

The Instructional Effects of On-line Tests on the Large-scale IT Courses

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Abstract - Kumamoto University implements basic courses of information technologies as required subjects of all faculties from 2002. They can be assumed as large-scale courses because there are approximately 1,800 learners respectively. They are managed by sharing the identical contents in the blended learning style. WebCT is applied as a LMS from 2003. For the confirmation of the achievement and the relearning with the item that cannot be achieved, nearly 20 on-line tests (quiz) are implemented for a year. All the tests can be taken repeatedly for a fixed period. This paper shows the instructional effect based on the statistical data of the on-line tests, based on the results of all the 13 on-line tests implemented at the course of "The Basic Course of Information Technologies B" in the second semester of 2003.

Index Terms - e-Learning, large-scale course, LMS, on-line test, quiz, WebCT

INTRODUCTION

Kumamoto University has been strongly developing the information technology - based learning environments in recent years, and established the Center for Multimedia and Information Technologies (CMIT) in April 2002. One of the center's main purposes is "University guarantees that all graduates from whichever department acquire the constant level information technologies". In order to achieve the purpose, we implemented the basic courses of information technologies as required subjects of all faculties by sharing the identical contents in the blended learning style from 2002.

University has been strongly developing the information technology-based learning environments in recent years. Ten gigabits network connects almost all buildings and gigabits networks chain rooms. The whole campus is almost covered by around 100 wireless access points secured by encryption

and authentication. There are 920 well-arranged PCs for learners. We have a school information system, where every student does course registration and various procedures in campus life etc., and all teaching staffs input results of courses. This highly IT-based learning environment strongly supports the basic courses of information technologies.

The courses consist of "Basic Course of Information Technologies A / B" in the first (A) and second (B) semester for the fresh people. The course "A" aims that learners can use office applications and the Internet safely with good netiquette, and "B" aims that learners can open and send information over the Internet and can understand basic mechanisms of the Internet.

They are rather large-scale courses with 1,800 learners, where WebCT is applied as a Learning Management System (LMS) from 2003. Learners are divided into 29 classes with 9 professors managed by the use of cross-listed courses with Instructional Management System (IMS). The averaged number of students per class is 40-100 supported by a professor and a few TAs. The LMS is very effective for both styles of on- and off-campus learning, and is used for these courses in the Blended Learning style.

For the confirmation of the achievement and the relearning with the item that cannot be achieved, nearly 20 on-line tests (quiz) are implemented for a year. All the tests can be taken repeatedly in anytime within a fixed period over the Internet, and only the best mark is recorded as a result; nevertheless all the attempts are logged in the WebCT server. Such logs are very useful for leading learners and WebCT provides some referring functions for instructors. More detailed statistical data are gathered directory from the WebCT server by using a perl script developed by us. This paper will show the statistical data of the on-line tests and discuss its instructional effects.

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ON-LINE TESTS

We will show the statistical data of the on-line tests, based on the results of whole 13 on-line tests implemented at the course of “The Basic Course of Information Technologies B” in the second semester of 2003. The course has 13 weeks of lectures and each lecture has an on-line test as shown in Fig. 1. Table 1 shows all the contents of the lessons and some information of the on-line tests.

Before starting the course, almost all of the learners had already finished “The Basic Course of Information Technologies A” and therefore had acquired basic skills for applications of the word processor, spreadsheet, presentation, paint and draw, and for using common Internet applications such as email and Web browsing. The course “A” also implemented WebCT with several on-line tests, and almost all the learners have enough experiences to use them. All the tests can be taken repeatedly in anytime within a fixed period over the Internet, and only the best mark is recorded as a result. Learners can know their mark and comments just after finishing the test by automatic marking. Order of questions and items are randomized in each trial in order to prevent remembering the order.

I. Case 1 (Test No. 3): The Typical Case

The Test No. 3 has a symmetric curve shape of the initial mark distribution as shown in Fig. 2. The peak is shifting from center (40-60 points) to the higher points (80-100 points) as increasing the attempt number of times. 86 percent of learners get more than 80 points until 10th attempt which percentage is almost the same in the final result (87 percent). The total number of examinees was 1,707, and the maximum count of attempt was 26 as shown in Table 1.

The total number of questions is 15, and 4 examples are translated from Japanese to English as shown in Fig. 3. They are in an average level and all the 15 questions are presented in a single-choice format with 4 or 5 alternatives.

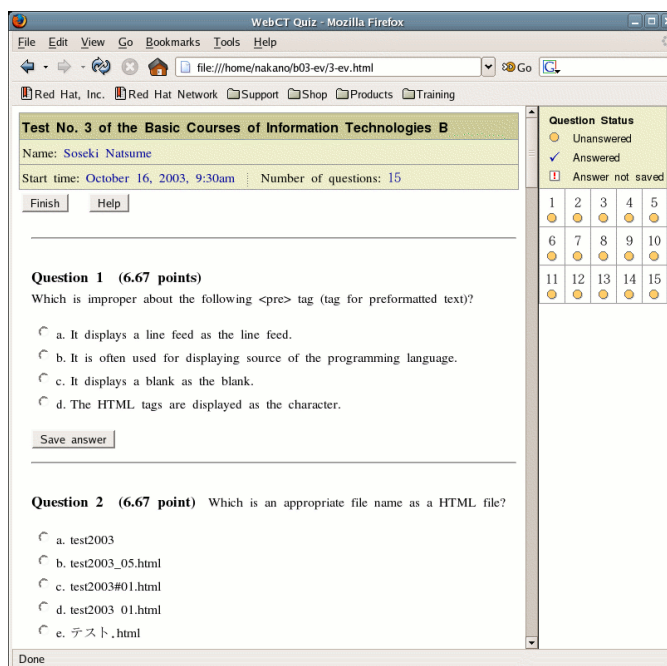


FIGURE 1
Screen capture of on-line test (translated to English).

II. Case 2 (Test No. 4): The More Difficult Case

The Test No. 4 does not have a symmetric curve shape of the initial mark distribution and the maximum percent of learners stay in the range of 0-20 points as shown in Fig. 4. The peak is shifting slowly from lower points (0-20 points) to the higher points (80-100 points) as increasing attempt number of times. 57 percent of learners get more than 80 points until 10th attempt which percentage is still lower than the final result (71 percent). The total number of examinees was 1,695, and the maximum count of attempt was 62 as shown in Table 1. Many learners attempt test over 10 times as shown in Fig. 4.

TABLE I
Learning contents and test conditions of the Basic Course of Information Technologies B.

Test No.	Learning subjects	Number of examinees	Max. attempt	Period
1	Text editor and data folder (preparation to edit HTML files)	1,682	25	Oct. 6 – 20, 2003
2	HTML1 (anyway, attempt to write HTML source)	1,638	16	Oct. 6 – 20, 2003
3	HTML2 (basic structure of HTML, characters, lists)	1,707	26	Oct. 15 – 28, 2003
4	HTML3 (links, images, animated GIF)	1,695	62	Oct. 22 – Nov. 11, 2003
5	HTML4 (frames, elements and attributes, meta tags)	1,647	44	Oct. 29 – Nov. 17, 2003
6	HTML5 (CSS: Cascade Style Sheet)	1,592	77	Oct. 29 – Nov. 17, 2003
7	File upload using FTP (upload and HTML validation)	1,586	20	Nov. 5 – Nov. 25, 2003
8	Email mechanism (mechanism and security)	1,655	21	Nov. 26 – Dec. 12, 2003
9	Legal responsibility (reviewing the recent cases)	1,624	21	Dec. 3 – Dec. 16, 2003
10	Intro. JavaScript1 (basics, operators, functions, event)	1,555	13	Dec. 3 – Dec. 16, 2003
11	Intro. JavaScript2 (conditional execution, loops)	1,596	46	Dec. 10 – Dec. 24, 2003
12	Intro. JavaScript3 (event, examples)	1,476	53	Dec. 17, 2003 – Jan. 20, 2004
13	Composer (HTML using StarSuite or Netscape)	1,632	21	Jan. 19, – Feb. 1, 2004

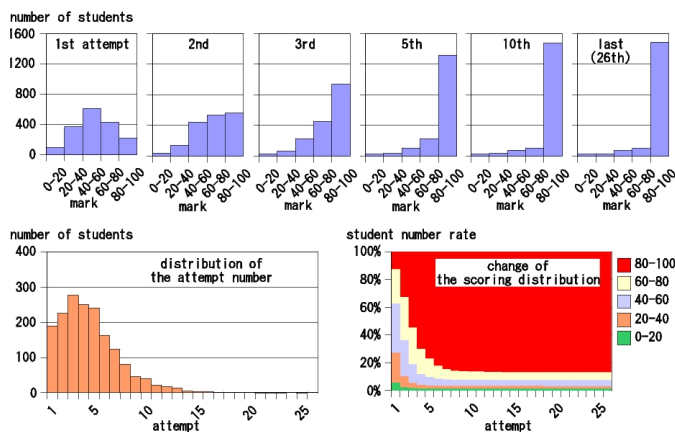


FIGURE 2

Test no. 3: The mark distributions, the distribution of the attempt number of times, and the change of scoring distribution

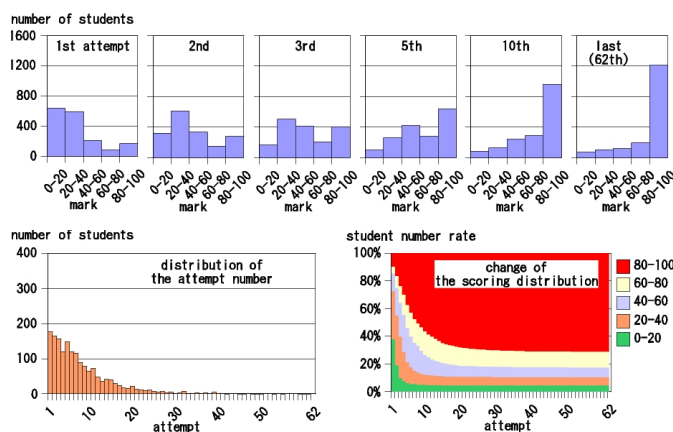


FIGURE 4

Test no. 4: The mark distributions, the distribution of the attempt number of times, and the change of scoring distribution

Question 1 (6.67 points) Which is improper about the following `<pre>` tag (tag for preformatted text)?

- a. It displays a line feed as the line feed.
- b. It is often used for displaying source of the programming language.
- c. It displays a blank as the blank.
- d. The HTML tags are displayed as the character.

Question 2 (6.67 points) Which is an appropriate file name as a HTML file?

- a. test2003
- b. test2003_05.html
- c. test2003#01.html
- d. test2003 01.html
- e. test.html (written in Japanese characters)

Question 3 (6.67 points) Choose one incorrect statement among below in surrounding with the `<center>` tag.

- a. A list (`` and so on), too, is put in the center.
- b. A heading (`<h1>`, `<h2>` and so on), too, put in the center.
- c. The ` ` is counted as a character for centering.
- d. A image (`` and so on), too, is put in the center.

Question 4 (6.67 points) Choose the same expression as `color="yellow"`.

- a. `color="#00ffff"`
- b. `color="#ffff00"`
- c. `color="#ff00ff"`
- d. `color="#fff000"`

FIGURE 3

Test no. 3: Example of the questions (5 ones from 15 questions).

Question 1 (10 points) Put the appropriate href attribute for `<a>` tag in considering relative path to make a link to `kisoB\ex2\ex21.html` on the source of `kisoB\ex3\ex31.html`.

Question 2 (10 points) Choose all incorrect statements among below related to the background of Web pages. (Wrong answers may result in a minus score)

- a. Only the image can be set as a background.
- b. Only the color can be set as a background.
- c. Web browsers can specify the background for each page.
- d. The background image is always repeated.
- e. There is no correct answer.

Question 3 (10 points) Choose all incorrect statements among below related to the animated GIF. (Wrong answers may result in a minus score)

- a. No plugins required.
- b. The file size is usually smaller than a normal GIF file.
- c. Web browsers cannot control animation.
- d. Audio can be combined into a single animated GIF file.
- e. There is no correct answer.

FIGURE 5

Test no. 4: Example of the questions (3 ones from 10 questions).

The total number of questions is 10, and 3 examples are translated from Japanese to English as shown in Fig. 5. These examples are in an average level and the questions are presented in 3 formats; 4 single-choice questions with 4, 4, 9 and 9 alternatives, and 3 multi-choice questions with all 4 alternatives, and 3 short answer questions. The type of questions makes the test more difficult than case 1.

Figure 6 shows the change of mark distributions in more detail. The divided range is 10 points (20 points in Fig. 4) and the peaks are more clearly shown. The peak are placed at approximately 30 points and it is shifting slowly to the higher points as increasing attempt number of times. Nevertheless,

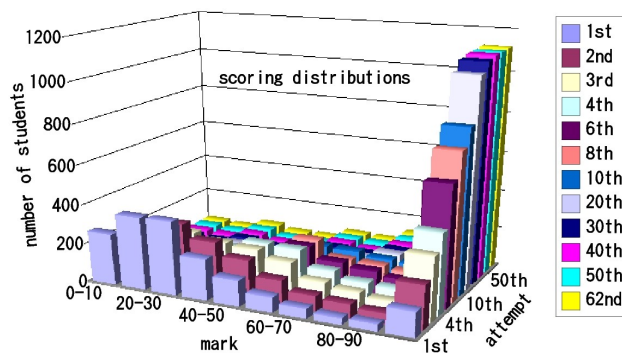


FIGURE 6

Test no. 4: change of scoring distributions form in detail.

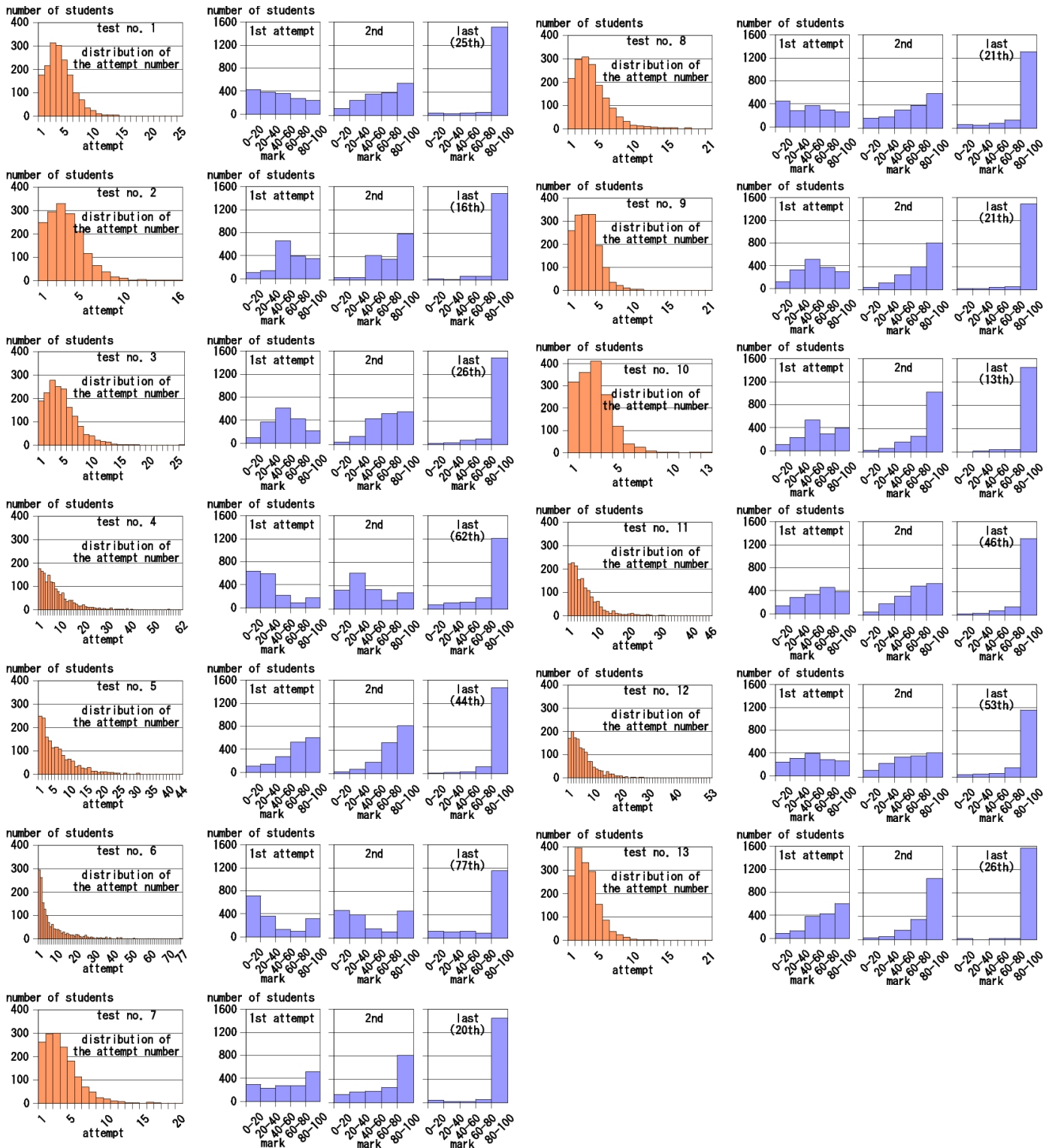


FIGURE 7

The distribution of the attempt number of times and The mark distributions on initial, 2nd and the final attempts for all 13 on-line tests.

the change of learners number at the range of 90-100 points is much more dominant comparing to the peak shift as shown in Fig. 6. It seems that learners can jump from around 60 points to 90 points quickly, because there are no clear peaks at the range of 60-90 point. Such an analysis can be done because of the sufficient number of examinees 1,695 in the large-scale course.

III. All On-line Tests for comparison

It is not possible to show all 13 cases as same as the case 1 or 2 on account of space consideration. The distribution curve of attempt number of times and the 3 scoring distribution curves at the initial, 2nd and the final attempts are picked up for all the tests implemented at the course of "The Basic Course of Information Technologies B" as shown in Fig. 7. The learning subjects, the number of examinees, the maximum attempt number of times and the date for each lesson are shown in Table. 1.

The number of examinees has a range of 1,476-1,707 and the value is sufficient for statistical. The maximum number of attempts is widely distributed from 13 to 77 depending on the difficulties of the questions. The distribution curves of the attempt number of times have a peak in the case of rather small maximum number of attempt, and have no peaks in the other case. In the both cases, the curve shapes have a similarity. The curves of mark distributions are changing as increasing the attempt number of times, and the changing state have many variations.

DISCUSSIONS AND CONCLUSIONS

All the 13 on-line tests implemented at the course of "The Basic Course of Information Technologies B" have a similar shape of the mark distribution at the final attempt as shown in Fig. 7. Each learner can know not only his mark but also the average mark just after finishing the test by the automatic marking system, and then, some of them try again if they can not be satisfied with their marks. The mark distributions have different shapes at the initial attempt, however, they have similar shapes at the final attempt depending on learners (sometimes over 70 attempts). Almost all the learners have reached to the passing level at the final results. Such results are declared with enough statistical data.

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