Design of Learning Courses of Sorting Algorithms using LAMS

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Abstract

The development of communication technology and the spread of computers and internet have affected to the field of education. In this paper, we design a learning process with LAMS to make the new education environment which is required in an information age. We made the learning environment with LAMS which develops the learner's algorithmic thinking faculty on some sorting algorithm, especially such as selection sort, bubble sort and insertion sort algorithm. In addition, we analyse the effectiveness of the learning environment. The designed contents were applied to elementary school students' learning and a questionnaire survey was conducted after a learning course. The research of the questionnaire shows that the learning system using LAMS motivates a learner for learning and provides a convenient learning environment.

1. INTRODUCTION

The development of communication technology and the spread of computers and internet have affected to the field of education. The learning methods of learners are being changed into the method based on digital information. As the environments of education are changed, it is needed to sloughs off the traditional learning methods, which communicate information uni-laterally. We need to make the environments

that the learners can take the lead in learning themselves and help them to maximize self-realization. For these reasons, it is really required to change the environments of education.

In this paper, we design a learning process and contents by LAMS (Learning Activity Management System)[7],[8] to make the new education environment which is required in an information age. The LAMS provides sequential education environments, and a making tool GUI which let an instructor design the sequence of learning process not as general LMS (Learning Activity System) [3]-[6]. In addition, the LAMS makes it possible that an instructor sequentially manages the states of a learner from various points of view and immediately reacts on it. Therefore, an instructor can manage the learning process with learners regardless of time or place with LAMS[1],[2].

The first goal of the paper is to make the learning environment with LAMS which develops the learner's algorithmic thinking faculty on some sorting algorithms, especially such as Selection Sort, Bubble Sort and Insertion Sort Algorithm which are the sorting algorithms for computers, and also gives rise to the motivation of learners themselves and feels a sense of responsibility through various learning activities. The second goal is to analyze the effectiveness of the learning environment with LAMS.

The rest of the paper is organized as follows. Section 2 describes the composition the design of the learning system which we developed. Section 3 shows the implementation of the basic and advanced learning course about sorting algorithms. Section 4 shows the result of questionnaire that learners reply to some questions about the usefulness of the proposed learning system. Finally, section 5 describes the conclusion of our paper and the future works.

2. DESIGN OF A LEARNING SYSTEM BASED ON LAMS

Since the LAMS provides sequential education environments, and a making tool   for GUI which let an instructor design the sequence of learning process not as the general LMS, it is very applicable to the learners who the level is similar to elementary students. In this paper, we design the learning process with LAMS which is more understandable to learners about data sorting algorithms, which a field of the Data Structure. Fig. 1 simply shows the composition of LAMS learning system.
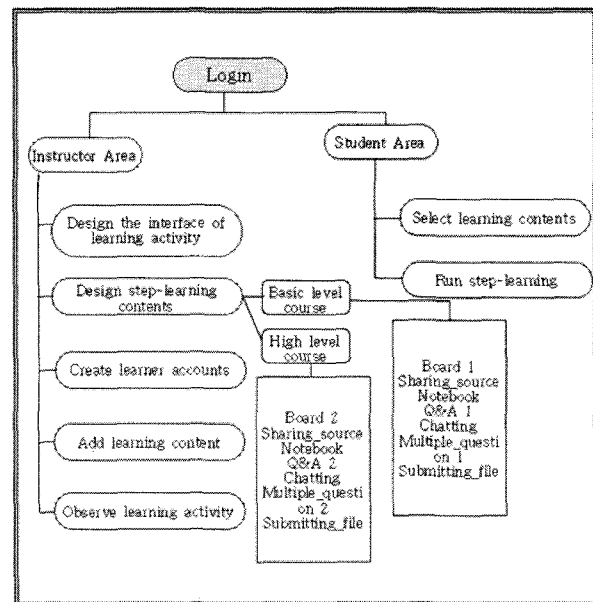

Fig. 1. Composition of the LAMS learning system

An instructor logs on at 'Instructor Area' and then designs the interface related to learning activities and step-learning contents. The learning process is composed to 'Basic Level Course' and 'Advanced Level Course' to provide step-learning. The Basic Level Course includes 'Board 1', 'Sharing source', 'Notebook', 'Q&A', 'Chatting', 'Multiple question 1' and 'Submitting file'. The Advanced Level Course includes Insertion Sorting Algorithm as well as everything which the Basic Level Course includes. A student logs on at 'Student Area', selects the preferable learning contents and then executes the selected learning-contents by stages. An instructor observes the learners' learning process and immediately reacts on it.

Fig. 2 presents the learning process according to the procedures. First, it needs to design the interface for learning activity and design the each learning course classified by levels. It is finished to design the learning courses if students' learning activities and needed contents for it according to each course are written and saved. A student can start the learning activities after apply the designed learning course and get the grant for learning. In addition, the instructors can monitor the activities of the students with LAMS's morning function. The instructors also reference the activities of the students and do appropriate feedback with them according to the results of the activities. The effect of learning upon the learners is increased through this learning process.

3. IMPLEMENTATION OF A LEARNING COURSE ABOUT SORT ALGORITHMS

3.1 System Environments
Tab.1 shows the system environments of the proposed system. We use LAMS version 2.0.2. Clients use Microsoft internet explorer to connect to LAMS server via internet.

3.2 Introduction to a proposed learning course

In this paper, we propose a learning course about sort algorithms using LAMS. We analyze LAMS and conclude that it is even suitable for teaching elementary school students. So we decide to use LAMS for teaching sort algorithms to our students. We design two separated learning course named basic and advanced.

Design interface for learning activity

↓

Design step-learning activity (basic level course, advanced level course)

↓

Save the designed learning contents

↓

Make a learner account

↓

Grant learner authority

↓

Observe learning activity

↓

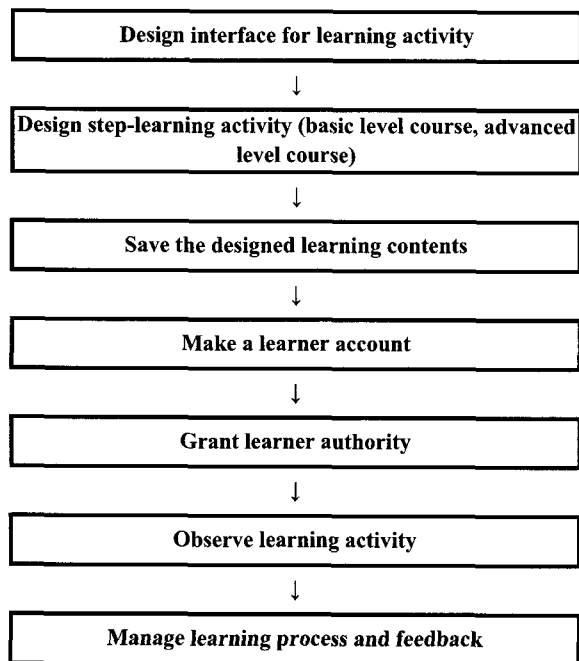| Manage learning process and feedback |
| :---: |

Fig. 2. The LAMS learning process

In basic, we design course about to learn selection and bubble sort algorithms. In advanced, we design course about to learn selection, bubble and insertion sort algorithms. The basic course is separated from the advanced course by the selection activity. Students can select the basic or advanced course according to their ability.

Students learning start up with the contents board activity. Next they share their know-how and idea by resource sharing activity. Not only the basic course also the advanced course has notebook activity, question and answer activity, chatting activity, examination activity and report file submit activity. Fig. 3 shows the design of a proposed learning course.

Tab. 1. System Environments

Classification		Contents
Server	OS	Window XP Professional
	DBMS	Mysql 5.0
	Language	J2SE SDK 6.0
	Chatting Server	Wildfire 2.6.2
	Development Tool	LAMS 2.0.2
Client	OS	Window XP Professional
	Web Browser	Internet Explorer 6.0 or higher

3.3 Implementation of learning activities

3.3.1 Selection activity - boards of basic level and advanced level courses

The board shows objectives and goals of learning course and detail explanation of sort algorithms. We can use FCK editor that is provided by LAMS to make visual contents of detail examples of sort algorithms. LAMS's FCK editor is easier to make contents than FLASH or XML editor. Fig. 4. shows an explanation of selection sort algorithm. This page has a link to the power point presentation file that contains more detail examples.
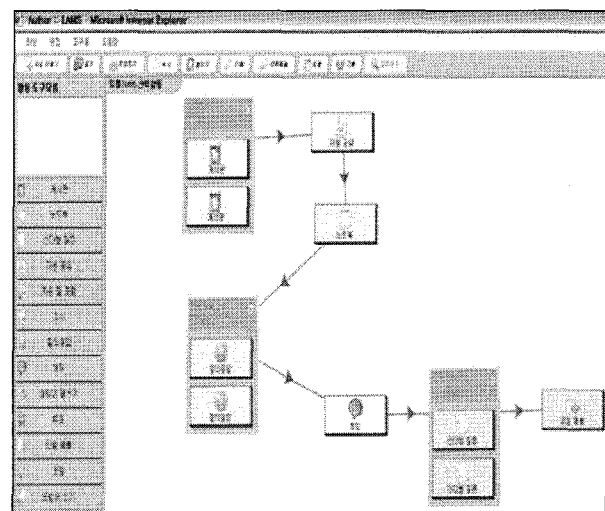

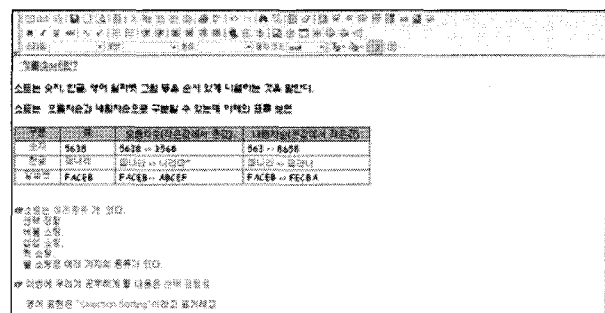Fig. 3. Design of a proposed learning course

Fig. 4. Design of a board activity

3.3.2 Resource sharing activity

Resource sharing is one of the major features of LAMS. We use Hot-potatoes software to make simple questions. Hot-potatoes shows problems and students choose an answer. It also shows percentage of the correct answer. However it has minor problem that is not support Korean language. So the elementary school students cannot understand very well. Fig. 5 shows design of a resource sharing activity.

3.3.3 Question and answer activity

We use question and answer activity for a simple test that learners estimate how understand the sorting algorithms. Fig. 6 shows the design of question and answer activity. Learner

selects one item of the examples of each question and click 'submit' button then he can see the result of the test.
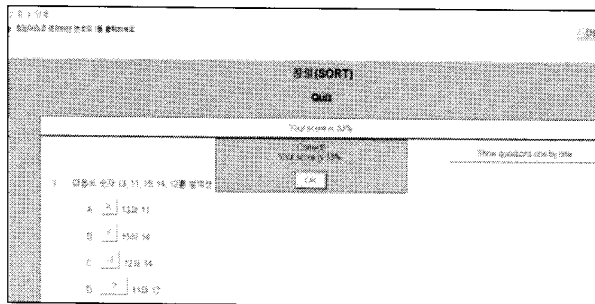

Fig. 5. Design of a resource sharing activity (use hot potatoes)

Fig. 6. Design of a question and answer activity

4. ANALYSIS OF A QUESTIONNAIRE ABOUT OUR LEARNING SYSTEM

After the learning course, we enforce a questionnaire to twenty students of sixth grade of the elementary school at Daejeon city in South Korea. We make an analysis of the various answers and describe the results. Questions of the questionnaire are attached to the end of this paper.

1. Understanding about the interface of learning system

	Number of answers	%
Strongly disagree	0	0
Disagree	0	0
Neutral	6	10
Agree	16	27
Strongly agree	38	63
Summary	60	100

2. Satisfaction with the sequential learning process of LAMS

	Number of answers	%
Strongly disagree	0	0
Disagree	0	0
Neutral	4	10
Agree	14	23
Strongly agree	42	70
Summary	60	100

3. Needs for the web based learning systems like LAMS

	Number of answers	%
Strongly disagree	0	0
Disagree	0	0
Neutral	3	5
Agree	17	28
Strongly agree	40	67
Summary	60	100

4. Experience in studying about the data sort algorithms

	Number of answers	%
No	4	7
Yes	56	93
Summary	60	100

5. Understanding about the contents of the learning courses

	Number of answers	%
Strongly disagree	0	0
Disagree	0	0
Neutral	2	3
Agree	12	20
Strongly agree	46	77
Summary	60	100

6. Satisfaction with the logical and procedural learning contents of computer education

	Number of answers	%
Strongly disagree	0	0
Disagree	0	0
Neutral	2	3
Agree	17	28
Strongly agree	41	68
Summary	60	100

7. Effectiveness of the learning system using LAMS

	Number of answers	%
Strongly disagree	0	0
Disagree	0	0
Neutral	4	7
Agree	11	18
Strongly agree	45	75
Summary	60	100

8. Try to study another contents like this course

	Number of answers	%
Have no idea	0	0
Not at all	0	0
Quite a bit	13	22
Almost totally	47	78
Summary	60	100

9. Exciting or interesting things during the learning course

- Chat with other learners.
- Share personal study note with other learners
- Real-time result check the answer of the test

Most of learners who study the sorting algorithms using the proposed learning system think that the learning system using LAMS is very useful to study about the computer education. And they think the sequential learning process of LAMS is more effective than previous e-learning system. Some learners want to LAMS provides more learning activities for share or interaction between students.

5. CONCLUSIONS

In this paper, we designed and implemented the system which can learn the contents on the sorting algorithm with LAMS, which is freeware. The one of the goals of the system is that a learner develops the ability for solving problems through logical thinking. Another goal of the system is to let a learner take the lead in learning themselves and help them to maximize self-realization.

We made up a questionnaire to evaluate the usefulness of the learning system using LAMS after a learning course. The research of the questionnaire shows that the learning system using LAMS motivates a learner for learning and provides a convenient learning environment. As a result, we expect that the effect of learning is much increased if LAMS are used to various curriculums

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Appendix: Satisfaction research on the learning courses about the data sorting algorithms using LAMS.

The following questions are about the satisfaction when LAMS which provides sequence learning is used. This questionnaire is anonymous. The information contained in it will be treated as confidential.

< Questions >
1. How do you think that the composition of the main window is easy to see and not stressful?
    ① strongly agree   ② agree   ③ neutral   ④ disagree
    ⑤ strongly disagree

2. How do you think that the function which the learning stage is moved to next automatically is helpful to learn?
    ① strongly agree   ② agree   ③ neutral   ④ disagree
    ⑤ strongly disagree

3. How do you think that the learning contents in web sites employ the function which the learning stage is moved to next in future?
    ① strongly agree   ② agree   ③ neutral   ④ disagree
    ⑤ strongly disagree

4. Have you ever studied the data sorting algorithm?
    ① no   ② yes

5. How do you think that the contents are very understandable?
    ① strongly agree   ② agree   ③ neutral   ④ disagree
    ⑤ strongly disagree

6. How do you think that the education of computer algorithm is instructed through the logical and procedural learning contents in future?
    ① strongly agree   ② agree   ③ neutral   ④ disagree
    ⑤ strongly disagree

7. How do you think that the learning on data sorting algorithm with LAMS is effective?
    ① strongly agree   ② agree   ③ neutral   ④ disagree
    ⑤ strongly disagree

8. Do you want to use them for learning if the education site like this system is exists?
    ① I don't know   ② not at all.   ③ quite a bit   ④ almost totally

9. Please, write your opinions about what is the most interest things during the learning.

10. Please, write your opinions about what is needs more to improve this system.

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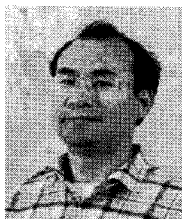
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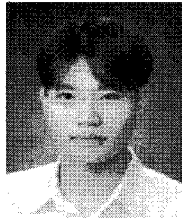
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