

Perceived Impact of Using Improvised Instructional Materials on Teaching and Learning: A Case Study of Chemistry Students and Teachers in Southeast, Nigeria

Deborah Affiah¹, Glory Okore¹, Rosemary Uchegbu¹, Geraldine Omerekpe², Augustine Isemede¹

¹(Department of Chemistry, School of Science/ Alvan Ikoku Federal College of Education Owerri, Nigeria)

²(Department of Special Needs, School of General Education/ Alvan Ikoku Federal College of Education Owerri, Nigeria)

Abstract: This study examined the perceived impact of using improvised instructional materials on teaching and learning chemistry in secondary schools in Owerri Municipal Council Area of Imo State. The study adopted a descriptive design. Two hundred and thirteen (213) students and fourteen (14) chemistry teachers were sampled across four secondary schools in Owerri Municipal Council Area of Imo State. Data for the study was collected quantitatively using both a checklist and questionnaire and data analysis was done with Microsoft excel with consideration of mean and percentage. The result of the study highlighted the unavailability and ineffective use of improvised instructional materials across the schools selected for the study. It also showed that improvised instructional materials influence teaching and learning. In conclusion, there is a need for teachers to be trained on improvisation of materials as this will enable them to acquire the necessary skills and appropriate techniques required for teaching students. Hence, it was recommended that teachers should accept the use of improvised instructional materials as a method in teaching chemistry since it is found to be most effective.

Key Word: Chemistry, Improvisation, Instructional Materials, Teaching

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I. Introduction

In the absence of approved real or original and sophisticated materials, improvised methods are employed to achieve the same learning effect as real materials would have provided. These materials can be created from easily available objects in the environment or invented from scratch^{1,2}. The purpose of improvisation is to provide a solution to a problem, it entails teachers establishing a physical reality through creative and manipulative actions and emotions while also ensuring that the learners' learning experience is soothed^{3,7}. When students are involved in the creation of the necessary learning products, improvised educational materials have been found to encourage students to engage in creative and analytical thinking. Because improvised materials allow students to apply concepts through play-like activities, topics taught using improvised methods become more evident to them⁴.

Chemistry education is critical for improving the quality of teaching and research, as well as ensuring that students have the requisite skills and knowledge essential for educational success^{2,8}. The teaching and learning of chemistry in secondary schools has become extremely difficult because of unequipped laboratories, and inexperienced chemistry teachers among others, which has resulted in or allowed for a lack of enthusiasm and interest among students¹⁰. The mastery of chemistry concepts cannot be fully achieved without the use of learning instructional materials in teaching¹². In the absence of stipulated materials and equipment, instructional materials when used in teaching science subjects have been shown to help enrich the learning experience while the lack of these materials in the classroom makes teaching and learning less attractive^{1,12}.

Improvisation is more than just the development of import-substitution materials for the actual thing; it is also an activity that fosters curiosity, vigilance, persistence, and perseverance, all of which are essential to science, scientists, and learning^{13,14}. Improvisation is also aimed at providing substitutes or alternatives to conventional science materials, especially where teachers do not know how to manipulate existing conventional materials to make learning chemistry easy^{4,8}. Emphasis should there be laid on using cheap and locally available materials which are familiar to the students. On this note, this study set out to determine the Perceived Impact of using improvised instructional materials on the teaching and learning of chemistry among chemistry students and their teachers. The objectives were to determine the types of improved instructional materials, the

availability of such materials for teaching and learning, and the effects of the use of these materials on the students and teachers.

Research Questions

This research aims to find answers to the following questions.

1. To what extent are the various types of improvised Instructional Materials available in teaching and learning chemistry in senior secondary schools in Owerri Municipal Council Area?
2. To what extent are the improvised Instructional Materials utilized in teaching and learning chemistry in senior secondary schools in Owerri Municipal Council Area?
3. To what extent does the use of improvised Instructional Materials affect the teaching and learning of chemistry in senior secondary schools in Owerri Municipal Council Area?

II. Material And Methods

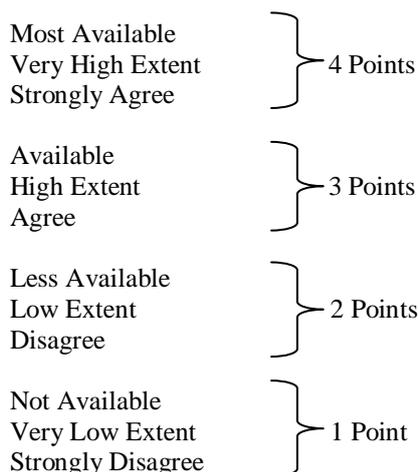
Study Design: The study adopted a descriptive survey design aimed at gathering information about variables such as knowledge, perception, and attitude.

Study Location: The study was conducted among Senior Secondary-2 (SS2) Chemistry students and their teachers across schools in Owerri Municipal Council Area of Imo State, Nigeria. Imo State is a very important state in southeastern Nigeria. Owerri Municipal is bounded on the North by Amakaohia, on the NorthEast by Uratta, on the East by Egbu, on the South East by Naze all in Owerri North LGA, on the South by Nekede, and on the Northwest by Irete both in Owerri West LGA. The inhabitants of Owerri Municipal are mostly civil servants and businessmen and women with moderate economic backgrounds. The council has an urban setting. The council formally has an autonomous community with five kindreds(Owerri Nchiise) made up of Umuodu, Umuoyima, Umuororonjo, Umuonyeche, and Amawom.

Study Duration: December 2020 to May 2021

Sample size: The sample size of the study was determined by simple random sampling of four (4) schools from 10 available schools in Owerri municipal. A total of two hundred and thirteen (213) SS2 chemistry students and fourteen (14) teachers were selected for the study.

Data Collection and Statistical analysis: Data was collected quantitatively using a questionnaire specifically for student respondents and a checklist was administered to both students and teachers. Data collected and analyzed within a period January-March 2021. Data analysis was done using Microsoft Excel with results presented in the tables according to the research questions. The data will be analyzed based on statistical mean, standard deviation, and percentage. Results were summarized as follows.



III. Result

Research Question One: What are the various types of Improvised Instructional Materials available in teaching and learning of chemistry?

Table 1. Teacher's responses, weight, percentage, mean, standard deviation and decision as regards to research question one

Items	Total number of Responses	Total Score	Most Available	Available	Less available	Not available	Mean	SD	Decision
Beakers	14	50	57%	43%	0%	0%	3.57	3.07	Accepted

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Bunsen Burners	14	35	14%	21%	64%	0%	2.5	2.07	Accepted
Funnels	14	47	43%	50%	7%	0%	3.36	2.88	Accepted
Measuring Cylinder	14	33	29%	7%	36%	29%	2.36	2.14	Rejected
Test Tubes	14	38	36%	29%	7%	29%	2.71	2.48	Accepted
Filter Paper	14	43	29%	50%	21%	0%	3.07	2.62	Accepted
Reagent Bottles	14	36	14%	29%	57%	0%	2.57	2.14	Accepted
Gauze	14	26	14%	7%	29%	50%	1.86	1.65	Rejected
Spatula	14	35	29%	21%	21%	29%	2.5	2.27	Accepted
Retort Stand	14	32	14%	21%	43%	21%	2.29	1.96	Rejected
Evaporating Dish	14	31	21%	14%	29%	36%	2.21	2	Rejected
Petri Dish	14	24	0%	29%	14%	57%	1.71	1.41	Rejected
Pipette	14	31	7%	29%	43%	21%	2.21	1.85	Rejected
Crucible Tong	14	24	0%	29%	14%	57%	1.71	1.41	Rejected
Wash Bottle	14	36	14%	29%	57%	0%	2.57	2.14	Accepted
Stirring Rod	14	33	14%	14%	64%	7%	2.36	1.96	Rejected
Mortar and Pestle	14	24	0%	7%	57%	36%	1.71	1.25	Rejected
Dropper	14	23	0%	14%	36%	50%	1.64	1.25	Rejected
Striker (Lighter)	14	33	7%	43%	29%	21%	2.36	2	Rejected
Tripod	14	23	0%	7%	50%	43%	1.64	1.2	Rejected
Indicator/Dye	14	37	43%	14%	7%	36%	2.64	2.48	Accepted
Average	14	33.05	18%	24%	33%	25%	2.36	2.01	Rejected

Table 1 above represents the teacher's responses on the availability of various types of improvised instructional materials, twenty-one (21) checklist items (instructional materials) were tested for. The test was weighed on a scale as follows, most available, available, less available, and not available. The mean value of Nine (9) items was above 2.50 while the other twelve (12) items had a mean of less than 2.50. From the analysis, the average mean across all the items tested was 2.36 which is below the decision rule and this indicates that there is no availability of improvised instructional materials in the teaching and learning of chemistry.

Research Question Two: To what extent are the Improvised Instructional Materials utilized in teaching and learning of chemistry?

Table 2. Student's responses, weight, percentage, mean, standard deviation and decision as regards to research question two

Items	Total number of Responses	Total Score	Very High Extent	High Extent	Low Extent	Very Low Extent	Mean	SD	Decision
Beakers	194	356	14%	6%	5%	75%	1.59	1.46	Rejected
Bunsen Burners	194	336	5%	10%	12%	73%	1.46	1.19	Rejected
Funnels	194	394	16%	9%	6%	69%	1.72	1.61	Rejected
Measuring Cylinder	193	356	9%	8%	13%	70%	1.55	1.34	Rejected
Test Tubes	194	371	9%	10%	12%	69%	1.6	1.40	Rejected
Filter Paper	195	336	3%	11%	15%	72%	1.44	1.12	Rejected
Reagent Bottles	191	308	4%	8%	10%	77%	1.39	1.09	Rejected
Gauze	194	296	2%	6%	14%	78%	1.31	0.91	Rejected
Spatula	193	289	3%	5%	12%	80%	1.3	0.93	Rejected
Retort Stand	195	353	12%	8%	4%	76%	1.57	1.43	Rejected
Evaporating Dish	193	302	4%	6%	11%	79%	1.35	1.03	Rejected
Petri Dish	194	283	4%	5%	9%	83%	1.29	0.94	Rejected
Pipette	194	339	10%	7%	7%	76%	1.51	1.33	Rejected
Crucible Tong	195	304	6%	5%	10%	80%	1.36	1.07	Rejected

Wash Bottle	192	342	10%	6%	9%	74%	1.53	1.34	Rejected
Stirring Rod	194	326	6%	9%	9%	76%	1.44	1.19	Rejected
Mortar and Pestle	191	323	7%	6%	10%	76%	1.45	1.21	Rejected
Dropper	190	322	11%	4%	6%	78%	1.48	1.31	Rejected
Striker (Lighter)	194	311	7%	5%	10%	79%	1.39	1.13	Rejected
Tripod	191	310	8%	4%	10%	79%	1.41	1.17	Rejected
Indicator/Dye	192	324	8%	6%	8%	77%	1.46	1.24	Rejected
Average	193.19	327.7	7%	7%	10%	76%	1.46	1.21	Rejected

Table 2 represents students' responses to the utilization of improvised instructional materials. A total of 21 items were tested and the result of the analysis shows a 76% average of “very low extent” and the mean value across all the items was 1.46 which is less than 2.50. The average mean of 1.46 is below the decision rule standard; the outcome of these responses from the students implies that improvised instructional materials are not being utilized in the teaching and learning of chemistry across the schools.

Research Question Three: To what extent does the use of improvised instructional materials influence teaching and learning of chemistry?

Table 3. Student's responses, weight, percentage, mean, standard deviation and decision as regards to research question three.

Questionnaire Items	Total number of Responses	Total Score	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	SD	Decision
Understanding of use	195	682	73%	14%	2%	11%	3.5	3.11	Accepted
Real objects to explanation	195	676	71%	15%	5%	10%	3.47	3.08	Accepted
Interactive Learning	195	682	67%	22%	4%	7%	3.5	3.08	Accepted
Improves acquisition of practical skills	195	654	62%	22%	5%	11%	3.35	2.98	Accepted
Improves performance	194	673	70%	16%	4%	10%	3.47	3.08	Accepted
Average	194.8	673.4	69%	18%	4%	10%	3.46	3.06	Accepted

Table 3 represents students' responses to the influence of improvised instructional materials on teaching. Five parameters were considered for this research question and the result from students indicated 69% strongly agreed that these materials influence their learning of chemistry. An average mean score of 3.46 is above the stipulated average mean value of the decision rule of 2.50 as considered in the methodology. This implies that the students agreed that improvised instructional materials will affect the teaching and learning of chemistry.

IV. Discussion

The responses to the the first research question by the teachers shows that most of the improvised materials were either not available in the schools at the time of this study as identified by the teachers interviewed or they are not familiar with them. This can be confirmed in the average mean value of 2.36 which is below the standard of the decision rule. The implication of this is that these improvised instructional materials are not available for teaching and learning of chemistry. This might have an effect in the ability of the students to properly understand the subject and could also influence the decision to pursue chemistry as a career⁵.

The second research question attempted to determine the level of utilization of chemistry Improvised Instructional Materials and the result clearly shows that these materials are not being utilized where available as confirmed by the student’s responses. Up to 76% of respondents chose “very low extent” of utilization by their teachers. The students also confirmed that they have never seen or heard of some of the improvised materials mention in the checklist. The finding is similar to another finding⁴, that reported that the teachers are not making appreciable efforts at providing or improvising those instructional materials that are not available in their laboratories which may be a result of lack of the raw materials in the school environment or that the teacher lacks the skills for improvisation as a result of poor training they received from their preparatory institutions. In

situation where these materials are available but not utilized, the ineffective utilization of this materials may lead to them becoming obsolete over a period of time.

The third research question examined how the use of improvised instructional materials influences the teaching and learning of chemistry. The students confirmed that when improvised instructional materials are used, they understand the usage, it is usually preferred because they are familiar objects, it make learning more interactive, it enhance practical skill acquisition and also leads to improved performance in chemistry. This implies that improvised instructional materials influences teaching and learning of chemistry. This result is similar to the findings^{6,11}, who reported that the students taught using improvised instructional materials performed better in chemistry than those taught using conventional lecture method. Improve instructional materials affects students educational achievement⁹.

V. Conclusion

This study has identified that the availability and utilization of improvised instructional materials will enhance the teaching of chemistry across schools in Imo state. However, there is inadequate improvised instructional materials across the schools that participated in the study and in few cases where these improvised instructional materials are available, they are not effectively utilized in the teaching and learning of chemistry. Students also confirmed ease of learning where improvised instructional materials are being used effectively.

VI. Recommendations

The following recommendations were made:

Because it has been proven to be effective, chemistry teachers should accept the use of improvised instructional materials as a technique of teaching chemistry.

Government should provide materials for improvisation of instructional aids across school.

The school administrators in collaboration with the government should provide training and workshop sessions to equip teachers with skills for improvisation where standard materials are not available.

School administrators/principals should ensure that improvised instructional materials be made accessible to the teachers and students at all times.

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