E-Learning Content Design and Implementation based on Learners' Levels

Hye-Jin Jeong and Yong-Sung Kim

***Abstract*—The modern techniques of content design should not depend on restrictions of schedules and physical spaces. Still, the learning that depends on the contents provided from a server is difficult to implement effectively without taking into consideration learners' levels. The learning should fit the learners' abilities. In this study, we propose the methods of developing learning content that fits the individual levels. Evaluations for individual levels are presented as the first level and the second level. The first level presents "evaluation learning" for each paragraph of the learning, while at the second level evaluations are carried out through "Trying the following" and "Trying oneself". "Checking Test" as part of the "sum of learning" is carried out during the first evaluation. Also "Trying oneself" is carried out as commensurate learning according to learners' levels.**

***Index Terms*—Learning self-initiative, e-Learning, bi-directional learning.**

I. Introduction

21ST century represents an information-oriented society and requires new learning methods fit to the current of the times in unlimitedly increasing knowledge and rapid changes of education environments [1].

The modern techniques of content treatment are migrating towards the continuous learning in learning culture and learning spaces, escaping from the restrictions of schedules and physical spaces

However, it is in the situation that there is insufficient good quality content that uses the web-based learning methods. These methods enable learners to study on their own according to their own abilities [2].

Good quality of content refers to constructing properly the levels of difficulty and the learning objectives to be achieved on the basis of the given contents of assignments and given learning condition and environment [3].

Still in case of the most modern education contents, like videos, texts or animations, etc., only one direction method is used. Sometimes the methods of grafting games and simulations for inducing learners' interest are used, but anyway they are carried out as unidirectional process provided from the server, and normally they do not consider learners' levels.

Because of this, effective learning is difficult and the fact that learning fits the learners' abilities is difficult to achieve.

Accordingly, in this study, we suggest the method of developing learning content that fits correctly the individual levels of learners.

For this, this study provides "learning evaluation" for each learning paragraph and evaluates individual levels. These evaluation values are arranged to carry out learning suitable for learners' levels. They are presented in a verification corner (part of the window) of various window forms such as multiple choice forms, OX forms, filling up blanks, matching pairs, etc.

Also, in case of tasks requiring practices, practical learning is possible by carrying out the task using the mouse events or keyboard inputs through "Trying the following" or "Trying oneself" procedures.

For the moment, learners' levels are evaluated indirectly by practice tasks that are repeatedly performed. The next task is decided according to the evaluation results of the previous task.

This paper first analyzes the related work (Section II) and then presents the system that implements the proposed method of e-learning based on the evaluation of learners' level (Sections III and IV). Finally, conclusions are drawn (Section V).

II. Related Work

The more e-Learning education based on Internet increases, the more studies are taking place for ensuring the high quality of content and its deployment ([4], [5], [6]).

Some studies are centered on learning with self-initiative and improvement of the creativity. In general, we cannot affirm that self-initiative learning effectiveness depends upon how efficiently these initiatives are used in learning [7].

Good quality of e-Learning education depends on properly carrying out education of learners' levels and achievement of the objective of learning, given content of the tasks and the learning circumstances and environments [3].

Simulation of the learning content using web document formats and multimedia have been provided through various ways to induce learners' interest and make them study continuously. Still, the learning keeps depending on the high quality content provided from the server [3].

Manuscript received October 12, 2008. Manuscript accepted for publication February 26, 2009.

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It is possible to support flexible learning through web, which has functions to support the gaining of various objectives of the learning, but its' limitation is not holding learners' individual characteristics ([8], [9]).

Thus, as e-Learning education on the web basis is more widely used, and there are not enough studies that take into account individual learners' active participation, this theme is very important.

III. System Design

General web-based e-Learning is improved by introducing high-level learning method for being in accordance to education circumstances of different countries and for presenting individualized tasks based on learners' individual differences.

Namely, we propose to use one additional higher level combined with various education methodologies such as "Review the learned", "Preview learning", "Laying the basic competence", "Checking Test", "Trying the following", "Trying oneself", etc. Also, in our system the content is designed as presented in Fig. 1 to control learning progress according to individual differences. This allows for centering on tasks that improve creativity, research abilities and self-initiative.

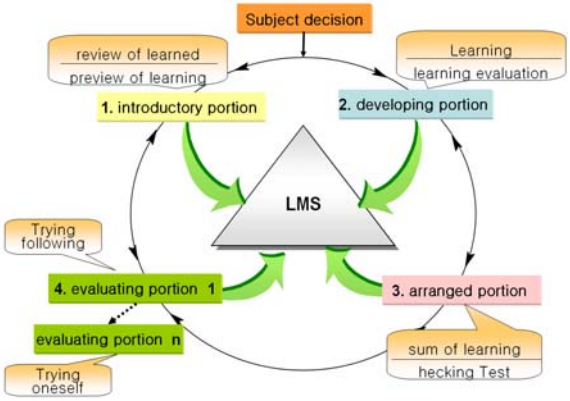

Fig. 1. Design of Instruction-Learning flow.

A. Evaluation of Individual Learning Levels

In case of learning requiring practical exercises, the individual learning levels are decided by the first and the second evaluations. In case of theoretical learning not requiring practical exercises, the individual learning levels are decided by the first evaluation. The first evaluation for individual levels is carried out by developing portion and the second evaluation for individual levels is carried out of evaluating portion (see Fig. 1).

1) The first evaluation of individual levels: developing portion

The content table of the developing portion where learning is carried out is divided into various paragraphs. In this case, provisional evaluations are done after learning of each paragraph is finished. The procedure is presented in Fig. 2.

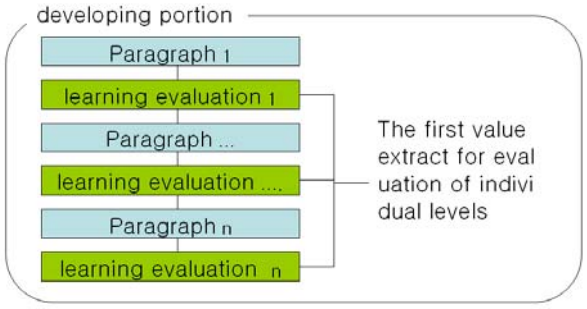

Fig. 2. The first evaluation of individual levels.

For the values obtained during the evaluation at this time, the learning suitable for learners' levels is updated when "Checking Test" of the corresponding portion is executed. The procedure is presented in Fig. 3.

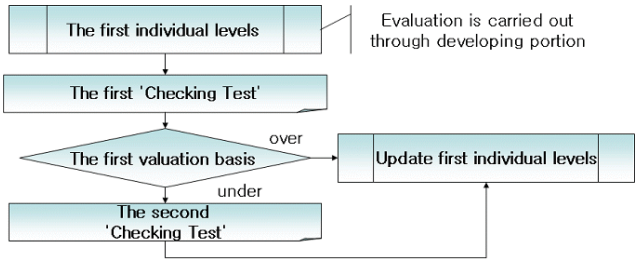

Fig. 3. The learning procedure of "Checking Test" according to levels.

2) The second evaluation of individual levels: evaluating portion

The evaluating portion, where learning is carried out, consists of many evaluating items.

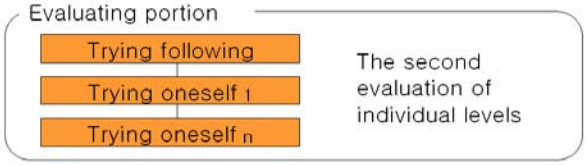

Fig. 4. The second evaluation method "Trying oneself".

The second evaluation is basically carried out through "Trying the following". Learners carry out tasks with the help of "narration" and "help menu" of task performance manager in "Trying the following". It is decided whether "Trying the following" should be repeated once again, while the evaluation is performed in learning evaluation region, or the next evaluating portion should be learned. The procedure is presented in Fig. 5.

Learners' levels are evaluated by the first and the second procedures, and learning is carried out according to the evaluated levels.

IV. System Implementation

This paper presents the methodology for implementation and development that is suitable for the education environment of a given country (in our case, we applied it to South Korea), based on available web-based e-learning environments.

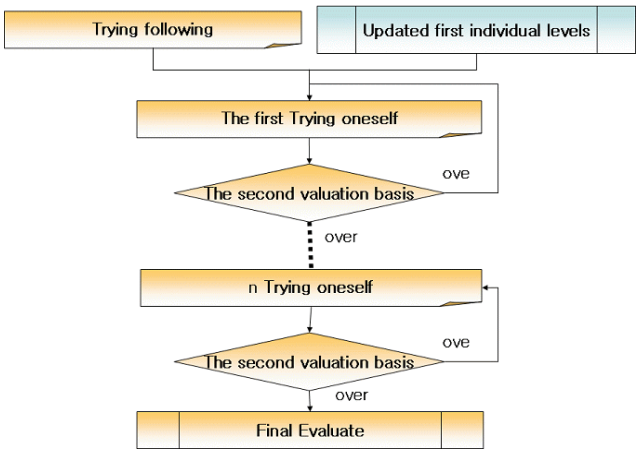

Fig. 5. "Trying oneself" during the second evaluation of the individual levels.

CAD requiring practices was chosen as learning content subject. The content composition is divided into subject decision, introductory portion, developing portion, arranged portion and evaluation portion.

A. *Subject Decision*

The stages are composed as presented in Fig. 6 to induce learners' curiosity and motivate them about the subject before the learning begins.

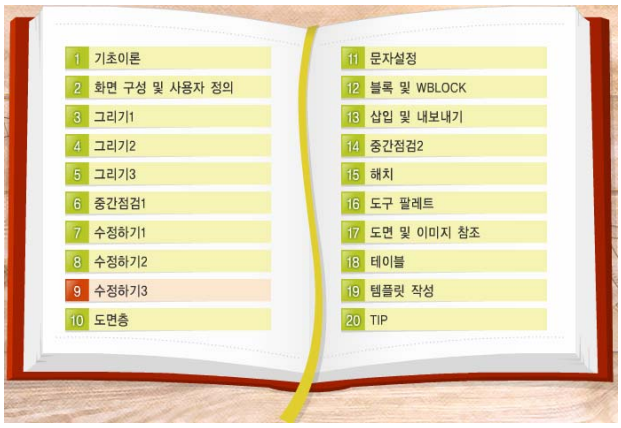

Fig. 6. Subject decision.

Fig. 7. Review of learned data.

Fig. 8. Preview of learning process.

B. *Introductory Portion*

This portion explains the content learned in previous periods as presented in Fig. 7, to make the learners to review the content learned before.

Also, it presents the tasks to learn at this time (Fig. 8) and construct the scheme of the task performance results to be presented in advance as shown in Fig. 9.

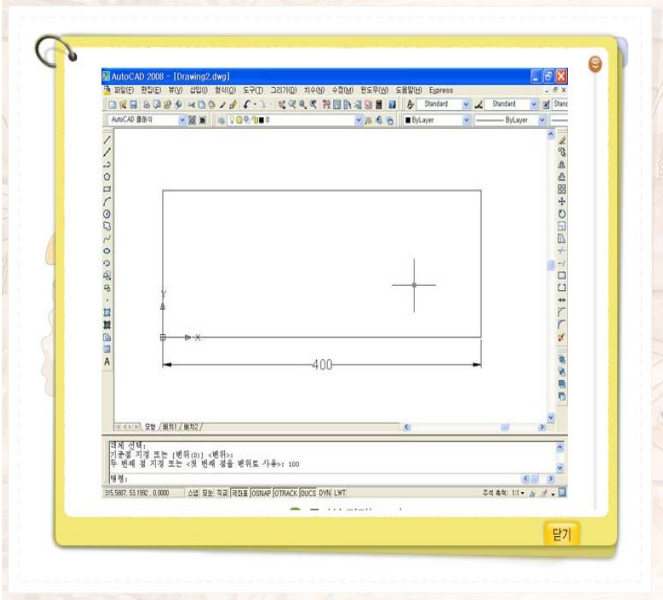

Fig. 9. Preview of learning results.

C. *Developing Portion*

Developing portion includes "Laying basic competence", "Learning guide", "Taking rest", "Learning evaluation", etc. The learning content is composed in the way that it is sufficient for each task and for each possible subject, considering all the techniques needed for content development, centered on media content.

1) *Laying basic Competence*

The learning provides the basic knowledge requirements to solve the proposed tasks as shown in Fig. 10, i.e. the concepts that the user should be familiar with.

Fig. 10. Basic learning.

2) Learning Guide/Taking Rest

Learning guide uses various ideas of the education engineering instruction-learning theory such as necessary content and the related terms that are required to solve the proposed tasks. This helps the learners to understand the content and obliges them to obtain comprehensive knowledge.

Especially, it provides learning content and the related content, setting "taking rest" corner to raise learners' concentration.

3) Learning Evaluation

Learning evaluations are carried out for each paragraph when learning is in process as presented in Fig. 11. The evaluations made during this time become the measure to evaluate the correctness of the individual levels.

Namely, at the beginning, the first evaluation of individual levels is carried out.

Fig. 11. Learning evaluation.

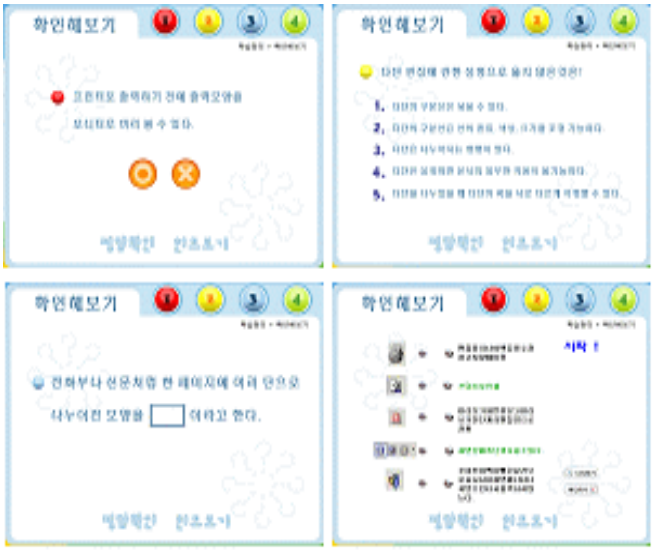

Fig. 12. Checking Test:OX (Yes/No) form, multi-choice form, filling up blanks, matching pairs.

D. Arranging Portion (Checking Test)

Various evaluating tools were used to obtain better comprehension of the learned content. These tools makes learners confirm in person the learned contents, using quizzes such as true-false form, multi-choice form, filling up blanks, matching pairs, etc. Also, it maintains the feedback between the learning and the confirmed results.

1) Checking Test

"Checking test" uses various evaluating tools to understand learned contents more deeply. It makes learners confirm in person the learned contents, using quizzes such as OX form (Yes/No), multi-choice form, filling up blanks, matching pairs, etc.

For the moment, the number of quizzes is dynamic according to the first evaluation scores of individual levels. Namely, learners with low individual levels have to solve more quizzes in addition to basic quizzes and the number is controlled according to the user level.

2) The Sum of Learning

The sum of learning arranges the core content learned through developing portion and verification. For the moment, major keywords and important items are presented for raising the concentration and the learners should confirm their comprehension by clicking them with mouse in person.

E. Evaluating Portion (Trying oneself)

Usually, two or more tasks to be solved by learners are presented by the system that waits for their solving. First of all, learners solve tasks according to the hints through "Trying the following" as presented in Fig. 13.

Afterwards, learners do practices in person according to working directions without hints through "Trying oneself" as shown in Fig. 14. The system evaluates the spent time and the errors during this time, and then makes a decision whether it presents the next task after reevaluating the current one with the results obtained in arranged portion.

Fig. 13. Sum of learning.

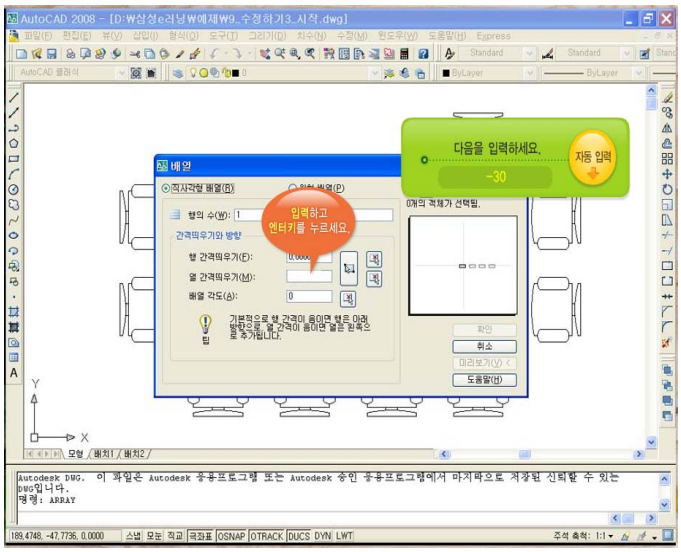

Fig. 14. Trying the following.

If learners' levels come out as low in reevaluation, the system does not present the next task and asks to repeat the practices, and if the scores are high then the learner is allowed to perform the next task.

V. Conclusion and Future Work

This paper presents e-Learning content that allows for self-initiative learning and takes into account the individual differences. In this way we improve Web-based Learning by introducing there an education engineering theory.

Namely, first, we evaluate the individual levels and carry out "Checking Test" learning that is suitable to the levels through "Laying the basic competence" of learning content, learning guide, taking rest and learning evaluation.

Also, the second evaluation of individual levels is carried out through "Trying the following" and "Trying oneself" of evaluating portion. The learners' learning levels were considered during the next task performance and we observed that the learners' levels rose through repeated learning, thus, improving the learning quality.

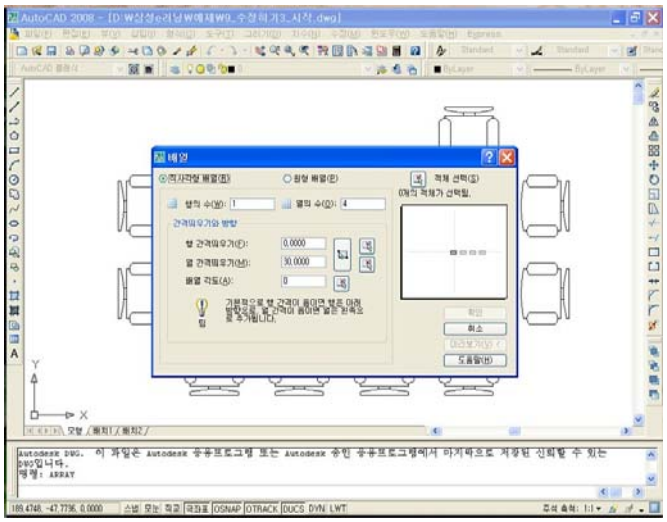

Fig. 14. Trying oneself.

This can augment the efficiency of learning through bi-directional procedures utilizing a variety of learning methods, instead of unidirectional learning.

The learning that considers the learners' levels suggested in this paper would make implementation of education contents of a new type that does not make *a priori* segregation of learners according to their age or sex.

In future, the studies are needed to solve various problems related to the use in actual education sites. Also, we would like to apply an education methodology even one level higher and implement various instruction-learning theories according to the curriculum content.

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