System Design of Challenge-Based Learning Management System

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Abstract—The research aimed to 1) analysis and synthesis system design of Challenge-Based Learning Management System, 2) design system of Challenge-Based Learning Management System and 3) evaluate the system design of challenge-Based Learning Management System. Two phases of the research will be carried out: a development and an evaluation of the system design. Samples are experts in the field of information technology, challenge-based learning and learning management system. Five experts are selected by purposive sampling method. The obtained data are analyzed using mean and standard deviation. The research result demonstrates the following findings: (1) system design of challenge-based learning management system consist of 1) use case diagram of challenge-based learning management system 2) sitemap of challenge-based learning management system 3) sequence diagram of challenge-based learning management and system 4) entity relationship diagram of challenge-based learning management and system and (2) the five experts have evaluated the system design showed highest suitability.

Keywords—System Design; Challenge-Based Learning; Learning Management System;

I. INTRODUCTION

Learning and Teaching in the 21st century in line with the National Education Act B.E. 2542 and 2545, Section 22, requires that provision of learning must be based on the principle that every student can learn and self-develop. Students should be encouraged to develop naturally to their full potential. Also, Section 24 specifies that educational institutions and relevant agencies must arrange activities, learning environment and facilities in line with interests and aptitudes of students [4]. Apple Classroom of Tomorrow (2009) explains that learning is an approach based on the challenge of applying the lessons in classes and workshops to challenge settlement to go through. Learning through challenges involved teaching and learning methods in order to motivate the students in various technologies and facilities around them to solve real-world problems. Through this approach, students should implement assignments based on skills and interests, while the lecturer or other experts with challenging questions posed by the students and the students are trained to be brave act
II. RELATED LITERATURE

A. Information System Design

System design is the process of defining the components, modules, interfaces, and data for a system to satisfy specified requirements. System development is the process of creating or altering systems, along with the processes, practices, models, and methodologies used to develop them [6].

Systems design implies a systematic approach to the design of a system. It may take a bottom-up or top-down approach, but either way the process is systematic wherein it takes into account all related variables of the system that needs to be created from the architecture, to the required hardware and software, right down to the data and how it travels and transforms throughout its travel through the system [8].

B. Challenge-Based Learning

Apple Computer Inc. has applied CBL to the collaboration project, Apple Classrooms of Tomorrow (ACOT), between public schools, universities, and research agencies with great success [1]. The Challenge-Based Learning Framework as shown in Figure 1.

![Challenge-Based Learning Framework](Image)

Figure 1. Challenge-Based Learning Framework

Challenge-Based Learning is implemented in this study as follows:

1. Big Idea Start by working with students to identify the big idea. A big idea is one that is important on a global scale and that students can work with to gain the deep multidisciplinary content knowledge and understanding that is required by the standards for their grade level. A good place to look for big ideas is in the major news stories of the day.

2. Essential Questions which serves as the link between your lives and the big idea. The question should be answerable through research, help focus students’ efforts, and provide a framework for the challenge.

2.3 The Challenge

The challenge turns the essential question into a call to action by charging participants with developing a local solution to a global problem. A challenge is immediate and actionable. Choosing and setting up the challenge is crucial. If it is interesting and sufficiently close to home, students will derive personal meaning and feel a sense of accomplishment upon proposing and implementing a solution. If the challenge also has greater global significance, students will gain confidence and self-esteem as they engage with issues they know to be truly important.

2.3.1 Guiding Questions

Students can now generate their own guiding questions to identify the knowledge they will need to understand to develop a solution to the challenge.

2.3.2 Guiding Activities

Students identify and engage in guiding activities, including simulations, research, games, calculations, expert interviews, surveys, and other activities that help them acquire the knowledge needed to answer the guiding questions and to develop an innovative, insightful, and realistic solution.

2.3.3 Guiding Resources

Students did their research using books, class lecture notes, papers, the Internet and expert opinions in developing solutions to their guiding questions. They watched videos on the Internet to learn how to fend off social engineering tactics.

2.4 Solutions : Implementation

They should select one solution through prototyping, experimentation, or other means. next, they fully research, document, and develop that solution and then identify steps to carry out their implementation plan.

2.5 Evolution & Assessment

Challenge Based Learning presents a wide variety of opportunities for assessment. Informative assessment of content and skills can be built in throughout the challenge, and the solutions to the challenge provide an excellent opportunity for summative assessment. traditional assessment methods can be used at many different points during the process [2].

However, the CBL experience provides the opportunity to integrate a variety of alternative and authentic assessment tools. These tools are performance based in that students are not only expected to know the information but apply it in real-world situations. They also provide a longitudinal source of rich data that can be used to assess depth of knowledge and change over time.

C. Learning Management System

Ayub, Rohani, Wan Marzuki, Wan Zah and Wong [11] defined Learning Management System (LMS) as a web based technology which assists in the planning, distribution and evaluation of a specific learning process. It is a software environment designed to manage user learning interference as well as deliver learning content and resources to students. LMS can also refer to an application that is used for tracking, managing learning
and administrating system, and is particularly used in a learning environment.

LMS is also one of the solutions which are useful for both students and lecturer in online learning environment. LMS are tools for student communication and interaction among students and lecturers. LMS will help the lecturers to provide their learning materials and also interactivity features such as thread chatroom, files sharing and forums. As mentioned, LMS also support management task such as delivery and tracking, examination, scheduling, virtual live classes and several statistical analyses. This may save lecturers a lot of time and effort without making any substantial change in teaching process [11].

A typical LMS provides an instructor or moderator to prepare and deliver content, monitor participation by students, as well as assess student’s performance online. The LMS provides interactive features to the students. As such, threaded discussions, video conferencing, and forums for discussion are the main features of an LMS. The goal of an LMS is to keep track of student’s progress and performance. The LMS is not just viewed as an instructional trend but as a tool that benefits the adopters as well. As a web based learning tool, the LMS facilitates “any time, any place, any pace” access to learning content and management [12].

III. PURPOSE OF THE RESEARCH

1) To analysis and synthesis system design of Challenge-Based Learning Management System.
2) To design system of Challenge-Based Learning Management System.
3) To evaluate the system design of Challenge-Based Learning Management system

IV. RESEARCH METHODOLOGY

A. Phase 1

System Design of Challenge-Based Learning Management System.
1.1 Relevant articles and research works are studied, analyzed, and synthesized to formulate a concept of the system design.
1.2 A system design is developed based on the data obtained from the research study used in the formulation of the system design concept.
1.3 The system design is presented to advisors for consideration and modified it as guided.
1.4 Built to evaluate the system design suitability tools.

B. Phase 2

Evaluation and certification of the system design of Challenge-Based Learning Management System.
2.1 The system design is submitted to the experts for review and evaluate the suitability.
2.2 The system design is modified according to the experts suggestions.
2.3 After modification, the system design is presented in form of narrative diagram.

V. RESULTS

The study results are presented in two parts.

A. Part 1

System design of challenge-based learning management system consist of 1) Use Case Diagram of Challenge-based Learning Management System 2) Site map of Challenge-based Learning Management System 3) Sequence diagram of Challenge-based Learning Management System 4) Entity Relationship Diagram of Challenge-based Learning Management System, as shown in Figure 2 to Figure 5.
Figure 4. Sequence Diagram of Challenge-Based Learning Management System.
Figure 5. Entity Relationship Diagram of Challenge-Based Learning Management System.
The system design is comprised of three stakeholders, could be explained as follows:

- **Students/Learners**
  - Who use their mobile device access to learning management system, students can log in to join learning activities, students can handle of seven parts 1) Challenge based Learning Activity 2) Course Management 3) Content 4) Course Tools 5) Data Management 6) Location-based Services and 7) Test & Evaluation.
- **Instructors/Teachers**
  - Who register and manage (create, read, update and delete) courses, provide various digital contents (text, image, multimedia, slide, and compression files), Instructors can handle of seven parts 1) Challenge based Learning Activity Management 2) Course Management 3) Content Management 4) Course Tools 5) Data Management 6) Location-based Services and 7) Test & Evaluation Management.
- **Administrators**
  - The administrators are the people in charge of managing and administering the learning management system, Administrators can handle of two parts 1) Course Management and 2) Content Management.

**B. Part 2**

Evaluation results of the system design of Challenge-Based Learning Management System. The evaluation is carried out by submitting the developed system design to the five experts for a certification on the suitability of its components, methodology, steps, activities, and for a test. The evaluation result by the expert has shown that the system’s design principle concept and objective have highest suitability ($\bar{x} = 4.60$, S.D. = 0.50) see table 1, the component of Challenge-Based Learning Management System have highest suitability ($\bar{x} = 4.53$, S.D. = 0.55) see table 2, and The evaluation of system design of Challenge-Based Learning Management System when really using have highest suitability($\bar{x} = 4.80$, S.D. = 0.45) see table 3.

**VI. DISCUSSION**

The research results in the following points for discussion.

6.1 The expert’s evaluation demonstrates that the components, steps, and activities of the model are highest suitable. The result also aligns with the research finding of suggesting that the Challenge-Based Learning Management System Consists of 1) use case diagram of challenge-based learning management system 2) sitemap of challenge-based learning management system 3) sequence diagram of challenge-based learning management system 4) entity relationship diagram of challenge-based learning management system.

6.2 The expert’s evaluation also reveals that the system design of Challenge-Based Learning Management System highest suitable for the possibility of applying in real situation.

6.3 Challenge-Based Learning Management System following Marin, Hargis, & Cavanaugh, (2013) were developed the structure of a Foundations English Language (FEL) course that integrates the use of Challenge Based Learning (CBL) and iPad mobile learning technology. the Center for Teaching and Learning (CTL) provided a follow up session of the CBL introduction solely to level three teachers in order to share the course outline with them and to familiarize them with how their current assessment structure would fit into the CBL course. Then, one faculty member made stories of CBL initiatives in the classroom [9].

**ACKNOWLEDGMENT**

The researchers would like to thank Faculty of Technical Education and College of Industrial Technology at King Mongkut’s University of Technology North Bangkok which supported the tools and location for the research.

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