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USING MFAMOSING LIMESTONE ORE IN TEACHING THE CONCEPT OF SEPARATION OF MIXTURES IN SENIOR SECONDARY SCHOOL CHEMISTRY

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ABSTRACT

The purpose of the study was to determine the effectiveness of using Mfamosing limestone ore, in the teaching of the concept of separation of mixture. This in response to the call for the deployment of materials within the learner's immediate environment as a means of finding a solution to persistent shortage of learning resources for the teaching of Chemistry in secondary schools. A total of 120 senior secondary two (SS2) chemistry students were involved in the study. This number was made up of 62 females and 58 males from four secondary schools in Calabar educational zone of Cross River State of Nigeria. A pretest- posttest control group design was used for the study. From the findings, it was observed that Mfamosing limestone ore as a resource for the teaching of concept of separation of mixture is more effective in enhancing student's performance in chemistry than iron filings and Sulphur as a resource. The result also showed an insignificant difference existing between the performance of male and female students when taught the concept of separation of mixture using Mfamosing limestone ore. Conclusion from findings led to the recommendation that chemistry teachers should be encouraged to explore the use of limestone ore to teach the concept of separation of mixtures.

INTRODUCTION

Extensive use has been made of the rich deposit of limestone ore of Mfamosing in Cross River State in the areas of Agriculture and Cement Production. It could also serve as a potential resource in the teaching of concepts in the Senior Secondary Chemistry. It was the application of new recoveries in science and technology that transform the erstwhile backward societies to advanced states. The speed with which there new phenomena were disseminated and proliferated gave the western world a leeway to gaining a substantial scientific and technological hegemony to cover the rest of the world. On this background, the need to be resourceful, flexible and innovative in order to face the challenges posed by increasing knowledge in science is imperative.

Balogun (1982) said that in developing learning and teaching materials, the use of learner's environment and locally available resources should be used in providing first hand science experience. It is believed that if local materials are effectively used, it will motivate the learner depending on how the learner perceives and pays attention to the local materials used.

The use of local materials in science teaching implies the utilization of the scientist's environment, which is a practice in improvisation (Inyang 1997) He advocates the use of local materials in Chemistry education. He admitted that we are yet to devise school-based experiments to illustrate, justify or explain the usage of such materials He further stressed the value for such experiments not only for teaching chemistry in secondary schools but also application in cement industries.

It is pertinent to emphasize that there is urgent need for Chemistry Educators to re-examine the present method of teaching Chemistry with a view to adopting an approach that involves largely experimental methods in which effective utilization of available local materials could be used. Though some work has started, it is not yet exhausted since about 57.1% of Senior Secondary Chemistry topics can be taught using local resources (Inyang, 1997) Since science is better learned through the process approach it is important for science teachers to look for resources beyond the classroom.

On this ground the need to use limestone ore (kaunwa) as a resource in teaching separation of mixtures in chemistry is in support of Eshiet (1996) that the environment provides a situation that helps learners to acquire experiences that enhance learning in the affective, psychomotor and cognitive domains.

STATEMENT OF THE PROBLEM

Chemistry as a science is activity oriented and the suggested method for teaching it, which is guided – discovery method is resource – based, Eshiet (1996). There is inadequate utilization of learning resources within the learner's environment by science teachers, Inyang (1997) This suggests that the mastery of chemistry concepts cannot be fully achieved without the use of learning materials in teaching chemistry. So the teaching of chemistry without learning materials will certainly result to poor achievement and lack of interest in the course. There is deficiency in the development of chemistry in Nigeria and could be traced to unavailability of effective teaching and learning resources in our science classroom (Nwosu 2000). Also teachers have not been able to utilize resources within our environment to enhance teaching and learning of science. This work sought to provide an example of deploying local materials like Mfamosing limestone ore in teaching the concept of the separation of mixtures rather than using conventional iron filings and sulphur.

PURPOSE OF THE STUDY

1. To compare the effects of using limestone ore (Kaunwa) and standard iron fillings and Sulphur in teaching the concept of separation of mixtures on students' performance in chemistry.
2. To determine the influence of sex on students' performance when taught the concept of separation of mixtures using limestone ore (Kaunwa).

Hypotheses

Ho. 1. There is no significant difference in the performance of students when taught the concept separation of mixtures using limestone ore (Kaunwa) as a resource compared to using a mixture of iron fillings and sulphur.

Ho. 2: There is no significant difference between the performance of male and female students when taught the concept of separation of mixtures using limestone ore (Kaunwa).

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Design of the Study
Pretest – posttest control group design was used in the study

Sample and Sampling Techniques
A total of 120 students took part in the study using intact classes. Out of population of nine hundred and eighty (980) senior secondary (SS2) chemistry students in Calabar Educational Zone of Cross River State. This was made up of 58 male students and 62 female students Purposive sampling technique was used to select schools from the population. The criteria was (1) Schools that have graduate teachers in chemistry with at least three years of teaching experience. (2) Schools with well-equipped chemistry laboratory. (3) Schools in which the concept of mixtures had been taught Eight schools met the criteria, four schools were randomly selected through the use of balloting from the eight schools and they were randomly assigned to experimental and control groups There were two experimental groups made up of 30 and 34 students respectively and also two control groups made up of 29 and 27 students respectively.

Instrument and Validation
A researcher designed Chemistry Achievement Test (CAT) was the instrument used for the study A total of fifty-(50) multiple – choice items were constructed on the concept of separation techniques and separation of mixtures. The instruments were faced and content validated by two Chemistry experts. Reliability of the instrument was determined using Kuder-Richardson's formula 21 A reliability index of 0.76 was obtained

Research Procedure
Pretest was administered to the two groups (experimental and control groups) for one hour Treatment was given to the experimental groups for three weeks. The experimental groups were taught the separation of mixtures with limestone ore (Kaunwa) while the control groups were taught the same concept using the conventional iron fillings and sulphur for the same period of time. Posttest was administered to the two groups (experimental and control groups) after the treatment for one hour

Method of Data Analysis
The data collected were analyzed using Analysis of Covariance (ANCOVA) using pretest as covariates. All hypotheses were tested at 0 05 level of significance.

RESULTS

Hypothesis One (Ho 1)
There is no significant difference in the performance of students when taught the concepts separation of mixtures using limestone Ore (Kaunwa) as a resources compared to a mixture of iron fillings and sulphur.
The analysis is as shown in Table 1

Table 1: Analysis of Covariance (ANCOVA) of the performance of students taught with limestone ore and those taught with iron fillings and sulphur using pretest scores as covariates

Source of Variation	SS	DF	MS	F	Decision at P<. 05
Pretest	512.79	1	512.79	44.10	*
Main Effect	1220.56	1	1220.56	104.98	*
Explained	1733.34	2	866.67	74.54	*
Residual	1360.36	117	11.63		
Total	3093.70	119	23.00		

* = Significant at P < 0 05 alpha level
Critical F – Value = 3 92

Table 1 shows that the resources material main effect was significant at P < 0 05 The calculated F – Value, 104 98 was greater than the critical F – Value, 3 92, therefore, the null hypothesis which stated that there is no significant difference between the performance of students when taught concept of separation of mixtures using Mfamosing limestone ore as a resources material and those taught with iron fillings and sulphur was rejected However, consequent upon the existence of significant difference in the performance of Chemistry students taught with Mfamosing limestone ore and those taught with iron fillings and sulphur, Multiple Classification Analysis (MCA) was considered to determine the specific contribution of the levels of resource materials to the gain in student's performance in Chemistry.

Table 2: Multiple Classification Analysis (MCA) of the posttest scores of students taught with limestone ore and those taught with iron fillings and sulphur.

Grand Mean = 32.55	N	Unadjusted	Adjusted for Independent variable and Covariates	
Variable + Category		Dev'n	Eta	Dev'n	Beta
Resource Material			0.68		0.63
Limestore Ore	64	3.23		3.01	
Iron fillings and Sulphur	56	-3.69		-3.45	
Multiple R = 0.75					
Multiple R. Squared = 0.56					

Table 2 shows that students taught with Mfamosing limestone ore performed significantly better than those taught with iron fillings and sulphur. Table 2 also indicates a multiple regression index of R = 0.75 with a multiple regression squared of R^2 = 0.56. This implies that 56% of the total variance in the performance of students in Chemistry is attributable to the influence of the resource material used for teaching the concept of separation of mixtures.

Hypothesis two (Ho 2)
There is no significant difference in the performance of male and female students when taught the concept of

separation of mixtures using Mfamosing limestone ore as a resource.
The analysis is as shown on Table 3

Table 3: Analysis of Covariance (ANCOVA) of the performance of male and female students taught with Mfamosing Limestone ore using pretest scores as covariates.

Source of Variation	SS	DF	MS	F	Decision at P<.05
Pretest	**195.04**	**1**	**195.04**	**12.31**	*
Main Effect	**15.65**	**1**	**15.65**	**0.99**	**NS**
Explained	**210.96**	**2**	**105.34**	**6.65**	*
Residual	**966.25**	**61**	**15.84**		
Total	**1176.94**	**63**	**18.68**		

* = Significant at $p < 0.05$ alpha level
NS = Not Significant $p > 0.05$
Critical F – Value = 3.99

Table 3 shows that the gender main effect was not significant at $P < 0.05$. The calculated F– Value, 0.99 was less than the Critical F– Value, 3.99, therefore, the null hypothesis which stated that there is no significant difference in the performance of male and female students when taught the concept of separation of mixtures using Mfamosing limestone ore was retained.

DISCUSSION OF RESULTS

The results of hypothesis one showed that a significant difference was found to exist between the performances of students taught the concept of separation of mixtures using Mfamosing limestone ore as a resource material and those taught with iron fillings and sulphur. The findings as shown in Table 2 indicated that students taught the concept of separation of mixtures using Mfamosing limestone ore performed significant better than those taught with iron fillings and sulphur. The results also showed that 56% of the total variance in the performance of students in Chemistry was attributed to the influence of the resource material used in teaching the concept of separation of mixtures. This might be due to the fact that using total materials from the environment as resource in teaching provide concrete basis for conceptual thinking and thus facilitate better and proper understanding of Chemistry concepts. Also using local materials from the environment as a resource for teaching enhances students' interest and attitude towards the subject due to nature and level of activities in the class. This was consistent with the findings of Alonge (1983), Obi (1992) and Ezeliora (1995) that resource materials from the environment were effective in enhancing achievement and interest in science.

The results of hypothesis two showed that there was no significant difference in the performance of male and female students when taught the concept of separation of mixtures using Mfamosing limestone ore as a resource. The non-significant difference in the academic achievement of male and female students is in line with previous studies carried out by Akinbobola (2004) who concluded in his research on students achievement on the basis of gender, that there is no significant difference between the achievement levels of boys and girls in the learning of selected science concepts. This study is in line with the findings of Onwioduokit (1996) after investigating the effect of gender differences among undergraduate students enrolment and academic performance in science concluded that women's performance in science is not significantly different from that of men. Ezeliora (1995) also stressed that that locally improvised models and resources engender interest and increase achievement in the students than the standard models and materials. The more familiar the students are with the instructional environment of a science class, the more interest they are likely to develop and hence more achievement in the subject.

Implication of the Study

This study has provided useful insight into the use of Mfamosing limestone ore in teaching the concept of separation of mixtures in Senior Secondary Chemistry. Students can benefit from the experiments developed using materials from the immediate environment as a resource. The environment provides a wide range of resources that can be utilized in the teaching and learning of Chemistry,

CONCLUSION

On the basis of the findings in this study, the following conclusions were drawn:

1. There exists significance difference between the performance of students taught with Mfamosong limestone ore as a resource and those taught with iron fillings and sulphur.
2. Mfamosing limestone ore as a resource for teaching the concept of separation of mixtures is more effective in enhancing students' performance in Chemistry than iron fillings and sulphur as a resource.
3. There exists no significant difference between the performance of male and female Chemistry students when taught the concept of separation of mixture using Mfamosing limestone ore as a resource.

RECOMMENDATION

Based on the results of the study the following recommendations were made:

1. Textbook authors should draw examples like, Mfamosing limestone ore in teaching the concept of separation of mixtures from the local environment in presenting materials in their books.
2. Chemistry teachers should explore the use of Mfamosing limestone ore to teach the concept of separation of mixture.
3. Seminars/Workshops should be organized for Chemistry teachers to appraise them with the utilization of local resources in the learning and teaching of Chemistry.

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