



宮崎大学学術情報リポジトリ

University of Miyazaki Academic Repository

Competency analysis of discovery learning for transformer principles by discovery laboratory for vocation education

メタデータ	言語: Japanese 出版者: 公開日: 2020-10-27 キーワード: Transformer Principle, Discover Laboratory, Vocational certificate 作成者: Phansirod, W., Poonthong, W., Arunrungrusmi, S., Tunlasakul, K., Mungkung, N., U-Panasak, N., Yuji, T. メールアドレス: 所属:
URL	http://hdl.handle.net/10458/00010045

Competency analysis of discovery learning for transformer principles by discovery laboratory for vocation education

W. Phansirirot, W. Poonthong¹, S. Arunrungrusmi¹, K. Tunlasakul¹, N. Mungkung¹, N. U-Panasak²
and T. Yuji³

¹Department of Electrical Technology Education, Faculty of Industrial Education and Technology,
King Mongkut's University of Technology Thonburi, Bangkok, Thailand

²Electrical Power, Minburi Technical College

³University of Miyazaki, Japan

Abstract

This study was aimed to conduct a comparative study of academic achievement between 2 kinds of instruction (discovery laboratory learning approach and conventional teaching approach) on the topic of the connection of the transformer. The tools used in this study contained conventional and discovery laboratory teaching approaches, learning achievement test with 4 choices for 30 items, behavior observation form and 3 laboratory sheet. Laboratory sheet 1 is transformer ratio, laboratory 2 is transformer connection, and laboratory 3 is power of transformer. The sampling group consisted of 30 second year vocational education diploma students from the department of electrical power, Phijit Technical College. They were split into 2 groups of 15 people: control and experimental groups. They were chosen in a purposive sampling manner. Before the treatment, the sampling group was given a test about previous knowledge and they had to reach the requirement of 80%. The experimental group was given discovery laboratory approach. The control group was given conventional teaching approach. The research results revealed that the efficiency of discover laboratory Learning was at 82.12/85.2, which was higher than 80/80 as already identified by the criteria. The mean score of students' score towards the discovery laboratory learning was at 35.4 for experimental group and control group's score was at 29.1. The research results were that the discovery laboratory teaching approach could help the experimental group achieve learning achievement in the area of memory and the learning achievement of the experimental group was higher than that of the control group at the statistical significance of 0.05 level.

Keywords: Transformer Principle, Discover Laboratory, Vocational certificate

1. 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. This kind of teaching aims at giving more permanent knowledge to students so that they have to learn a lot and they are forced to long time 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, the researchers would like to conduct a comparative study of academic achievement between discover laboratory learning approach and conventional teaching approach on the topic of transformer principle.

In this study on the comparative study of academic achievement between discovery laboratory learning and conventional teaching approaches on the topic of the transformer principle, students were divided into 2 groups: Group 1 was the experimental group while Group 2 the control group. Their academic achievement would be compared.

2. Discovery laboratory set

The discovery laboratory learning set are consist of the following section as shown in Fig.1.

1. Transformer
2. Ammeter
3. Voltmeter
4. ¥

5. Wrong connection signal LED lamp
6. Correct connection signal LED lamp

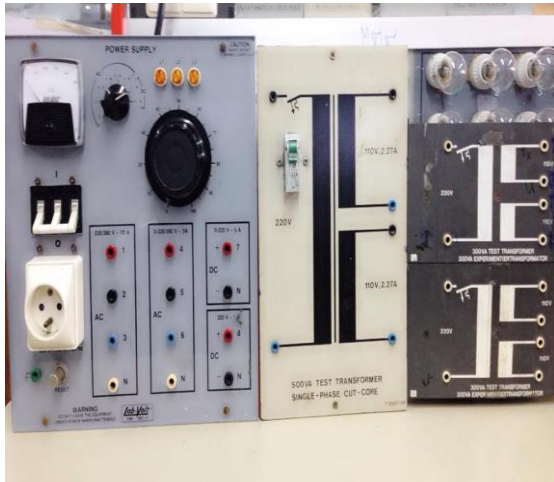


Fig.1. Transformer Discovery Laboratory Set

In this research, the researcher has created a worksheet for the transformers by a student discovery experiment set.

Summarize the experimental results and questions at the end of the worksheet by 4 worksheets as follows:

1. Determination of high and low voltage polarity
2. Open-circuit testing
3. Closed Circuit Test
4. Parallel circuit connection of 1 phase transformer

3. Research Methodology

1. A test about previous knowledge in the design of the transformer principle was given to students from both experimental and control groups until students from both groups passed 80% requirement.

2. The pretest of 40 questions with 4 multiple choices was given to both experimental and control group.

3. The experimental group was taught in accordance with discover laboratory learning approach whereas the control was given conventional teaching approach.

4. The posttest was given as a learning achievement and this was the same pretest but the items and choices were rearranged for both experimental and control groups.

5. The data were analyzed and the score from both groups was compared with previous knowledge, learning achievement, and behavior through t-test statistical technique. Both groups were independent.

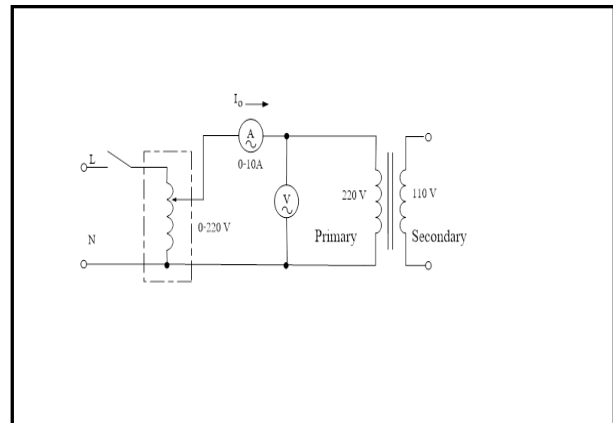


Fig.2 Experimental Transformer Polarity Circuit

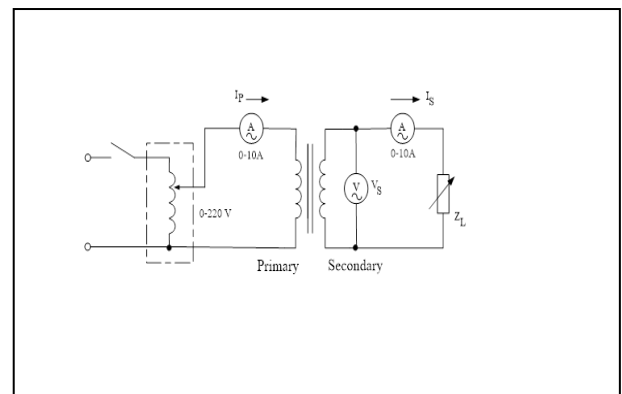


Fig.3 Load test circuit

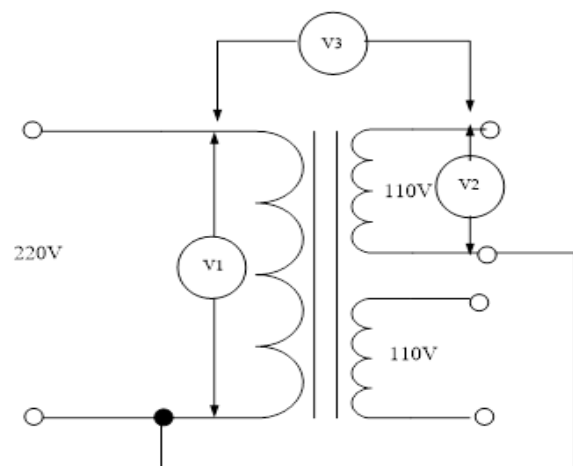


Fig.4 Polarity circuit for secondary test

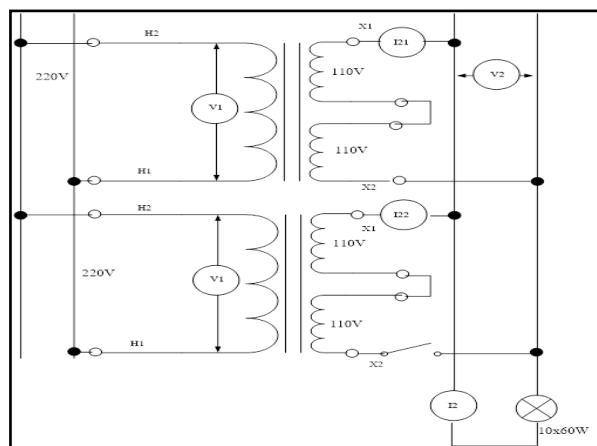


Fig. 5 Transformer connection circuit

4. Results

The research on the learning achievement of both experimental and control groups through learning achievement test containing 40 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 0.05. This means that the experimental group showed higher learning achievement than the control group. Discovery laboratory learning 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	31.4	1.78	-3.22
Control group	15	27.3	2.43	

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 2.557 and the t value from calculation was -3.22. 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	17.25	1.78	-13.88
Posttest	15	24.35	1.49	

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 2.557 whereas the t value from the calculation was -13.88. This means that the learning achievement from pretest and posttest for the experimental group was statistically significant. Students with discover laboratory learning approach showed higher learning outcome.

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	16.35	2.53	-4.57
Posttest	15	21.85	1.41	

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 2.557 and the t value from calculation was -4.57. This means that the learning outcome for pretest and posttest of the control group was statistically significant.

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

Sampling group	N	\bar{X}	S. D.	t-value
Experimental group	15	34.4	1.49	3.48**
Control group	15	29.3	1.31	

** 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 3.48**. This means that the learning outcome 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 outcome than students with conventional teaching approach.

5. Conclusion

According to the research on the learning achievement between the experimental and control groups through learning outcome of 40 items with 4 multiple choices, the scores were analyzed using t-test technique with 2 independent sampling groups and it was found that the experimental group and the control group showed statistically significant difference in their learning achievement at the level of 0.05. The experimental group showed higher learning achievement than the control group. Therefore, the discover laboratory approach could help the experimental group students gain better results than the control group with conventional teaching approach.

3. Reference

[1] De Cecco, J.P., 1968, *The Psychology of Learning and Instruction Educational Psychology*, New Jersey, Printice – Hall, Inc, pp.387-427

[2] Schiever, S.W., 1991, *A Comprehensive Approach to teaching Thinking* Massachusetts, allyn and Bacon, pp. 3-34

[3] Kausmeier, H.J. and Ripple, R.E. 1971, *Learning and Human Ability*, 3rd ed, New York, Harper of Row Publihers, pp 397-402

[4] Herriman, P.L 1947, *Dictionary of Psychology*, New York, Philosophical library, p.124

[5] Woolfolk, A.E., 1993, *Education Psychology*, 5th ed, Messachusetts, allyn and Bacon, pp. 3-34

[6] Chusak Pleanphoo, 2002, *Principle*, Department of Electrical Technology Education, Faculty of Industrial Education and Technology, King Mongkut's University of Technology Thonburi, pp. 1-3

[7] Wichai Wongyai, 1989, *Instruction on Generalization and Principle*, Journal of Research on Education (Local), No. 3, pp. 19-32

[8] Jirasak Lueng-urai, *The Bible of Serial Communication on PC*, Bangkok, Ruenkaew Printing house

[9]. Narong Tancheewawong, 1999, *PLC System*, Bangkok, TPA Printing House

[10] Surang Kowtakul, 2010, *Educational Psychology*, Chulalongkorn University Press, p. 207.