
**9-A. Energy Engineering and
Electrical Engineering I**

Oral Presentation

A Study of learning Achievement Using Defensive Instruction System

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ABSTRACT-This study was aimed to conduct a comparative study of academic achievement between defensive instruction and conventional instruction on the topic of the circuit analysis for higher vocational diploma in the area of electrical power because most graduates from this area could not apply what they have learned in their work. To improve the quality of instruction based on the project of structure -of-knowledge construction, this study was divided into 2 parts: Part 1 will be defensive instruction which means giving lecture to students and checking their perception, data application and real work application on the topic of circuit analysis. Part 2 will be structure -of-knowledge instruction which means giving assignments to broaden students' knowledge and checking their reasoning as well as principles for application and assessment of their academic achievement. The sampling group was composed of 30 second-year higher vocational diploma students in the Department of electronic in college of industrial technology. According to the results, the structure of-knowledge instruction was more effective than the defensive instruction in terms of thinking development, problem solving and data collection.

Keywords: Defensive Instruction, Learning outcome , certificate

I. Introduction

Recently, the instruction in educational institutes under the supervision of the Office of the Vocational Education Commission is usually based on one textbook or many textbooks with the same title. The instructors usually give lecture to students or solve problems in front of the classroom so that students can learn how to imitate and do practice at the end of each chapter. The contents about industrial education vary in meanings and structures, especially the structure of the contents in the area of electrical power which is a branch of applied sciences. It contains a lot of abstract bodies of knowledge. If instructors can transfer this structure of knowledge to the learners to fully understand the concepts and the meanings as well as the structure in a concrete manner, learners can perform successfully in class. Instructional management in the area of electronic circuit course is considered as one important subject for technicians. Therefore, traditional instruction could not improve students, resulting in lack of holistic

understanding about the contents which students could apply in related subjects. The instruction which can improve students must choose appropriate contents from the textbook which contain concepts, principles and theories as well as the way to make learners appreciate the structure of knowledge and their relationship in holistic manner as well as ability to solve the problem. The instructors usually give lecture to students or solve problems in front of the classroom so that students can learn how to imitate and do exercises at the end of each chapter. This kind of teaching aims at giving more knowledge to students so that they have to learn a lot and they are forced to remember. However, to gain higher understanding and idea and to solve problems require the application of various teaching methods so that learners can use brains to tackle with the contents and develop understanding inside the learners. Therefore, this research was to compare the conventional teaching approach with the defensive instruction approach on the topic of circuit analysis to develop knowledge and ability of students. The research was done in the following steps:

1. Selection of subject topic
2. Planning and checking the teaching plan
3. Development of learning achievement test and checking the quality of the test
4. Development of behavior observation form
5. Treatment
6. Data analysis

II. Experiment

A comparative study of achievement between defensive instruction and conventional instruction was performed under topic of circuit analysis.

This research was an experimental one which had experimental and control groups. It followed Non Randomized Control group Pretest-posttest Design

Table.1 shows Non Randomized Control group Pretest-posttest Design

Group	Pretest	Treatment	Posttest
Experimental group	T1	X	T2
Control group	T1	-X	T2

T1 means Pretest.

T2 means Posttest

X means body-of-knowledge instruction

-X means defensive instruction Research plan

To test their previous knowledge about the contents, both groups were given pretest containing 80 questions with 4 multiple choices to assess their knowledge about electrical system design and then their knowledge was compared between the experimental and control group. The researchers treated the experimental group with body-of-knowledge instruction and the control group with defensive instruction on the topic of circuit analysis. Both kinds of instruction were different. As for Posttest, the researchers used the same Pretest containing 80 questions with 4 multiple choices to assess the student's learning achievement. However, the test was rearranged and used after the treatment to compare their knowledge before and after the treatment for both groups. All scores from the tests were calculated using statistics. Results from the statistical calculation were interpreted.

The research on the learning achievement of both experimental and control groups through learning achievement test containing 30 items of 4 multiple choices. Their scores were compared through t-test statistical technique. It was found that the experimental group and the control group showed significantly different learning achievement at the statistical level of 0.01. This means that the experimental group showed higher learning achievement than the control group. Defensive teaching approach could help the experimental group achieve better scores than the group with conventional teaching approach.

Table 1 Comparison of learning achievement between the experimental and control groups

Sampling group	N	\bar{X}	S.D.	t-value
Experimental group	15	16.25	1.79	-3.14
Control group	15	18.35	2.45	

According to the analysis of the data from Table 1, it was found that the value was statistically significant (0.01, df = 28). The t value from the table was 2.467 and the t value from calculation was -3.14. This means that the experimental group and the control group had statistically significant difference for their learning achievement.

Table.2 shows the mean, standard deviation and t-test value for the learning achievement pretest of the experimental group.

Experimental group	N	\bar{X}	S.D.	t-value
Pretest	15	16.35	1.81	-13.69
Posttest	15	23.25	1.52	

According to the analysis of Table 2, it was found that the t value was statistically significant (0.01, df = 28). The t value from the table was 2.457 whereas the t value from the calculation was -13.69. This means that the learning achievement from pretest and posttest for the experimental group was statistically significant. Students with principle teaching approach showed higher learning achievement.

Table.3 shows the mean, standard deviation and t-test value for the learning achievement pretest of the control group.

Control group	N	\bar{X}	S.D.	t-value
Pretest	15	18.32	2.44	-4.49
Posttest	15	21.76	1.32	

According to the analysis of Table 3, it was found that the t value was statistically significant (0.01, df = 28). The t value from the table was 2.457 and the t value from calculation was -4.49. This means that the learning achievement for pretest and posttest of the control-group was statistically significant. Students with conventional teaching approach showed difference in their pretest and posttest learning achievement.

Table.4 shows the mean, standard deviation and t-test of the posttest learning achievement for both experimental and control groups.

Sampling group	N	\bar{X}	S.D.	t-value
Experimental group	15	23.38	1.49	3.44 **
Control group	15	21.75	1.32	

** Statistically significant at the 0.01 level

According to the analysis of Table 4, it was found that the t value was statistically significant (0.01, df = 28). The t value from the table was 2.457 whereas the t value from calculation was 3.44**. This means that the learning achievement for posttest of the experimental group and the control group was statistically significant. In other words, the students with principle teaching approach showed higher learning achievement than students with conventional teaching approach.

According to Table 5, the comparison of Posttest between experimental and control groups revealed the learning achievement, memory level, understanding level, application, knowledge about defensive instruction and knowledge about structure of-knowledge instruction. $T_{\text{Calculation}}$ was less than T_{Table} . This means that there was no difference between experimental and control groups in the learning achievement, memory level, understanding level, application, knowledge about defensive instruction and knowledge about structure of-knowledge. However, the average of the experimental group was higher than the control group.

III. CONCLUSION

According to the comparative study of academic achievement between defensive instruction and structure -of-knowledge instruction on the topic of the electrical system design, the experimental group with structure -of-knowledge instruction showed higher average than the control group with defensive instruction. According to the table of comparison, the

mean score of experimental group was 59.108 whereas the mean of

Table.5 The statistical technique for this comparative study of achievement between the experimental and control groups.

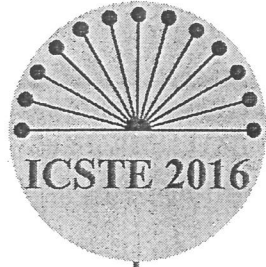
Assessment	\bar{X}		S.D.		T_{Table}	$T_{\text{Calculation}}$
	Experimental group	Control group	Experimental group	Control group		
Learning achievement	63.85	58.05	6.807	5.448	2.093	.000*
Memory level	62.55	59.30	3.394	4.118		.008*
Understanding level	61.850	60.60	6.876	4.989		.385*
Application	55.00	50.35	8.628	6.467		.065*
Knowledge about defensive instruction	48.35	46.00	12.21	12.43		.000*
Knowledge about structure of-knowledge instruction	51.05	48.55	8.660	8.238		.001*

control group was 52.808. When they were analyzed using t-test, there was statistical significance at the 0.05 level. Therefore, the structure-of-knowledge proved beneficial for instruction. The experimental group showed higher learning achievement than the control group. Therefore, the defensive teaching approach could help the experimental group students gain better results than the control group with conventional teaching approach.

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