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A comparison of academic achievement on the Intranet in a course on electric transformers between individual-learning and group-learning

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ABSTRACT: The purposes of this study were to develop the course on electric transformers on the Intranet and to find out the efficiency of the lessons. This study also compared the academic achievement between individual-learning and group-learning and researched the problems and satisfactions of the students to the course. The tools of this study included the Intranet lesson in a course on electric transformers, an academic achievement test and questionnaires measuring satisfaction. The sample comprised of 55 students studying their first year in a diploma in electrical power at Pichit Technical College, Pichit, Thailand. The sample was divided into three groups: the first group studied using one computer per person, the second group studied using one computer per two persons, while the third group studied using one computer per three persons. The sample size was 19, 18 and 18 students respectively. At the end of the course, the academic achievements of those samples were analysed by using one-way ANOVA. The efficiency of the lesson, E1/E2, was determined to be 81.09/81.77 and every group achieved significantly high scores. There was no statistically significant difference between the three groups of students. Lastly, most students were highly satisfied with the course on the Intranet.

INTRODUCTION

A wide variety of instructional delivery systems are used in vocational programmes, including vocational instruction, laboratory application supervised work experience and vocational student organisation activities. Within the context of rapid technological change, an education system is challenged to provide increased educational opportunities without increased budgets. Many educational institutions have developed various programmes and methods to generate new opportunities for their students.

The introduction of online learning poses a challenge for educators, who have a long tradition of face-to-face discussion-oriented education. In the virtual classroom, the class can be formatted to be synchronous and asynchronous. Synchronous communication occurs when students and instructors meet online in a chat room to discuss issues and concerns surrounding the class. Asynchronous communication occurs via bulletin boards and e-mail.

The Intranet is another way of online learning within the campus. Many Thai institutes have had problems with Internet equipment systems; thus, researchers decided to develop modules on the Intranet. In order to utilise Web-based instruction, instructors need to consider many factors, including possible problems with equipment, the system potential of personnel and differences between learners. In some cases, instructors have had to develop their own media. These are things that educators should be concerned with.

Due to the Nation ACT, the education system has reformed. Instructors have had to seek new means to stay in contact with their class. Since a class consists of a collection of individuals who are not all the same, cognisance must be taken of their varying learning speeds. Some are slow and prefer to learn with groups, while others prefer to learn individually. Educational researchers should know whether or not these styles of learning affect the outcome. Moreover, on-campus technology has experimented with using it in teaching.

OBJECTIVES

The purposes of this study were as follows:

- To develop modules covering electric transformers on the Intranet and to find out the efficiency of these modules;
- To compare the academic achievements between individual learning and group learning;
- To study the satisfaction of the students involved towards these modules.

TOOLS

The tools of this study included the Intranet module for the course on electric transformers, the achievement test and a questionnaire to determine the level of satisfaction.

SAMPLE

The sample was comprised of 55 first year students who studying their diploma in electrical power at Pichit Technical College, Pichit, Thailand. They were divided into three groups of 19, 18 and 18.

PROCEDURE

The content of the course, *Electric Transformers*, was analysed and the system of membership and Web-based instruction were set, then the modules of *Electric Transformers* on the Intranet were developed. The content and modules were checked by experts to be sure of their quality.

There were five modules, namely:

- Construction of single phase and three-phase transformers;
- Operating principles of transformers;
- Equivalent circuit and vector diagrams of a transformer;
- Transformer testing;
- Autotransformer and three-phase transformer connection.

These modules, together with the test, were tried out. The experiment was then conducted to determine its efficiency.

The samples were divided into three groups, the first group studied one computer per person, the second group studied on one computer per two persons, while the third group studied one computer per three persons. These three groups were investigated and compared. They were tested before and after the experiment. They were also asked to rate their satisfaction level. The module delivery via the Intranet and communication between learners and instructor is shown in Figure 1.

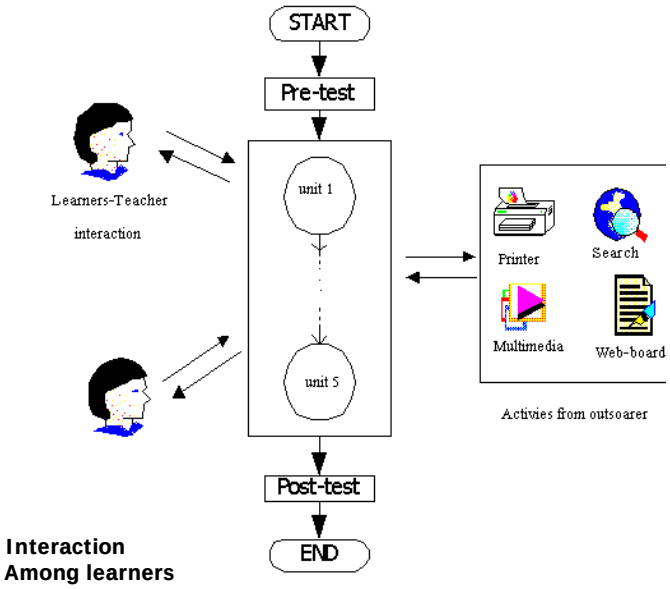

Figure 1: Communication via the Intranet.

RESULTS

Although the modules of *Electric Transformers* were delivered to students on campus, they were developed as Web-Based Instruction (WBI). These developed modules were comprised of five units. There was interaction between learners and modules in every module, as shown in Figures 2-7.

Figure 2: Welcome to the home page.

In order to study the efficiency of the modules, the scores from pre- and post-tests were compared. The passing score of each module was also studied. Figure 7 illustrates a comparison of the pre- and post-test scores.

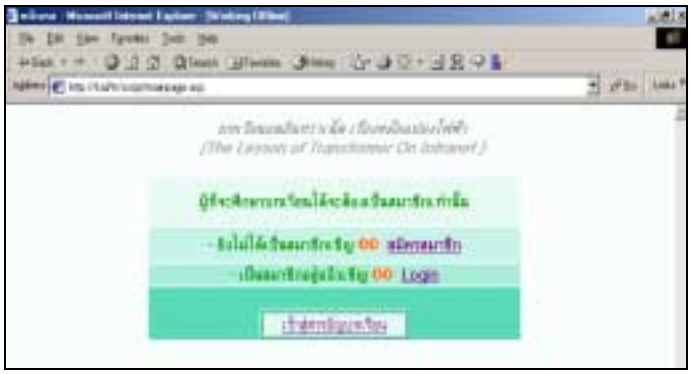

Figure 3: Registration page.

Figure 4: Modules available on the Intranet.

Figure 5: Principles of transformers.

Figure 6: Exercise.

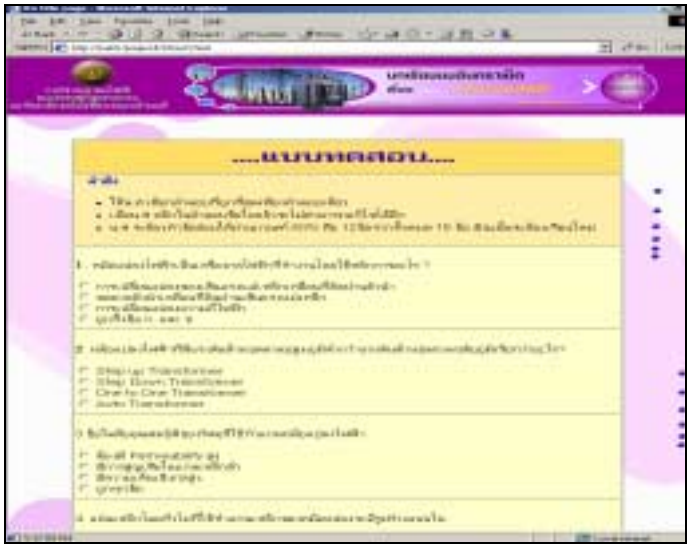

Figure 7: Test.

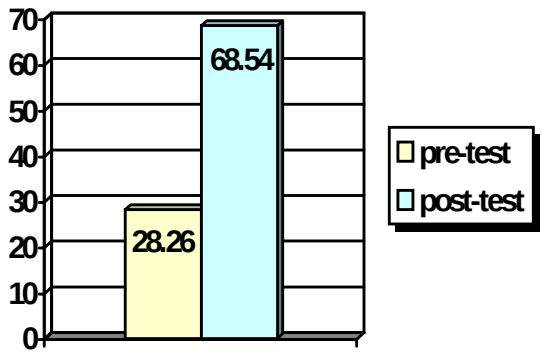

Figure 8: Mean score of the pre- and post-tests.

The study on the efficiency of the modules involved the passing scores of each module and the passing score of the post-tests. The average score was 81.09/81.77, which was above the criterion set out in Table 1.

Table 1: Score of each module and post-test.

	N	Min	Max	Total	Item	
After each unit	55	55	74	3,568	80	$E_1 = 81.09$
Post-test	55	47	75	3,598	80	$E_2 = 81.77$

In order to compare the academic achievement between individual and group learning, three types of scores were analysed. The effect of learning was initially studied. First, the three groups of students were compared to determine the difference between the pre- and post-test performance of each group, using the t-test dependent as shown in Table 2. The mean scores of these three groups were compared as shown in Figure 9. The scores of these groups were then compared, using ANOVA, to find out if there was any significant difference among these groups.

Table 2: T-test of the pre- and post-test scores of each group.

Group Type	Pre-test			Post-test		t-test
	n	$\bar{x}$	SD	$\bar{x}$	SD	
1:1	19	28.26	5.54	68.54	8.61	18.636**
2:1	18	28.22	4.63	66.00	6.10	23.555**
3:1	18	27.50	5.72	64.39	8.13	10.640**

**P<0.01

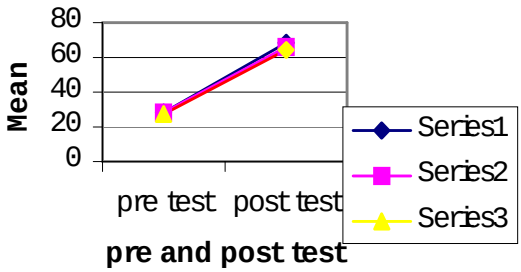

Figure 9: Pre- and post-test score of three groups.

It can be seen in Table 2 that a comparison of the pre- and post-test scores of each group, using t-test, were significantly different. The average post-test scores of each group was higher than the pre-test score at alpha 0.01.

The average of gain scores were analysed by ANOVA, as shown in Table 3, so as to compare achievements between the three groups: the group of students who studied on the computer 1 to 1, those who studied 1 to 2, and those who studied 1 to 3.

Table 3: Analysis of variance (ANOVA) of the gain scores.

Source of variance	SS	df	MS	F
Between group	7.861	2	3.931	0.056
Within group	3	51	70.79	
Total	3,689.382	54		

P > .05

The results in Table 3 show the gain score of each group; these were analysed by utilising analysis of variance (ANOVA). It can be seen that there was no significant difference between these three groups, ie their gain scores were not significantly different.

This study also examined the level of students' satisfaction towards learning the modules delivered over the Intranet. The learners were asked about the Intranet system and about the modules to analyse their satisfaction using a questionnaire that utilised a 5-point scale: very good, good, average, poor and very poor. The scores were assigned to 5, 4, 3, 2 and 1 respectively. The mean score and standard deviation of each item are displayed in Table 4.

Table 4: Mean and standard deviation of students' level of satisfaction towards the modules.

Item	n	$\bar{x}$	SD
System			
Username & password	55	3.95	0.70
Search content	55	4.18	0.77
Web board	55	3.75	0.78
Modules on Intranet			
Interesting content	55	4.45	0.60
Understandable to level of students	55	3.89	0.71
Continuity of presentation	55	4.05	0.67
Alphabet in lesson	55	4.12	0.88
Colour	55	4.09	0.79
Image	55	4.21	0.87
Animation	55	4.14	0.80
Sound	55	3.56	0.89
Exercise	55	3.98	0.99
Time to study	55	3.70	0.97
The whole programme	55	4.29	0.85

The results in Table 4 indicate that students were indeed satisfied with these modules on the Intranet on every item. The average of students' satisfaction on System was from 3.75 to 4.18, with a standard deviation of between 0.70 and 0.78. For students' satisfaction on Modules, the means were between 3.56 and 4.45, with a standard deviation from 0.60 to 0.99. Students were satisfied with the contents the most. They were asked to evaluate the whole programme, which was assessed to the second order, then they were satisfied with image and animation (means were 4.29, 4.21, 4.14 respectively). The last order was about sound. This indicates that students were satisfied with the developed modules on every level.

DISCUSSION

Students who studied modules from the *Electric Transformers* courses on the Intranet achieved significantly higher scores in the post-test than on the pre-test, since the course and modules were designed well. According to the interaction set of the components on each page and the sound, students could learn and practice by themselves.

The online curriculum is more flexible and can be adjusted to suit different learning styles in comparison to the lecturing of traditional courses. Salinas compared learning with multimedia and without multimedia, with the result that learners utilising computers and multimedia obtained higher scores than those without computers and multimedia [1]. Interestingly, they also used less time. Because the equipment was not especially convenient for them, learners have to manage their time and effort to study. However, these learning packages were presented to learners to be a new option. Because this software was new and fashionable, this new media proved interesting and engaging for learners.

In order to compare the groups' achievements, it was found that of the three groups that learned modules on the Intranet, the individual or group results were not significantly different to the results from the studies of Durnin and Cheatham [2][3]. These two authors studied about the interaction of Computer-Aided Instruction (CAI) and group size; one to one, one to two and one to three. Durnin suggested that a group of four learners for one computer was too many to learn efficiently.

WBI has been proven in many cases to be as effective as tradition methods of instruction. The reasons for such results could be attributed to many factors. One factor was connected to innovation concerning the Intranet, as it was *fashionable* media, therefore it attracted the attention of teenage students. This study ensured that everyone had access to the information they needed in order to practice and had a free exchange of ideas and knowledge, as well as enhancing their personal well-being. Moreover, a group of three persons was not considered as being too many. Thus, it contributed to learning and the students involved fully enjoyed their CAI on the Intranet.

Students were satisfied with the system and modules, which reflects Kurubacak study on learners' attitudes towards WBI [4]. It was found that they were interested in online learning. They had a chance to search new ideas and had the opportunity to share ideas with others. This study ensured that everyone had access to the relevant information that they needed to practice and had a free exchange of ideas and knowledge, as well as enhanced well-being. Thus, it contributed to students' learning and they fully enjoyed their CAI via Web pages.

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