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# Impact of an Improvised AC Generator System on Students' Performance in Basic Science and Technology in Lagos State Schools

**[1]Isiaka A. Raheem, [2]Ganiyat P. Raheem-Folayinka, [3]Abdulsalam Abdukarim, [4]Afolabi Adedayo & [5]Ufomanefe Kayode**
*[1]Department of Physics, Faculty of Science, University of Lagos.*
*[2&2]Department of Science Education, Faculty of Education, University of Lagos.*
*[4&5]Department of Curriculum and Instruction, College of Education, Texas Tech University*

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## Abstract

This study investigates the impact of an Improvised Alternating Current Generator (IACG) on students' academic performance in Basic Science and Technology in Lagos State Upper Basic Schools. Employing a quasi-experimental design, the research sampled 360 students from six local educational districts, using IACG, lesson plans, and performance tests as research instruments to gather data. The findings revealed a significant difference in academic performance between IACG-taught students and those not taught with IACG, while no significant gender difference was observed among IACG-taught students. The study concludes by recommending that school authorities promote and empower regular improvisation of instructional materials to enhance students' academic performance in science and technology-related subjects across Lagos state and Nigeria.

**Keywords:** *Improvisation, AC Generator, Students' Performance, Basic Science and Technology, Basic 9 Students*

***Corresponding Author:*** Isiaka A. Raheem - ORCID: https://orcid.org/0000-0002-0092-2596

Ganiyat P. Raheem-Folayinka - ORCID: https://orcid.org/0009-0002-1757-2016
Abdulsalam Abdukarim - ORCID: https://orcid.org/0009-0005-9114-2147
Afolabi Adedayo - ORCID: https://orcid.org/0000-0003-1148-6635
Ufomanefe Kayode - ORCID: https://orcid.org/0009-0005-6950-4498

**Background to the Study**

Basic technology represents a core technology subject stipulated in both the Federal Republic of Nigeria National Policy on Education (2013) and the Universal Basic Education (UBE) Act of 2004 to prepare, familiarize, and inculcate the foundations of technological knowledge and aptitude in learners and also prepare them for the more rigorous advanced technological courses in the senior secondary and tertiary education levels. Basic Technology was designed in the curriculum to be delivered for the three years of junior secondary education in Nigeria, during which learners are expected to be exposed to the basics of key technological concepts such as technical drawing, auto mechanics, applied electricity, metalwork, woodwork, plastics, ceramics, and other technological concepts (Adeoye & Olabiyi, 2011).

The Nigerian Educational Research and Development Council (NERDC) (2008) and the Federal Ministry of Education (2007) stated that Nigerian schools' curriculums were periodically revised across all education levels to prepare younger generations for the nation's technological literacy, productivity, and advancement. To this end, Oyelade and Abolade (2017) and the Federal Ministry of Education (2013) noted that Basic Technology was later integrated with Basic Science, Physical and Health Education, and Information Technology to form Basic Science Technology. The new transformation makes Basic Science and Technology a composite subject at the Upper Basic Educational level. However, Green (2023) identified that the lack of improvised or quality instructional materials in teaching negatively impacts teachers' ability to teach effectively, especially at the junior secondary school level, and leads to difficulties in student learning and variations in learning speed. This leaves teachers with the fundamental responsibility of providing appropriate instructional materials for effective teaching, especially in public schools. Lawal, Shuaibu, and Sodangi (2023) suggested that teachers should design and build these improvised instructional materials with the assistance of the learners as this enhances their interest in basic technology. Existing scholarship has identified the importance of improvised instructional materials in teaching basic technology and science. However, this study aims to understand the impact of these improvised instructional materials on learning outcomes by exemplifying the improvised AC generator system

**Literature Review**

Complete implementation of educational subjects' curriculums and excellent performance of students according to UNESCO (2014) and Odili, Ebisine, and Ajuar (2011) depends largely on the availability of professional and competent teachers; age and readiness of students; availability of instructional materials (ready-made or improvised types); and appropriate utilization of the available instructional materials for teaching and learning of the subjects' matter. Ogunleye and Raheem (2013) defined improvisation as replacing, substituting, or supplementing standard instructional materials with locally available materials or resources.

Ogbe and Omenka (2017) stated that ready-made and improvised instructional materials are classifications of instructional materials. Ready-made types are industrially and commercially produced by experts for instructional purposes; while improvised types are made by educationists, technologists, and students with locally sourced materials whenever a ready-made type is not available. The main objective of improvisation in the school system is to solve immediate students' and teachers' instructional activities difficulties, challenge teachers' level of competency and boost students' creativities, among others (Bawa & Ibrahim, 2019; Ogunleye & Raheem, 2013).

Byrnes and Miller (2007) posited that students' academic performance is a basic indicator to be considered in defining and planning educational intervention. Albeit, it has been emphasized that academic performance is a complex and multidimensional issue with many factors simultaneously influencing predictors for its' explanation most researchers tend to analyze each variable separately, preventing them from getting a full picture of the situation. Students' excellent academic performance in any science and technology-based subject is not gender specific, but rather on the exposure of the learners to real-time practical activities during their learning (De Silva et al., 2018; Okolie et al., 2014; Mushtaq & Khan, 2012). Conversely, Adigun, et al. (2015) in their study revealed that female students perform better in practical related subjects than their male counterparts. The British Broadcasting Corporation (BBC) (2024) and WatElectrical (2019) described an alternating current generator as a device that transforms mechanical energy into electrical energy to generate alternating current. Alternating Current travels in two directions and the current emanates from the movement of a loop of a coil in magnetic fields (electromagnetic induction). Bicycle Dynamos, Electric Generator (Diesel & Petrol types) and Hydro-Electric Power Plant are examples of appliances operated based on the conversion of mechanical energy to electrical energy. and beyond.

**Theoretical Framework**

This study is grounded in a multi-theoretical framework combining Constructivist Learning Theory, Cognitive Load Theory, Resource-Based Learning Theory, and Experiential Learning Theory to comprehensively analyze how the Improvised Alternating Current Generator (IACG) impacts student learning and academic performance. These theories collectively provide insight into the mechanisms through which hands-on, resource-oriented instructional materials enhance the learning experience, particularly in a Nigerian educational context. This is because these theories encompass the need for active, experiential learning even though there is a limitation in access to resources.

Constructivist Learning Theory (Piaget, 1976; Vygotsky, 1978) asserts that all learners enthusiastically create knowledge through direct interaction with their immediate environment. This theory highlights the importance of hands-on experiences and tangible instructional materials in fostering deeper understanding and critical thinking. The IACG supports constructivist principles by enabling students to directly observe and manipulate the principles of energy conversion. It aligns with Bawa and Ibrahim's (2019) findings that improvised instructional materials foster creativity and scientific skills. Through active engagement with the IACG, students construct knowledge based on experimentation, observation, and reflection, promoting deeper learning of abstract scientific concepts.

Cognitive Load Theory (Sweller, 1988) emphasizes the role of instructional materials in reducing extraneous cognitive load, thereby optimizing learning processes. This theory underlines the importance of designing materials that facilitate comprehension and reduce the mental effort required to process complex information. The IACG simplifies the understanding of energy conversion by providing a visual and interactive representation of mechanical-to-electrical energy transformation. This supports UNESCO's (2014) assertion that adequate instructional resources are critical for effective learning and aligns with Odili et al. (2011), who emphasized the importance of resource availability for successful curriculum implementation.

Resource-Based Learning Theory (Butler, 2012) posits that student learning is maximized when educational resources are relevant, accessible, and practical. The improvisation of instructional materials, such as the IACG, exemplifies this theory by addressing resource scarcity with locally available materials. Ogunleye and Raheem (2013) demonstrated that low-cost improvised materials enhance accessibility and promote creativity in both teaching and learning. Ogbe and Omenka (2017) further classified instructional materials into ready-made and improvised categories, emphasizing their critical role in addressing educational challenges. The IACG's design ensures that students can interact with relevant, cost-effective resources tailored to their educational needs.

Kolb's Experiential Learning Theory (Kolb et al., 2001) provides a complementary perspective by focusing on the importance of learning through experience. This model outlines four interconnected stages of learning: concrete experience, reflective observation, abstract conceptualization, and active experimentation.

The IACG enables students to engage with all four stages:

1. **Concrete Experience**: Students physically interact with the IACG to observe energy conversion.
2. **Reflective Observation**: Learners analyze the outcomes of their hands-on activities.
3. **Abstract Conceptualization**: Students conceptualize the scientific principles behind their observations.
4. **Active Experimentation**: Learners apply these principles in practical contexts, reinforcing their understanding.

This experiential approach aligns with the study's quantitative methodology and guided the development of the research questions and discussion of findings. The inclusion of experiential learning not only reinforces theoretical understanding but also bridges the gap between theoretical knowledge and practical application.

**Synthesis of Theories**

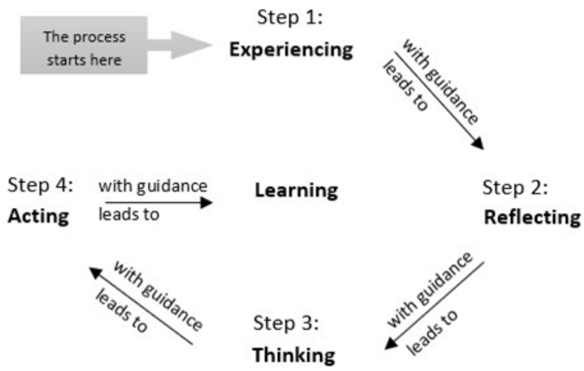
Together, these theoretical perspectives explain how the IACG enhances learning by:

i. Facilitating active knowledge construction through hands-on experimentation (Constructivist Theory).
ii. Reducing cognitive barriers with concrete demonstrations of abstract concepts (Cognitive Load Theory).
iii. Providing accessible, relevant resources that address material scarcity (Resource-

Based Learning Theory).

iv. Promoting experiential learning through interactive engagement with the material (Experiential Learning Theory).

**Figure 1:** Model of Experiential Learning Theory




**Relevance to the Study**

This theoretical framework underpins the study's quasi-experimental design, offering a robust lens to analyze the impact of the IACG on students' academic performance. It explains the observed improvements in learning outcomes and the non-significant gender differences, as both male and female students benefit equally from the interactive, experiential nature of the IACG. By integrating these complementary theories, the framework not only validates the study's findings but also highlights the dynamic potential of resourceful, experiential teaching methods in enhancing science education in resource-limited settings. It underscores the importance of innovative instructional materials in bridging theoretical knowledge and practical application for meaningful learning experiences.

**Statement of the Problem**

Improvisations of instructional materials in the school system by teachers bring teachers' and students' awareness into the moment and turn on their creativity. Presently in most of the secondary schools in Lagos state, there are inadequate teaching resources. Instructional materials for the instructional deliveries of Basic Science and Technology are in few numbers compared to the number of students, there are a lot of broken-down and outdated tools and equipment. Many students at Upper Basic Education level possess little or no interest in enrolling for science and technology courses at tertiary institutions because they were not exposed to real practical activities which require the usage of Instructional materials.

This study, therefore, examined the impact of an Improvised Alternating Current Generator (IACG) on students' academic performance in Basic Science and Technology in some Lagos State Upper Basic Schools.

**Purpose of the Study**

This study examined the:

(a) Impact of an Improvised Alternating Current Generator on students' academic performance in Basic Science and Technology; and

(b) Impact of an Improvised Alternating Current Generator on students' academic performance in Basic Science and Technology concerning gender.

**Research Hypothesis**

The following null hypotheses were tested:

**Ho 1:** There is no significant difference in students' academic performance between students taught with an Improvised Alternating Current Generator and those not taught with an Improvised Alternating Current Generator.

**Ho 2:** There is no significant difference in students' academic performance between male and female students taught with an Improvised Alternating Current Generator.

**Method**

**Research Design**

This study utilized quasi-experimental research design to test the cause-and-effect relationship of Improvised Alternating Current Generator (IACG) between experimental group and control group within the population area of the study. The experimental group was exposed to the IACG during classroom instructional activities that lesson contents' of (i) principles of appliances which convert mechanical energy to electrical energy; (ii) identification of appliances operated based on conversion of mechanical energy to electrical energy; (iii) identification of simple alternating current generator parts; and (iv) demonstration of working principle of simple alternating current generator as one of the appliances operated based on conversion of mechanical energy to electrical energy. The instructional activities lasted for two periods (80 minutes) and were strictly carried out by the Basic Science and Technology teachers within the lesson periods at each school selected for this study.

**Study Area**

This study was carried out in all six educational districts in Lagos State. One school was selected from each educational district. The schools used for the study involved International Secondary School (ISL), University of Lagos from Mainland Local Government; Imoye Junior High School (IJHS), Mile 2 from Amuwo-Odofin Local Government; Ransome-Kuti Memorial Junior Grammar School (RMJGS) from Mushin in Mushin Local Government; State Junior High School (SJHS), Abesan Estate from Alimosho Local Government; Gbagada Comprehensive Junior Secondary School (GCJSS), Gbagada from Shomolu Local Government; and King Ado Junior Secondary School (KAJSS), Ojo-Giwa from Lagos Island Local Government.

**Population, Sample, and Sampling Technique**

The study's population comprised all Basic 9 Students in all Government Upper Basic Education Schools in the six local educational districts of Lagos State. The sample used for this study comprised of three hundred and sixty students. The sample for the experimental group involved one hundred and eighty students from ISL, IJHS, and RMJGS; while the sample for the control group involved one hundred and eighty students from SJHS, GCJSS, and KAJSS. Sixty students from the terminal class of each school were randomly selected. The findings discovered by all respondents are generalized to all populations for the study.

**Research Instrument**

The research instruments for this study comprised an Improvised Alternating Current Generator (IACG), a Basic Science and Technology Lesson Plan (BSTLP), and a Basic Science and Technology Written Performance Test (BSTWPT). The BSTLP and BSTWPT were developed based on the (i) principles of appliances that convert mechanical energy to electrical energy; (ii) identification of appliances operated based on conversion of mechanical energy to electrical energy; (iii) identification of simple alternating current generator parts; and (iv) demonstration of working principle of simple alternating current generator as one of the appliances operated based on conversion of mechanical energy to electrical energy as the Basic Science and Technology subject' contents topics for the respondents class level used for this study. The research instruments were validated by experts accordingly. The BSTWPT was made up of fifteen objective questions with answer/distractor options A – D, and five short-answer questions that related to the diagram representation of the AC generator (figure 2). The IACG was the construction-type of improvisation (Figures 1 & 2) and fabricated at the Physics Workshop, Department of Physics, Faculty of Science, University of Lagos with hand and machine tools and equipment from locally sourced materials within a month by the AC generator diagram shown in Hyperphysics (2011) website (Figure 3).

The locally sourced materials involved engineering materials, machine parts, and fasteners such as metals, wood, bar magnets, slip rings, bolts, nuts, sellotape, and lead (Table 1, appendix 1). The IACG was improvised as a treatment instrument for the teaching and demonstration of practical lesson contents written in BSTLP comprehensively for this study.

**Figure 2:** Picture of the Improvised Alternating Current Generator (IACG)

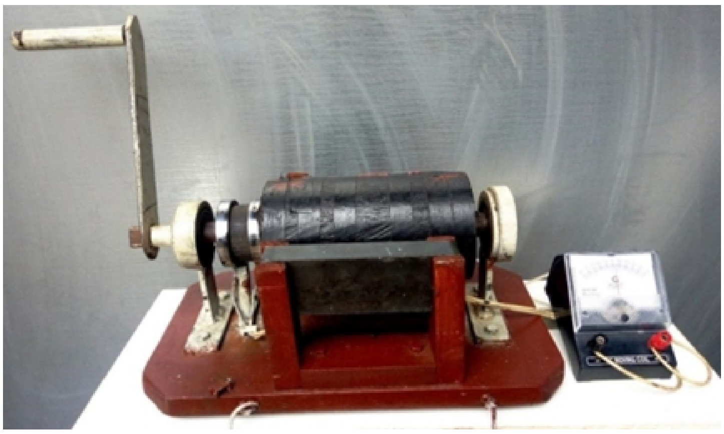


**Figure 3:** Schematic Diagram of the Improvised Alternating Current Generator (IACG)

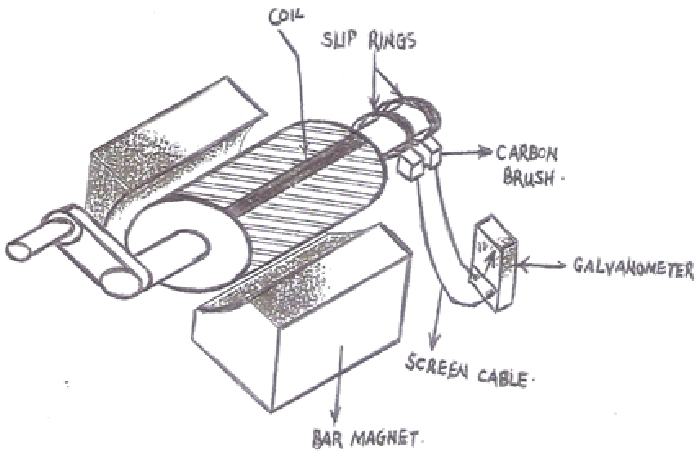
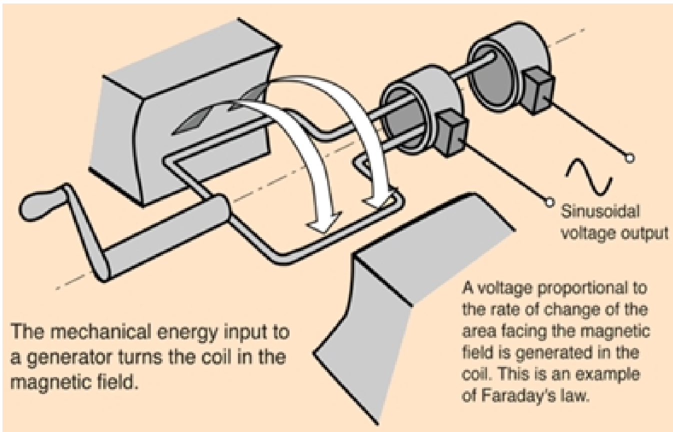



**Figure 4:** Alternating Current Generator Diagram based on Fleming's Right-Hand Rule.




## Data Analysis

In testing hypothesis 1 and 2, T-test was employed to find out if there will be significant differences in students' academic performance between students taught with an IACG and those not taught with an IACG; and if there will be no significant differences in students' academic performance between male and female in the experimental group.

## Analysis of Research Hypothesis

**Hypothesis 1:** There is no significant difference in students' academic performance between students taught with an Improvised Alternating Current Generator and those not taught with an Improvised Alternating Current Generator.

**Table 1**: T-test analysis between the academic achievement of students taught with an improvised Alternating Current Generator (Experimental Group) and students not taught with an improvised Alternating Current Generator (Control Group).

| | Mean | Standard Deviation | Number | Degree of Freedom | Standard Error Mean | T- Test | Significant Level |
|---|---|---|---|---|---|---|---|
| **Experimental Group** | 16.08 | 1.95 | 180 | 179 | 0.19 | 5.74 | 0.05 |
| **Control Group** | 4.65 | 1.72 | 180 | | | | |

Table 1 reveals the T-test between the academic achievements of students taught with an improvised Alternating Current Generator (Experimental Group) and students not taught with an improvised Alternating Current Generator (Control Group) with a calculated t-value of 5.74, while the critical t-value is 1.96 at 0.05 level of significant. Since the calculated t-value is more than the critical t-value, the null hypothesis is rejected. Therefore, there is a significant difference between the performance of the students in both groups, favoring the experimental group.

**Hypothesis 2:** There is no significant difference in academic achievement between male and female students taught with an improvised Alternating Current Generator.

**Table 2:** T-test analysis between the academic performance of male and female students taught with an improvised Alternating Current Generator (Experimental Group).

| | Mean | Standard Deviation | Number | Degree of Freedom | Standard Error Mean | T- Test | Significant Level |
|---|---|---|---|---|---|---|---|
| **Male** | 15.96 | 1.94 | 88 | 87 | 0.28 | -0.92 | 0.46 |
| **Female** | 16.23 | 1.97 | 92 | | | | |

As seen in Table 2, the mean performance of the male student is 15.96 while that of the female student is 16.23 which is slightly higher than their male counterparts. However, the table further revealed the T-test between the academic performance of male and female students taught with an improvised Alternating Current Generator (Experimental Group) with a calculated t-value of -0.92, while the critical t-value is 1.98 at a 0.05 level of significance. Since the calculated t-value is less than the critical t-value, the null hypothesis is accepted. Therefore, there was no significant difference in the academic performance of the students in the experimental group based on gender.

**Discussion of Findings**

The study underscores the critical role of improvised instructional materials (IIMs), the Improvised Alternating Current Generator (IACG), in enhancing students' academic performance and engagement in Basic Science and Technology. The findings are supported by a robust multi-theoretical framework that synthesizes Constructivist Learning Theory (CLT), Cognitive Load Theory (CLT), and Resource-Based Learning Theory (RBLT). These theories collectively explain how IIMs facilitate learning through active engagement, reduce cognitive barriers, and enhance accessibility to relevant educational resources.

As articulated by Piaget (1976) and Vygotsky (1978), Constructivist Learning Theory opined that learners dynamically create knowledge through interaction with their immediate environment. This theoretical foundation highlights the significance of hands-on engagement and experimentation in fostering meaningful learning experiences. The IACG enables students to interact directly with the principles of energy conversion, providing opportunities for experimentation, hypothesis testing, and reflection. This aligns with Daramola et al. (2023) findings that improvisation in instructional materials fosters the development of scientific skills and attitudes. By providing a tangible model, the IACG facilitates the internalization of abstract scientific concepts, reinforcing students' understanding through experiential learning.

Further supporting this claim, Kolb's Experiential Learning Theory (ELT) emphasizes the recurrent nature of active learning through concrete experiences, reflective observation, abstract conceptualization, and functioning experimentation (Kolb et al., 2001). The IACG operationalizes these stages by allowing students to engage with real-world energy conversion processes. Cakir (2008) similarly concluded that hands-on, constructivist learning experiences significantly improve comprehension and application, demonstrating effectiveness across diverse student groups.

Cognitive Load Theory (Sweller, 1988) offers a complementary perspective by focusing on the optimization of cognitive resources during learning. Effective instructional materials, such as the IACG, minimize extraneous cognitive load and allow students to focus on core learning tasks. The IACG serves as a visual and manipulative resource that bridges the gap between abstract theoretical content and practical understanding, reducing cognitive strain associated with traditional text-based or purely theoretical instruction. This aligns with UNESCO's (2014) recognition of the importance of appropriate instructional resources in fostering effective learning. Moreover, Odili et al. (2011) emphasized that curriculum implementation relies heavily on the accessibility and proper utilization of instructional materials. The visual and interactive features of the IACG address these pedagogical requirements, facilitating students' comprehension of complex concepts, such as the conversion of mechanical energy to electrical energy.

Resource-Based Learning Theory (Butler, 2012) underscores the role of relevant instructional resources in effective teaching and learning. This theory advocates for the use of locally improvised materials to address shortages in educational resources, particularly in contexts with limited funding. The IACG exemplifies this principle by utilizing accessible materials to create a cost-effective yet impactful teaching tool. Ogunleye and Raheem (2013) demonstrated that low-cost, improvised instructional materials significantly enhance students' creativity, adaptability, and engagement, a finding echoed in the present study. Additionally, Ogbe and Omenka (2017) highlighted the distinction between ready-made and improvised resources, emphasizing the potential of the latter to address unique educational challenges. The IACG not only enhances accessibility but also encourages educators to creatively adapt to resource constraints, fostering an environment of innovation and resilience.

The theoretical perspectives illustrate how the IACG achieves its pedagogical objectives by:

1. **Facilitating Active Knowledge Construction**: Constructivist principles emphasize the importance of direct engagement, experimentation, and reflection, all of which are supported by the IACG (Kolb et al., 2001; Daramola et al., 2023).
2. **Reducing Cognitive Barriers**: By providing visual and manipulative resources, the IACG aligns with Cognitive Load Theory, enabling students to overcome the challenges of abstract scientific content (Sweller, 1988; UNESCO, 2014).
3. **Enhancing Resource Accessibility**: Resource-Based Learning Theory highlights the role of locally relevant and cost-effective materials, as demonstrated by the IACG's contribution to contextualized and meaningful learning (Ogunleye & Raheem, 2013; Ogbe & Omenka, 2017).

## Conclusion

Regular improvisation of Instructional materials by Teachers in the school system is a key factor in boosting the academic performance of students. Improvised Instructional Materials supplement, reinforce, clarify, and vitalize instruction. Also, Improvised Instructional Materials boost the development of students' creativity, scientific attitudes, and skills. The effectiveness of students' learning of energy-based technological appliances and conversion of Mechanical Energy to Electrical Energy which represents the working principle of alternating current generators strongly depends on the availability of instructional materials, teachers' usage skill of instructional materials, maintenance of existing instructional materials and improvisation of needed instructional materials. A school can be well equipped with assorted instructional materials today and a shortage of Instructional Materials tomorrow if improvisation is neglected.

## Implications of the Study

The study reaffirms the necessity of regular improvisation of instructional materials as a sustainable approach to addressing resource shortages in schools. Schools equipped with an assortment of instructional materials today may face shortages tomorrow without a focus on continuous innovation and improvisation. The findings are consistent with prior research, such as Cakir (2008) and Ogunleye and Raheem (2013), which emphasize the enduring benefits of hands-on, constructivist learning experiences. Future research should explore the long-term impacts of improvised instructional materials on students' academic trajectories and their adaptability in resource-constrained settings. Additionally, comparative studies between improvised and commercially produced instructional materials could provide deeper insights into cost-effectiveness and pedagogical efficacy.

**Recommendations**

Hopefully, the following recommendations if put into action will go a long way in assisting to boost the rate of improvisation of Instructional materials by Basic Science and Technology teachers and all teachers in general at all Upper Basic schools in Lagos state and other parts of Nigeria. The recommendations are as follows:

1. All Basic Science and Technology teachers in Lagos state and other Nigeria States should be trained and retrained periodically on improvisation of Instructional materials.
2. Modern tools and equipment for the production and improvisation of Instructional materials should be provided to all Upper Basic Education level schools in Lagos State and other Nigerian states.
3. Students should be encouraged to imbibe the habit of utilizing materials at their disposal for learning through improvisation principles.
4. Intra-and Inter-schools' competitions should be organized by School administrators and Governments on Improvisation of Instructional materials to promote and assess the level of improvisation among teachers and students.
5. Society must be educated and involved in encouraging the Improvisation to use available materials in our environment.

**Suggestions for Further Studies**

The solution to a problem is the beginning of another problem(s). This study looked at the impact of an IACG on students' academic performance in Basic Science and Technology in some Lagos State Secondary Schools.

Therefore, for further research, the following suggestions are hereby suggested:

1. Studies on the similar or same topic should be conducted in Vocational and Technical Colleges in all Nigeria States to enhance getting a further reliable result and provide a basis for a wider generation.
2. An oral interview should also be used together with a written test in future studies for those students who have hand impairment or difficulty in writing to contribute their responses on the impact of an IACG on their academic performance in Basic Science and Technology.
3. Research should also extend to the assessment of Teachers' improvisation of Instructional materials in Lagos state Secondary schools.

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**Appendix 1**

**Table 1:** Descriptions of components parts of an Improvised Alternating Current (AC) Generator

| S/N | Name of Components | Nature of Materials | Number of Parts | Dimensions | Functions |
|---|---|---|---|---|---|
| 1 | Rotor | Wood (Processed) | 1 | Ø 101 X 178 | It is an armature of the generator. |
| 2 | Drive Shaft | Mild steel (Machined) | 1 | Ø 23 X 330 | It transmits the power from spinner to the armature. |
| 3 | Bar Magnet | Ferromagnetic (Scrap) | 2 | 145.5 X 50 X 25.5 | It generates the magnetic fields between poles. |
| 4 | Bar magnet Holder | Wood (Scrap) | 2 | 2 | It keeps the magnet in a steady state. |
| 5 | Base | Wood (Scrap) | 1 | 347 X 208 X 22 | It supports all parts. |
| 6 | Boss | Metal (Machined) | 2 | Ø 56.4 X 25 | It housed the shaft's bearings. |
| 7 | Slip Ring | Metal (Machined) | 2 | Ø 62 X 11 | It delivers current to the Brush. |
| 8 | Slip Rings Divider | Wood (Scrap) | 1 | Ø 53.2 X 37.5 | It partitions the Slip Rings. |
| 9 | Spring | Metal (Scrap) | 2 | Ø 7 X 11 | It compresses the Brush against Slip Ring. |
| 10 | Spinner | Metal (Machined) | 1 | - | It used to spin the Drive shaft. |
| 11 | Bolt and Nut | Metal (New) | 10 | M 6 X 35 | It fastened all the parts together. |
| 12 | Washer | Metal (New) | 10 | Ø 15 X 1 | It keeps the Bolt and Nut secured. |
| 13 | Brush | Lead (Machined) | 2 | 14 X 11 X 8 | It conducts current between moving parts and wires. |
| 14 | Brush Stand | Metal (Machined) | 2 | - | It supports the Brush. |
| 15 | Coil | Copper (New) | 1 Loop | 30 Turns | It functions as current inductor. |
| 16 | Bearing | Metal (Scrap) | 2 | Ø 46.4 X 20 | It supports a rotating Drive Shaft. |
| 17 | Sellotape | Rubber (New) | 1 Reel | Ø 40 X 20 | It adheres Coil to the Rotor. |
| 18 | Base Stand | Rubber (Scrap) | 4 | Ø 21 X 10 | It carries all parts weight. |
| 19 | Flexible Wire | Metal (New) | 1 | 1 Yard | It transmits the current from the Brush to the Meter. |