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Promoting Extrinsic Motivation Based on Result of LMS Quiz

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Abstract: When learning alone using LMS, students can find it difficult to maintain motivation because self-managed learning ability is required. In this research, we focused on the role of praise as an extrinsic form of motivation because it is thought that it is necessary to support learning. We designed a function of praise giving for students based on their results in a quiz with LMS which was implemented in quiz module of Moodle. It was introduced to the programing exercises and experiments were conducted to test the results.

Keywords: Extrinsic Motivation, Praise, Learning Log, LMS, Quiz

1. Introduction

Learning Management Systems (LMS) are web-based applications specialized for browsing learning materials, taking quiz, submitting reports, and notification of grades. LMS has been widely introduced to educational institutions. Students are expected to proceed with self-managed learning without restrictions of time and place with using the system. However, self-managed learning tends to cause students to experience difficulties with maintaining motivation as they are required to plan their own study schedule and carry this out by themselves.

In this research, we focus on effectiveness of *praise*, an extrinsic form of motivation. The praise function is designed to encourage students to study based on the result of an LMS quiz. It is evaluated within the context of an actual programming course in order to investigate how praise affects the learning motivation of each student.

2. Motivation and Learning

2.1 Extrinsic and Intrinsic Motivation

Motivation for learning can be considered from two perspectives; (i) intrinsic, such as framing learning activities as fun, and (ii) extrinsic, such as framing tasks as necessary in order to graduate. Learning activities without intrinsic motivation are thought to hamper maintain motivation for learning over the long term.

According to Keller (2009), a feedback loop of motivation in learning activities is often found. Confidence due to the sense of accomplishment when the activity is completed and curiosity about the next activity due to this sense of satisfaction awakens intrinsic motivation for learning. Stimulating learning activities is essential to improve this motivation feedback loop. Although extrinsic motivation has less influence of self-managed learning on students than intrinsic motivation, it is expected to encourage them and raise their intrinsic motivation. Introducing extrinsic motivation is considered to be one of the effective ways of stimulating the learning process.

2.2 Motivation by Praise

Hurlock (1925) conducted an experiment on children for 4 days concerned with how praise affected their test scores. It revealed that the scores of children who were given praise showed consistent

improvement and therefore, praise seems to be effective for stimulating learning as a form of extrinsic motivation.

Shimada (2012) conducted an experiment that praised students using a web-based learning system. A function of praising and scolding was implemented to maintain learning motivation of these students. The result revealed that the students who were given praise were more motivated in performing the learning tasks. This cohort was more pleased when they answered questions correctly and appropriate messages were shown. However, this cohort's scores were almost the same as students who studied without praise. The reason was that the tests were perhaps too easy for the students. However, as this experiment was conducted only once, its reliability is debatable. Such kinds of praise should be introduced to actual courses on several occasions in order to gain a more reliable indication of its effectiveness.

3. Promoting Motivation with LMS

The key idea of this research is giving praise based on learning activities. This maintains and improves their learning motivation as a using result of a quiz taken via the LMS. It is assumed that praising learning activities especially supports less motivated students. Hurlock (1925) reveals that scolding is not effective for boosting learning motivation so scolding was not implemented.

Scores and repetition of the quiz ensured that the impression that the messages were generated at random was reduced.

The praise function was implemented via the quiz module of Moodle. It was introduced to a programming course in a university as an experiment. Changes in student's learning were investigated in order to evaluate the effective praise in improving motivation.

4. Praising Function

4.1 Design of Praise Message

The praise messages were shown to students individually after finishing the quiz. The flow indicating the praise messages displayed is shown in Figure 1. An example of a praise message is shown in Figure 2.

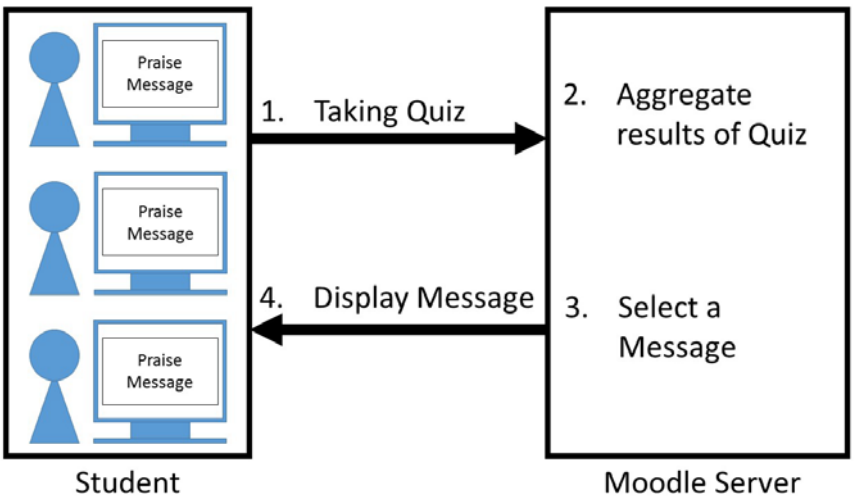

Figure 1. Flow of indicating praise messages

Figure 2. Example of a praise message

For example, if the student's score was high, an admiring message such as "That's good" or "Wonderful" was displayed. On the contrary, if the score was bad, encouraging messages such as "You challenged!" or "Let's review a little" were displayed. In addition, if the student took the quiz repeatedly, messages such as "You're really improving" "You're getting better" were displayed. The details of choosing messages are described in the next section.

The function records chosen praise messages, quiz scores, the number of time the quiz is taken and the quiz ID for each student. Eighty kinds of praise messages were prepared and displayed one after another so that the same message was not repeatedly displayed.

4.2 Choosing Method of Praise Messages

In order to choose the proper praise message, "Score Rate" and "Time of Taking Quiz" were used. Score Rate is the percentage of the score. Time of Taking Quiz is the amount of time taken to conclude the quiz. The results of the quiz were classified into five types of praising plans considering these parameters. The classified plans are defined as praise plans A-E respectively. The rules and thresholds for determining the praise plan are shown in Figure 3.

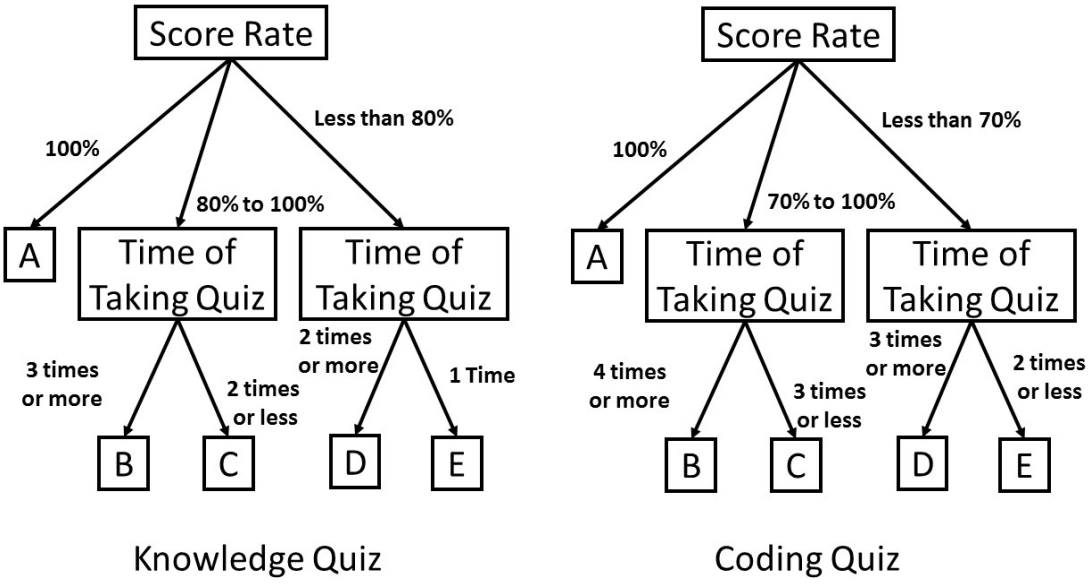

Figure 3. Rules and thresholds of praise plan

The rules and thresholds for determining the praise plan were set up with reference to the result of the quiz in the previous year. Table 1 shows the criteria assumed for the praise plans.

Table 1. Criteria assumed for the praise plans

Praise plan	Criteria
A	Score Rate is 100%
B	Many examinations and high score rate
C	Few examinations and high score rate
D	Many examinations and low score rate
E	Few examination and low score rate

The quizzes were classified into four categories defined as: "Knowledge / exercise," "Coding / exercise," "Knowledge / review" and "Coding / review." The labels of categories are shown in Table 2. Different rules and thresholds of the praise plan were set for the knowledge quiz and coding quiz.

Table 2. Labels of categories

Categories	Meaning
Knowledge	Quiz on choosing an option or filling in blank
Coding	Quiz on operating the terminal or coding
Exercise	Quiz about the contents explained in the current lesson
Review	Quiz about the contents explained in a previous lesson

5. Experiment

We conducted an experiment in C language programming courses held in one semester. The courses are for first-year students in a university of science and engineering. The courses consist of fifteen lessons once a week. Students used the praise function from the beginning of the 11th lesson to the end of the 15th lesson. Each lesson is taught in computer laboratories. 373 students in six classes took 6629 quizzes during the experiment. After completion of the experiment, a questionnaire on attitudes to the quiz was filled out by the students both in introduced classes and ordinary classes for comparison. The questions are shown in Table 4.

6. Results

6.1 Effectiveness of Praise Function

We compared how many times the quiz was taken between the two cohorts; the class with the praise function and the ordinary class. Figure 4 shows a comparative graph of the times the quiz was taken per student. The shaded part in Figure 4 is the period in which the praise function was introduced. Looking at the graph, classes that introduced the praise function showed an increase in the number of times the quiz was taken. There is a possibility that students took the quiz more times because of the novelty of the praise function. Considering the prior period of the experiment in Figure 4, the students in the praise condition might be intrinsically well-motivated to take quiz more times than the ordinary condition subjects. There are many elements that affect student's motivation and it is uncertain that the praise function is the specific cause which increased the times the quiz was taken unconditionally. However, it is possible that the praise function influenced the learning effectiveness of the students.

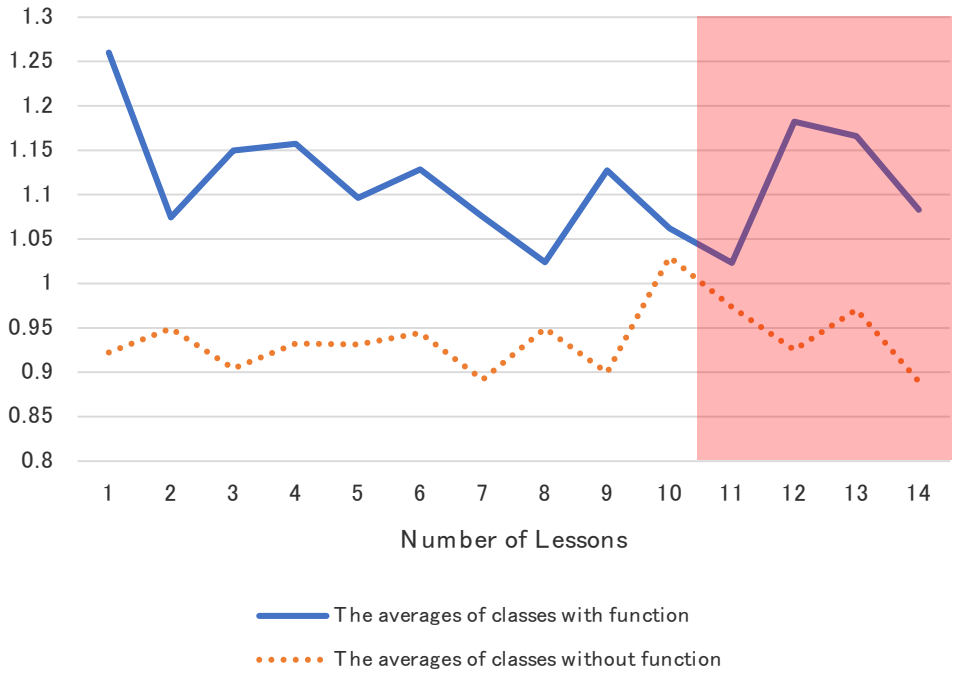

Figure 4. Comparison of average times of taking quiz (averages of all classes = 1)

6.2 Evaluation of the Praise Plans

Table 3 shows the number of displayed messages about the knowledge review quiz obtained from the experiment. The columns show the results of classified messages into praise plans A-E and the number of messages. The rows show the messages displayed in each quiz of lessons #11, #13, #14 and every lesson of the experiment. The results of lessons #12 and the other categories are included in the total row.

Table 3. Number of displayed messages in each lesson and praise plan

	A	B	C	D	E	All
#11	205 (38%)	7 (1%)	105 (19%)	46 (9%)	180 (33%)	543
#13	108 (20%)	40 (7%)	84 (15%)	79 (14%)	244 (44%)	555
#14	115 (21%)	29 (5%)	78 (14%)	66 (12%)	264 (48%)	552
Total	2095 (32%)	229 (3%)	1149 (17%)	504 (8%)	2652 (40%)	6629

As the total number of displayed messages in each praise plan, the number of praise plan A and E is larger than the other plans, while the number of praise plans B and D is fewer than the other plans. The reason for this imbalance in the displayed messages is thought to be caused by the inadequate rules and thresholds for determining praise plans.

The highest rates of correct answers are calculated as best scores for each student per quiz. The average of the best scores from all the quizzes is 72.5%. The average number of time the quiz was taken is 1.62 times. In addition, the rate of taking the quiz (which is taken only once for each student) is 59%. The average number of times the quiz was taken before reaching a perfect score was 1.9 times, thus, it was inadequate to set the threshold of taking the quiz to three times or more.

The praise plans A-E of lessons #13 and #14 seems to be more balanced than those of lesson #11 and every other lesson of the experiment. The reason is perhaps that quizzes in these lessons are considered to be very difficult. The quiz in lesson #13 deals with the topics of pointers and the quiz in lesson #14 deals with the topics of character strings using pointers. From the results of taking quiz in each lesson, the rules and thresholds for determining the praise plan should be designed relating to the quiz scores.

6.3 Result of Questionnaire

As a result of the questionnaire, Table 4 shows the average of the scores divided into the praise condition and the no-praise condition.

Table 4. The average scores of questionnaire

#	Questions	Praise	No Praise
Q1	Was the quiz on knowledge difficult?	3.55	3.69
Q2	Was the quiz on knowledge long?	3.45	3.38
Q3	Was the quiz on operation difficult?	3.98	3.94
Q4	Was the quiz on operation long?	3.51	3.72
Q5	Did you master the knowledge needed with the quiz?	3.61	3.58
Q6	Did you master operation with the quiz?	3.51	3.43
Q7	Did you try until you understood the quiz fully?	3.31	3.29
Q8	Have you confirmed the results of the quiz?	3.67	4.08

Looking at the average scores of the questionnaires, there was no difference between the praised class and the no-praise class. As consequence of this, there are many elements other than LMS that constitute the lesson; it is possible that those elements are not dependent on LMS-affected scores. For example, the teaching method was different for each teacher in charge of teaching and the tendency of motivation for learning and the learning activities carried out by each class was different. This could have had a huge influence. In addition, the questionnaire design may not have been adequate to investigate the influence of praise on motivation.

7. Conclusion

In this research, we developed an experiment to maintain and improve motivation for learning using praise based on student's learning activities with LMS and conducted an experiment on its effectiveness. In the Moodle quiz, we developed means of classifying students using their score rate and the number of times they took the test and displayed a praise message image accordingly. In addition, this was introduced to university lecture and an experiment was carried out. Based on the results, further analysis was undertaken.

In terms of future work, we think that set the threshold value based on the data of the last year should be considered in more detail and that the threshold should be altered with reference to the log data in order to make it possible to set the threshold for deciding on a praise plan according to the difficulty level of the quiz. This research does not investigate the content of praise messages. It is necessary to conduct a questionnaire about the content of the message and to investigate which type of messages are most effective for boosting motivation for learning.

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