The Design and Implementation of Responsive Web-based Smart Learning System for Elementary Informatics Gifted Students’ Cyber Project Learning

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Abstract

Project-based learning in cyberspace has been diversely attempted to increase collaborative abilities and creativity considering regional distribution and individualization of gifted students since the advent of e-learning systems. In this study we analyzed related studies and requirements on systems for currently-provided cyber project learning of informatics gifted elementary student. And we designed and implemented the smart learning system based on theoretical background review and requirements analysis.

Index Terms: Smart learning system, Cyber Project Learning, Informatics gifted

I. INTRODUCTION

The gifted education of informatics for elementary school students in Korea has many types of teaching and learning methods [1]. Among them, project-based learning in cyberspace has been diversely attempted to increase collaborative abilities and creativity considering regional distribution and individualization of gifted students since the advent of e-learning systems. However, with the rapid advancement of mobile device and information technologies in recent years, the utilization on e-learning-based systems, which were previously utilized, has become scarce compared to recently introduced smart learning systems, and the utilization on personal computers (PC) only as a means of interaction between teachers and students in a cyber space has caused a number of problems in responses to the need of learning parties appropriately in the timely manner. Teachers have also similar problems in handling and assessment on students since they cannot obtain various pieces of data about activities and progress of students.

Thus, this study aims to analyze requirements on systems required for currently-provided cyber project learning of informatics gifted elementary students in order to supply a system for cyber project learning in which the above problems are resolved, and to discuss related previous studies.

II. Backgrounds

A. Cyber project learning of informatics gifted students
Cyber teaching and learning refers to a comprehensive teaching and learning method including guidance of learning process, assignment submission, discussion room for communication between teachers and learners and between learners, and e-mentoring by means of electronic communication using web chatting room based on online learning environment (OLE) [2][3].

Furthermore, cyber project learning is directed by students throughout all processes in learning including exploration activities about topics and issues and activities of expression about the outcomes. It has advantages that learners have an opportunity to meet the up-to-date learning materials and assess their levels about learning outcomes and error correction through understanding and communication between learners [4][5].

**B. Responsive web-based smart learning system**

A responsive web is coined by Ethan Marcotte for the first time, which refers to a web that responds to a horizontal length of browser and device. That is, it is a web design environment that responds to a horizontal size in a web browser to optimize a layout and provide the web content. The main technologies required to implement the proposed system as a responsive web are HTML5, CSS3, and JavaScript for authoring web pages, and PHP and MySQL for database access and management. A responsive web can be used regardless of operating systems (OS) and device types including browser type, which enables teachers and learners to have real-time and asynchronous learning in diverse environments [6].

The term smart learning system was coined in recent years, and its definition is not established yet but the Ministry of Education (2011) combined two words: the “smart education” and “system” and scholars approached this view as the first definition of smart learning. This study defined the smart learning system based on the previous studies as an interactive real-time learning system that can support cross-platform environment and cooperative learning that is self-directed education.

### III. METHODS

#### A. Requirement analysis on subjects of cyber teaching and learning

The practical requirements of subjects in cyber teaching and learning were analyzed to design specific functions required to the smart learning system for cyber project learning by informatics gifted students developed in this study. To do this, interviews were conducted with three teachers who were responsible for informatics gifted education for elementary students in Goyang-si, Gyeonggi-do, and 10 teachers who were responsible for gifted education at elementary schools in Chungbuk to determine the problems in existing systems. In addition, 16 students who attended gifted education class in information were surveyed to extract required functions in the system. Through the analysis of users’ requirements, we could extract seven key functions for the system: supporting mobile environments, statistical presentation, space for groups, chatting function, video streaming, assessment, and material site. To implement these seven functions, technologies that can
be adoptable in the smart learning system are web community-based notice board type, and module type that can be operated separately inside the system.

**B. Design of the smart learning system**

1) **Design of user interface**

The user interface design was conducted based on the theoretical background review, LTSA model [7], and functional analysis (See Fig. 1). Learners and teachers are connected to the system as student and teacher modes, respectively, through member subscription and login at PCs and mobile devices. Teachers have a right to create and manage a class space and submit assessment materials. They are also accessible to statistical materials. On the other hand, learners can use common spaces such as notice, classroom, learning materials, question board, and assessment as well as a group space that can be accessible by authorized group inside the system. Teachers and students can also utilize chatting and notes functions in common.

2) **Design of databases**

The database used to implement the system is as follows: class data, user data, board and reply data, note data, mapping information relation, statistical information - a database is not assigned specifically but preferred results are found at the database through query.

Once a learner or teacher (manager) is registered in the system as a user, and inputs information about institution and small group, the information is recorded in a corresponding database table. A teacher (manager) that belongs to institution can manipulate menu and notice board information displayed in the screen at education center operated by him/her, and has an administration right on each notice board.

Fig. 2 shows the tables and relations for each entity of the database design (draft) in this system.

**IV. RESULTS**

The development tool (IDE) used to develop the smart learning system was coda2 for MAC, and the PHP, HTML5, JavaScript, CSS3, and MySQL were used to
implement the design of system. The web server environment was developed with Linux and the developed system can be accessible through all web browsers in PCs and mobile devices (except for IE 8.0 or lower version). The implemented system is shown in Fig. 3.

Fig. 3. The implemented smart learning system for elementary informatics gifted students

V. DISCUSSION AND CONCLUSIONS

This study aimed to design and implement a responsive web-based smart learning system through analysis on the requirements of the system needed in cyber project learning of gifted elementary school students in informatics. The present system is currently applying to the gifted education field. For the future study, the satisfaction level and practical utilization effect felt by teaching and learning subjects will be analyzed, and the results will be reflected in the system to manage and update the system constantly thereby propagating the system into a wider school field.

REFERENCES