TEACHERS' USE OF MULTIPLE RESOURCES AND STUDENTS' ACADEMIC PERFORMANCE IN CHEMISTRY

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Abstract
The study examined the effect of teachers' use of multiple resources on students' academic performance in Chemistry. The study adopted a quasi-experimental pre-test, post-test research design. The population of the study consisted of all the 1975 SS2 Chemistry students of the 2022/2023 academic session in the 22 co-educational public secondary schools in Eket Federal Constituency of Akwa Ibom State, Nigeria. A total of one hundred and fifty (150) SS2 Chemistry students constituted the sample for the study using a multi-stage sampling technique. One instrument titled "Chemistry Performance Test on Saponification (CPTS)" was used in gathering data for the study. The instrument was subjected to face and content validity. A reliability coefficient of 0.88 was obtained using the Kuder-Richardson formula-20. Two research questions and two hypotheses guided the study. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The findings of the study showed that there was a significant difference in the academic performance of students taught the concept of saponification separately using computer simulations, locally sourced materials and charts. The findings also showed that there was no significant difference in the academic performance of male and female students taught the concept of saponification using computer simulation, locally sourced materials and charts. The findings confirmed the efficacy of the use of locally sourced materials in instructional delivery. It was therefore recommended that teachers should use locally sourced materials in teaching to ease students' learning difficulties in Chemistry concepts such as saponification.

Keywords: Chemistry, Computer Simulations, Local Resources, Charts, Students Academic Performance, Saponification.

Introduction

Science education is the bedrock of any society and is one of the determinant factors in measuring of nation's growth and development. It is a fundamental component in the pursuit of success in all human undertakings. Undoubtedly, the significance of science education in enhancing the quality of human lives cannot be overstated (Jimenez-Liso, Martinez-Chico, Avraamidu & Lucio-Villegas, 2021). The contemporary landscape is marked by the ever-growing impact of science and technology, making it imperative for any nation to prioritize science education at every level of academic pursuit as it is an indispensable factor for thriving in diverse fields of human endeavours. Science education emerges as a crucial component for meaningful existence within any society, positioned at the core of generating essential resources for socio-economic, scientific, and technological advancements crucial for national progress. In light of this, the inclusion of science subjects in the secondary schools' curriculum takes on profound significance. It not only moulds students into future scientists but also nurtures the ability to think and act in alignment with scientific principles, an aspect of great importance. Therefore, science education research, inventions, and practices should adapt to the evolving

needs and aspirations of society, mirroring its values (Akpan, 2018a). It is essential to recognize that every educational strategy, device or method aims at enhancing students' learning outcomes (Itighise & Akpan, 2022). To actualize this objective, appropriate instructional materials and devices should be used by teachers to impart knowledge effectively to the learners (Itighise & Akpan, 2022; Arop, Umanah & Effiong, 2015).

Chemistry, as a science subject, particularly demands the use of appropriate instructional materials to facilitate students' understanding of the concepts. Chemistry is the study of the nature, composition, structure and properties of matter as well as substances that make up our environment and the various changes they undergo (Umanah, 2017). It involves the study of material substances that occur on earth and in the universe. Chemistry as a branch of science and a prerequisite subject for many fields of learning has been and will continue to be of tremendous importance to mankind. The application of its principles has helped in modern inventions and technological development. The functional role of chemistry as one of the science subjects in both national and global development cannot be overemphasized (Umanah & Etiubon, 2022).
Chemistry satisfies our natural curiosity and allows individuals to gain some experiences of the scientific methods which help in everyday life and the study of other science subjects. The knowledge of chemistry can be applied to protect man from sub-standard drugs, unsafe food, and unclean water. Scientific discoveries of how to use natural products in the manufacture of drugs and herbal medicine, dyes, artificial fertilizers, herbicides, insecticides and pesticides for more productive agriculture, materials for home building, fuels for transportation, chemicals for road construction and the production of currencies and notes are all driven by Chemistry (Majek, 2018).

Chemistry is an experimental science subject that requires a dynamic teaching approach that actively engages students through hands-on, minds-on, and heads-on experiences to develop scientific skills, a positive attitude and promote desired social values thereby preparing students to effectively tackle problems and contribute to national development (Umanah & Etiubon, 2022). Unfortunately, the teaching and learning of Chemistry has faced numerous challenges, hindering many students from performing well in external examinations such as the West African Senior School Certificate Examination (WASSCE) and the National Examination Council (NECO).

According to the West African Examination Council Chief Examiner's Report (2022), the performance of students in some concepts in chemistry at the end of secondary education has remained poor. This could be attributed to factors such as the abstract nature of chemistry, poorly equipped laboratories, lack of experienced chemistry teachers and the inability of teachers to utilize instructional resources while teaching. Cletus (2019) observed that one of the necessary inputs that could facilitate sound and effective teaching and learning of Chemistry to actualize its objectives is the proper utilization of instructional resources. Instructional resources are the essential tools needed to aid teaching and learning effectively and efficiently. They are vital to the teaching of any subject in the school curriculum. They play a very important role in the teaching-learning process. Chemistry teachers need to look for a way of providing the equipment and materials that will enhance meaningful learning in chemistry. This necessarily calls for resourcefulness on the part of the chemistry teacher (Umanah & Udo, 2015).

Saponification was found to be one of the concepts which are mildly difficult for students to learn and West African Examination Chief Examiners Report over the years indicates poor performance of students in questions involving this concept. Saponification is simply the process of making soaps. It is the hydrolysis of an ester with sodium hydroxide (NaOH) or potassium hydroxide (KOH) to give alcohol and sodium or potassium salt of the acid. Soaps are just potassium or sodium salts of long-chain fatty acids. During saponification, ester reacts with an inorganic base to produce alcohol and soap. Generally, it occurs when triglycerides react with potassium or sodium hydroxide (lye) to produce glycerol and fatty acid salt, called soap. Triglycerides are generally animal fats and vegetable oils. When they react

with sodium hydroxide, a hard form of soap is created. This is where potassium comes and creates a softer version of the soap. The equation can be written as: Ester + Base ——————> Alcohol + Soap. It has therefore become necessary to seek appropriate and effective instructional resources that could enhance students' understanding and improve their academic performance in the concept of saponification and chemistry generally.

In recent years, attention has shifted towards exploring the power of modern technologies in the classroom to make the teaching and learning process easier, flexible and effective. One of such modern technology that is currently gaining attention and popularity in the classroom is computer simulations (William, 2019). Computer simulation is a computer program that creates animated, interactive, game-like environments, which focus on connecting real-life phenomena to the underlying science concepts (Lasisi, Oti, Arowolo, Agbeyenku & Ojoko, 2021). It makes the visual and conceptual models of scientific concepts simple so that they can be understood by learners. Computer simulations are therefore computer-generated versions of real-world objects. It provides a near-authentic environment, context and situation for task-based learning (Chen, Pan, Sung & Chang, 2013). According to Nkemakolam, Chinelo, & Jane (2018), computer simulations enable learners to view events, processes and activities, that otherwise may not have been available to them through interactive engagement. Chemistry teachers can also leverage the use of this instructional resource to effectively design classroom instructions that are interactive and time-efficient (DeLoizer & Rhodes, 2016).

Computer simulation has been identified as an effective instructional resource for enhancing students' learning of difficult and abstract concepts as it incorporates multimedia elements such as graphics, animation, static pictures, simulations, photos, videos, text and narration on the computer screen (Cheung, Slavin, Kim & Lake, 2016; Elangovan & Ismail, 2014). The use of computers in the classroom has been proven to be advantageous in many ways (Akpan, 2018b). It has been found to facilitate students' learning and develop students' ability to learn independently, analyze information, think critically and solve problems. Teachers can use computer simulation to arouse and sustain students' attention, present facts and information, teach concepts and principles, guide thinking and induce transfer of learning which can improve students' academic performance (William, 2019).

The other instructional resource which could ensure active participation of students in the teaching and learning process is the use of local resources. Okeke (2020) posited that, in order to enhance the quality of instruction, the teacher need to source for, evaluate and select materials that can meaningfully engage learners so as to produce a more effective lesson delivery. When these materials are gotten from the immediate environment of the learners or the local environment, they are called locally made resources. Emmanuel (2021) opined that, these locally made materials can make teaching more effective and students learning more exciting since such materials can be manipulated in such a way that learning becomes more practical and experiential than theoretical and abstract. Having realized the importance of community resources in linking the school with the community, Akpan & Babayemi (2022) opined that for knowledge transfer in science teaching and learning, teachers must be encouraged, supported and financed to expose the students to the opportunities available in the community by linking the theoretical components of their teaching and learning programmes with the resources practical realities expressed in the resources of the community. This means that the use of locally made resources can ease, improve, encourage, motivate and promote teaching and learning.

Chart is one other instructional resource that is commonly employed in teaching and learning. A chart is a combination of graphics and pictorial media designed for the orderly and logically visualizing of relationship between key facts or ideas. It is a visual aid that can be used in the teaching and learning process to resume, compare, and against reality (Pancare, 2016). The use of charts in teaching and learning will help teachers bring into reality what they teach and as such make teaching more effective. Charts are good examples of visual presentations

which assist students in understanding ideas more than when the teacher just talks (Hargrave, 2023). Charts, if carefully explored, should be able to stimulate students' interest, boost their class participation and enhance their learning irrespective of their learning modality or style and gender.

Gender is one of the factors that influence students' academic performance in science in general and Chemistry in particular. It is a concept that calls for research from time to time. According to William (2019) gender had no significant influence on students' academic performance when taught using computer simulation packages and flip chart. Okorie & Eze (2016) also reported no significant influence of gender on students' academic performance. Arop, Umanah & Effiong (2015) reported that female students performed better than males when taught using instructional materials while Itighise and Umanah (2019) reported that male students performed better than their female counterparts. Since the reports from various studies on gender are inconsistent and inconclusive, gender as a variable attracts further investigation in this study.

Statement of the Problem

Despite the importance of chemistry to the nation's technological growth and development, it has been observed that students' academic performance in the subject in external examinations has been very poor. This is further supported by the West African Examination Council Chief Examiner's Report (2022), that the performance of students in chemistry at the end of secondary education has remained poor. The concern about the performance of students in Chemistry has led to several suggestions for improvement. Poor presentation of instructional content by teachers at the senior secondary school level has been identified as one of the major factors contributing to the poor performance of students in Chemistry. This is highly disturbing because Chemistry is necessary for students who want to become future scientists. The persistent lack of proper use of appropriate instructional resources in communicating and explaining difficult and abstract concepts makes students passive rather than active learners and could contribute to poor academic performance. Chemistry educators have continually sought better teaching methods and resources that could enhance students' performance in Chemistry. The question then is, will teachers' use of multiple resources (computer simulations, locally resourced materials and charts) enhance students' academic performance in Chemistry on the concept of saponification in secondary schools in Eket Federal Constituency of Akwa Ibom State?

Purpose of the Study

The purpose of the study was to determine the effect of teachers' use of multiple resources (computer simulations, local resources and charts) on students' academic performance in chemistry in Eket Federal Constituency, Akwa Ibom State.

Specifically, the study sought to:

(i) Determine the difference in the academic performance mean scores of students taught concept of saponification with computer simulation, locally sourced materials and charts.

(ii) Determine the difference in the academic performance mean scores of male and female students taught the concept of saponification with computer simulation, locally sourced materials and charts.

Research Questions

The following questions were raised to guide the study:

1. What is the difference in the academic performance mean scores of students taught the concept of saponification with computer simulation, locally sourced materials and charts?

2. What is the difference in the academic performance mean scores of male and female students taught the concept of saponification with computer simulation, locally sourced materials and charts?

Hypotheses

The following null hypotheses (H_o) were formulated to guide the study:

1. There is no significant difference in the academic performance mean scores of students taught the concept of saponification with computer simulation, locally sourced materials and charts.
2. There is no significant difference in the academic performance mean scores of male and female students taught the concept of saponification with computer simulation, locally sourced materials and charts.

Methodology

The study adopted a quasi-experimental design using a pre-test and post-test experimental design. This design was considered appropriate because intact classes without randomization were used for the groups. The population of this study consisted of all Senior Secondary Two (SS2) Chemistry students in the twenty-two co-educational public secondary schools in Eket Federal Constituency of Akwa Ibom State, Nigeria. The population of the study consisted of 1975 SS2 students in the study area (Source: Area Education Office, Eket, 2022). The choice of SS2 students is due to the fact that the concept of saponification is found in the curriculum in Senior Secondary Two.

The sample for the study consisted of one hundred and fifty (150) senior secondary two (SS2) students drawn from three intact classes in three selected secondary schools in the study area using multi-stage sampling technique. The first stage involved using simple random sampling technique to select a Local Government Area out of the four Local Government Areas in Eket Federal Constituency. The second stage involved randomly selecting three schools out of nine secondary schools in the Local Government Area earlier selected. Finally, three intact classes from the three selected secondary schools were randomly assigned groups and used for the study.

One instrument titled: **Chemistry Performance Test on Saponification (CPTS)** was used in gathering data for the study. The instrument consisted of fifty (50) multiple choice questions lettered A-D with only one correct option. The test items were drawn from the concept of saponification. The Chemistry Performance Test on Saponification (CPTS) was subjected to both content and face validations. This was done by one Chemistry lecturer and one expert in Measurement and Evaluation in the Department of Science Education, Akwa Ibom State University. A reliability co-efficient of 0.88 was obtained for the instrument using Kuder-Richardson's formula-20.

Chemistry Performance Test on Saponification (CPTS) was administered to the students as pretest to ascertain the academic performance level of the students before the treatments. Lesson package on saponification was used in teaching the different groups. The Computer Simulations Package was installed in all the computers in the ICT laboratory. Students in Experimental group 1 were taught the concept of saponification using computer simulations instructional package while those in Experimental group 2 were taught using local and those in the third group were taught using charts. After the treatment, a reshuffled CPTS was administered to the students in the three groups as post-test and the scripts were collected for marking and recording immediately. The entire process lasted for four weeks.

Data Analyses and Results

The data generated from both pretest and post-test were analyzed using mean, standard deviation and Analysis of Covariance (ANCOVA). Mean and standard deviation were used to

answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the formulated null hypotheses at.05 level of significance.

The result in Table 1 shows summary of the pre-test and post-test mean scores and standard deviation of scores of students taught the concept of saponification with computer simulation, locally sourced materials and charts. The result in the Table reveals the post-test and pre-test scores of 74.69 and 37.44 respectively, for those taught using locally sourced materials which yielded the best mean gain score of 37.55. This is followed by post-test-pre-test mean gain scores of 29.74 and 12.90forstudents taught using computer simulation and charts respectively. The post-test standard deviation scores of 9.11, 9.32 and 7.34 for students in computer simulation, locally sourced materials and charts groups indicates that student staughtusinglocallysourcedmaterialshadtheirrawscoresclosesttothegroupmean. This implies that there is difference in the academic performance mean scores of students taught the concept of saponification with locally sourced materials and those taught with computer simulation and charts. Expectedly, the groups had post-test mean scores that are higher than their pre-test mean scores.

Table 1: Mean (X) and Standard Deviation of students' pre-test and post-test scores classified by treatment groups.

Instructional resources	N	Pre-test		Post-test		Mean
		Mean	SD	Mean	SD	Gain Score
Computer simulation	56	36.96	5.37	66.70	9.11	29.74
Locally sourced Materials	49	37.14	6.04	74.69	9.32	37.55
Charts	45	37.44	7.34	56.33	7.51	12.90

The summary of the result of ANCOVA analysis of the academic performance of students taught the concept of saponification separately using computer simulations, locally sourced materials and charts is presented in Table 2 below:

Table 2: Summary of Analysis of Covariance (ANCOVA) of the students' post-test scores classified by treatment groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at .05 alpha level
Corrected Model	76656.511[a]	3	25552.170	536.567	.000	S
Intercept	20546.096	1	20546.096	431.445	.000	S
PRE TEST SCORES	33.256	1	33.256	.698	.405	NS
INSTRUCTIONAL RESOURCES	75142.000	2	37571.000	788.949	.000	S
Error	6952.749	146	47.622			
Total	546313.000	150				
Corrected Total	83609.260	149				

a. R Squared = .917 (Adjusted R Squared = .915), S= Significant at .05 alpha level, NS= Not significant at .05 alpha level

In Table 2, the calculated F-ratio for the effect of instructional resources at df 2,149 is 788.949, while its corresponding calculated level of significance is .000 alpha. This level of significance is less than .05 in which the decision is based, indicating that there was a significant difference in the academic performance of students in the concept taught with computer simulation, locally sourced materials and charts.With this observation, null hypothesis one was rejected. The direction of significance was determined using Scheffe post hoc test in Table 3.

Table 3: Scheffe Post Hoc tests for Post-test classified by treatment groups

(I) INSTRUCTIONAL RESOURCES	(J) INSTRUCTIONAL RESOURCES	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
LOCALLY SOURCED MATERIALS	COMPUTER SIMULATION	18.449*	1.359	.000	15.764	21.134
	CHART	54.846*	1.393	.000	52.093	57.600
COMPUTER SIMULATION	LOCALLY SOURCED MATERIALS	-18.449*	1.359	.000	-21.134	-15.764
	CHART	36.398*	1.425	.000	33.581	39.214
CHART	LOCALLY SOURCED MATERIALS	-54.846*	1.393	.000	-57.600	-52.093
	COMPUTER SIMULATION	-36.398*	1.425	.000	-39.214	-33.581

Based on estimated marginal means
*. The mean difference is significant at the .05 level.

The results in Table 3shows that students taught with locally sourced materials achieved significantly better performance compared with those taught computer simulation and chart. Those taught char thad the least performance.
The result in Table 4 shows the summary of the pre-test and post-test mean scores and standard deviation of scores of male and female students taught using computer simulation, locally sourced materials and charts.

Table 4: Mean (X) and StandardDeviation of students' Pre-test and Post-test Scores classified by Gender

Gender	N	Pre-test		Post-test		Mean Gain Score
		$\bar{x}$	SD	$\bar{x}$	SD	
Male	79	36.96	6.12	66.18	8.26	29.22
Female	71	37.37	6.62	65.47	8.95	28.10

The post-test and pre-test mean scores of 66.18 and 36.96 respectively, for male students yielded a slightly higher mean gain score of 29.22. This is followed by the post-test - pre-test mean gain scores 65.47 and 37.37 respectively with mean gain score 28.10 for female students. Expectedly all the groups had post-test mean scores that are higher than their pre-test mean scores. The result revealed that the mean difference for academic performance of male and female students was negligible.
The summary of the result of ANCOVA analysis of the academic performance of male and female students taught the concept of saponification using computer simulations, locally sourced materials and charts is presented in Table 5 below:

Table 5: Summary of Analysis of Covariance (ANCOVA) of Students' Post-test Scores classified by Gender with Pre-test Scores as covariate

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision at .05 alpha level
Corrected Model	1675.926[a]	2	837.963	1.503	.226	NS
Intercept	13830.956	1	13830.956	24.815	.000	S
PRE TEST SCORES	1526.859	1	1526.859	2.739	.100	NS
GENDER	161.416	1	161.416	.290	.591	NS
Error	81933.334	147	557.370			
Total	546313.000	150				
Corrected Total	83609.260	149				

a. R Squared = .020 (Adjusted R Squared = .007) S = Significant at .05 alpha level, NS= Not significant at .05 alpha level

In Table 5, the calculated F-ratio for the effect of gender at df 1, 149 was .290 while its significant level is .591. This significant level is greater than .05 alpha in which the decision is based, indicating that the effect of gender on the students' performances was not statistically significant. With this observation, null hypothesis 2 was retained, which states that there is no significant difference in the academic performance mean scores of male and female students taught the concept of saponification using computer simulation, locally sourced materials and chart.

Discussion of Results

The result obtained in Tables 1, 2 and 3, gave answers to the first research question and hypothesis that was posed and formulated to guide this study It was revealed that there is a significant difference in the academic performance of students taught the concept of saponification using computer simulations, locally sourced materials and charts.

The findings revealed that there was a significant difference in the academic performance of students taught using computer simulation, locally sourced materials and charts. Chemistry students taught saponification using locally sourced materials performed better academically than those taught using computer simulation and charts. This result which was not due to error came as a plus for the use of locally sourced materials in teaching. Therefore, the null hypothesis which guessed otherwise was rejected. This result agrees with the findings of Etiubon (2015) who found a significant relationship between the use of instructional materials in teaching and academic performance of students when taught stoichiometry using hands-on activities. The study concluded that there is need for teaching strategies to be mapped for the utilization of different instructional strategies for the lofty goals of education to be attainable and that innovation will facilitate knowledge and skill acquisition in chemistry and other science based courses. The finding could also be attributed to the fact that using locally made materials for experiments would enable learners to participate fully in the actual construction of the apparatus and gives them more ideas about how such materials work. Again, locally made instructional materials bring home to the classroom, and clarify unfamiliar principles and concept of science to learners which would lead to better understanding by the child. The finding lend credence to that of Kabesa (2019) whose finding showed that the use of locally available resources in teaching will appeal to the different senses (visual, auditory, touch, smell and taste) and enhance better academic performance of the students. The finding of the study also lends credence to that of Emmanuel (2021) who found a statistically significant difference between the performances of students taught using locally sourced instructional materials and those taught using conventional method.

The finding is possible in view of the fact that the use of teaching aids which is directly gotten from the immediate environment of the child would help to make the learning concept simpler and easier for students to master and apply in their daily situations and this would lead to effective academic performance. The finding is in line with that of Nja, Cornelius, Ukpebi, Edoho & Neji (2020) who found that there is a significant relationship between students' academic performance when taught with and without kitchen resources. Teachers were therefore encouraged to use kitchen resources in teaching Chemistry to foster interest which will lead to high academic performance.

The result of the analysis of the difference in the academic performance of male and female students taught the concept of saponification using computer simulations, locally sourced materials and those taught using charts revealed that there is no statistical significant difference in the academic performance of male and female students (Tables 4and 5). This result came across as a plus for the female students. Therefore, the null hypothesis which stated that there is no significant main effect of gender on students' academic performance in the concept of saponification was retained.

The findings of this study is in agreement with those of Joseph, John, Eric, Yusuf & Olubunmi (2015); Okorie & Eze (2016) which found no significant difference in male and female students' academic performance in Chemistry in their separate studies and Oludipe & Oludipe (2018), which did not also establish any significant effect of gender on academic performance of students in Basic Science but contrast with the findings of Alordiah, Akpadaka & Oviogbodu (2018), which reported that there was a statistically significant influence of gender on the academic performance of students' in Chemistry in their research. The findings of this study is also not in line with that of Ezeudu & Obi (2015), which investigated effect of gender on students' academic achievement in Chemistry in Nsukka Local Government Area of Enugu State and found that male students achieved significantly better than their female counterparts, indicating that gender has influence on academic performance.

However, the findings of this study is in consonance with that of Godspower-Echie & Ihenko (2017) that found no significant influence of gender on students' academic performance in Integrated Science. The findings revealed by the result of this study aligns with the one arrived at by Ajayi & Ogbeba (2017), that investigated the effect of gender on Senior Secondary School Chemistry students' performance in Stoichiometry using hands-on activities, which found no significant difference in their performance and concluded that gender has no effect on the achievement of Chemistry students' in Stoichiometry. Although in this study, the post-test mean score of the female students was slightly higher that of the male students but it was not statistically significant. The result of this study has been able to bridge the gap in the performance of male and female students.

The finding is in line with that of William (2019) whose finding showed that there was no significant difference in the academic performance of male and female students taught using the computer simulation package. The study also revealed that there was no significant difference in the academic performance of male and female students taught with the flip charts. The finding is in line with that of Joseph, John, Eric, Yusuf & Olubunmi (2015) who found that there was no significant difference between the performance of male and female students. It was also reported that though the male students had slightly better performance compared to the female students, it was not significant, meaning that gender does not significantly determine the performance of students in chemistry.

Conclusion

The primary concern of this study was to investigate the effect of the use of computer simulation, locally sourced materials and charts in teaching chemistry concepts such as saponification on the performance of students such that no significant difference would be accounted for. It was found that the posttest mean score of the students taught using locally sourced materials was greater than that of students taught using computer simulation and charts. The ANCOVA test conducted further revealed that there was a statistically significant difference in the performance of students taught using computer simulation, locally sourced materials and those taught using charts. Another concern of the study was to investigate if there is any significant difference in the performance of male and female students taught saponification using computer simulation, locally sourced materials as well as male and female students taught using charts. The result showed no statistical difference in the academic performance of male and female students in the three experimental groups. These results confirm the efficacy of the use of locally sourced materials in instructional delivery to ease students' learning difficulties in Chemistry concepts such as saponification.

Recommendations

The following recommendations were made based on the findings:

1. Chemistry teachers should use locally sourced materials as a tool in teaching saponification and other concepts in chemistry to enhance students' understanding and higher performance

in chemistry. Teachers should embrace these tools as they enhance the learning experience, making abstract concepts more tangible and engaging.

2. Curriculum developers should integrate instructional resources such as locally sourced materials into the chemistry curriculum and make it a vital resource for teaching and learning chemistry in senior secondary schools in Nigeria.
3. School principal plays a pivotal role in fostering an environment that promotes innovative teaching practices. It is recommended that school principals should allocate resources and provide support for teacher training programs focused on utilizing locally sourced materials.
4. Professional bodies, such as Science Teachers Association of Nigeria (STAN), Nigeria Union of Teachers (NUT), Chemical Society of Nigeria (CSN), American Chemical Society (ACS) and others should organize workshops, conferences, and seminars to educate chemistry teachers and other science teachers on the benefits of locally sourced materials in teaching and learning.
5. Government bodies overseeing education should recognize the importance of leveraging locally sourced materials in science education. Integrating the use of locally sourced materials into educational policies and guidelines will signal a commitment to modernizing teaching methods and enhancing students' academic performance in chemistry.

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