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UBIQUITOUS LEARNING ENVIRONMENT USING ANDROID MOBILE APPLICATION

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ABSTRACT

Great involvement of technology to the people's daily lives is evident almost everywhere, even in the educational setting. People's daily existence never ceases to include technology interaction. With the prominent and daily use and integration of technology to a student's daily routine, utilization of their mobile gadgets for educative purposes can be advantageous both to students and teachers alike.

This paper aimed to introduce the use of Android-based e-learning environment to adapt to the learning style of the 21st century learners. As shown in the previous studies, one of the main problems in any e-learning environment is on how to gain and retain the motivation of the learners. In this light, this paper explored the use of ARCS model by John Keller (1988) as a relevant learning pedagogy in the design of the proposed Android-based mobile e-learning.

Use of LMS, a local server, and website building applications were used to build the mobile application. Several ways on how to incorporate the four elements of ARCS in the e-learning media were developed based on past researches.

KEYWORDS: Ubiquitous Learning Environment, Mobile Application, Android Technology, ARCS Learning Pedagogy

INTRODUCTION

Technology nowadays is more social and people-oriented [7]. Because of the constant evolvement of technology, education saw an opportunity to lift its level up, and catch up with the advances that are taking place. Online education built its ground and is now rapidly growing. Online education started as websites, catering to desktops, but now, mobile learning is starting to crowd up the online education arena.

Many believe that e-learning can improve and transform today's learning setting. It has been a wide practice that if the design of a learning module is attractive enough, learning and engagement will be guaranteed [20]. Lecturers fail to consider other factors such as motivation. Yes, e-learning poses a variety of opportunities for learners across the globe, but without appropriate motivation, these opportunities can be considered wasted [20].

This research in hand is done with an intention to explore the maximization of use of e-learning via mobile phones. The concept of ubiquitous computing is involved. Ubiquitous can be defined as existing or being everywhere at the same time. When applying this concept to technology, the term ubiquitous implies that technology is everywhere and we use it all the time [23]. According to Weiser used the term ubiquitous computing to define "machines that fit the human environment instead of forcing humans to enter theirs."

The exploration of ubiquitous computing in a learning environment is also a task at hand. In the educative scenario, any setting where in students can become totally immersed in the learning process is considered a ubiquitous

learning environment. Since the mobile devices support the anytime, anywhere learning, m-learning can foster the growth of the ubiquitous learning [17]. The continuous growth of technology, along with the further evolution of ubiquitous learning environments, give way to the optimization of academic and informational processes [23]. And since the biggest dilemma of any e-learning now concerns gaining and retaining motivation, John Keller's ARCS Motivational Model will be used as the learning pedagogy.

Various works related to u-learning have been performed. Most of which are e-learning modules that are created for different types of learners. Some reasons why e-learning modules were developed were for distance learning [23], time constraint [1], unparalleled schedules [4], aid for underachievers [11], for implementing exams [18], and for enhancing the learning interactivity by making it available outside the classroom setting [9].

While all these modules are backed up by a learning theory, few have used the ARCS model, and even fewer have implemented it ever so effectively. Solutions or ways on how to effectively apply the ARCS principles into an e-learning module, specifically on cellular phones, ranges from little to none.

This paper aims to explore on the application of ubiquitous computing by trying to create a native mobile application or a web application that will serve as web portal of the university's learning management system. This application will be guided by a learning pedagogy. Modification and addition of some features of the LMS is also a challenge, especially to show the implementation of the chosen learning pedagogy.

LITERATURE REVIEW

Ubiquitous Computing

In 1991, Weiser coined the term "ubiquitous computing". Ubiquitous can be defined as "existing or being everywhere at the same time," "constantly encountered," and "widespread." It also is known as pervasive computing, ambient intelligence or every ware. Each term emphasizes slightly different aspects. It is termed physical computing, the Internet of Things, haptic computing, and things that think, when the objects involved are the concern.

The faultless incorporation of computers to the physical world defines what ubiquitous computing is. As our lives gradually lean toward a more ubiquitous computing environment, blending of computers into our everyday lives would be less conspicuous, and as computers become ubiquitous, they will eventually fade into background [7].

Technologies are the product of social needs. When they work for us, their social affordances sometimes prove to be more revolutionary than their technical specifications [3].

Ubiquitous Learning (U-Learning)

Ubiquitous learning envisions an environment where in the seamless integration of physical and digital devices is present, access to application and data can be made anywhere in the environment, and applications are not bound to a single device and can be migrated [16].

A u-learning environment is able to conduct more active and more adaptive learning activities in the real world [6]. Learning with u-computing technology is a special case of mobile learning. U-learning is learning at right time, in the right place, with the right device, containing the right contents, and used by right learners [6].

Moodle

Nowadays, most learning organizations have integrated an LMS with their information systems to a point where all learning activities (virtual and non-virtual) have a counterpart (syllabus, assessments, scheduling, etc.) in the LMS virtual classrooms [4].

Moodle is an LMS software, and an Open Source community. It is a free, open source software package designed using pedagogical principles, to help educators create effective online learning communities [22]. These pedagogical principles are the basis of Social Constructionism that make Moodle a platform specially fit to create learning communities [5].

Mobile Application (M- Learning)

Mobile devices can facilitate human interaction and access to information resources anytime and anywhere. Mobile devices can be a very useful consult tool and a way to access last recent events in the classroom [5].

Mobile learning is characterized by its potential for learning to be spontaneous, informal, personalized and ubiquitous [13]. M-learning serves not to replace current web-based applications, but only to extend it. This is the reason why ability of integrating mobile applications to an LMS is necessary [4]. The portability and immediate communication properties of mobile devices influence the learning processes in interacting with peers, accessing resources and transferring data [10].

Collaborative Learning

When learners at varying performance levels work together towards a common goal, collaborative learning is carried out. The learners are responsible for their learning while simultaneously involved in the learning of others. Thus, the success of one can be of aid to the other learners. Various collaborative learning activities are used by teachers to promote the learning performance of students. Through the use of computers, whole discipline of computer supported collaborative learning (CSCL) emerged.

ARCS

Now there are many learning pedagogies out there, behaviorism theories, constructivism theories, and many more. We have chosen to utilize the ARCS model because according to researches, one of the biggest problems faced by e-learning media now is: without the luxury of face-to-face interaction with its audience, how can one keep its audience motivated enough to not only complete the courses created, but to actually enjoy learning the skills and knowledge that is set before them [19] ? ARCS main goal is not only to build up motivation, but also to retain it. It is good to remember that e-learning cannot control learners directly, so the motivation of learners is necessary to sustain learning. John Keller's ARCS Model of Motivational Design states that there are four steps for promoting and sustaining motivation in the learning process: Attention, Relevance, Confidence, and Satisfaction (ARCS). It is a problem solving approach for designing the motivational aspects of learning environments to stimulate and sustain students' motivation to learn [8].

This model will be made use as the learning pedagogy to be employed in the mobile application. It has been widely used and validated by teachers and trainors in elementary and secondary schools, colleges, and universities, and in adult learning settings in corporations, government agencies, nonprofit organizations, and military organizations.

In other words, in virtually every setting in which there is a requirement for people to learn. It has also been used around the world on virtually every continent, and has been used extensively in Asia, Europe, and Latin America [8].

Beyond LMS

Even though motivational strategies gained from ARCS will be implemented on the learning management system, a great deal of involvement in the motivating process also relies on what the mentors will provide as resources. The format, the layout, the arrangement of activities, these are some of the important keys a mentor should put into consideration when creating resources for the students. The mentors should provide resources that will embody the principles held by the ARCS model. Even though the LMS will be peppered with the ARCS principles, if the mentor's idea of grabbing attention is by providing a 27-slide power point presentation with pure text, the system would fail [11]. It just means that the role of the teacher is still vital, and the LMS could not fully replace a teacher.

METHODS

The aim of this study is to look for a learning pedagogy that would present the best solution for the problem faced by e-learning now: gaining and retaining motivation. This pedagogy will then be applied to a learning environment which, in this case, is the university's LMS.

- **LMS**

A learning management system is a software application or a web-based technology that is used in an organization to set up, instigate, and assess a learning pedagogy. It can provide instructors with numerous features like creating and conveying content, monitoring student activity, evaluating student performance, and taking measures on such. An LMS can also provide students with interactive and collaborative features such as threaded discussions and forums. The LMS used in the university is the Moodle LMS. It is open-source so it was downloaded and installed, and was studied.

- **ARCS Model of Motivational Design**

For one to fully engage in a particular behavior, one must be genuinely motivated. Motivation is the most neglected aspect of instructional strategy, and perhaps the most vital element learners need. Even the most elegantly designed training program would be of no use if a student has no motivation to learn. Absence of motivation will surely be a hinder to a student's retention ability. Many students who are forced to complete training programs are motivated only to "pass the test" or "pass the course" [11]. The ARCS Model of Motivation theory revolves around the motivation of a student and its importance. The ARCS model touches many aspects involving motivation. It discusses not only how to grab a student's attention, but more importantly it has something to say about how to sustain that attention. ARCS consists of four concepts that, when used and executed properly, would lead to greater motivation. These concepts are Attention, Relevance, Confidence, and Satisfaction. The ARCS model showcases the interaction between the learning materials, and the learners [15].

Attention

The attention mentioned in this theory refers to the interest displayed by learners in taking in the concepts/ideas being taught. According to John Keller, there are three ways to grab attention:

- Perceptual Arousal - using surprise or uncertain situations.

- Inquiry Arousal - offering challenging questions and/or problems to answer/solve.
- Variability - using a variety of resources and methods of teaching.

Proposed strategy for LMS:

- Graphics, Animations, Colors, Humor, Statistics, Facts, Mystery [11]
- Questions, Challenges/Brainstorming Events, Conflict [8]
- Changing type of learning [14]

Relevance

Attention and curiosity are necessary but just aren't enough conditions for motivation. When a student sees that there is a point to his/her learning experience, he becomes more motivated. It is necessary that a student will perceive that the learning experience is in sync with their goals and are somehow connected to them, in any aspect. The 3 major strategies Keller presented are:

- Goal Orientation – present worth and future usefulness of gained knowledge.
- Motive Matching – understand learner's motives, provide them choices.
- Familiarity – role model, match content to learner's skills and past experiences.

Proposed strategy for LMS:

- Job-related examples, Case Studies, Scenarios, Simulations [8]
- Student can choose the content he/she wants to study [14]
- School color [14], Student's name [11]

Confidence

Confidence arises when course requirements and objective are clear. Confidence means learners believe that success is achievable. It establishes positive expectations for achieving success. The effort put forth toward reaching a goal added with motivation is what dictates the confidence level of the student.

Proposed strategy for LMS:

- Syllabus, Grading Policy, Rubrics, Estimated time to complete tasks [12]
- Meaningful and constructive feedback, Help [14]

Satisfaction

Attentive learners that are interested in the content and are moderately challenged will be motivated to learn. The next step now would be to make that motivation last. This will be satisfied by the fourth condition of motivation which is satisfaction [11]. Keller suggests three main strategies to promote satisfaction:

- Intrinsic Reinforcement – encourage and support intrinsic enjoyment of the learning experience.

- Extrinsic Rewards – provide positive reinforcement and motivational feedback.
- Equity – maintain consistent standards and consequences for success.

Proposed strategy for LMS:

- Opportunities to apply what one has learned, Personal Recognition [12]
- Grades, Privileges, Certificates, Positive Reinforcement, Motivational Feedback [14]
- Consistency, Sense of fairness [8]
- **Android OS**

Android was built from the ground-up to enable developers to create compelling mobile applications that take full advantage of all a handset has to offer. It was built to be truly open. Android is built on the open Linux Kernel. Furthermore, it utilizes a custom virtual machine that was designed to optimize memory and hardware resources in a mobile environment. Android is open source; it can be liberally extended to incorporate new cutting edge technologies as they emerge. The platform will continue to evolve as the developer community works together to build innovative mobile applications.

The mobile application of the university's LMS that will be developed will be built specifically for Android-based cell phones. Android-based phones were chosen due to the fact that more students are using Android-based smart phones. We will not be exploring the creation of applications for other available cell phone OS.

- **Mockups & Prototype**

Before a prototype was created, planning and creation of layout for the mobile application was done. The interface of each page of the mobile application, along with the flow of events circling the mobile pages, were created via mockups. After lay outing the design, coding for it was done. On these pages, the principles of ARCS are embedded.

RESULTS

After reading papers and analyzing the four principles embodied by ARCS, we have thought up of ways on how to translate these principles into the mobile application. Listed here are the approaches we took to translate each principle into mobile application.

Strategies to Gain Attention

- Perceptual Arousal - Graphics, Animations, Colors, Humor, Statistics, Facts, Mystery [11] (see Figure 1)

Figure 1: Use Graphics, Animations, and Colors to Gain Attention

- Inquiry Arousal - Questions, Challenges/Brainstorming Events, Conflict [8]
- Variability – Different file formats of resources [14], different multimedia elements on interface (see Figure 2)

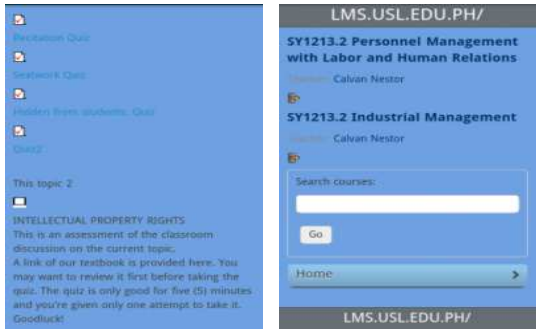

Figure 2: Resources in Different File Formats and Interface with Different Multimedia Elements

Strategies to Establish Relevance

- Goal Orientation - Job-related examples, Case Studies, Scenarios, Simulations [8]
- Motive Matching - Student can choose the content he/she wants to study [14]
- Familiarity - School color [14], Student's name [11] (see Figure 3)

Figure 3: Use of Color Blue and Use of Student's Name to Establish Relevance

Strategies to Boost Confidence

- Syllabus, Grading Policy, Rubrics, Estimated time to complete tasks [12] (see Figure 4)
- Meaningful and constructive feedback, Help [14]

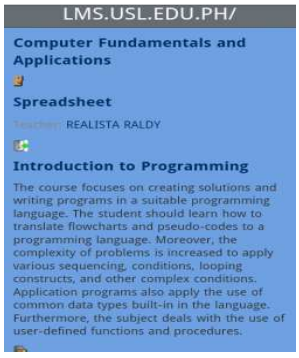

Figure 4: Show Course Content to Let Student's Know What is in Store for Them

Strategies to Give Satisfaction

- Intrinsic Reinforcement - Opportunities to apply what one has learned, Personal Recognition [12] (see Figure 5)

Figure 5: Provide Exercises Where Students can Apply the Lessons Learned

- Extrinsic Rewards - Grades, Privileges, Certificates, Positive Reinforcement, Motivational Feedback [14] (see Figure 6)

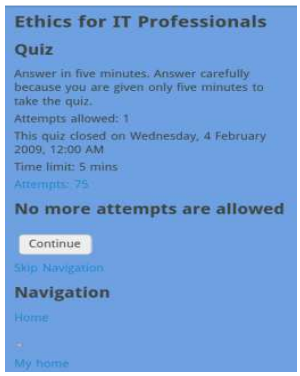

Figure 6: Provide Feedbacks for Quizzes

- Equity - Consistency, Sense of fairness [8]

CONCLUSIONS AND FURTHER WORK

Although millions of e-learning are roaming around the educational sector now, and some among these employ John Keller's ARCS motivational model as their learning pedagogy, few to none have tried to apply the ARCS model into a mobile learning application.

This study explored the ARCS model and was able to translate some of its principles into concepts applicable to mobile learning. It is very possible to do so, but requires the right amount of knowledge so as not to make the learning module too attractive, or too complex. On creating e-learning modules, one needs to remember that it is not all about presentation. Factors such as motivation should be considered. The primary goal of creating any mobile learning environment should be for educational purposes and not for entertainment.

For future work, it is recommended that a similar project be created that will be suited not only for Android cellphones. And since it is deemed possible to apply ARCS as a learning pedagogy to a mobile application, testing for effectiveness and efficiency should be conducted to a group of users.

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