# Effects of Glencoe's and Rusbult's Problem-Solving Instructional Strategies on Students' Ability Level and Interest in Electrical Installation and Maintenance Work in North-Central, Nigeria

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## Abstract

*The study determined the Effects of Glencoe's and Rusbult's Problem-Solving Instructional Strategies on Students' Ability Level and Interest in Electrical Installation and Maintenance Work in North-Central, Nigeria. Two research questions were raised. The study adopted a factorial research design. The study was conducted in the North-central geo-political zone of Nigeria. The population for this study comprised of 1013 NTC II students of EIMW in the technical colleges in North-central, Nigeria. A simple random sampling technique and purposive sampling technique was used in the study. Instrument for data collection was design by researcher. The instruments were validated by three experts. The reliability coefficient of: EIWAT was determined as 0.80 and EIWII was determined as 0.70 using Cronbach's Alpha statistical technique. The data collected were analyzed using mean and standard deviation to answer all the research questions. Findings from the study revealed that students taught EIMW using Rusbult's problem-solving strategy have low ability students than using Glencoe's and Rusbult's problem-solving strategies had higher mean skill achievement and interest scores than high and medium ability students. Based on the findings from the study, among others recommendations were made that, Electrical Installation and Maintenance Works teachers should adopt the use of Rusbult's problem-solving strategy to enhance students' ability level and interest. The study further recommend that Science and Technical Schools Board should sensitize and train Electrical Installation and Maintenance Works teachers on the use of Glencoe's and Rusbult's problem-solving strategies in order to enhance students' ability level and skill achievements.*

## INTRODUCTION

Technical Education has been recognized all over the world as a tool for empowering people, especially the youths, for sustainable livelihood and social-economic development (Sanni, 2012). Technical Education have been preparing individuals to wind up skilled workers and professionals since the preparation qualifies them for occupations in both open and private segments of the economy. In view of the above definitions the term technical education in general is a form of training that has to do with the securing of practical skills in a certain profession, art or employment. It also provides individuals or learner with vital training and the proper aptitudes as well as addition specialized information, so that, so that an individual or students will be able to exercise a profession, art or activity, irrespective of their age or their training level. The goals of technical colleges, as stated by Federal Republic of Nigeria (FRN) (2013) are, to provide trained manpower in the applied sciences, technology and business, particularly at craft, advanced craft and technician levels; provide the technical knowledge and vocational skills necessary for agricultural, commercial and economic development; and give training and impart the requisite skills to individuals who shall be self-reliant economically and in tune with latest technology. The courses offered at these technical colleges includes general subjects which are offered by all students they are mathematics, English languages, social studies, civic education, physics, chemistry and religion. While trade areas among others which are optional are Carpentry and Joinery, Motor Vehicle Mechanics (MVM), Blocklaying and Concreting, Computer Craft Studies (CCS) and Electrical Installation and Maintenance Work (EIMW).

EIMW as one of the engineering trades offered in Nigerian Technical colleges, it involves the application of scientific knowledge in the design, selection of materials, construction, operation and maintenance of Electrical equipment. The Federal Republic of Nigeria (FRN,

2013), indicates that the programme for EIMW in Nigeria Technical Colleges was designed to produce competent craftsmen that are expected to test, diagnose, service and completely repair any fault relating to electrical installation main units and systems to the manufacturers' specification as indicated in the Technical College curriculum for EIMW (NBTE, 2010). The curriculum of EIMW is structured in foundation and trade modules which consist of general education such as mathematics, English languages, social studies, civic education, physics, chemistry and religion, theory and related courses, workshop practice, industrial training components and small business management and entrepreneurial training. This curriculum if adequately implemented is expected to produce competent craftsmen in EIMW for industrial and technological development in Nigeria.

Electrical and Electronics industries need the service of craftsmen who can adapt to the changes and challenges in technology in the industries. The need for preparing students for these change and challenges therefore has necessitated a shift from instructional strategies that are based on the behavioural learning theories to those rooted in cognitive psychological learning theories for which Glencoe and Rusbult's problem-solving strategies are one (Teman and Dauda, 2019). Problem-solving plays a very important role in Education, as it is used to train students/learners to apply scientific knowledge and skills learned. Besides, problems are seen as a vehicle for developing student's general problem-solving capacity and for making lessons more pleasant and motivating. Wun and Sharifah, (2016) asserted that problem solving is an important life skill in the 21st century.

With the low performance of EIMW student in this technical colleges, most of these graduates faces several challenges and most people enjoy the stimulating challenge of a good problem and the satisfaction of solving it. You feel this satisfaction more when you master the tools of problem solving (Rusbult, 1989). Rusbult believes that you get "oriented" by

using all available information (words, pictures, and free information) to form a clear, complete mental picture of the problem situation. By reading the problem statement carefully, you get accurate comprehension, the meaning of words and sentence structure in order to gather all the important facts. Most problems are written clearly, so use standard reading techniques to accurately interpret what is written. In Rusbult problem solving, the teacher gives detailed explanation to students at every stage of solving the problem and also provides the procedures for solving the problem where necessary.

Glencoe and McGraw-Hill believes that some students don't spend time identifying the problem, which makes it more challenging for them to create, execute, and analyze the effectiveness of a solution plan. Glencoe therefore proposed four phases of problem solving (Exploration, planning, solving and examination). In exploration stage, students brainstorm and study the problem properly in order to understand it. In planning stage, the students identify the basic facts and materials needed for solving the problem. At this phase too, the students identify the parameters, formula or diagrams that are required for solving the problem. In solving stage, the students carry out the plan prepared and solve the problem identified. The last stage of the problem is examination where the students examine their answers carefully to see if it fits the facts given in the problem or the problem has been adequately solved (Teman & Dauda, 2019). In Glencoe problem solving, the teacher serves as guide or facilitator at every phase of the problem solving.

However, academic performances of students in EIMW is to measure the achievement in both theory and practical. Students' academic achievement is determined by an achievement test which should cover the three domains of learning, namely: cognitive, psychomotor and affective. Student's level of academic achievement is usually influenced by many factors such as students' readiness, personality and ability level. Ability level enables students to understand and transfer understanding from one situation to another. Ability level is the

characteristic mode of functioning that a student exhibits in intellectual activities in a highly consistent and persuasive way (Charles, *et al*, 2017). The students are placed into ability groups based on their academic strengths and weaknesses (Davidson, 2019). Ability grouping, also known as homogeneous grouping, is the educational method of placing students into groups in respect to their academic achievement level. Udofia (2012) observed that students' ability level is a significant factor in their academic achievement with the high-level students benefitting more from particular teaching methods than their low ability counterparts in Electrical/Electronics. This inconsistency on the extent to which students of different academic abilities benefit from particular teaching methods underscores the need for this study to explore the effect of problem-solving strategies on students ability in electrical installation and maintenance work.

In electrical installation and maintenance works, students' assessment is based on both theory and practical abilities, interest and ability level. The teaching strategy employed by the teacher could be a strong determinant of students' level of academic achievement and interest. Therefore, achievement of students in electrical installation and maintenance work could depend on the teaching methodology and motivating factor (either intrinsic or extrinsic), ability and interest. Interest is an important factor in learning. Interest is an important variable in learning because if a student has positive interest towards a particular subject he or she will not only enjoy studying the subject but would also derive satisfaction from the knowledge of the subject. Interest is perceived in relation to internal state of mind or reactions to external environment or predisposition to experience (Abdurahaman *et al.*, 2016). Based on the foregoing, it becomes necessary to investigate the efficiency of problem solving approach on students' achievement and interest in EIMW especially in teaching topics such as battery charging and electric machines. This study will therefore ascertain whether

Glencoe and Rusbult problem solving strategies will be better in enhancing students' ability level and interest in Electrical Installation and Maintenance work trade at Technical Colleges.

**Statement of the Research Problem**

EIMW students upon graduation are expected to possess skills among others in domestic and industrial installation, as well as having the ability to operate, maintain and repair electrical and electronic equipment (Bakare, 2012). It is hoped that these skills will boost their chances at enterprise and self-reliance. The realization of this objective rests hugely on the quality and strategies of instruction they receive from the teacher. EIMW students have been reported to perform poorly in EIMW related courses in their final college examinations for some years now. An analysis of National Business and Technical Examination Board (NABTEB) examinations conducted in May/June for electrical installation and maintenance students in government technical colleges in North-Central Nigeria, from 2011 to 2018 revealed that student perform poorly. Sadly, EIMW graduates are deficient in employability skills, workplace skills and job generation competencies (Abubakar and Danjuma, 2012). This abysmal outing at final and college examinations could be linked to a few factors but most prominently theuse of inappropriate and uninspiring teaching methods by the teachers. Akinsuroju (2012) revealed that most teachers adopt teaching methods that are easy to implement in the classroom, but most of the time inadequate and inappropriate for teaching trades like EIMW because the methods and strategies do not provide a link between the industry and classroom situation.

The problem of poor performance at final and college examinations, as well as the lack of adequate requisite skills for survival in the world of work, is worsened by the fact that the teaching methods adopted by the teachers might mostly be 'talk-and-chalk' based-methods and so are void of student participation in the learning process. This makes it paramount to

seek strategies for teaching EIMW that aims at improving its understanding and performance by students both theoretically and practically. Some of the teaching methods that could prepare EIMW for entry-level jobs, advancement in the workplace and higher-order thinking and problem-solving work skills are; Glencoe's and Rusbult's Problem-Solving Strategies. Studies have shown that Glencoe's and Rusbult's Problem-Solving Strategies are effective in teaching and learning of technical subjects (Nfon, 2013), but, it is not certain if they will produce similar results when used to teaching trades like EIMW. Hence, the problem of this study is to examine the effects of Glencoe's and Rusbult's Problem-Solving Strategies on students' achievement and interest in EIMW in technical colleges.

**Aim and Objectives of the Study**

The aim of this study was to determine the effects of the Glencoe's problem-solving strategies (GPSS) and Rusbult's problem-solving strategies (RPSS) on student ability level and interest in EIMW in Technical Colleges. Specifically, the objectives of the study was to determine the effect of:

1. Glencoe's and Rusbult's problem-solving strategies on students' interest in studying electrical installation and maintenance work (EIMW).
2. Ability level on skills achievement of student taught EIMW with Glencoe's and Rusbult's problem-solving strategies.

**Research Question**

The following research questions were formulated based on the objectives of the research.

1. What is the effects of Glencoe's and Rusbult's problem-solving strategies on students' interest in studying EIMW?.
2. What is the effects of ability level on skills achievement of students' in EIMW when taught using Glencoe's and Rusbult's problem-solving strategies?

**Hypotheses**

$HO_1$: There is no significance difference between students interest mean scores in studying EIMW using Glencoe's and the Rusbult's problem-solving strategies

$HO_2$: There is no significant difference between the mean scores of ability level on skills achievement ofstudents' taught EIMW with Glencoe's and Rusbult's problem-solving strategies zs

## RESEARCH METHODOLOGY

A factorial research design was used in this study. Specifically, the pretest, posttest, non-equivalent control group design was adopted for the study. This study was conducted in the North-central geo-political zone of Nigeria. The population for this study comprised of 1013 NTC II students of EIMW in the 29 accredited technical colleges in North-central geo-political zone of Nigeria. NTC II students was used for the study because of the nature of NBTE curriculum for technical colleges which provides that the topics on battery charging and electrical machines are taught in the second year of EIMW trade. A simple random sampling technique and purposive sampling technique was used in the study. In the first stage, the simple random sampling technique was used to select 12 technical colleges from the list of 29 in the geo-political zone. The sample size for this study was 430 NTC II EIMW students. In the second stage, random sampling technique was used to assign one TC each to the two treatment groups, Glencoe's problem-solving strategy and Rusbult's problem-solving strategy in each state. Six technical colleges were assigned to GPSS while six technical colleges were also assigned to RPSS. Therefore, six intact classes comprising 209 students were assigned to GPSS, while the six intact classes comprising 221 were assigned to RPSS. Furthermore, purposive sampling technique was used to assign 56 students to high ability level, 158 students to ability level and 216 students to low ability level. Two instruments were used for the study. They are: Electrical Installation Work Cognitive Achievement Test (EIWCAT) and Electrical Installation Work Interest Inventory (EIWII). The researcher

prepared two sets of lesson plans that was used for teaching the two experimental groups. 40 question item was administered to NTC III EIMW students of Government Technical College, Malali Kaduna State. After this, the coefficient of internal consistency of EIWCAT was determined and it was found to be 0.80 and the reliability of EIWII was determined as 0.81. The EIMW teachers administered the pretest to the two treatment groups (Glencoe Problem solving strategies group and Rubusult problem solving strategies group) in their respective schools. In the pretest, the EIMW cognitive Achievement Test, EIMW psychomotor Achievement Test and the EIMW interest on both the two experimental groups respectively. The EIMW teachers used the skill achievement test scoring guide to rate the students. The students checked (√) to indicate the degree to which they agreed or disagreed with statement in the EIMW interest inventory. The researcher marked the answer sheets of the EIMWCAT and scoring guide of EIMWPAT to obtain the students' scores on the test before the treatment while the interest inventory was scored by the researcher to determine each of the student's interest before the treatment.

## RESULTS AND DISCUSSION

### Research Question 1

What is the effect of Glencoe's and Rusbult's problem-solving strategies on students' interest in studying EIMW?

The data for answering research question three is contained in Table 4.3.

**Table 1: Mean of Pre-test and Post-test Interest Scores of Students Taught EIMW Using Glencoe's and Rusbult's Problem-Solving Strategies**

| Groups | | Pretest | | Posttest | | |
|---|---|---|---|---|---|---|
| | N | Mean | SD | Mean | SD | Mean Gain |
| **Glencoe's Problem-Solving Strategy** | 221 | 34.42 | 1.67 | 67.39 | 1.12 | 32.97 |
| **Rusbult's Problem-Solving** | 209 | 34.22 | 0.99 | 78.35 | 0.90 | 44.13 |

**Strategy**

Table 1 showed that, students taught EIMW using Glencoe's problem-solving strategy had pre-test mean interest score of 34.42 with standard deviation of 1.67 and post-test score of 67.39 with standard deviation of 1.12. The mean gained between the pre-test and post-test mean interest scores of the students taught EIMW using Glencoe's problem-solving strategy was 32.97. The students taught EIMW using Rusbult's problem-solving strategy had pre-test mean interest score of 34.22 with standard deviation of 0.99 and post-test score of 78.35 with standard deviation of 0.90. The mean gained between the pre-test and post-test mean interest scores of the students taught EIMW using Rusbult's problem-solving strategy was 44.13. This indicated that, students taught EIMW using Rusbult's problem-solving strategy had higher mean interest scores than students taught using Glencoe's problem-solving strategy.

**Research Question 2**

What is the effect ability level on skill achievement of students' in EIMW when taught using Glencoe's and Rusbult's problem-solving strategies?

The data for answering research question four is contained in Table 2.

**Table 2: Mean of Pre-test and Post-test Skill Achievement Scores of High, Medium and Low Ability Students Taught EIMW Using Glencoe's and Rusbult's Problem-Solving Strategies**

| Ability Levels | Glencoe's Problem-Solving Strategy | | | | | | Rusbult's Problem-Solving Strategy | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pretest | | | Posttest | | | Pretest | | | Posttest | | |
| | N | Mean | SD | Mean | SD | Mean Gain | N | Mean | SD | Mean | SD | Mean Gain |
| **High Ability** | 25 | 27.08 | 0.85 | 83.85 | 0.86 | 56.77 | 31 | 26.99 | 0.98 | 82.65 | 0.93 | 55.66 |
| **Medium** | 78 | 23.61 | 2.5 | 79.12 | 1.2 | 55.51 | 80 | 24.07 | 1.7 | 78.66 | 0.9 | 54.59 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ability** | | | 3 | | 8 | | | | 0 | | 6 | |
| **Low Ability** | 10 6 | 19.41 | 1.1 4 | 78.95 | 0.9 4 | 59.54 | 11 0 | 20.44 | 1.0 2 | 77.87 | 0.8 8 | 57.43 |

Table 2 showed that, the high ability students taught EIMW using Glencoe's problem-solving strategies had pre-test mean skill achievement score of 27.08 with standard deviation of 0.85 and post-test score of 83.85 with standard deviation of 0.86. The mean gained between the pre-test and post-test mean skill achievement scores of the high ability students was 56.77. The medium ability students taught EIMW using Glencoe's problem-solving strategies had pre-test mean skill achievement score of 23.61 with standard deviation of 2.53 and post-test score of 79.12 with standard deviation of 1.28. The mean gained between the pre-test and post-test mean skill achievement scores of the medium ability students was 55.51. The low ability students taught EIMW using Glencoe's problem-solving strategies had pre-test mean skill achievement score of 19.41 with standard deviation of 1.14 and post-test score of 78.95 with standard deviation of 0.94. The mean gained between the pre-test and post-test mean skill achievement scores of the low ability students was 59.54.

Furthermore, the high ability students taught EIMW using Rusbult's problem-solving strategies had pre-test mean skill achievement score of 26.99 with standard deviation of 0.98 and post-test score of 82.65 with standard deviation of 0.93. The mean gained between the pre-test and post-test mean skill achievement scores of the high ability students was 55.66. The medium ability students taught EIMW using Rusbult'sproblem-solving strategies had pre-test mean skill achievement score of 24.07 with standard deviation of 1.70 and post-test score of 78.66 with standard deviation of 0.96. The mean gained between the pre-test and post-test mean skill achievement scores of the medium ability students was 54.59. The low ability students taught EIMW using Rusbult's problem-solving strategies had pre-test mean skill achievement score of 20.44 with standard deviation of 1.20 and post-test score of 77.87

with standard deviation of 0.88. The mean gained between the pre-test and post-test mean skill achievement scores of the low ability students was 57.43. This indicated that, the combined low ability students taught EIMW using Glencoe's and Rusbult's problem-solving strategies had higher mean skill achievement score than the high and medium ability students.

**Hypothesis One**

There is no significance difference between students interest mean scores in studying EIMW using Glencoe's and the Rusbult's problem-solving strategies. The data for testing hypothesis three is contained in Table 3.

**Table 3: Analysis of Covariance for the test of Significance Difference Between Students' Interest Mean Scores in EIMW When Taught Using Glencoe's and Rusbult's Problem-Solving Strategies**

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 1290.29[a] | 2 | 6452.64 | 621.50 | .000 |
| Intercept | 3568.82 | 1 | 3568.82 | 343.22 | .000 |
| Pretest | 1.33 | 1 | 1.330 | 1.282 | .258 |
| Group | 1285.42 | 1 | 1285.42 | 123.97 | .000* |
| Error | 443.22 | 427 | 1.038 | | |
| Total | 22873.00 | 430 | | | |
| Corrected Total | 1334.51 | 429 | | | |

a. R Squared = .967 (Adjusted R Squared = .967)

Table 4.8 show the F-calculated value for testing the significance difference between the interest scores of students taught EIMW using Glencoe's and those taught using Rusbult's problem-solving strategies. The F-calculated value of 123.97 was obtained with associated exact Sig. 2 tailed value of 0.00. Since the associated Sig. 2 tailed value of 0.00 is less than 0.05, the null hypothesis which stated that there is no significance difference between students' interest mean scores in EIMW when taught using Glencoe's and those taught using Rusbult's problem-solving strategies is rejected. This implied that, there is significance

difference between students' interest mean scores in EIMW when taught using Glencoe's and those taught using Rusbult's problem-solving strategies.

**Hypothesis Two**

There is no significant difference between the mean scores of high, medium and low ability levels on the skills achievement of students taught EIMW with Glencoe's and Rusbult's problem-solving strategies. The data for testing hypothesis four is contained in Table 4.

**Table 4: Analysis of Covariance for the test of Significance Difference Between the Mean Scores of High, Medium and Low Ability Levels on the Skills Achievement of Students Taught EIMW with Glencoe's and Rusbult's Problem-Solving Strategies**

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 1322.86[a] | 3 | 440.95 | 609.50 | .000 |
| Intercept | 1251.33 | 1 | 1251.33 | 1729.75 | .000 |
| Pretest | 184.00 | 1 | 184.00 | 254.33 | .000 |
| Ability Levels | 506.85 | 2 | 253.42 | 350.29 | .000* |
| Error | 308.19 | 426 | .72 | | |
| Total | 27300.00 | 430 | | | |
| Corrected Total | 1631.06 | 429 | | | |

a. R Squared = .811 (Adjusted R Squared = .810)

Table 4 show the F-calculated value for testing the significance difference between the mean scores of high, medium and low ability levels on the skill achievement of students taught EIMW with Glencoe's and Rusbult's problem-solving strategies. The F-calculated value of 350.29 was obtained with associated exact Sig. 2 tailed value of 0.00. Since the associated Sig. 2 tailed value of 0.00 is less than 0.05, the null hypothesis which stated that there is no significance difference between the mean scores of high, medium and low ability levels on the skill achievement of students taught EIMW with Glencoe's and Rusbult's problem-

solving strategies is rejected. Hence, there is significance difference between the mean scores of high, medium and low ability levels on the skill achievement of students taught EIMW with Glencoe's and Rusbult's problem-solving strategies**.** In order to determine the ability level responsible for the significance difference, post hoc test was carried out as shown in Table 4.

**Findings of the study**

1. Rusbult's and Glencoe's problem-solving strategies are effective in improving students interest in EIMW but Rusbult's problem-solving strategy is more effective in student interest in EIMW than Glencoe's problem-solving strategy.
2. The ability levels are effective in improving students skill achievement but Low ability students taught EIMW using Glencoe's and Rusbult's problem-solving strategies had higher mean skill achievement score than high and medium ability students.
3. There was significant difference between students' interest mean scores in EIMW when taught using Glencoe's and those taught using Rusbult's problem-solving strategies.
4. There was significant difference between the mean scores of high, medium and low ability levels on the skills achievement of students taught EIMW with Glencoe's and Rusbult's problem-solving strategies.

**Discussion of Findings**

Findings on the effects of Glencoe's and Rusbult's problem-solving strategies on students' interest in EIMW revealed that, the students taught EIMW using Rusbult's problem-solving strategy had higher mean interest scores than students taught using Glencoe's problem-solving strategy. The finding provided a clearer understanding that, the interest of students in learning EIMW is stimulated using Rusbult's problem-solving strategy than using Glencoe's problem-solving strategy. The finding is also in-line with the findings of Ogumah *et al.*

(2019) on the **e**ffect of guided inquiry teaching method on students' academic performance and interest in EIMW in technical colleges in Gombe State that revealed guided inquiry significantly impacted the interest of students. However, the characteristics of Rusbult's problem solving strategy that allows the teacher to give detailed explanation and procedures to students at every stage of problem solving where necessary could be the stimulus responsible for arousing the students' interest in EIMW. Shadreck (2018) confirmed that, the distinctive features of Rusbult's problem solving strategy that allows students' engagement and participation in the learning processes is capable of arousing interest. The finding revealed an interesting fact that, interest among students can be stimulated using Rusbult's problem solving strategy. This implied that, stimulating the interest of students in learning EIMW can be achieved using Rusbult's problem solving strategy.

Similarly, finding on the test for significance difference between the students' interest mean scores in EIMW when taught using Glencoe's and those taught using Rusbult's problem-solving strategies revealed statistical significant. The revealed statistical significant difference show the great extent to which Rusbult's problem-solving strategy stimulates students' interest in EIMW especially, when compared with Glencoe's problem-solving strategy. Literarily, the finding is in harmony with the finding of Akinwumi *et al.,* (2018) that revealed statistical significant difference between the interest of students taught Biology using problem–solving teaching strategy and their counterparts taught using the conventional method.

Findings on the effects of ability level on the skills achievement of students' in EIMW when taught using Glencoe's and Rusbult's problem-solving strategies revealed that, the low ability students taught EIMW using Glencoe's and Rusbult's problem-solving strategies had higher mean skill achievement score than the medium ability students. The finding shows

that, Glencoe's and Rusbult's problem-solving strategies are effective in enhancing the skill achievement of low ability students in EIMW. The finding is in concordance with the finding of Olaniyan and Mosewo (2015) that revealed enhanced academic performance of low scoring level male students on the effects of a target-task problem-solving model on senior secondary school students' performance in Physics. In other words, the finding also revealed that, Glencoe's and Rusbult's problem-solving strategies have taken care of the difference that existed between the low and high ability students taught EIMW in the skill achievement test.

Finding on the test for significant difference between the mean scores of high, medium and low ability levels on the skills achievement of students taught EIMW with Glencoe's and Rusbult's problem-solving strategies revealed statistical significant. The statistical significant difference was traced to the scores of high ability level students taught EIMW using Glencoe's and Rusbult's problem-solving strategies. The finding entailed that, there was no significance difference between the skill achievement scores of low and medium ability level students taught EIMW using Glencoe's and Rusbult's problem-solving strategies. The finding is similar to the finding of Shadreck (2018) that revealed that, low ability students taught Chemistry in Zimbabwe using problem-solving instructional strategy performed significantly better than their high and medium ability counterparts.

## CONCLUSION

Based on the findings of the study, insights on the effects of Glencoe's and Rusbult's Problem-Solving Strategies on students' ability level and interest in Electrical Installation and Maintenance Works (EIMW) in technical colleges was provided. The study found out that: students taught EIMW using Rusbult's problem-solving strategy had higher mean skill achievement and interest scores and students taught EIMW using Glencoe's problem-solving

strategy had higher mean cognitive achievement scores. Therefore, it is concluded that, Glencoe's and Rusbult's problem-solving strategies had positive effects on students' cognitive and skill achievement as well as interest in EIMW.

**Recommendations**

Based on the findings from the study, the following recommendations were made:

1. Electrical Installation and Maintenance Works teachers should adopt the use of: Rusbult's problem-solving strategy to enhance students' skill achievement and interest; and Glencoe's problem-solving strategy to enhance students' cognitive achievement.
2. Science and Technical Schools Board should sensitize and train Electrical Installation and Maintenance Works teachers on the use of Glencoe's and Rusbult's problem-solving strategies in order to enhance students' cognitive and skill achievements as well as stimulate their interest.
3. Administrators of technical colleges should encourage the teaching of Electrical Installation and Maintenance Works using Glencoe's and Rusbult's problem-solving strategies in order to enhance students' cognitive and skill achievements as well as stimulate their interest.

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