

## Measuring effects of the contents of the Individual Reviewing System for introductory computer education

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### Abstract

*At a preparatory stage in computer programming education, the Department of Electronic Engineering at Tokyo Denki University offers an introductory course with a strong emphasis upon computer literacy of incoming students. We start our program with an assumption that all students are inexperienced learners who are hitting a computer keyboard for the first time. No matter how low the level of the course is set, however, there will be a certain number of students who are unable to digest what they are taught during the classroom instruction. Instructors cannot take care of slow learners individually after class, and thus it is imperative to create a system that would improve the learning delay without employing a human approach. In order to meet this need, we have developed an Individual Reviewing System, which makes use of multimedia. We also focus upon the time variation from the classroom instruction to the reviewing time for the students, and try to identify the difference in the effect of the system generated by whether the instructor and the designer of the contents are identical or not. We have obtained a positive feedback as effective approaches.*

### 1. Introduction

At a preparatory stage in computer programming education, the Department of Electronic Engineering at Tokyo Denki University offers an introductory course with a strong emphasis upon computer literacy of incoming students, as the details were described in the example of the Department of Electronic Engineering [1].

We start our program with an assumption that all students are inexperienced learners who are hitting a computer keyboard for the first time. No matter how low the level of the course is set, however, there will be a certain number of students who are unable to digest what they are taught during the classroom instruction.

Instructors cannot take care of slow learners individually after class, and thus it is imperative to create a system that would respond to the learning delay without drawing upon human resources. In order to meet this need, we proposed that we keep up with this need with the Individual Reviewing System using multimedia [2-5]. We have already reported the effect of the system [6]. We have obtained a positive feedback as effective approaches [7].

In this thesis, we also focus upon the time variation from the classroom instruction to the reviewing time for the students, and try to identify the difference in the effect of the system generated by whether the instructor and the designer of the contents are identical or not.

### 2. Contents and Implementation of the class

Introduction to Computer Programming I is a class offered at the first semester of the School of Engineering. Some of the students are inexperienced learners who are operating a personal computer for the first time. The classroom instructions are somewhat different in each class. The contents are shown on the table 1. The contents of each item are changing every year, due to the rapid development of the computer environment in recent years.

When we give a lecture, we show the actual operation of a personal computer. In order to secure enough time to practice computers, students use the computer room for two consecutive periods every week. Each student is able to use a desktop-type personal computer that has access to the Internet through LAN. In addition there is a monitor display between two students. The monitor display shows the teacher's personal computer screen, the teacher's notebook, and the student's computer screen that is selected by the teacher. The class is conducted for about 140 students at a time. In order to secure enough time to give the students private lessons, there are four teachers: a professor, an assistant professor, a lecturer, and an

instructor. There are also three teaching assistants who are graduate students. The six teachers and teaching assistants except the one in charge of the lecture go around in the classroom and answer students' questions promptly.

We always tell the students to use a personal computer after school. But to promote the use of computers by all the students, we give three or four papers for each semester.

Table 1. The course contents of the Department of Electronic Engineering

| Weeks   | Course Items   |
|---------|--|
| 1 week  | Distribution user IDs and passwords, copyright, basic operation, etc                             |
| 2 week  | Typing the alphabet and Japanese characters, writing the Japanese text (self introduction) , etc |
| 3 week  | E-mail, manner of the e-mail, etc  |
| 4 week  | Net surfing, net news, netiquet, etc   |
| 5 week  | Word, writing a report, etc  |
| 6 week  | Excel, producing a graph, cooperation of Word and Excel.   |
| 7 week  | Experience 3D modeling ( myShade ), etc  |
| 8 week  | Multimedia, editing sound and image, etc   |
| 9 week  | Making Web page No. 1, using Word  |
| 10 week | Making Web page No. 2, transfer to the web server  |
| 11 week | Web page contest, mutual evaluation by students  |
| 12 week | Understanding of software, introduction to programming   |
| 13 week | Term exam  |

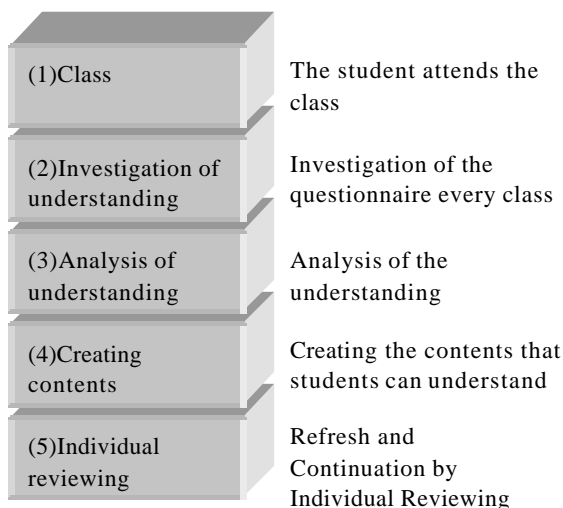


Figure 1. Individual Reviewing System

### 3. Individual Reviewing System

We have developed the Individual Reviewing System so that students can review the items they do not understand well in class and we can offer effective contents for reviewing to them.

The contents of the Individual Reviewing System are the same as the contents for reviewing. But in our research, as is shown on Figure 1, we defined the Individual Reviewing System as the whole process which consists of (1)class, (2)investigation of understanding, (3)analysis of understanding, (4)creating contents, and (5)individual reviewing. We will discuss the concept of the Individual Reviewing System below.

#### 3.1. Individual Reviewing

In this research, we have been developing the system that is not the Individual Learning System but the Individual Reviewing system. In the development of this system, our aims are to give the students an opportunity to review what they did not understand in class at their pace and to make the reviewing process effective.

#### 3.2. Using multi-media Technology

It is difficult that beginners understand the computer operation with only text and voice explanation. It is easier for them to understand it if we explain the operation procedure, step by step, using pictures. By adding motion pictures, we can explain the subtle points in computer operation accurately. Using multimedia technology, we can make the individual reviewing more effective.

#### 3.3. Using Software Tools

In the development of the Individual Reviewing System, we used a software tool on the market instead of developing a new software tool employing multimedia. The important thing in the development of this system is to make the contents of the Individual Reviewing System effective. As the result of the investigation of software tools, we selected the Authorware ( ATTAIN ) by Macromedia in this research.

### 4. Analysis of the learning delay

When we develop the contents, in order to get the basic data, it is necessary to investigate the causes for the learning delay. In order to do that, we go through three steps. First, students answer the questionnaire at the end of the class every time. Second, they answer the understanding level for the term of the class by "yes" or

“no”. And finally, they freely write their impression of the class.

We investigate some questions the teaching assistants got and their answers to the questions. Then we find out the causes for the learning delay by analyzing these data. The flow of the class that uses the questionnaire is shown in Figure 2. The result of the questionnaire in every class is open to the students on the Web server. We reply to some questions on the questionnaire at the first part of the next class. The class was activated for both students and teachers with this flow built into the class [8].

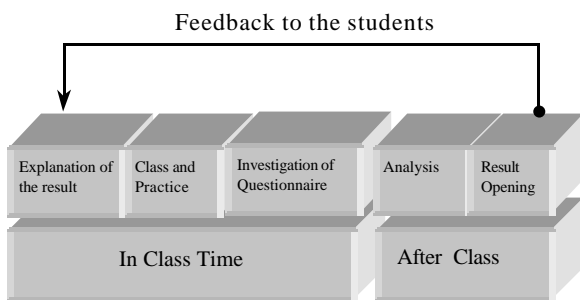


Figure 2. Flow of the class investigation questionnaire

As an example of the questionnaire, the result of the questionnaire in the class, where the theme was the making of Web page (Home page), is shown in Figure 3. The understanding level for the learning content is quite high immediately after class.

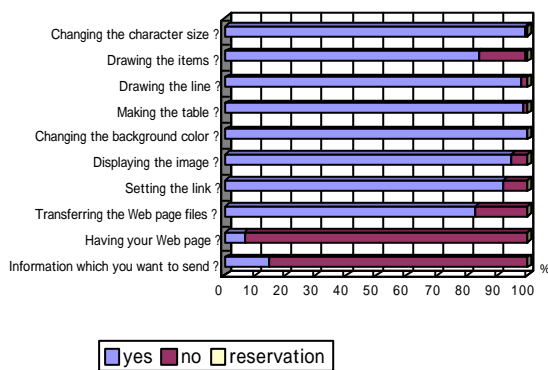


Figure 3. Understanding level of the "Web page"

## 5. Know-how of the making contents

We have been developing the contents of some class instructions in accordance with the result of the analysis

of the investigation questionnaire. We came up with various ideas to make the contents realized. The flow of the class where students have been lectured is important at the reviewing.

In order to meet this demand, we use the knowledge object by ATTAIN. The operation on the screen is overlooked when students lose their concentration. In order to deal with this trouble, we used the simple picture that makes clear the operation order and the operator. We used the function of the animation for attracting attention by the movement and how to display the figure. Although clarifying the operation order and the operator is so effective, we added voice explanation to make it better. If the explanation using voice is difficult, we can use the motion picture.

## 6. Evaluation of the Contents

We have measured the effect of the review using the Individual Reviewing System that is equipped with some contents developed. We investigated the effect of this system when it was used after class, eight weeks later, and about half a year later, and when the instructor and the designer of the contents were different. In each result, we confirmed the effect that we had expected. In this chapter, we will discuss the measuring and evaluating method for the class of the making Web page.

### 6.1. Contents of the "Making Web page"

In Figure 4, the flow of the contents in the class, where the theme is the making of Web page, is recreated with the use the knowledge object. Using this object, students can quickly find the review item they want to cover.

Another content for the class of the making Web page is shown in Figure 5.



Figure 4. Flow of the class (in Japanese)

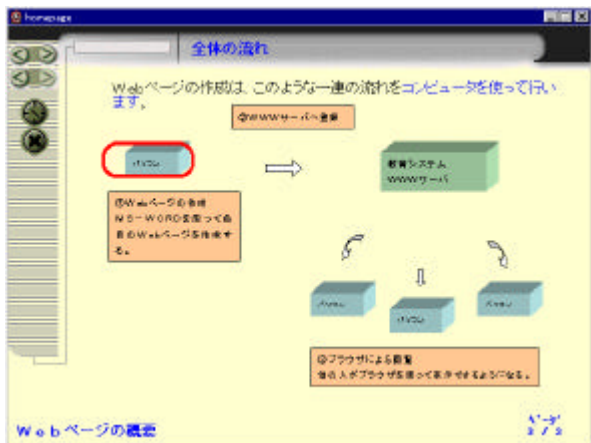


Figure 5. Example of the contents (in Japanese)

## 6.2. Measuring effects of the contents

The measurement of the system investigated the questionnaire that students answer before using the system and after using the system for about thirty minutes during the class. For each item of the investigation, if students understand the item, they answer "yes" in unsigned. The same as if students do not understand the item, they answer "no". And if students reserve to the item, they answer "reservation". The reviewing is shown in figure 6.



Figure 6. The reviewing using the system

In the Individual Reviewing System, we are developing contents that students can understand when they could not understand the class. In the item that student could understand at the class, they have forgotten it when student actually used some item of the class. It is expected that the Individual Reviewing System gives the effect to the latter. In order to confirm these effects, we measured the effect of the content that is the making Web page object after about half a year. The result of the measurement is as follows.

The valid number was 105 for this questionnaire. The result of the questionnaire before and after the review is shown in the figure 7 and figure 8 which show the ratio of "yes", "no" and "reservation".

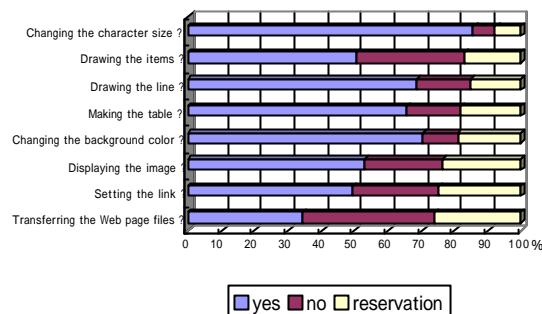


Figure 7. Understanding level of the before reviewing

As in Figure 7 compared with the understanding level (Figure 3), there are many students who understand the item not enough and forgot the item that they learned at the class before reviewing with the system. As in Figure 8, the understanding level of the students increase to high, as the ratio of the "reservation" and "no" decrease, it seems that the reviewing is effective.

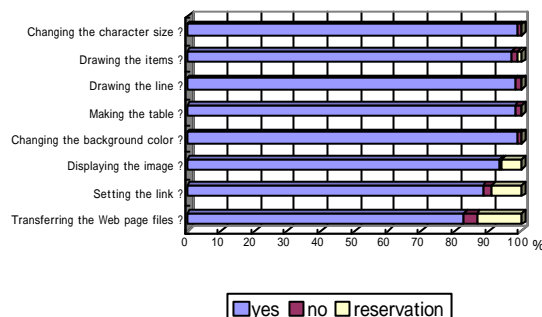


Figure 8. Understanding level of the after reviewing

Although the class does mainly the operation of the personal computer, we do not evaluate their result by skill of the operation. When we give papers and a final exam to the students, we expect the acknowledgment and skill for the students, so it is necessary that student review the item of the class that they do not understand at the class

## 7. Effect of the Individual Reviewing System

In each case of immediately after the class, after 8 weeks, after half a year, the instructor and the designer of the contents are identical or not, so the effect that was

described in previous chapter is shown in Figure 9, Figure 10, Figure 11, and Figure 12 [9][10]. These figures are result of the analysis of how the transition changes before and after the reviewing.

In each of the figures, “effective” is transition that means “reservation” to “yes”, “no” to “reservation” and “no” to “yes”. “Non effective” is transition that means “yes” to “yes”, “reservation” to “reservation” and “no” to “no”. The transition from the “yes” to “yes” was eliminated because we taught students understood the class before reviewing. “Contrary effective” is transition that means “yes” to “no”, “yes” to “reservation” and “reservation” to “no”. It means that students do not understand by using the system.

The Figure 9 shows the effect of the contents about the class whose theme was making Web page immediately after class. We think that the number of the student who could not understand the class is summation of the effective number and effective none. The effective lines show the high level over the effective none, so it can be seen that many students who could not understand the class could understand by using the Individual Reviewing System.

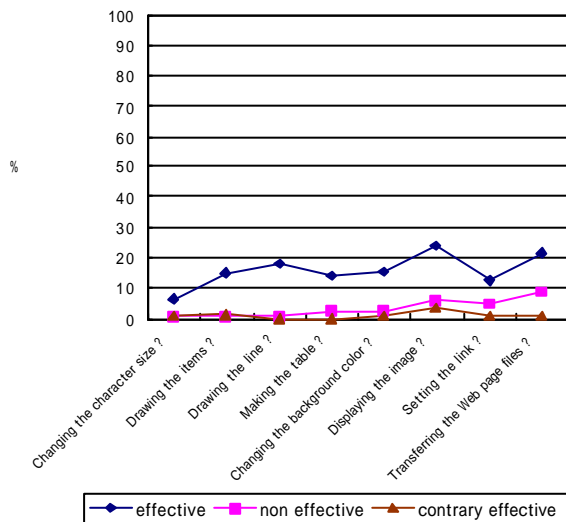


Figure 9. Effect of the system after class immediately

On the other hand, students are 10 percent in the maximum. It may be seen that the students who were not be able to understand the class by the reviewing are shown by the effective none line. We can see more effective none in the set up of the Web page link and transfer of files to the Web server. Especially, transferring files to the Web server is troublesome. It seems difficult that student understand the class of the transfer files to the Web server. We are not able to make these students understand the class by using the system. It may be

necessary that student attend the class again or should be lectured by individual lecture.

The Figure 10 shows the effect of the contents on the class, whose theme was the e-mail after 8 weeks. As can be seen from the effective curve in figure 10, a considerable number of students forgot the contents of the class. One of the characteristics is that the effective value of the domain name and the mailer content increases up to 50 percent. Although students use the e-mail everyday, it does not mean that students use the e-mail while they are conscious of the meaning of it. The manner seems to have been forgotten.

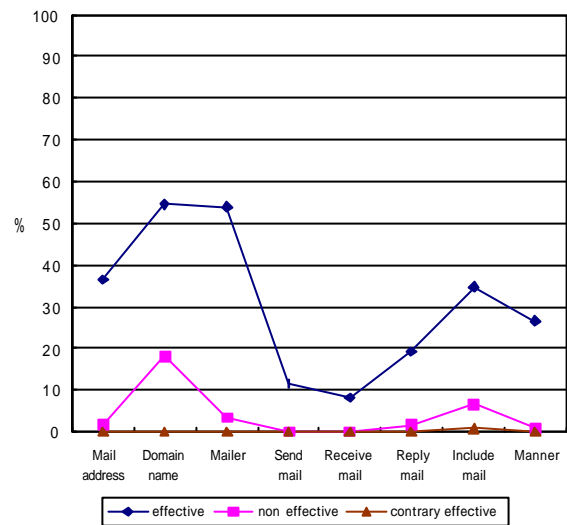


Figure 10. Effect of the system after 8 weeks

The Figure 11 shows the effect of the contents on the class whose theme was the making Web page, Introduction to Computer and Programming II in the fall semester. All of the students do not update their homepage every day. Therefore, most students forgot what they have learned. It seems that the line of the effective shows a high level at the range. It seems that the students’ memory was refreshed by using the system.

The figure 12 is result of the measurement for the “e-mail” after one week. The difference of three result in above chapter are trying to identify the difference in the effect of the system generated by whether the instructor and the designer of the contents are identical or not. The contents have been made based on the result of the questionnaire like other contents. Although it has been only one week after the class, there is an effect of the contents as the whole. But we can see incongruity because the author of the contents do not grasp the flow of the class enough. It is interesting that the trend of the line looks like figure 10.

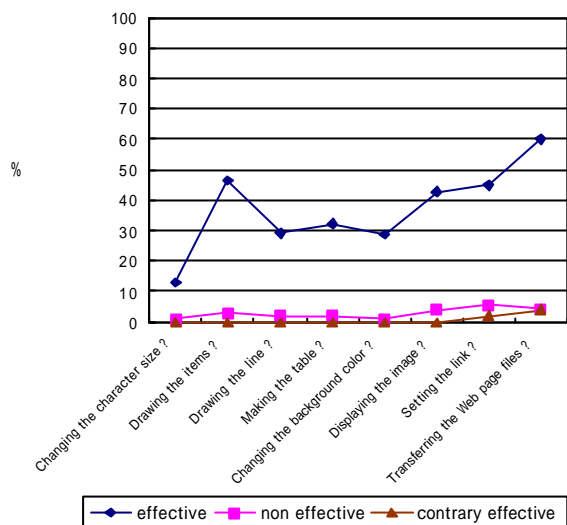


Figure 11. Effect of the system after half a year

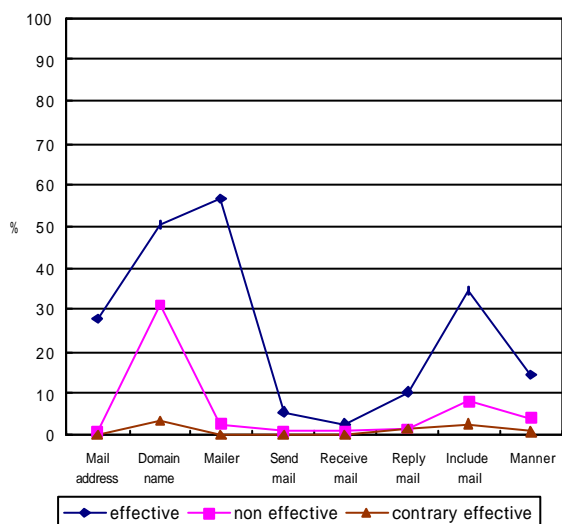


Figure 12. The instructor and the designer of the contents are identical or not

## 8. Conclusion

It became clear that there is a tendency that the effect of the review increases as time passes after class, since the contents that are understood in class are often forgotten as time passes. Because the flow of the class is recreated, we can see that the review is effective even after half a year.

Although it is natural that students increase the effect of the learning by reviewing the contents of the class after class, we understood how important it is that we give a chance for the students to review and prepare the

contents for the review. This system is greatly influenced by the contents, so it is important that we analyze the causes of the learning delay and develop the contents based on the analysis. Although much labor is required to develop this system, as is shown in the previous chapter, it is true that this system is effective enough to reward our labor. However, in order to spread the use of this system to other classes, we think it is necessary that we develop more effective methods to create the contents.

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