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IMPROVISATION OF INSTRUCTIONAL MATERIALS AND JUNIOR SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN BASIC SCIENCE IN RIVERS STATE, NIGERIA

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Abstract
The objective of this research was to investigate the impact of improvised teaching materials on the academic performance of junior secondary school students studying basic science in Rivers State, Nigeria. The study comprised eight research aspects, including four research questions, aims, and hypotheses. Using a quasi-experimental approach, 233 JSS II students enrolled in basic science for the study. The experimental group (71 males, 46 females) and control group (46 males, 70 females) underwent testing with the Improvised Basic Science Performance Test (IBSPET), comprising thirty objective test items. Descriptive and inferential statistics, including the independent and paired sample t-test, were employed. The results, at a 0.05 significance level, indicated a significantly positive difference in the performance of students taught basic science with improvised materials. Moreover, a notable gender difference was observed in the performance of male and female students using these materials. In conclusion, the study underscores the importance of instructor training in improvisational techniques, emphasizing the need for educators to engage in ongoing professional development opportunities like workshops and seminars to enhance their skills in developing and effectively utilizing instructional materials.

Keywords: Roles, Improvisation, Instructional Material, Academic Achievement

Introduction

One significant aspect of teacher education that is receiving considerable attention pertains to the utilization of instructional materials by teachers to enhance their teaching. These materials encompass visual and audio-visual aids and may take the form of both concrete and non-concrete resources. When used by teachers, these instructional tools serve to enliven the learning process by stimulating the involvement of students and contributing to a greater grasp of new concepts. It is essential to keep in mind, however, that these materials are not an end in and of themselves; rather, they are a means to a goal (Kadzera, 2006). Even while they cannot take the position of the instructor, they can serve as helpful tools for instructors to accomplish their learning and teaching goals to facilitate efficient teaching and learning at private secondary schools, a wide variety of instructional resources, including chalkboards, models, graphs, charts, maps, images, diagrams, cartoons, slides, filmstrips, and radio, are required. According to Lockheed (1991) the use of instructional resources is an essential part of the educational process, and the execution of the curriculum would be difficult in the absence of these materials.

The improvisation of instructional materials plays a pivotal role in facilitating communication between teachers and students during instruction. Additionally, these improvised materials can serve as motivators in the teaching-learning process, capturing students' attention and eliminating boredom. Particularly for inexperienced teachers, instructional materials are essential in all aspects of teaching, providing background information on subjects, aiding in lesson planning, and assisting in assessing students' knowledge through assignments, tests, projects, and exams. Balogun (2015) highlights the indispensable role of instructional materials in science education, emphasizing that effective teaching in this field necessitates the existence of experiments for teaching. Instructional materials, encompassing both print and non-print items such as kits, textbooks, newspapers, pictures, recordings, slides, transparencies, videos, workbooks, charts, and electronic media, are crucial for conveying information to students in the educational process.

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In the context of junior secondary school, the improvisation of instructional materials holds a crucial role in the teaching and learning process, enhancing students' memory retention. Given the expansive nature of education today, reliance solely on oral teaching is insufficient for successful pedagogy. Therefore, the use of engaging instructional materials becomes essential to elevate learning achievement. The situation in many developing countries, including Nigeria, is not as favourable as it is in more developed nations such as the United States, which makes active use of instructional materials in the teaching and learning process. The distribution of instructional resources to schools of poor quality and insufficient numbers, inadequate training for secondary teachers in the utilisation of these materials, and a lack of enthusiasm among teachers in incorporating instructional materials into their teaching processes are all challenges.

Visual materials, audio-visual materials, and items that convey information and may be seen through the sense of sight are the three categories that can be used to classify instructional materials. These can be more tangible items like models or prints, or they can be visual aids like pictures, periodicals, or journals. Both types of materials can be used. According to an old Chinese proverb, "What I hear I forget, what I see I remember, and what I do, I understand". this categorization highlights the fascinating quality of visual and audio-visual content.

Statement of the Problem

The field of education in Nigeria faces several obstacles, one of the most significant of which is the insufficient availability and utilisation of instructional resources at the junior secondary school level to meet the obstacles presented by current technology. The generally poor quality of education that can be found in many developing nations. The insufficient availability of resources, qualified instructors, proper facilities, materials, and techniques, all of which contribute to the problems that are the focus of this research, makes it impossible to improve the quality of education. According to Hamza (2010), the current Nigerian educational system has a significant challenge in the form of a lack of trained instructors across a wide range of educational levels. This shortage has a negative influence on instructors' capacity to improvise instructional materials for teaching at all levels, which in turn hurts the quality of educational institutions, as well as the development of educational materials and the training of teachers. Junior secondary schools have difficulty when it comes to student learning as a result of a lack of instructional materials, which can lead to variances in the learning speed.

According to UNESCO (2014), one of the challenges that educators confront in the classroom is a lack of sufficient instructional resources or materials of low quality. This contributes to the difficulty of the teaching process. According to Jibri (2006) students are unable to make the needed behavioural changes in the context of the teaching and learning process because ineffective teaching techniques, along with a lack of instructional resources, contribute to this incapacity. In today's educational institutions, it's possible that teachers lack the abilities necessary to make successful use of instructional resources, or that the materials themselves aren't widely available. When this occurs, it becomes necessary to look for different techniques to meet the extra issues that exist inside schools. As a consequence of this, the purpose of this study is to evaluate the influence that improvising instructional materials has on the academic accomplishment of junior secondary students in Rivers State who are majoring in fundamental science.

Aim and Objectives of the study

The study aims to explore the improvisation of instructional materials and junior secondary school students' academic achievement in basic science in Rivers State, Nigeria. The following list outlines the goals of this research:

1. Compare the academic performance of students who were taught fundamental science in junior secondary schools in Rivers State utilising improvised teaching materials and those without improvised instructional materials.
2. Compare the academic performance of male and female students who were taught fundamental science in junior secondary schools in Rivers State utilising improvised teaching materials.
3. find out the students' academic performance when taught basic science in junior secondary schools in Rivers State without utilising improvised teaching materials.
4. Examine the disparity in treatment effects for students in junior secondary schools in the state of Rivers who are being taught fundamental science with improvised teaching materials.

Research Questions

To find solutions to the issues that are being investigated, the following research questions were developed:

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1. How does the academic performance of those taught basic science with improvised instructional materials differ from those taught without improvised instructional materials in junior secondary schools in Rivers State?
2. What is the academic performance of male and female students who were taught fundamental science in junior secondary schools in Rivers State utilising improvised teaching materials?
3. Without the use of improvised teaching materials, what are the mean performance scores of pupils who were taught basic science at junior secondary schools in the state of Rivers?
4. What impact does the intervention have on the students' understanding of fundamental scientific concepts when those concepts are presented in junior secondary schools in the state of Rivers utilising improvised teaching materials?

Hypotheses

For this investigation, the following null hypotheses were developed:

1. The academic performance of basic science students in junior secondary schools in Rivers State does not exhibit a significant difference between those taught with improvised instructional materials and those taught without.
2. There is no significant difference in the mean performance scores of males and females learning fundamental science in junior secondary schools in Rivers State when using improvised instructional materials.
3. There is no significant difference in the mean performance scores of students taught basic science in junior secondary schools in Rivers State before and after the instructions without improvised teaching tools
4. The treatment effect for students in junior secondary schools in Rivers State who are taught basic science using improvised teaching materials does not show a significant difference.

Methodology

In this work, a quasi-experimental approach was used, and more specifically, a pre-test post-test, non-equivalent control group design. This indicates that the research was conducted using classes in their entirety, sometimes known as non-randomized groups. According to Sambo (2005), the use of intact classes is possible when conducting research using a quasi-experimental method. The impracticality of randomly picking individuals and allocating them to groups without creating interruptions to the academic programme and timetable of the secondary schools that were the focus of this inquiry was the driving force behind the choice of this design as the solution to the problem. In addition, the purpose of the study was to experiment to evaluate the academic performance of students in fundamental science through the utilisation of improvised teaching materials. This experiment was intended to utilise both control and experimental intact classrooms. As a result, the design that was selected was considered to be an excellent fit for the goals of the research. The study's population comprises all JSS II basic science students in Rivers State, totalling 39,227 students. According to the school census completed in 2011/2012 in the state of Rivers, this total comprises 17,072 female students in addition to twenty-two thousand and 22,155 male students. As was explained earlier, the research used a design with a non-equivalent control group that consisted of pre-test and post-test. The sample size was determined with the use of a cluster sampling strategy. This method involved picking four schools in Rivers State, Nigeria, that each had complete JSSII courses. Students were selected for both the experimental group and the control group from classrooms that already existed, more precisely from classes that had students of both genders. This strategy was used to permit the representation of both sexes within each of the four groups and to guarantee that the subjects all adhere to the same standards. As a result, J.S.S. JSSIIB Rumueme and J.S.S. JSSIID Alesa Eleme were chosen to be part of the experimental group. On the other hand, J.S.S. JSSIIA Odiemerenyi and J.S.S. JSSIIC Port Harcourt were picked to be part of the control group. There were 117 students in all included in the sample for the experimental group, with 71 males and 46 females in the mix. Similarly, there were 70 male students and 46 female students in the control group.

Data for this study were gathered using a researcher-developed tool called the Improvised Basic Science Performance Test (IBSPET). The IBSPET is comprised of thirty different objective test items that have been thoughtfully developed to evaluate the effectiveness of the education that was delivered throughout the experiment using improvised instructional materials. After conducting an in-depth analysis of the curriculum, the researcher came up with a list of particular issues that were included in the JSSII basic scientific material for the term. In addition, to guarantee an exhaustive coverage of the material, the themes that were picked were further disaggregated into units and teaching subtopics that had attainable goals. The researcher hoped that with this breakdown, they would be better able to manufacture test objects. The created test items were put through testing by the researcher to ensure that they included all of the material that was covered in the therapy. The IBSPET served as the instrument that was used to evaluate the

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students' overall performance**.**

Assessments of the IBSPET's face and content validity were carried out by supervisors in the ITS and Instruction Sections of the Department of Integrated Science at Ignatius Ajuru University. This was done so that the validity of the IBSPET instrument could be guaranteed. Before putting the instrument through its first round of pilot testing, the supervisors gave it a comprehensive review, during which they made any required adjustments, revisions, and suggestions relating to its construction and content. To determine whether or not the research instrument could be relied upon, a pilot study was carried out at G.J.S.S. Rumueme with two whole classes as participants. According to the plan that Kerlinger (2004) laid out for the pilot project, the major purpose of the investigation was to determine whether or not the instrument was appropriate, adequate, and effective. The data that were gathered were put through statistical analysis so that the researchers could determine how reliable the improvised basic science performance most it (IBSPET) that was used in this study was. As a direct consequence of this, the reliability coefficient was calculated with the use of the PPMCC, which led to a reliability coefficient of 0.77. This result provides evidence that the instrument may be trusted since, in general, the more closely the result approaches the value one (1), the more trustworthy the instrument is thought to be.

The following methods were utilised to collect the necessary data for this investigation:

- The researcher gave the pre-test to both the experimental group and the control group while they were still at their respective schools. For the pre-test, we used something called the Improvised Basic Science Performance Test (IBSPET). The students were given objective question sheets on which to record their answers. The researcher evaluated the sheets to determine the scores that the students had received before receiving the therapy. This provided a baseline estimate of the student's proficiency in fundamental science.
- The treatment consisted of in-class education that was spread out over eight weeks and included eight different lesson times for each of the participating classes. The regular instructors of basic science were the ones who delivered this teaching to the appropriate courses after receiving further training from the researcher.
- iii) The post-treatment test was carried out immediately after the completion of the treatment period. The researcher administered the post-test using the IBSPET instrument and gave the students objective question sheets to fill out with the appropriate responses for the IBSPET. After that, the researcher evaluated the student sheets to ascertain the students' scores after receiving the therapy, and he or she finished this procedure within the experiment's time limit of eight weeks.

To do the analysis of the biodata, the data that was obtained was first arranged in a tabular fashion, and then the replies were converted into percentages. These percentages were then analysed in further depth. To conduct the analysis of the study questions, descriptive statistics such as mean and standard deviation were utilised. In addition, t-tests conducted at a significance level of 0.05 were utilised to evaluate the four hypotheses. Those hypotheses that had a probability that was more than 5% were thrown out ($p > 0.05$), while those that had a probability that was lower than 5% were kept (p 0.05).

Results

Research Question 1: How does the academic performance of those taught basic science with improvised instructional materials differ from those taught without improvised instructional materials in junior secondary schools in Rivers State?

Table 1: Summary of descriptive statistics on the difference between academic performance of the experimental and control groups

Group	*N*	*Mean*	*SD*	*Std. Error Mean*
Experimental	117	29.53	1.873	.173
Control	116	28.59	2.052	.191

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Based on the information that was compiled and displayed in the table that was just above it, the experimental group finished with a mean score of 29.53, a standard deviation of 1.873, and a standard error mean of.173. In contrast, the mean score obtained by the control group was 28.59, with a standard deviation of 2.052 and a mean standard error of.191. Students who were taught fundamental science with the use of improvised teaching materials demonstrated a higher mean score compared to students who were taught without the use of such resources, which is an important finding based on the findings of the study.

Research Question 2: What is the academic performance of male and female students who were taught fundamental science in junior secondary schools in Rivers State utilising improvised teaching materials?

Table 2: Descriptive statistics on the of the male and the female students in the experimental group.

Sex	*N*	*Mean*	*SD*	*Std. Error Mean*
Male	71	29.29	2.384	.285
Female	46	29.90	2.401	.045

The following table lists the mean performance scores attained by males and females who were educated using makeshift or improvised educational materials. The average score attained by the male participants was 29.29, with a standard deviation of 2.384 and a mean standard error of.285 points. In comparison, the mean score for the female participants was 29.90, with a standard deviation of 2.401 and a mean standard error of.045. According to the findings of this study, girls had a significantly higher mean performance score compared to their male counterparts

Research Question 3: Without the use of improvised teaching materials, what are the mean performance scores of pupils who were taught basic science at junior secondary schools in the state of Rivers?

Table 3: Descriptive statistics on the performance of students in the control group

Source	*N*	*Mean*	*SD*	*Std. Error Mean*
Pre-test	116	12.17	3.818	.355
Post-test	116	28.58	2.052	.191

According to the information presented in Table 4.5, junior secondary school students in Rivers State, who were instructed in basic science without the use of improvised teaching materials, had ia a pre-test score of 12.17, accompanied by a standard deviation of 3.818 and a standard error mean of 0.355. This data reveals that the students also exhibited a standard error mean of 0.355. In the post-test, their average score increased to 28.58, with a standard deviation of 2.052 and a mean standard error of 0.191. The investigation's findings indicate that the students' overall performance on the post-test surpassed their previous performance on the pre-test

Research Question 4: What impact does the therapy have on the students' understanding of fundamental scientific concepts when those concepts are presented in junior secondary schools in the state of Rivers utilizing improvised teaching materials?

Table 4: Descriptive statistics on the performance of students in the experimental group

Source	*N*	*Mean*	*SD*	*Std. Error Mean*
Pre-test	117	11.50	3.967	.367
Post-test	117	29.53	1.873	.173

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The students who were taught with improvised instructional materials had a mean score of 11.50 on the pre-test, the standard deviation was 3.967, and the mean standard error was .367, as shown in the table that has been provided. On the other hand, the mean score on the post-test is 29.53, with a standard deviation of 1.873 and a mean standard error of.173. According to these findings, the students' performance on the post-test resulted in a mean score that was greater than their mean score on the pre-test.

Hypothesis 1: The academic performance of basic science students in junior secondary schools in Rivers State does not exhibit a significant difference between those taught with improvised instructional materials and those taught without

Table 5: Summary of independent sample t-test showing difference in post-test scores of experimental and control group.

Group	*N*	*Mean*	*SD*	*df*	*t*	*Sig. (2-tailed)*
Experimental	117	29.53	1.873	231	164.721	.002
Control	116	28.59	2.052			

The data that is shown in the table above reveals that the experimental group earned a mean score of 29.53, with a standard deviation of 1.873, whereas the control group obtained a mean score of 28.59, with a standard deviation of 2.052. These results are presented in comparison to one another below. According to the findings, the students who were instructed in fundamental sciences with the assistance of improvised educational materials demonstrated a higher mean score in comparison to those who were instructed without such resources. In addition, a t-value of 164.721 is included in the table, along with a significant value of 0.002 (p less than 0.005). This indicates that the null hypothesis should be rejected, which indicates that there is a large performance gap between those students who were taught fundamental science with the aid of improvised teaching materials and those students who were taught without such resources

Hypothesis 2: There is no significant difference in the mean performance scores of males and females learning fundamental science in junior secondary schools in Rivers State when using improvised instructional materials.

Table 6: Summary of independent sample t-test showing the difference in post-test scores of boys and girls in the experimental group.

Sex	*N*	*Mean*	*SD*	*df*	*t*	*Sig. (2-tailed)*
Male	71	29.29	2.384	115	-1.760	.001
Female	46	29.90	2.401			

According to the data that is shown, the mean performance score of males who were educated using improvised instructional materials was 29.29, with a standard deviation of 2.384, while the mean performance score that girls attained was 29.90, with a standard deviation of 2.401. According to these findings, as compared to their male counterparts, girls displayed much higher mean performance ratings than they did. In addition, a t-value of -1.760 is included in the table, along with a significant value of 0.001 (p less than 0.005). As a consequence of this, the null hypothesis is rejected, which indicates that there is a statistically significant performance gap between the grades earned by male and female students who were taught social studies utilising ad hoc teaching materials.

Hypothesis 3: There is no significant difference in the mean performance scores of students taught basic science in junior secondary schools in Rivers State before and after the instructions without improvised teaching tools

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Table 7: Paired sample t-test showing differences in pre-test and post-test mean scores of the control group.

Source	*Mean*	*N*	*SD*	*df*	*t*	*Sig. (2-tailed)*
Pre-test score	12.17	116	3.818	230	.317	.004
Post-test score	28.58	116	2.052			

Table 7 illustrates that junior secondary school students in Rivers State who were instructed in fundamental science without the utilization of improvised teaching materials achieved mean pre-test scores of 12.17, accompanied by a standard deviation of 3.818. Their mean score went up to 28.58 on the post-test, and their standard deviation was 2.052. According to the results, pupils did better on the post-test than they had on the pretest. The table also includes a significant value of 0.004 (P less than 0.005) and a t-value of.317. The results show that students in junior secondary schools in Rivers State were taught basic science without the use of improvised teaching materials, thus rejecting the null hypothesis and indicating a statistically significant difference between their pre- and post-test mean scores.

Hypothesis 4: The treatment effect for students in junior secondary schools in Rivers State who are taught basic science using improvised teaching materials does not show a significant difference.

Table 8: Paired sample t-test showing differences in the treatment effect for the students taught basic science using improvised instructional materials.

Source	*Mean*	*N*	*SD*	*df*	*t*	*Sig. (2-tailed)*
Pre-test score	11.50	117	3.967	232	31.347	.000
Post-test score	29.53	117	1.873			

Based on the data supplied in the table, the average pre-test score for students who were taught with makeshift materials was 11.50 (SD = 3.967), whereas the average post-test score was 29.53 (SD = 1.873). These results suggest that students' total post-test performance is higher than their pre-test performance. In addition, the t-value of 31.347 from the paired sample t-test is statistically significant at the 0.000 level (p less than 0.005). It follows that the treatment effect is significantly different for pupils who were taught the basics of science with makeshift resources, hence the null hypothesis must be rejected.

Discussion

A substantial difference in the academic performance of students who were taught fundamental science is shown by the findings of research question one and hypothesis one, which were analysed using an independent sample t-test. The performance of those who were given improvised educational materials was significantly higher than that of their peers who were taught without such resources. To be more specific, the group that participated in the experiment had mean scores of 29.53 (with a standard deviation of 1.873), whereas the group that served as the control had mean scores of 28.59 (with a standard deviation of 2.052). This demonstrates that students who were instructed with improvised educational resources obtained a higher mean score than students who were instructed without such items. In addition, the t-value of 164.721, which had a significant value of 0.002 (p less than 0.005), led to the rejection of the null hypothesis, which confirmed that there is a significant difference in the performance of students who were taught fundamental science with and without improvised instructional materials. This is consistent with the findings of Egbochukwu (2002), which highlighted the considerable influence that locally generated instructional materials had on the goals of public primary education and the need to educate teachers in improvisation.

The findings of the second hypothesis indicate that there is a statistically significant gender gap in the academic performance of students who were taught fundamental science with improvised teaching materials. females scored

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significantly better than boys, with mean performance scores of 29.90 (standard deviation of 2.401) for females and 29.29 (standard deviation of 2.384) for boys. This finding is noteworthy. The null hypothesis was rejected as a result of a t-value of -1.760 and a significant value of 0.001 (p less than 0.005), both of which led to the rejection of the alternative hypothesis, which indicated a major gap in the performance of boys and girls who were taught fundamental science using improvised teaching materials. This conclusion is consistent with an observation made by Adeyanju. (2005), which emphasised the motivating influence that instructional materials had on learners and their positive link with increased performance. This discovery has a positive correlation with improved performance.

There is a statistically significant difference between the pre-test and post-test mean scores of students who were taught fundamental science without the use of improvised teaching resources, as revealed by the study for Hypothesis 3, which utilised the paired sample t-test. The students' mean score on the pre-test was 12.17, and the standard deviation was 3.818; on the post-test, their mean score was 28.58, and the standard deviation was 2.052. This represents a considerable improvement in the students' performance. A t-value of 0.317, in conjunction with a significant value of 0.004 (P less than 0.005), led to the conclusion that the null hypothesis should not be accepted. Students at junior secondary schools in Rivers State who were taught fundamental science without the use of improvised teaching materials showed a substantial difference between their pre-test and post-test mean scores, as shown by the data shown below. This conclusion is consistent with the argument made by Umar (2012) that students taught without instructional resources can demonstrate progress in performance when supervised by a trained and experienced instructor. Hamza (2010) held the position that instructional materials are necessary for increased performance; however, this study contradicts Hamza's stance.

The results of testing hypothesis number four indicate that there is a meaningful distinction in the treatment impact for those pupils who were instructed in fundamental science utilising makeshift educational resources. The students who were taught with improvised instructional materials had a mean score of 11.50 on the pre-test, with a standard deviation of 3.967, but their mean score considerably rose to 29.53 on the post-test, with a standard deviation of 1.873. The null hypothesis was refuted as a result of the results of the paired sample t-test, which produced a t-value of 31.347 and a significant value of 0.000 (p less than 0.005) respectively. This highlights a substantial difference in the treatment effects for pupils who were taught fundamental science utilising makeshift or unconventional educational tools. This conclusion is in line with Johnston (2006) which highlighted the importance of the efficacy of instructional materials in the process of teaching and learning. Instructional materials help teachers define their aims and facilitate students' knowledge acquisition and retention.

Conclusion

The most important takeaways from the research show that there is a discernible gap between the academic achievement of pupils who were instructed in fundamental science utilising improvised teaching materials and those who were instructed without such resources. In addition, the research shows that there is a considerable performance gap between male and female students when improvised teaching materials are used to teach fundamental scientific concepts. Teacher training in improvisation is crucial as students taught fundamental science with improvised materials outperform those without. The course equips participants with essential strategies for effective classroom improvisation. Gender differences in performance suggest that improvised instructional materials act as incentives, enhancing student participation and understanding. Findings indicate a significant difference in mean scores for students taught elementary science without improvised materials, emphasizing the potential for improved performance under competent professors. The study conclusively demonstrates the efficacy of instructional materials, particularly in fundamental science, underscoring their positive impact on the teaching-learning process

Recommendations

Based on the study's findings, the following specific recommendations can be put forward:

1. Implement training and ongoing professional development programs for teachers, conducted through workshops, seminars, and conferences. These initiatives should focus on equipping teachers with the necessary skills for creating and utilizing instructional materials effectively in the classroom.
2. Promote the use of instructional materials that serve as motivational tools, encouraging students to actively engage in learning activities. In light of the study's results, it is crucial to educate teachers on the selection and utilization of appropriate instructional materials to enhance the teaching and learning process.

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Additionally, it is recommended to provide sufficient motivation for teachers to improvise and incorporate instructional materials into their teaching practices. This can be achieved through improvements in teachers' working conditions and better remuneration

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