Practices and studies of how to answer students' questions -- try to achieve students' improvements and staff's "Work Style Reform" --

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Abstract

This paper is a study and educational practice report to improve answering questions from students to improve their abilities and cut working time.

Because of the COVID-19 pandemic, staff have more tasks than before. So they should try to reduce the time for other tasks.

When students study or think something deeply, they usually need discussion with teachers, and it often occurs after lectures. Suppose that a quarter of the students want to discuss and that each of them spends 6 minutes after one lecture, the total time on the academic discussion with students (excluding lecture times) accounts for 20.6% of the total work time in a week. Therefore, it is useful to consider how to answer students' questions more efficiently to save time.

The author's conclusion is to upload discussion data to Learning Management System (for example "Blackboard Learn" and "Web Class"), this is because after uploading data, all students can read it so, logically speaking, only one discussion needs one topic (actually, of course, some students may need more) and because it is also useful for students to get reading skills better.

Next, the author thinks about how to get the discussion data easily. There are 4 ideas.

The first idea is to type a summary after the discussion.

The second one is to write and draw on paper and scan them after discussion.

The third one is to take photographs.

The fourth one is to use the interactive whiteboard (the electric blackboard).

The author tries all of them and concludes that using the interactive whiteboard was the best idea. It is because there are three advantages.

The first advantage is that it allows teachers and students to concentrate on the discussion because it can provide the data after the discussion.

The second one is its functions, for example, copying the whole screen, cutting/copying/deleting/moving letters and drawings. These make teachers explain more smoothly.

The third one is that it easily makes physical distance because its screen is wide and can expand letters or drawings.

Keywords: *Learning Management System, interactive whiteboard (electric blackboard), academic discussion with students, reading skills, Work Style Reform*

Introduction

When someone wants to consider and understand things, dialogue might be needed. Especially for students who have graduated from junior high school within a few years, it must be necessary to discuss. Therefore, they go to school to learn how to read technical books and how to think. At school, staff teach some 40 students with different backgrounds at the same time. So, it is impossible to give full explanations to each student. Therefore, learners ask educators directly what they cannot understand on their own. Generally speaking, they ask outside of their class, not during class. Then how much time do teachers need for these out-of-class questions? Let us calculate the time under the following assumptions.

[Assumptions]

- In each class, a quarter of the students ask questions outside of the class.
- Each question, there require 6 minutes.
- There are 8 classes per week per teacher.
- There are 40 students in each class.

Under these assumptions, the weekly out-of-class Q&A time is [6 * (40 / 4) * 8 =] 480 minutes. At the National College of Technology (KOSEN), the prescribed working hours are 7 hours and 45 minutes per working day, and the working days per week are 5 days. In other words, the prescribed working hours per week are 2325 minutes. Therefore, about 20.6% of the regular working hours in a week are spent answering out-of-class questions.

By the way, because of the COVID-19 pandemic, staff have more tasks than before. For these additional tasks, they should try to reduce the time for other tasks. Answering out-of-class questions from students needs much time, therefore it is useful for staff to consider how to answer these questions more efficiently to save time. In addition, it is useful for students to consider that. This

is because shortening or reducing the Q&A time while maintaining the quality of the answering lets teachers spend more time for the classes, and the simple answer allows students to understand easily.

The author searched previous research. He found [1, Jun MADA], but this research is for remote classes, not for answering questions from students. Therefore, he tried to think of methods and ideas for Q&A.

Thinking methods and ideas

As a method to shorten or reduce the Q&A time, the author used a method similar to FAQ, that is, “teachers write frequently asked questions and their answers in advance and show them for all students, and ask them to read these FAQ first if possible when they have questions.”. Since it is difficult to determine which questions are "frequently asked questions" and which ones are not, the author decided to treat all the questions from students as "frequently asked questions". And he put them in the Learning Management System (hereinafter referred to as LMS) which the students and teachers ordinarily use. So, all the answers to the questions from students must be transferred as electronic data.

This method also has two advantages for students. The first one is that they can search for answers to their questions anytime and anywhere. The second one is that their reading and comprehension skills will improve. The answers were written for other students, so he or she should read and think about them. And if he or she cannot understand them, he or she should inform their teachers what is OK and what is not OK and ask them to understand. Therefore, this method also has educational advantages for students.

Next, the author thought about how to get the discussion data easily. There were 4 ideas. He tried all of them and found the advantages and disadvantages of each idea. They are shown below. In addition, there are effective conditions for each idea.

The first idea is to type a summary after the discussion. This idea is to summarize the questions and answers by typing after the discussion. The teacher takes notes while answering questions, and after the discussion, he looks at the notes and summarizes them.

[Advantage]

- It can be carried out without making the students wait.
- It can summarize questions simply

[Disadvantage]

- A considerable amount of time is required (in addition to the answering time).
- It needs to summarize as soon as possible not to forget the discussions.

This idea is effective when the number of questions is a few and there is already a certain amount of "FAQ" (that is when there are few new contents to be added while answering questions).

The second one is to use A4 size papers. When the teacher explains, he writes and draws on A4 size papers so that he can scan them and upload them to the LMS after discussion.

[Advantage]

- It can be carried out without making the students wait.
- It can get the data for LSM easily (only scanning or photographing the papers).
- It requires nothing but a scanner (or a digital camera), that is, it can do on a low budget.

[Disadvantage]

- It requires a desk or something to write and draw on paper.
- When two or more students listen to the answers at the same time, some may not be able to see the paper, or some may have to read from different directions
- It makes teachers have a certain number of sheets of paper at any time.
- The distance between the student(s) and the teacher tends to be close (need to be careful because of the COVID-19 pandemic).

This idea is effective when one student discusses one teacher. Therefore, it is effective when a tutor manages questions.

The third one is to take photographs. When the teacher explains to students, he writes and draws on a blackboard or a whiteboard, and before erasing them, he takes photographs of them with his digital camera.

[Advantage]

- There are no troubles if two or more students listen to the answers at the same time. (compare to the second one)
- It is easy to maintain a certain distance between the student(s) and the teacher. (more appropriate than the second one in terms of the COVID-19 pandemic)
- It can get the data for LMS easily. (just change the file name)

[Disadvantage]

- It requires a blackboard or a whiteboard.
- When the teacher takes a photograph, the students must wait. They are interrupted in their thinking.
- Teachers must have a digital camera at any time.
- It is necessary to be careful about personal information (such as information about the students and the school, especially near the bulletin board).

This idea is effective if staff cannot carry the fourth one. It is because there are few changes from the existing work, as it is just adding taking photographs, and uploading them.

The fourth one is to use an interactive whiteboard (an electric blackboard). After discussion, it offers the discussion data.

[Advantage]

- It can be carried out without making the students wait.
- There are no troubles if two or more students listen to the answers at the same time. (compare to the second one)
- It is easy to maintain a certain distance between the student(s) and the teacher. (more appropriate

than the second one in terms of the COVID-19 pandemic)
- It can get the data for LMS easily. (just change the file name)
- Teachers do not have to have papers, digital cameras, and so on. (compare to the second one and the third one)
- It offers only the data written and drawn at the time of explanation. (personal information is not included. compare to the third one.)

[Disadvantage]
- An interactive whiteboard is required. It is very expensive and if another person uses it, the teacher cannot discuss the students.
- (Of course, some interactive whiteboards can move,) discussions can only be carried out near the interactive whiteboard.
- Data saving may fail due to power outages, so the teacher needs to save frequently.

This idea is effective if staff can use an interactive whiteboard freely.

Practices and their data

In this section, there are the practices and data of the author's ideas. The first content is the data for the usefulness of uploading on an LMS. The LMS which the author uses ("Blackboard Learn") gives the access data. From April to August 2022, the author uploaded 178 Q&A data. The LMS offers the access data of these 178. He calculates the mean times of the accesses and it showed 370.5 accesses per one Q&A data on average. This means that over 100 questions from students on one topic are solved by themselves. It is evidence to support the usefulness of uploading on the LMS.

The second content is the practices of the idea. As informed in the previous section, the author tried all four ideas. The readers easily imagine the practices of the first idea, second one, and third one. The practice of the fourth idea is shown below.

First, the author shows the main method among the specific ways of using an interactive whiteboard for answering questions.

1. Listen to the exercise number from the student and write it on the upper left of the interactive whiteboard. As a general rule, do not enlarge, reduce, move, or delete this description.
2. Listen to questions from students and write or draw them on the interactive whiteboard using the black pen mode. At that time, what is written or drawn is limited to those in the exercise sentence and what they say.
3. Add (write or draw) the things which are lead from what is written or drawn at the previous step in (a) different color(s) (for example, calculations, reasoning, angles, lengths of sides, what you can say from the definition of words, using some theorems, and so on.).
4. If the students understand, change color(s) to black if possible.
5. If no space is left or if needed, make a copy of the current screen. The copy screen is on the next page. On the new page, keep the exercise number and what is needed to think. Then erase the left other than the last calculus (or thinking). The last calculus (or thinking) is put in empty spaces, especially near the beginning of the line.
6. Repeat the previous three steps until the student is satisfied with the explanation. In case of power outages, save the screens temporarily when the students are thinking.
7. When the students are satisfied, save all of the screens as one electronic file. The interactive whiteboard creates a PDF file.
8. Clear the screens and move on to the next question.

Next, the author shows the practices. There are two figures below. These are an example of the file which the interactive whiteboard created. Figure 2 is created from a copy of Figure 1. The reader compares them and realizes that Figure 2 is made of Figure 1, that is to say, copy the whole of Figure 1, erase some sentences, circle, and underlines, copy a part of the last sentence, move and change the color of it, move the whole of the last sentence and write some new sentences. In other words, the functions of the interactive whiteboard help teachers to explain more easily.

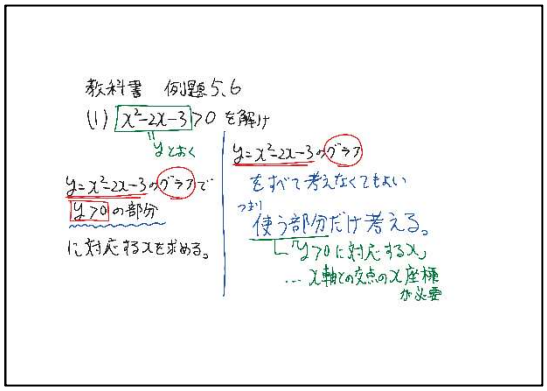

Figure 1: Source screen

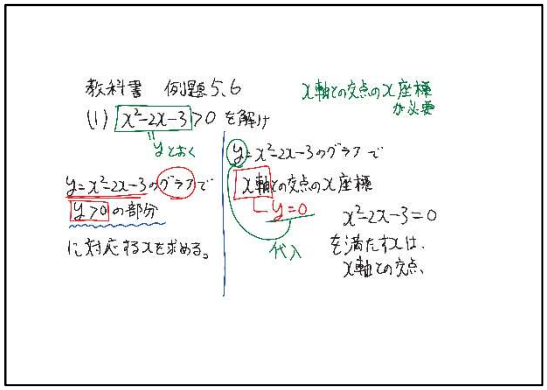

Figure 2: Copied and modified screen

There are other two figures below. These are also an example of the file which the interactive whiteboard created. Figure 4 is created from a copy of Figure 3. The author wants to keep the screen of Figure 3 so he copies it. This is because after teaching in Figure 4, he goes back to the previous page (Figure 3) and suggests the student

write and draw what she understands. If she understands, she can do them. If she writes and draws wrongly, undo them and challenge them again and again. In other words, the functions of the interactive whiteboard help students to think as much as they want.

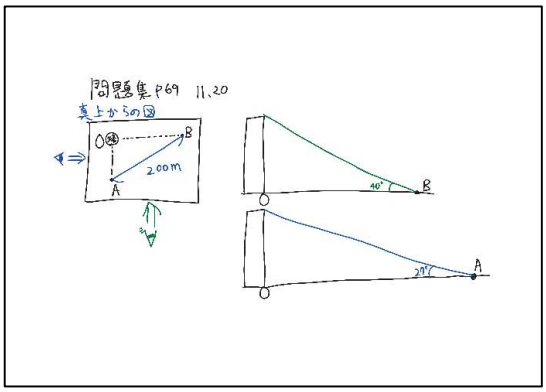

Figure 3: Base screen

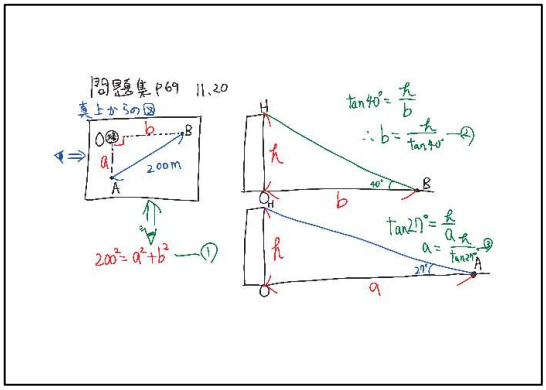

Figure 4: Explained screen

Conclusions

The author concludes that uploading Q&A data on an LMS is a good idea. And the author concludes that to create Q&A data, using the interactive whiteboard was the best idea. It is because there are three advantages.

The first advantage is that it allows teachers and students to concentrate on the discussion because it can provide the data after the discussion. There are no interruptions so it offers better time for students.

The second one is its functions for writing and drawing. For example, it can undo and redo writing or drawing, copy the whole screen, cut/copy/delete/move letters and drawings on its screen and change their colors. As is shown in the previous section(the main method among the specific ways of using an interactive whiteboard for answering questions), these functions make teachers explain more smoothly and make students understand more easily. Therefore, they can reduce discussion time effectively.

The third one is that it easily makes physical distance because its screen is wide and can expand letters or drawings. During the COVID-19 pandemic, these functions are more important than ordinary.

Using a Learning Management System and an interactive whiteboard makes academic discussion with students more effective. Q&A data uploaded on the LMS improves students' reading skills. And using the interactive whiteboard is useful for making physical distance, for students studying, and for cutting teachers' working time. These are the conclusion of this paper.

References

[1] Jun MADA (2021). Educational Effect of Simultaneous Interactive Lessons that can Connect with First-year Students. *Journal of Japanese Society for Engineering Education*, 69-2, 120-125.