A REPORT ON THE ONLINE LEARNING SYSTEM ON STATISTICS, PROVIDED FOR THE STUDENTS IN TOKYO UNIVERSITY OF INFORMATION SCIENCES

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The education with ICT is being promoted in Japan with the spread of the Internet. For the university students and the members of society, JMOOC is well-known as the free online learning system. In Nakagome, Miyadera, Yokoyama (2001), they developed an own online learning system by themselves for university students. For the younger students, many online systems are also to be used in Japan. In Tokyo University of Information Sciences, some of the students, who have wills to be teachers of mathematics in junior high schools or high schools, make use of an online learning system, named "Study sapuri" given by Recruit Holdings Co.,Ltd. to study mathematics.In this paper, we focus on the statistics, in particular "analysis of data", and we investigate the efficiency of the system "Study sapuri". We use the data and opinions collected from the trainee, the students. Furthermore, we consider a blended learning method in University class.

THE ONLINE LEARNING SYSTEM AND THE METHOD OF INVESTIGATION
The online learning system "Study sapuri"

"Study sapuri" is an online learning system which is provided for students of elementary school, junior high school and high school, and preparatory students. The system has many subjects (of course, including mathematics) and several level lessons. Besides video distribution system, "Study sapuri" has some functions such as follows:
(i)   Teachers can distribute homework online.
(ii)   Students can grasp their learning situation and teachers can grasp the learning situation of all students.
The fee is 980 yen per month. The webpage is given by https://studysapuri.jp (which is provided by only Japanese).

The students who are monitors of the system

The ten students who cooperated in the investigation belong to Tokyo University of Information Sciences, and most of them have wills to be teachers of mathematics in junior high schools or high schools, and they usually use "Study sapuri" to study high school mathematics.

Contents of the learning

The contents that students study with "Study sapuri" for the investigation is the basic "analysis of data". For more details, the contents are as follows:
(i)   "Average value", "Median", "Standard deviation" etc.
(ii)   "Box plot".
(iii)   "Scatter diagram" and "Correlation".
In Japanese high school, students mainly study calculus in their mathematical classes, and they study less statistics. For example, see Ito (2007). However, note that students study statistics in Tokyo University of Information Sciences, because some classes for statistics are provided here.
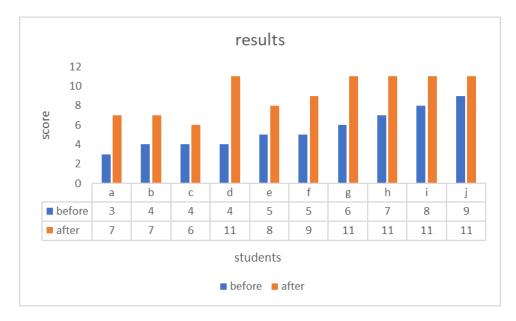
The method of investigation

Students studied the above contents with "Study sapuri" for predetermined two weeks. It takes about an hour to finish them. Before and after studying, students took two small tests which are the same. Then, the students answered the interview about the efficiency of the system "Study sapuri".

A REPORT ON THE INVESTIGATION
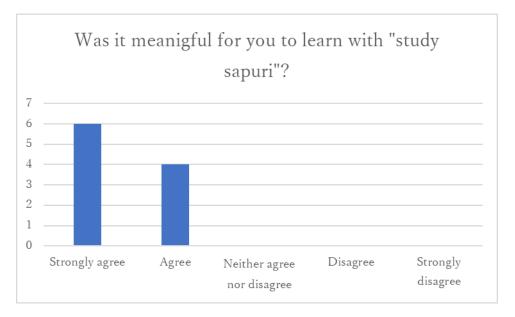*The results of small tests*

The ten students who study "analysis of data" by the use of "Study sapuri" took two small tests, which are the same. One test is done before they studied "analysis of data", and another is done after they studied. We compere the results of two, which is shown as follows (see the following tables). There are 11 exam questions in the test. Since each question is corresponded to one point, therefore the full score is 11 points.

results

score	a	b	c	d	e	f	g	h	i	j
before	3	4	4	4	5	5	6	7	8	9
after	7	7	6	11	8	9	11	11	11	11

students

■ before ■ after

The average of the small test before learning is 5.5, the high score is 9, and the low score is 3. The average of the small test after learning is 9.2, the high score is 11, and the low score is 6. From the above results, it will be obvious that the effectivity of the learning by using of "Study sapuri" is.

The results of interview for the students
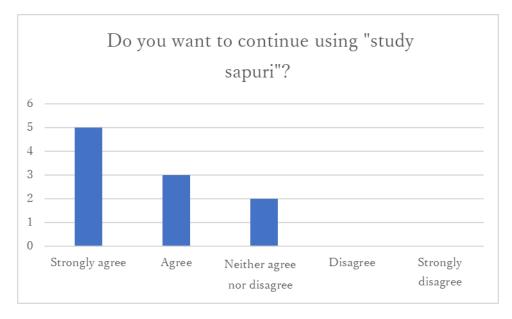*Question1.* Was it meaningful for you to learn with "Study sapuri"?

Was it meanigful for you to learn with "study sapuri"?

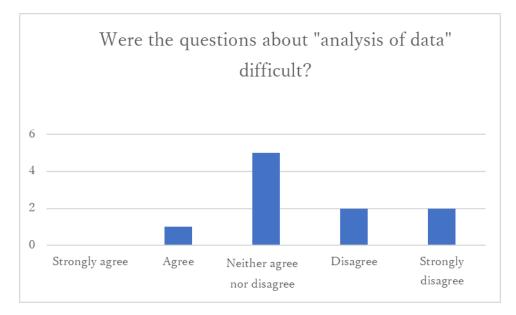|	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
	6	4			

Question2. Why did you think so to Question1?
Answers.
・Because I was able to look back at the video over and over again.

・It is because I can learn at my own pace.

・Because all I did was just watching videos.

・Because I could learn how to teach mathematics, too.

・The lecturer taught me some more details, so I could easily understand.

Question 3. Do you want to continue using "Study sapuri"?

Question 4. Were the questions about "analysis of data" difficult for you?

Question 5. What is the strong points for you to learn with online learning system like as "Study sapuri"?
Answers.

・   I can study at my spare time with the learning system.

・   I can study anytime, anywhere if I have an access environment to the Internet as when I am on the train.

- I can study repeatedly.

- I can study only the parts that I need.

- I have gotten into the habit of studying.

- Because I did only watching, it is easy for me.

Question 6. What is the weak points for you to learn with online learning system like as "study sapuri"?
Answers.

- It takes too much communications traffic.

- We can't ask the lecturer directly when we can't understand.

- Because nobody forced me to study, I often do not feel like learning.

- It is better that we use paper textbooks than electric ones.

Question 7. What do you think about that how should the learning system be improved?
Answers.

- Students can ask the lecturer directly, and they can receive the less from the lecturer though online.

- It is better that the fee is free.

- It is necessary that it takes less communications traffic.

- The relationship between the university classes and the online lessons should be.

- If the real-live lessons will be given, students must study, it is good for me.

THE AUTHOR TRIED THE ONLINE LEARNING SYSTEM "STUDY SAPURI"
The author, who is a mathematical teacher at Tokyo University of Information Sciences, also used "Study sapuri" to learn "analysis of data". As a teacher, the author considers the effectiveness of using the online learning system as follows.

Differences from ordinary lecture at university
(i)   The lecturer uses less black board, and the required items are already written on it before the lesson starts.
(ii)   Students are only required to listen to lecturer's lesson, so they don't have to write at all.
(iii)   It is not necessary that the lecturer ends the lesson on time.

The strong points of the online learning system
(i)   The lecturer can teach so effectively, since for example, it does not take so much time to write on the black board.
(ii)   The lecturer doesn't have to worry about how long it will take for the lesson.
(iii)   Students can learn repeatedly with the learning system.

The weak points of the learning system
(i)   The lecturer can't confirm whether the students can understand or not.
(ii)   Students can't ask the lecturer directly.
(iii)   The lecturer can't change his(her) lessons flexibly according to the student's understanding.

CONCLUSION
The efficiency of the system
The online learning system "Study sapuri" has a good reputation amongst the students. Note that the ten students who cooperated in the investigation have good wills to learning, because most of them like mathematics and want to be teachers.

Most students think that the merit of using "Study sapuri" is that "we can study anytime" and "we can study anywhere" and "we can study repeatedly". On the other hand, they answered that the demerit is that "we can't ask the lecturer directly". Furthermore, the amount of traffic is a bottleneck for the students.

As a teacher of mathematics in University, the author considers the merit of using online learning system is that "the lecturer can efficiently construct his(her) lessons such that there is less time to write on the blackboard", and the demerit is "the lecturer can't change his(her) lessons according to student's understanding (such as he(she) adds the detailed explanation, or adds the advanced materials)".

The author is worried about the following point. Some students say that "Only we have to do is to watch the video, it is so easy". Indeed, students' scores of small-tests were significantly higher after studying through online learning than before. But it isn't possible to conclude that students understood the contents really. Will it be possible to think theoretically just by watching the video? Investigating over time, or trying various method are important for the deep understanding?

A blended learning method in mathematics (statistics) at university

Here, as introduced in Tominaga, Kogo (2014), we consider a blended learning method which means a combined use of lectures at university and online learning system. In Japan, Department of Flipped Learning Technologies has been established in October 2013 by Tokyo University and NTTDocomo Co.,Ltd (see http://flit.iii.u-tokyo.ac.jp/seminar/001.html). It is seemed that the blended learning system is the one expected to develop in the future in Japan.

As we described above, one of the merits of online learning system is that "students can study anytime, anywhere in their pace". On the other hand, the demerit is that "students can't ask the lecturer directly". Then, one of suitable blended learning methods is as follows.
(i)   The university teacher gives instructions to the contents which students should study by using online learning system.
(ii)   The teacher checks students' using status of the system regularly.
(iii)   The teacher grasps their understanding by giving some test regularly.
(iv)   The teacher takes actions such as adding supplementary items in his(her) class, according to students' understanding.
(v)   The teacher answers questions from students by using his(her) class, office hours, etc.

For example, the student who is absent to his(her) class by catching a cold or any other inevitable reason, will be not able to understand in his(her) next class. But if he(she) studies by using online learning system and ask some questions to his(her) university teacher, then he(she) will able to understand. Indeed, as we described in Chapter2, teachers at junior high school or high school can do (i)-(iii) above, by using the online learning system "Study sapuri". As a result, they can do the above procedure (i)-(v). This means why the system "Study sapuri" is superior than other online learning systems, and the author thinks that that it is a reason introduced in many schools though it is a paid service. But, unfortunately the system does not correspond to universities. Speaking of greed, though the "Study sapuri" doesn't have, it is even better if there is a function for students to mutually share what they have examined (cf. Miura, Kawamoto and Arai (2007)). With respect to statistics education, there is a relationship between statistics and Excel which is the software, it seems to be suitable for blended learning methods. Of course, although the use of JMOOC can be considered, it has some disadvantages such that students can't use it "anytime". There are some challenges to use JMOOC for blended learning. As written in Shigeta (2016), open education will be important for university education.

In the future, online learning systems for university students will be developed more, and it is expected that blended learning methods is popular than now.

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