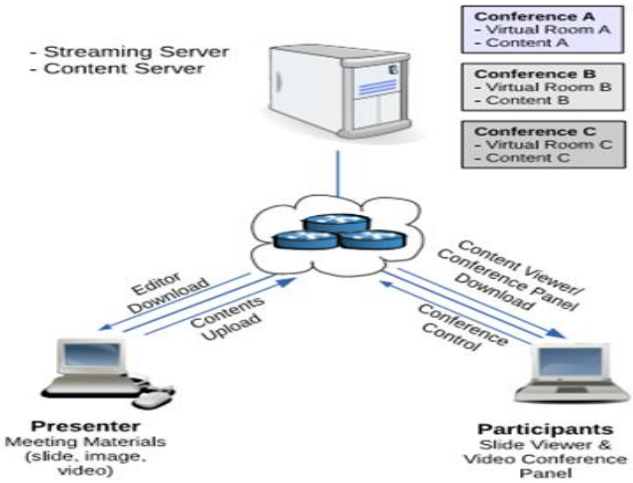

Figure 1. M-Learning System for STEAM

3. M-Learning Platform for STEAM

There are three main types of the m-Learning platform, *i.e.*, the standalone system, the server-client system, and cloud computing system. A lot of applications are working as a standalone system. They do not need network infrastructure, but they do require installation of software applications in the user's computer. They provide almost full support for various operating systems [16]. Moreover, the implementation of the m-Learning system on a cloud-computing platform has its peculiarities and needs a specific approach. This paper presents an m-Learning ecosystem based on cloud computing infrastructure. The benefits of this system are that it is reliable, flexible, and cost-efficient. The system also has mechanisms to guarantee teaching and learning activities, and the quality and the running of the ecosystem. In addition, this measured the positive impact of using cloud-computing architectures upon the m-Learning solution development [17]. The measured result shows that a cloud computing system can reduce the cost of infrastructure maintenance and risk of hardware failure of an m-Learning system, and Figure 2 below shows the m-Learning system workflow.

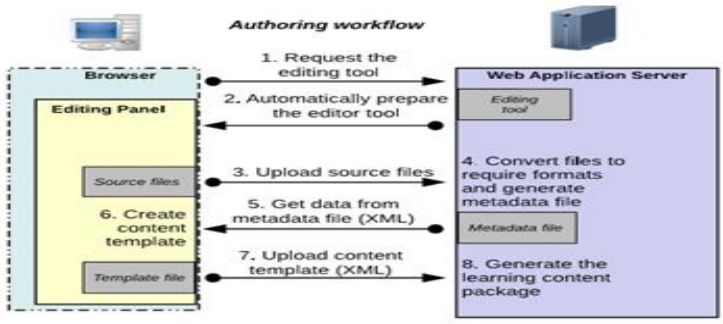

Figure 2. M-Learning System Workflow

4. Wireless-Based Content of m-Learning for STEAM

Learning contents are the essential element of an m-Learning system. The prevalent characteristics of learning content can be categorized in three groups: (1) General web-based learning content has been used as a standard e-learning system since web

technology was first initiated. It uses standard HTML elements such as text, images, and links for making content. (2) Slide-based learning content is composed of slides with embedded objects, such as text, image, and others. Slide is the main element of the content. It is used to control the embedded object from changing. (3) Wireless-based learning content is proposed to integrate data stream and slide presentation into a learning content. The wireless-based stream is used as a baseline of a learning content. Presentation slides are automatically changed by operating time. In the educational system, the use of this for student learning has long been discussed since it consist of various multimedia types such as image, audio, animation, and teacher actions. This form of technology brings courses alive by allowing online learners to use their visual and auditory senses to learn new concepts [18-20]. This streaming allows online instructors the opportunity to deliver alternative course materials to learners who use m-Learning system especially in higher education, and Figure 3 shows the data structure of the proposed wireless-based learning content package.

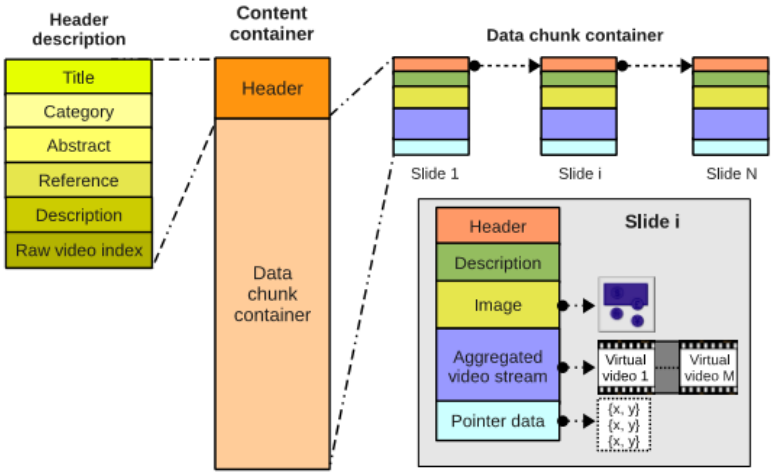

Figure 3. Data Structure of M-Learning Content Page

The content package consists of two segments, which are the header information and the slide chunk series of the presentation. The header segment is composed of six important fields. It contains the content general information such as title, category and subcategory, abstract, reference, raw file reference, and description of content. In the slides chunk segment, each slide is an independent unit with five fields, which contains important slide elements such as header, image, aggregated data stream, pointer data, and slide description. From the data structure, presentation slide is used as the baseline of content stream. Header information is key data used to reference other data chunks, making it flexible for rearranging the slide sequence that includes the whole data in a chunk. Image data is used for linking to an image file and pointer data also linked to a file that stores pointer action data [21-23]. Aggregated data are referred to the aggregated data stream wherein the virtual data clips are encapsulated. Slides data are stored into each file as separate data packages instead of one complete file. It is considered to be the best method for changing the meta-data file during editing and viewing operations, and Figure 4 shows a database schema for higher educational STEAM.

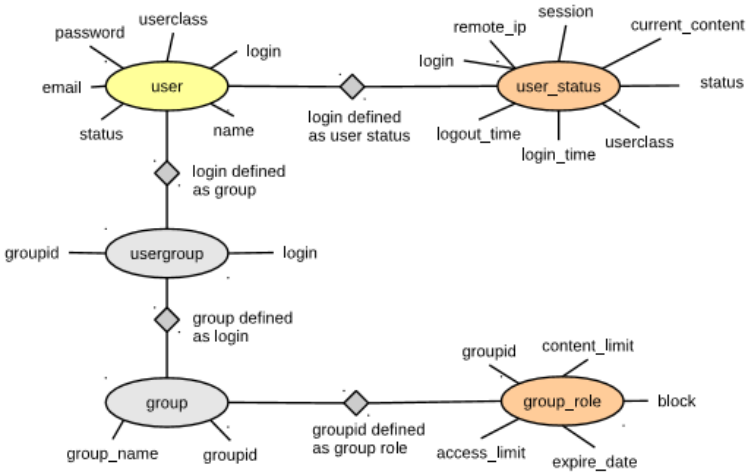

Figure 4. Database Schema for Higher Educational STEAM

5. Conclusions

The proposed authoring and viewing tools have exhibited numerous advantages as an m-Learning tool for higher education. The total system can help accomplish the purposes of distance learning among universities. It makes learning activities available anytime and anywhere. In addition, cross-platform and cloud computing are supported to break the barriers in various operating systems, and application software installation is not necessary on the users' computer. Since using online content is fast becoming a popular a trend for obtaining knowledge due to the vast availability of information and content from the Internet, then the proposed system can be used to support advanced knowledge by self-learning. It is considered to support classroom-based learning due to the increasing social demand internationally, and to address the limitations of traditional learning due to time, location, and cost. Therefore, the author implements a new online authoring tool for m-Learning system using Flash technology. The proposed system is achieved and optimized to support cloud computing technology since this technology is implemented in a wide variety of architectures, services, models, and other technologies for STEAM.

Acknowledgments

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