The Effect of Feedbacks on Web-Based Learning Modules for Vocational Students

Sumalee Chanchalor, Kanyuma Jitjumnong, and Preeyapus Phooljan

Abstract—The objectives of the research were to study the effects of feedbacks on achievement of vocational students who learned "Circuit Analysis by Mesh Current Method." Students received the feedback as they learned the modules on web-based. Then, to study students' satisfaction on learning the modules. The treatment variable was four types of feedback. The sample was 68 first year students in vocational collage. They were divided into four groups. Six modules of learning, questionnaire and test were developed. The modules were commented by experts for quality. The test was trial with 20 students. The reliability was $KR_{20} = .97$. Each group received learning module on web together with one type of feedback. The data was collected and analyzed by two ways analysis of variance (Two ways ANOVA). It was found that the score of each group on post-test increased more than pretest significantly. Group 1 who received feedback as explanation before test and private displayed gain the highest score. Group 4 who received the explanation after test and public displayed received the least gain score. Feedback on difference time showed effect on their score significantly but method of display the result showed no effects significantly.

Index Terms—Feedback, web based instruction, learning modules, vocational students, circuit analysis.

I. Introduction

Feedback is one thing necessary for anyone who wants to get better if we provide it in a suitable way. The learning design such as feedback is the important aspect which instructor should concern especially feedback on the web, which might require with some techniques.

A. Feedback on Learning Modules

Feedback is the information provided to a user to inform about the correct answer and to motivate them to further interact with the system, which is an important strategy for students to learn. Students learn more effectively if they receive frequent and meaningful feedback in timely manner. It's a powerful way to shape student learning [1]. Feedback reinforcing a message that would automatically connect responses to focus on correct responses. Feedback providing information that learners could also use to validate or change an error response. According to ref. [2], students need regular feedback in order to know how their performance was evaluated, how they could improve and how their grades are

calculated.

Feedback can come from the instructors, tutors, peers or stake holders. It can be implemented in the system. Ref. [3] suggested that feedback in the web-based learning system should have the qualities such as: prompt, timely, and thorough online feedback; ongoing formative feedback about online group discussions; ongoing summative feedback about grade; constructive, supportive and substantive online feedback; specific, objective and individual online feedback; consistent online feedback. The study of ref. [4] obtained useful and actionable knowledge that could be used by an adaption engine of web-based learning system.

Feedback could be present in many forms; such as textual, graphical animated audio video or a combination of these. Ref. [5] classified feedback into group or individual feedback, whereas ref. [6] used variety of parameters such as time of occurrence, progress coverage, target, function, intention, complexity, form of presentation, and grading information. With regard to time, feedback could be classified as immediate, delayed, and random feedback. With regard to progress coverage, it could be classified as immediate, continuous, and summative. With regard to target, it could be individual and group feedback. With regard to function, it could be classified as confirming, informing, correcting, explaining, evaluating, rewarding, motivating, criticizing, attraction of attention. With regard to intention, it could be classified as positive, negative, and neutral. With regard to complexity, it could be classified as knowledge of response, of result, answer until correct, elaborated feedback. With regard to presentation, it could be classified as textual, graphical, animated, and auditory. With regard to grading, it could be classified as formative and summative. Ref. [7] studied types of immediate feedback as informative, corrective feedback given to learners as quickly as the system will allow during instruction. Delayed feedback is informative, corrective feedback given to learners after a specified programming delay interval during instruction. Ref. [8] classified types of feedback into explicit, implicit and mixed-mode acquisition feedback. Normally, classification depended on the purpose of study.

The study of ref. [9] on the usage of multisource assessment and feedback process in the classroom and the potential impact on student learning was found that the assessment process, grounded in control and goal setting theories, provided means for students to take a proactive role in their learning. Ref. [10] and Ref. [11] found a significant effect for the group whose errors were underlined compared with the group who received no corrective feedback or only a marginal check. Suitable feedback could provide some knowledge to students. An increasing number of studies have

been investigated whether some types of feedback are more suitable than others.

The impact of feedback for personnel and others' performance may be affected by the amount of practice time needed to achieve proficiency and might have a larger effect with extended training periods representative of normal classroom instruction. In cases of web-based learning, there are some restrict conditions which is different from of normal classroom. To provide suitable type of feedback, instructors have to concern to each condition or each environment which would affect to promote their learning.

Web-based learning is often called online learning [12]. It can improve instructional quality and reduce costs associated with traditional instruction. Thus, it is increasingly used as a tool to support education nowadays. Several institutes provide web based as materials which is convenient for students to study. However, it might have some limitation and also some advantages: the positive aspects are that learners are able to use new technology which students get used to it. WBL offers huge opportunities for learning and access to knowledge and information. The limitations are that learners should have skills to this technology, have knowledge to operate this equipment; otherwise, they might not collaborate well. An advantage of web-based learning that learners can learn anytime. However, questions might not be answered in suitable time which means waiting time of learners. The lecturer should therefore set a schedule for learners to do each activity. Ref [13] said that educational reforms is improving student learning outcomes which will serve the primary goal of education.

Ref. [12] explained WBL types can be many features such as course information, teaching materials, communication via email and discussion boards, formative and summative assessments. To design appropriate learning requires understanding the learners and characteristics [14] Therefore, research should continue to explore the specific types of technology-rich learning environments. To created online learning, ref. [15] divided into two systems: 1) student system such as lesson menu for students to study, web board and 2) lecturer system which included administrator system where as Ref. [14] told that learning systems can be adapted to learners' needs and styles. This study was to find out which type of feedback would provide the most benefit for online environment.

B. Objectives

The objectives of the research were 1) to study the achievement of students who learned on web-based based with different types of feedback and display.2) to study students' satisfaction of learning modules on web.

II. METHODOLOGY

A. Sample

The sample for the study was 68 first year, vocational students in Saraburi Technical College. They were divided into 4 groups. Each group learned the same web-based learning module but different types of feedback as the follow:

Type 1. The explanation before the formative test the end

of each unit and showed the score privately.

Type 2. The explanation before the formative test the end of each unit and showed the score in public.

Type 3. The explanation after the formative test the end of each unit and showed the score privately.

Type 4. The explanation before the formative test the end of each unit and showed the score in public.

B. Tools

1) Learning module on the web with four types of feedback
2) Test
3) Questionnaire

The content of learning modules "Circuit Analysis by Mesh Current Method" was designed to learn on web with adobe photo shop CS3 PHP. It was divided into six units. Content and learning period as in Table I. Since this online lesson was used with Thai students thus it was presented in Thai language. The sample content and menu are in Fig. 1-2.

TABLE I: LEARNING MODULE FOR SIX UNITS

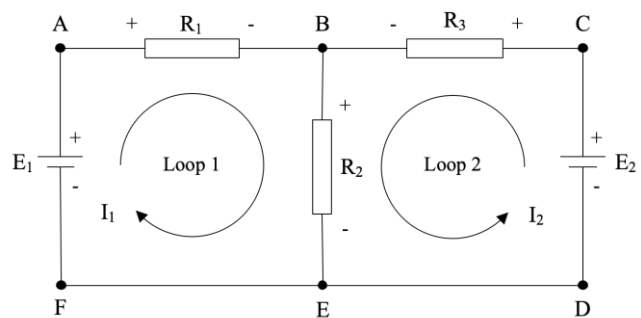| Unit	Topic	Period
1	Kirchhoff's Current Law (KCL)	5
2	Kirchhoff's Voltage Law (KVL)	5
3	Mesh Current 2 variable	5
4	Mesh Current 2 variable, shortcut method	5
5	Mesh Current 3 variable	5
6	Mesh Current 3 variable, shortcut method	5

Fig. 1. Sample of content.

Fig. 2. Sample of menu.

The web-based learning module was modified on web. To fulfill the objectives, the researchers created learning system which included of three sections:1) section for instructors, 2) section for learners and 3) service system such as communication ways, activity in using and sharing resources. The modules ware tested to find out its efficiency. The value of E1/E2 = 82.81/ 81.64.

To support the test validity, table of specification for these modules was created. Then the multiple-choice test was

developed and tried out with 20 students. According to cognitive domain of Bloom's Taxonomy, learning level and its weight of test items for each unit was in Table II.

TABLE II: ANALYSIS ON TABLE OF SPECIFICATION FOR LEARNING MODULES

Unit	Comprehension	Application	Analysis	Weight
1	/	/	/	2: 6: 2
2	/	/	/	2: 4: 4
3	/	/	/	3: 3: 4
4	/	-	/	6: - : 4
5	/	/	/	3: 3: 4
6	/	-	/	5: - : 5
Item	21	16	23	

The test of 60 items was constructed and proved to find out their quality. It was trial with 20 students. The reliability was $KR_{20} = .97$. The value of difficulty (p) and discriminant (r) of each item showed their suitable quality.

The questionnaire on learning modules was developed to find out students' satisfaction. It was five interval scale which covered general characteristics of the lesson and activities. It was also validated by three experts.

C. Experimental Design

The experiment was conducted using four types of feedback. Each group of student received one different feedback. This study was 2×2 factorial design. One variable (X_1) was on 2 types of feedbacks: explain before or after doing exercise. Another variable (X_2) was 2 methods of displays the result: private display or public display. Thus 68 students were divided into four classes: 17 students for each class. The number of each group was equal. Every group was test before participating the experiment and then they were tested again at the end of the experiment. Data was analyzed by two ways analysis of variance (Two ways ANOVA). The four groups experimental design was as in Table III.

TABLE III: FACTORIAL DESIGN FOR THE EXPERIMENT OF THIS STUDY

Type of Feedback/ Type of display	X_2	
X_1	I	II
1	A	B
2	C	D

III. RESULTS

Data collection was conducted through a learning module on computer. Each group composed of 17 members and received one of four types of feedback. It was found that there score of each group on post-test increased more than pretest significantly Group 1 who received feedback as explanation before test and private displayed gain the highest score. Group 4 who received the explanation after test and public displayed received the least gain score. The total was 68 members. The descriptive statistic of pre-test post-test and t-test of four groups were shown as in Table IV.

TABLE IV: DESCRIPTIVE STATISTICS OF PRE-TEST, POST-TEST AND T-TEST OF FOUR EXPERIMENTS GROUP

Group	Before		After		Gain score		t-test
	$\overline{x}$	S.D.	$\overline{x}$	S.D.	$\overline{x}$	S.D.	
1	25.59	4.13	50.12	3.48	24.53	4.78	20.27**
2	26.76	3.68	50.12	3.74	23.35	4.13	21.27**
3	24.88	2.47	46.88	1.69	22.00	2.78	28.14**
4	27.18	2.74	48.82	2.87	21.65	3.55	20.48**
total	26.10	3.38	48.99	3.26	22.88	3.96	

$**p < .01$

From Table IV, it was found that their mean score of each group increased significantly on post-test than pre-test. To find out the effects of feedback time (A) and types of display (B) by two ways analysis of variance. The result was as in Table V.

TABLE V: TWO WAYS ANALYSIS OF VARIANCE ON TYPES OF FEEDBACK AND TYPES OF DISPLAY

Analysis of Variance	SS	df	MS	F
Types of feedback (A)	87.20	1	87.20	9.37**
Types of display (B)	16.02	1	16.02	1.72
Interaction (A x B)	16.02	1	16.01	1.72
Within group	595.77	64	9.30	
total	715	67		

$**p < .01$

From Table V, the data was analyzed by two ways ANOVA, it was found that types of feedback on difference time: before and after doing exercise, showed effect on their score significantly but method of display the result showed no effect significantly. There was no interaction between types of feedback (A) and methods of display (B). Mean and standard deviation of gain score classified by types of feedback (A) and types of display (B) were as in Table VI.

TABLE VI: MEAN AND STANDARD DEVIATION OF GAIN SCORE CLASSIFIED BY TYPES OF FEEDBACK AND TYPES OF DISPLAY

Feedback	Method of display				Total average	
	Private		Public			
	$\overline{x}$	S.D.	$\overline{x}$	S.D.	$\overline{x}$	S.D.
Explain before exercise	24.53	4.78	23.35	4.13	23.94	4.45
Explain after exercise	22.00	2.78	21.65	3.55	21.85	3.15
Total average	23.27	3.78	22.50	3.84	22.89	3.81

The analysis data on type of feedback and types of display in Table IV shows that mean score of students who receive feedback with explanation before doing exercise gain more score on test than student who receive explanation after doing exercise (23.94>21.8). When concern to method of display, it was found a little bit higher mean score on private display (23.27) than those of public display (22.50). The difference is not significant. Group of students who received feedback before exercise with private display gained the highest mean score (24.53). However, their standard deviation of this group was also the greatest (4.78). Students who received feedback after the exercise with public display gain the lowest mean score (21.65).

The scores of students receiving feedback (explanation before and after doing exercise) were showed in Fig. 3.

After the experiment, students were asked to assess towards learning modules of "Circuit Analysis by Mesh Current Method. As the whole, twelve items, students assessed modules and its activities, in good level. They

preferred "presentation sequence" the first rank but weight "Stimulate to learn" as the last one. The result of each item as in Table VII.
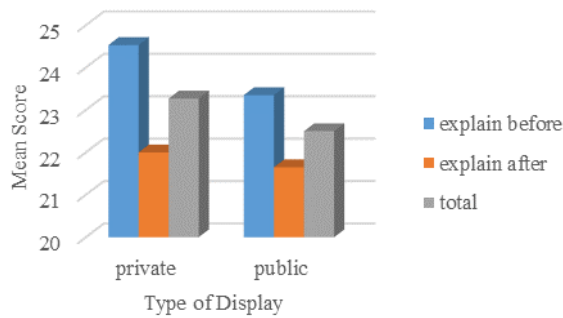

Fig. 3. The comparison gain scores of students with different types of feedback.

TABLE VII: MEAN AND STANDARD DEVIATION OF STUDENTS' SATISFACTION UPON MODULES AND ITS ACTIVITIES

Item	$\overline{x}$	S.D.	Rank
1.Easy to access	4.11	.58	4
2.Attractive menu	4.14	.46	3
3.Introduction	4.07	.44	7
4.Understandable of lesson on web	4.10	.49	5
5.Stimulate to learn	3.98	.40	12
6.Presentation sequence	4.25	.48	1
7.Learning method suit for content	4.08	.39	6
8.Relationship between images and content	4.16	.43	2
9.Good and clear example	4.07	.37	7
10.Conclusion	4.02	.42	9
11.Test	4.01	.27	10
12.Feedback	3.99	.39	11

IV. CONCLUSION AND DISCUSSION

For this study, it was found that after learning modules on web with feedback, students gained more score on post-test than those of pretest. The researcher developed the module drawing on the theory of CAI development and prepared in advance for facilitating the process of learning which was the tool to support formal program and can communicate with learners in various ways [12], [15]. WBL system was design to meet the requirement of content which adapted to students needs [14]. As the study of ref. [16] found that the students in primary level who learned on the web with project-based and with feedback bears fruit to accomplish education. Web and feedback had effect in their learning. Ref. [17] confirmed that feedback is a powerful way to shape students' learning. Moreover, the method of module learning will allow students to review whenever they prefer which is convenient and suitable for vocational students to review by themselves. Since the level of students' satisfaction was in good level for all items, the design of WBL can be developed more with technic and clarified concept for future study.

Suitable feedback was also showed power on their learning. As ref. [18] studied on types of corrective data for students in English confirmed that feedback provided direct, explicit written information to students. This study used two different feedbacks of the explanation to the students: before and after doing exercise. It was found that the gain scores of students receiving different period of feedback were significant different. The students who received feedback before doing exercise did more scores than those who received feedback after doing exercise. Ref. [19] suggested that feedback as being constructive will let students learn what was right or wrong, guided for mistake or hint for correct answer. Thus, for vocational students, it might be suitable to explain students before doing exercise. However, their standard deviation was the greatest than the other group. Since students who were active and self-regulated learning could develop more. As ref. [20] studied the effects of reflection prompts and tutor feedback on the development of students' self-regulated learning competence and indicated the practical value of combination of reflection prompts and tutor feedback to develop students' self-regulated learning.

Feedback to the students by explanation was powerful. It would be more efficient if using this type of feedback before doing the exercise.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

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