

Field Study on Graduate Course implemented with Three Learning Support Tools

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Overview We have proposed three class support tools and applied them to classes of a course in a specialized subject in a grad-student room/classroom in the engineering curriculum for a master's degree. 1 month after the final class session in the course, we conducted a survey on the actual learning situation, focusing on number of key words currently retained from the class series, content understanding, interest and desire, in-class and extra-class learning activities, views on adoption of the tools in other courses, and related impressions and proposals. The results show the certain effects of all three tools on the learning process and indicate that the information they provide will be representative of in-class and extra-class learning throughout the course period.

Key words: class application, university education, learning environment, educational tool development, Web utilization

1. Introduction

As reported by the Ministry of Education, Culture, Sports, Science and Technology, educational institutions are actively engaged in taking measures to evaluate classes, with as much as 93% of all national, public, and private universities in Japan implementing post-class questionnaires completed by students. As noted by many observers, however, the learning evaluations are generally performed after completion of the course; therefore, feedback of the results to students is absent. Development of a class format is awaited that enables determination of the state of learning as classes proceed through the course term and better supports learning.

Here we describe three learning support tools developed to heighten the effectiveness of class learning, and the effects of their utilization for classes on learning accomplishment as found in a survey performed subsequent to the final class session.

2. Method

2.1 Course

A course in marketing was selected for this study from among the elective courses specializing in training of engineers responsive to the various needs of our society. Table 1 shows the course design. Of the 23 students, four were foreign students, one of whom was from another university in Japan.

2.2 Grad-student room/classroom (Fig. 1)

The installed equipment comprised five screens, three Wi-Fi-controlled projectors installed in the

ceiling, two 90×180 cm wall-hung whiteboards, five 90×90 cm table whiteboards, and 30 whiteboard pens (four colors).

2.3 Three learning support tools

2.3.1 Web version of the Key Words Meeting (KWM)

The teacher registered the key words (KW) to be used prior to the class, and determined the KWs that had actually been used in that class. Then the teacher determined the appropriate feedback and the disclosure range based on student entries of KWs retained, students' desire for supplementary explanation and questions, and then entered the feedback for the students to peruse before the next class. This process, constituting the KWM, was performed via the Web.

2.3.2 Multi-screen

Three screens were used for simultaneous projection of the course contents currently being covered by the teachers, the overall class content, other teaching materials, and/or related information.

2.3.3 Table whiteboards (Fig. 2)

Magnetic whiteboards 90 cm square were cut from commercial products and laid on tables. The discussion theme was written in the center, and the students held a discussion while adding KWs from the discussion on all sides in different colored pens and wrote comments to indicate associations and related questions and answers.

2.4 Survey criteria

2.4.1 Student assessment immediately after class session

The students themselves performed self-assessment using the free response format for “Q1: Points of difference between before and after the class series”, and using the multiple-choice format, as well as the free response format for the reasons for the responses to the multiple-choice format, for “Q2: Intention to utilize the class content” and “Q3: Confidence in utilization of the class content (self-efficacy)”.

2.4.2 Survey on the actual learning situation at 1 month after final class session

In regard to the three tools, a survey was conducted consisting of seven five-choice questions together with free-written reasons for the chosen answers. The question contents were: Q1, number of KWs retained from the class series; Q2, understanding of class content; Q3, learning desire (interest, feelings about additional learning); Q4, learning activities in class (listening, speaking, and note taking); Q5, extra-class learning activities (review and preparation); Q6, desire for tool incorporation into other subjects; Q7, impressions and proposals.

2.4.3 Acquired learning utilization survey at 3 months after final class session (scheduled)

This survey is composed of five-choice questions together with free-written reasons for the chosen answers: Q1, state of utilization during the past 3 months; Q2, intention for future utilization; and Q3, confidence in future utilization (self-efficacy).

3. Results

3.1 Self-evaluation

The results on intention to utilize the class content by number and percentage of students were: by all means want to utilize it, 16 (69.6%); and want to utilize it if possible, 7 (30.4%). The results on confidence in ability for its utilization were: can utilize it with confidence, 10 (43.5%); can utilize it fairly well, 11 (47.8%); and cannot utilize it very well, 2 (8.7%).

3.2 Survey of the actual learning situation (Fig. 3)

The survey response rate was 78.3%. KWM was related to: Q1, increase in number of KWs retained; Q2, deepening of understanding; Q4, in-class learning activities; and Q5, extra-class learning activities. The table whiteboards were related to: Q3, desire to learn and Q4. The multi-screens were related to Q1 and Q2. The free-written reasons for chosen answers indicated that KWM was useful in regard to: feedback from

the teacher (responses to questions, note correction, and supplementary explanations); perusal of other students' entries; review effectiveness; and being aware of KWs during the class. Because of the time burden, however, few expressed a hope for KWM incorporation into other courses. The reasons given for responses on multi-screens were their usefulness in determining the position and flow of course contents relative to the overall class content, and other in-class effects. In regard to the table whiteboards, many expressed the opinion that the team discussions and write-ins heightened retainment and understanding, and facilitated participation in the discussion, but some also remarked that their use was difficult for some of the course content.

4. Discussion

All three tools had a certain effect on learning. Students were hesitant about incorporating KWM into other courses, but this hesitancy was their preoccupation with successful course completion together with anxiety and concern about their research and/or job hunting leading to difficulty managing their demanding schedule. In this course, however, the classes provided one of the few opportunities to gain knowledge in fields other than their own specialization, and the student review, extra-class learning, and feedback from the teacher were essential. Areas for further study include KWM operational improvement and strategic review of all courses.

The results also indicate that for classes that include students from abroad in particular, including table whiteboard notes on the discussions can be expected to effectively aid both the students and the teacher as compared with oral discussion alone. The multi-screens were deemed to be more effective when providing explanation of thorough procedures and/or comparison of bodies of knowledge. It might further be noted that given appropriate conditions, an improvement in grad-student room/classroom order and a reduction in power consumption can also be expected.

In educational institutions, assuring knowledge communication by ascertaining retainment of class content and related feedback is a key prerequisite for subsequent knowledge utilization and application. KWM is not considered a guarantee of effective knowledge utilization and application, but rather a tool for ascertaining knowledge transmission and generating the requisite feedback to enable effective communication of knowledge in a course. It is hoped that the learning support tools and the findings described here will be an

effective aid for extra-class learning guidance, teacher-student interactivity, and team learning.

Table 1. Class design

Class No.	Date	Mode	Content	Learning support tools		
				KWM	Multi-screen	Table whiteboard
1	4/10		Orientation	<input type="checkbox"/>	<input type="checkbox"/>	
2, 3	4/17	Lecture 1	Marketing theory	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4, 5	4/24	Lecture 2	Market survey techniques	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6, 7	5/1	Exercise	Case studies, two companies (review of Lectures 1 and 2)	<input type="checkbox"/>	<input type="checkbox"/>	
8, 9	5/15	Practice 1	Team conference, market needs survey planning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10, 11	5/22	Practice 2	Market survey performance, basic statistical analysis	<input type="checkbox"/>		<input type="checkbox"/>
12, 13	5/29	Practice 3	Additional survey and analysis, planning conference	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14, 15	6/5	Practice 4	Plan presentation by five teams, subject review	<input type="checkbox"/>	<input type="checkbox"/>	
16	6/5	Survey 1	Student assessment	<input type="checkbox"/>		
17	7/2	Survey 2	Learning acquisition survey	<input type="checkbox"/>		
18	7/31	Exam	Final examination	<input type="checkbox"/>		
19	10/31	Survey 3	Acquired learning utilization survey	<input type="checkbox"/>		



Fig.1 Grad-student room/classroom.



Fig.2 Using table whiteboards in a practice session.

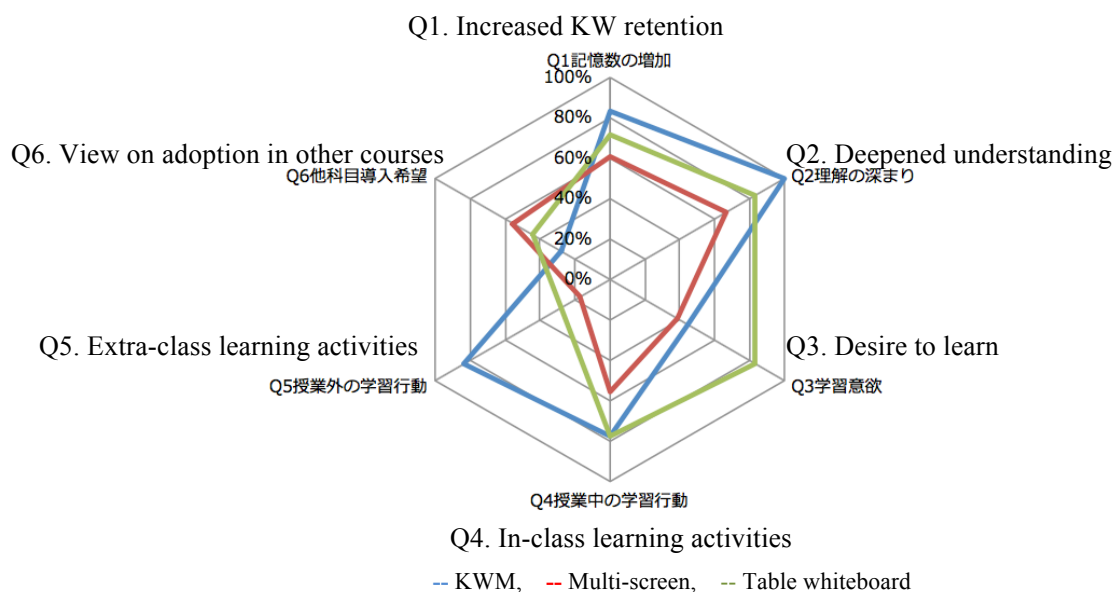


Fig.3 Results of the learning acquisition survey.