



Effect of Guided Discovery on Students' Academic Achievement in Basic Electricity Subject in Technical College in Bauchi State

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ABSTRACT

The primary objective of this research was to investigate the impact of guided discovery on students' academic performance in the basic electricity subject within technical colleges in Bauchi state. The study focused on the geographical area of Bauchi state, with a population of 212 NTC II students enrolled in technical colleges offering basic electricity. A sample of forty-two NTC II students, studying basic electricity, was randomly selected from the larger population. The research was guided by three research questions, and three hypotheses were tested at a significance level of 0.05. The findings revealed that students in the experimental group, who experienced the guided discovery method, achieved significantly better results compared to those in the conventional group. The positive outcomes were attributed to the treatment administered to the experimental group. Based on these results, it is recommended that teachers of basic electricity in technical subjects at the secondary school level incorporate the guided discovery method into their teaching strategies.

ARTICLE INFO

Article History

Received: June 2023

Received in revised form: July, 2023

Accepted: August, 2023

Published online: December, 2023

KEYWORDS

Basic electricity, Guided discovery, Bauchi State.

INTRODUCTION:

Basic electricity is a subject in electrical installation work taught at technical college level. This research work on the effect of guided discovery method in teaching and learning basic electricity in technical colleges is based on the theory of guided discovery in learning. Guided discovery learning is a learning that trains and guides students to learn, gain knowledge, and build concepts themselves. The guided discovery builds the understanding of concept of student under supervision of teacher and requires the teacher to be more creative in creating situations that can make students active in discovering their own knowledge and solve complicated and abstract concepts (Jena & Sun, 2021). The theory is attributed to Gigerenzer (1991), who viewed knowledge to be internalized by the learner through the process of accommodation and assimilation. Gigerenzer (1991) affirmed that a child comes from a home and mingled with

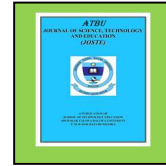
peer group that may not be interested in learning a particular subject, such as basic electricity, and when opportunity is given to them to construct things on their own, it may withdraw their averted mind (McLaren & Bruner, 2022). Duruk and Akgun (2020) submitted that students construct their own reality or at least interpret it base on their perceptions and experience, so an individual's knowledge is a function of one's prior experiences, mental structures and beliefs that are used to interpret objective and events. According to Duruk and Akgun (2020), knowledge is constructed from experience and learning is a personal interpretation of the world. Knowledge acquisition is an active process which is developed on the bases of experience and conceptual growth that comes from negotiation of meaning, the sharing of multiple perspectives and the changing of our internal representations which comes through collaborative learning. On this basis, McCurdy, Nickels and Bush (2020)

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stated that with the discovery method of instruction, students redefine, recognize, elaborate and change their initial concepts through interaction within themselves and their environment.

Students are taught using the same method of teaching year in year out without any review or update of current trend in the context of basic electricity. Therefore this study aimed at finding out the effect of guided discovery method of teaching on basic electricity in technical colleges.

Objectives of the Study

The purpose of this study is to determine the effect of guided discovery method on teaching and learning of basic electricity in technical colleges in Bauchi state. Specifically, the study sought to:

1. Determine the entry behaviour of students in basic electricity in guided discovery group and conventional group before the treatment.
2. Find out the achievement scores of students taught basic electricity using guided discovery method and those taught using conventional method after the treatment.
3. Determine the learning gain of student taught basic electricity in guided discovery group.

Research Questions

The study attempts the following research questions.

1. What is the entry behaviour of students in basic electricity in guided discovery group and conventional group before the treatment?
2. What is the achievement scores of students taught basic electricity using guided discovery method and those taught using conventional method after the treatment?
3. What is the learning gain of students taught basic electricity in guided discovery group?

Research Hypothesis

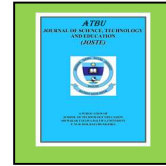
Ho₁: There is no significant difference in the entry behaviour of students in basic electricity in guided discovery group and conventional group before the treatment.

Ho₂: There is no significant difference in the achievement scores of students taught basic electricity using guided discovery method and those taught using conventional method after the treatment.

Ho₃: There is no significant difference in the learning gain of students taught basic electricity in guided discovery group.

METHODOLOGY

The study was conducted in Bauchi state. The population of the study was all 212 students in the eight technical colleges that were offering Basic electricity in Bauchi state. Random sampling technique was employed for selecting forty-two students as sample size from two technical colleges out of the study population. The sampled two technical colleges of intact classes were assigned into experimental and control groups. The instrument for data collection was Basic Electricity Achievement Test (BEAT) developed from Basic Electricity pass question papers of NTCII examination by National Business and Technical Examination Board (NABTEB), West Africa Examination Council (WAEC) and National Examination Council (NECO). Research Instrument was validated by experts in Technology Education from Department of Vocational and Technology Education, Faculty of Technology Education, Abubakar Tafawa Balewa University, Bauchi. The essence of the validation was to ensure clarity and appropriateness of the items. Data was collected by the researchers with the help of two research assistants from the sampled technical colleges. While the data obtained was analyzed using the mean and standard deviation to answer the three research questions and t-test was used for testing the hypotheses at 0.05 level of significance with the help of statistical package for social sciences (SPSS) version 2021.



RESULTS

Research Question One: What is the entry behaviour of students in basic electricity in

guided discovery group and conventional group before the treatment?

Table 1: Mean achievement scores of students in guided discovery group and conventional group before the treatment.

Groups	N	Mean score	Standard Deviation
Guided Discovery	22	11.23	9.28
Conventional	20	11.46	9.17

Table 1 shows the mean scores achievement of students in guided discovery group and conventional group before the treatment. The table reveals that guided discovery group had a mean score of 11.23 and the standard deviation of 9.28, while the

conventional group had a mean score of 11.46, with standard deviation of 9.17.

Research Question Two: What is the achievement scores of students taught basic electricity using guided discovery method and those thought using conventional method after the treatment?

Table 2: Mean achievement scores of students taught basic electricity in guided discovery and conventional group.

GROUPS	N	Mean score	Standard Deviation
Guided Discovery	22	55.86	15.42
Conventional	20	28.70	12.52

Table 2 is the posttest mean score 55.86 and standard deviation of 15.42 for the guided discovery group, and the mean score 28.70 and standard deviation of 12.52 for the conventional group.

Research Question Three: What is the learning gain of student taught basic electricity in guided discovery group?

Table 3: Mean achievement scores of student taught basic electricity in guided discovery group.

Groups	N	Mean score	Standard Deviation
Post-test	42	55.86	15.42
Pre-test	42	11.23	9.28

The mean scores and standard deviation of the posttest and pretest of the students in guided discovery group are depicted in Table 3. Table 3 shows that post-test mean score and standard deviation were 55.86 and 15.42 respectively. While the pre-test mean score and standard

deviation of the group stood at 11.23 and 9.28 respectively.

H₀₁: There is no significant difference in the entry behaviour of students in basic electricity in guided discovery group and conventional group before the treatment.

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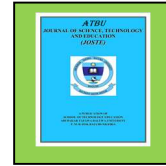


Table 4: Test of difference between the pre-test mean scores of students in basic electricity in guided discovery and conventional group:

Group	N	Mean	S.D	Df	P	Decision
Guided Discovery	22	2.29	0.49	40	0.88	H₀₁ Accepted
Conventional	20	2.27	0.48			

Table four shows the independent samples test that was conducted to compare the pre-test mean scores of conventional group and guided discovery group in basic electricity. The result from the table shows that there was no significance difference between the mean scores in conventional group (mean= 2.27 and S.D= 0.48) and guided discovery group (mean= 2.29 and S.D= 0.49) and P= 0.88. The P value is greater than the confidence level, that is P>0.05.

The null hypothesis which states that there is no significance difference between the pre-test mean scores of students in basic electricity in guided discovery and conventional group was accepted.

H₀₂: There is no significant difference between the post-test scores of students taught basic electricity using guided discovery method and those thought using conventional method.

Table 5: Test of difference between the post-test mean scores of students taught EWS in conventional and PBL group:

Group	N	Mean	S.D	Df	P	Decision
Conventional	20	3.89	0.72	40	0.00	H₀₃ Rejected
Guided discovery	22	4.69	0.24			

Table five shows the independent samples t-test that was conducted to compare the post-test mean scores of students taught basic electricity using guided discovery method and those taught using conventional method. The result from the table implies that there was a significance difference between the mean scores in conventional group (mean= 3.89 and S.D= 0.72) and guided discovery group (mean= 4.69 and S.D= 0.24). The P value, 0.00 is less than

the confidence level, that is P<0.05. The null hypothesis which states that there is no significance difference between the post-test mean scores of students taught basic electricity using guided discovery method and those taught using conventional method was rejected.

H₀₃: There is no significant difference in the learning gain of students taught basic electricity in guided discovery group.

Table 6: Test of difference between the pre-test and post-test mean scores of students taught Basic Electricity using Guided Discovery Method:

Variables	N	Mean	S.D	Df	P	Decision
Pre-test Scores	22	2.29	0.49	21	0.00	H₀₃ Rejected
Post-test scores	22	4.69	0.24			

Table six shows the paired samples test that was conducted to compare the pre-test and post-test mean scores of students taught basic electricity in guided discovery group. The

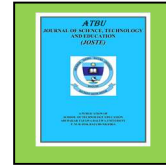
result from the table implies that there was a significance difference between the mean scores of students in the pre-test (mean= 2.29 and S.D= 0.49) and post-test (mean= 4.71 and S.D= 0.25)

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in basic electricity. The P value, 0.00 is less than the confidence level, that is $P < 0.05$. The null hypothesis which states that there is no significance difference in the learning gain of students taught basic electricity using guided discovery was rejected.

FINDINGS OF THE STUDY

Based on the data analyzed and in line with the research questions raised and hypotheses tested, the following findings emerged:

- i. There was no significant difference between the pre-test mean scores of students in basic electricity in guided discovery group and those in conventional group. This implies that both the guided discovery group and conventional group were at the same entry behaviour before the treatment was applied.
- ii. The post-test mean scores of students taught basic electricity using guided discovery method was significantly higher than the pre-test mean scores of students in basic electricity. The difference experienced in the students' performance in the two scores can be attributed to the treatment offered to the guided discovery group.
- iii. Significant difference existed between the post-test mean scores of students taught basic electricity using guided discovery method and those taught using conventional method. This implies that post-test mean score of students taught basic electricity using guided discovery was significantly higher than the mean score of students taught basic electricity using the conventional method of teaching.
- iv. Significant difference existed between the mean gain of students taught basic electricity in the guided discovery group. This indicates that the post-test mean achievement of students in basic electricity was significantly higher than the pre-test mean achievement of

students in basic electricity after the treatment.

CONCLUSION

The findings reveal that the guided discovery method has an effect on the academic achievement of students taught basic electricity. The guided discovery method serves as an alternative to the conventional method of teaching basic electricity. Guided discovery method enables active participation of students in the process of learning and as such gives room to students to apply their ideas in acquiring new skills and developing their existing talents in solving real life problems. Guided discovery method also allows cooperative learning among students, and as such encourages high rate of confidence in the students to learn and apply what they have learnt in their own pace.

RECOMMENDATIONS

The following recommendations were made based on the findings of the study:

- i. The teachers of basic electricity should adopt guided discovery method in teaching technical subjects at secondary school level.
- ii. Necessary tools and equipment that are needed in teaching technical subjects should be made available in order to give room for using guided discovery method.

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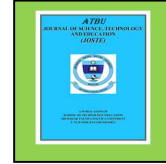
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