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EFFECT OF INSTRUCTIONAL MATERIALS ON STUDENTS' ACADEMIC ACHIEVEMENT IN FISHERY IN SENIOR SECONDARY SCHOOLS

VINCENT CHIDINDU ASOGWA, EDWARD CHUKWUKA ISIWU, AND CAJETHAN UCHE UGWUOKE

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ABSTRACT

This study determined the effects of instructional materials on students' academic achievement in Fishery in senior secondary schools. The study used a quasi-comparative-experimental research design. The study was carried in Enugu State, Nigeria, precisely in Nsukka Education Zone. The population of the study was 5726, which comprised all the SS II students in senior secondary school offering Fishery in Enugu State. The sample size for this study was 161 SS II Fishery students in 4 intact classes drawn from rural and urban senior secondary schools. An instrument titled "Fishery Achievement Test (FAT)" was used for data collection. The instrument was subjected to face and content validation by three experts. The instrument was trial tested on 50 SS II students in co-educational secondary school (intact class). Kuder-Richardson formula (K-R_{21}) was used to determine reliability of the test which gave a coefficient of 0.81. Data collected was analyzed using mean to answer the research questions while Analysis of Covariance (ANCOVA) to test the null hypotheses at .05 level of significance. It was found that instructional materials had an increasing effect on student's achievement in Fishery in secondary schools, instructional materials has more increasing effect on female than male students' achievement in Fishery in secondary schools and instructional materials has more increasing effect on urban than rural senior secondary schools students' achievement in Fishery. It was therefore recommended among others that teachers should always make use of instructional materials in Fishery during classroom instructions to enhance the students' achievement in Fishery.

KEYWORDS: academic achievement, fishery, instructional delivery, teachers, teaching resources

INTRODUCTION

Recently, there was innovation in the Nigerian educational sector which led to the curriculum review of secondary school system. Consequently, Fishery was introduced as a single subject in senior secondary school to ensure adequate supply of fish protein in the country.

According to Nigerian Educational Research and Development Council (NERDC, 2009), the objectives of Fishery in the curriculum of senior secondary schools are: to have Fishery as a trade for livelihood on completion of fish studies; to produce fish that will increase the nutritive value of man's diet; to meet with the gap between the demand for fish and its supply, and to bridge the gap between poverty and hunger.

Vincent Chidindu Asogwa, Department of Agricultural and Home Economics Education, Micheal Okpara University of Agriculture, Umudike, Abia State, Nigeria
Edward Chukwuka Isiwu, Department of Agricultural and Home Economics Education, Micheal Okpara University of Agriculture, Umudike, Abia State, Nigeria
Cajethan Uche Ugwuoke, Department of Agricultural Education, University of Nigeria, Nsukka

The pioneer students of this curriculum graduated in 2014 with very low achievement in the senior secondary school external examinations. Besides, it was observed that about 94% of the graduates lacked the entrepreneurial skills to embark on any Fishery occupations such as fish production, processing, preservation and marketing which was one of the objectives of the curriculum review. The observation was in conformity with the WAEC Chief Examiner's report (2017, 2018 and 2019) that only 48% of secondary school students passed Fishery in Nigeria. Adebule (2009) alerted that there has been much concern expressed about the apparent fall in the standard of education at the secondary school level. The implication is that the intension of the Federal Government to avert the existing gap between the quantity of fish demanded and the quantity supplied to the market, has not been met. It also means that the ugly situation will continue to exist if nothing is done in schools on time to abort it from the bud. This condition demands an urgent attention to investigate the causes of students' poor achievement in Fishery in senior secondary schools, so as to save the future generation from an impending doom of food insecurity in the State and country at large. In any case, the poor academic achievement of students in Fishery could be traced to many factors among which include teacher's strategy, method of teaching and use of instructional materials.

Instructional materials, in submission of Abdullahi (1982), are materials or tools locally made or imported that could make tremendous enhancement of lesson impact if intelligently used. Onyejemezi (1998) described instructional materials as resources or teaching materials which a teacher utilizes in the course of presenting a lesson in order to make the content of the lesson understandable to the learner. Agina-obu, (2005), explained instructional materials as concrete or physical objects which provide sound, visual or both to the sense organs during teaching. Esu, et al. (2004) noted that instructional materials facilitate learning of abstract concepts by helping to concretize ideas and stimulate learners' imagination. Also, their utilizations help to increase active participation in the learning process while saving teacher energy, reducing the verbal instructions. Agbulu and Wever (2011) maintained that instructional materials are relevant in education because they are used for the transference of information from one individual to another, help the teacher in extending his learner's horizon of experience, stimulate learners' interest and help both teachers and students to overcome physical limitations during the presentation of subject matter, among others. Agwu (2001) observed that instructional materials as apparatus of teaching may include textbooks, workbooks, charts, audio visual aids, chemicals, specimens and other relevant tools that will attract student s' attention, and which should only be introduced at the appropriate time by the teacher. The instructional materials required for effective teaching of fish production to students in senior secondary schools include nursery tanks/ponds, demonstration ponds, scoop nets, hatching troughs, aquaria tanks, compounded feeds, charts and pictures, video clips (NERDC, 2009). It is the view of the council that the recommended instructional materials of fish production in the curriculum should have effect on the academic achievement of the students if utilized by the teachers during instructions in the schools.

The concept of instructional materials above indicates that the teaching of Fishery without relevant instructional materials may certainly result in poor achievement among students. Franzer, et al. (1992) cautioned that no matter how well a trained and professionally qualified science teacher could be, he would be unable to put his ideas into practice if the school setting lacks the equipment and materials necessary for him to translate his competence into reality. In the same vein, Omabe (2006) stressed that instructional materials are central in the teaching and learning of subjects because no matter the efficiency of a teacher, effectiveness in lesson delivery cannot be guaranteed without the use of instructional materials. Some of the instructional materials for teaching fishery include: dissolved oxygen meter, pH meter, conducting meter, thermometer, water test kits, microscope, magnifying glass, aquaria tanks, hatching troughs, nursery tanks/ponds, demonstration pond, scoop net, aerators and accessories, plastic sieves, concentrate feeds, grinding machine, charts and pictures, video clips in fishery, pelleting machine, dissecting kits, water pump, sec chi disc, among others (NERDC, 2009). Asogwa, et al. (2013), found that some teachers utilize only 8 out of the several instructional materials recommended by NERDC (2009) for teaching Fishery in senior secondary schools in Nigeria. Some teachers of Fishery in senior secondary schools however, deliver most of their lessons to students without the use of instructional materials not minding that their non-use of instructional materials during classroom

instruction could be one of the factors of students' poor result in Fishery. This suggests that the teachers probably cast doubt if instructional materials actually had any effect on the learning ability of the students in fishery in schools. That is, they were not completely convinced that there might be a difference between the academic achievements of students taught Fishery with and without instructional materials in schools.

It was therefore, imperative to investigate the effect of instructional materials on students' academic achievement in Fishery to encourage teachers on their utilization in classrooms instruction. Hence, the main purpose of the study was to determine the effect of instructional materials on senior secondary school students' academic achievement in fishery.

RESEARCH QUESTIONS

1. What are the effects of instructional materials on senior secondary school students' academic achievement in Fishery?
2. What are the effects of instructional materials on male and female senior secondary school students' academic achievement in Fishery?
3. What are the effects of instructional materials on urban and rural senior secondary school students' academic achievement in Fishery?

Research Hypotheses

1. There is no significant difference in the mean effect of instructional materials on senior secondary school students' academic achievement in Fishery.
2. There is no significant difference in the mean effect of instructional materials on male and female senior secondary school students' academic achievement in Fishery.
3. There is no significant difference in the mean effect of instructional materials on urban and rural senior secondary school students' academic achievement in Fishery.

METHODOLOGY

The study adopted a quasi-comparative-experimental research based on 2 x 2 non-randomized pretest-posttest non-equivalent control, non-factorial design. This research design was used since the students in the study were not randomized into experimental and control groups but left intact and classified into groups in order to avoid disrupting the activities of the classes and the school programmes. The study was carried in Enugu State because it has lots of secondary schools that are offering Fishery in the senior classes. The State is also included in the students' poor academic achievement of 48% in Fishery in Nigeria. The population of the study was 5726, comprised all the SS II students in senior secondary schools offering Fishery in Enugu State. The sample size for this study was 161 SS II Fishery students in 4 intact classes drawn from rural and urban senior secondary schools in Nsukka Educational Zone. A multistage sampling technique was used. Random sampling technique was used to select the Educational Zone from the state. Purposive sampling technique was used to select mixed schools in the entire Zone. Stratified simple random sampling technique was used to choose 2 from rural and 2 from urban secondary schools. Simple random sampling technique was also used to assign control and experimental group to 1 rural and 1 urban secondary school and also in selecting one SS1I class in each of the schools where more than one class existed.

An instrument titled "Fishery Achievement Test (FAT)" was used for data collection. The FAT was developed from secondary school Fishery curriculum by (NERDC). FAT was a teacher-made test structured by the researchers based on the instructional objectives contained in SS1I Fishery Curriculum by the NERDC (2009). The test blueprint guided the selection of items and was anchored on the six levels of cognitive educational objectives of Bloom (1968). The first and second forms of the instrument were used as pre-test (pre-FAT) and post-test (post-FAT) to measure the student's prior knowledge and achievement in Fishery. However, the post-FAT was produced by re-arranging and re-constructing pre-FAT so as to alter its structural view from the pre-FAT but retain the same content. The topics listed to be taught during the study were divided into 4 units. Four lesson notes were planned and written on each unit to guide the research assistants (the class teachers of Fishery) in the experimental and control groups. Both groups used conventional method but the experimental group utilized relevant instructional materials. The difference between the two groups was in the use of instructional materials during class lessons. For consistency and objectivity in scoring the students' FAT items, a marking scheme was developed.

The instrument was face validated by three fishery seasoned experts. Each validate was given part of the Fishery curriculum, objectives of the study and FAT and requested to critically examine and comment on the scope of coverage,

content relevance, ability level being tested by the items, suitability and appropriateness of the items in accomplishing the research objectives. The suggestions and corrections of validates were used to produce the final copy of FAT used for data collection.

The instrument was trial tested on 50 SS II students in co-educational secondary school (intact class) in Obollo Education Zone of the State which have similar characteristics with the area of the study. The trial testing helped to calculate the testing period which was obtained by computing the average time taken by first, tenth and twentieth students to finish the test (Iji, 2002). The average time for the test computed was one hour. Kuder-Richardson formula (K-R_{21}) was used to determine reliability of the test items which gave a coefficient of 0.81 which means that the instrument was reliable for the study.

To conduct the study, the sampled schools were visited and permission was obtained from the principals of the schools to carry out the study. The teachers, who teach Fishery in the sampled schools served as research assistants after one week of educating them on how to use the lesson plan, administer and retrieve the FAT from the students. The research assistants administered the pre-FAT test to all sampled SSII Fishery students in an intact class in the four schools before lesson. The objective of the pre-test was to ascertain the homogeneity of the students' experience and knowledge in Fishery before the experiment. The research assistants then, taught the students an aspect of Fishery using the lesson plan designed for their group for 4 weeks. The study started on Friday, 26th June, 2019 and ended on Friday, 24th July, 2019. After which, the post-FAT was administered on the students to compute their achievement in Fishery. The marking scheme prepared was used to score the tests. Both descriptive and inferential statistics were used to analyze the data collected. Mean was used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at .05 level of significance. The choice of ANCOVA was to help in equating the initial differences that might exist among the non-randomized groups, using pre-test as covariate with the post-test. In testing of hypotheses, the hypothesis of no significant difference was rejected where the p-value was less than the alpha value of .05 while it was not rejected where the p-value was equal to or greater than the alpha value of .05.

RESULTS

The results for the study were obtained from the research questions answered and hypotheses tested through data collected and analyzed.

Research Question 1

What are the effects of instructional materials on senior secondary school students' achievement in Fishery?

Data in Table 1 showed that the students taught Fishery with instructional materials had a mean gain of 25.53 while those taught without instructional materials had a mean gain of 19.04. The mean difference between the two groups is 6.49. This indicated that instructional materials have an increasing effect of 6.49 on student's achievement in Fishery in secondary schools.

Research Question 2

What are the effects of instructional materials on senior secondary school male and female students' achievement in Fishery?

Data in Table 2 showed that the male and female students taught Fishery with instructional materials had achievement mean gain of 24.99 and 27.29 respectively. This indicated that instructional materials has more increasing effect of 2.30 on female than male students' achievement in Fishery in secondary schools.

Research Question 3

What are the effects of instructional materials on urban and rural senior secondary school students' achievement in Fishery?

Data in Table 3 showed that the students in urban and rural area taught Fishery with instructional materials had achievement mean gain of 25.95 and 24.94 respectively. This indicated that instructional materials has more increasing effect of 1.01 on urban than rural students' achievement in Fishery in secondary schools.

Hypothesis 1

There is no significant difference in the effect of instructional materials on senior secondary school students' achievement in Fishery.

Data in Table 4 (Page 14) shows a p-value of 0.009 which is less than the alpha value of 0.05. This indicates that there was a statistically significant difference ($p<0.05$) in the effect of instructional materials on the academic achievement of students taught with and without instructional materials. Therefore, the hypothesis of no significant difference in the effect of instructional materials on senior secondary

school students' achievement in Fishery was not accepted.

Hypothesis 2

There is no significant difference in the effects of instructional materials on male and female senior secondary school students' achievement in Fishery.

Data in Table 5 shows a p-value of 0.50 which is greater than the alpha value of 0.05. This indicates that there was no statistically significant difference in the effect of instructional materials on male and female senior secondary school students' achievement in Fishery. Therefore, the hypothesis of no significant difference in the effect of instructional materials on male and female senior secondary school students' achievement in Fishery was accepted.

Hypothesis 3

There is no significant difference in the effect of instructional materials on urban and rural senior secondary school students' achievement in Fishery?

Data in Table 6 shows a p-value of 0.008 which is less than the alpha value of 0.05. This indicates that there was a statistically significant difference in the effect of instructional materials on urban and rural senior secondary school students' achievement in Fishery. Therefore, the hypothesis of no significant difference in the effect of instructional materials on urban and rural senior secondary school students' achievement in Fishery not accepted.

DISCUSSION

The result of the study revealed that instructional materials have an increasing effect on student's achievement in Fishery in secondary schools. Besides, there was a statistically significant difference ($p<0.05$) in the effect of instructional materials on the academic achievement of students taught with and without instructional materials. The difference might be as a result of the adequate involvement of the sense organs when instructional materials are used in classroom instruction. The result was in line with report of Fakomogbon (2012) that the use of improvised instructional materials makes students to achieve better in their studies. Igu, et al. (2016) also found that students taught with instructional materials performed better than those taught without instructional materials in social studies in lower Basic Education in Nigeria. Besides, Adebule and Ayoola (2016) empirically certified that instructional material enhanced student's achievement in Mathematics. They affirmed that there was a remarkable difference between the performances of students taught with instructional materials and the performance of students taught without the use of instructional materials. In a study conducted by Aburime et al. (2016), it was found that there was a statistically significant difference in the mean scores of History students taught with adequate material resources and those taught with inadequate material resources.

It was equally found that instructional materials has more increasing effect on female than male students' achievement in Fishery in secondary schools. However, there was no statistically significant difference ($p>0.05$) in the effect of instructional materials on male and female senior secondary school students' achievement in Fishery. This result is in consonance with the Adebule and Ayoola (2016)**,** who found that both male and female students achieved equally under the same condition during teaching and learning process, since achievement has to do with mental and intellectual ability and not gender. They affirmed that there was no significant effect of gender on students' achievement in Mathematics. Igu, et al. (2014) found that there is no significant difference in the mean achievement of male and female students when taught with instructional materials and when taught without instructional materials in lower Basic Education in Nigeria.

The result of the study further indicated that instructional materials had more increasing effect on urban than rural senior secondary schools students' achievement in Fishery. Meanwhile, there was a statistically significant difference ($p<0.05$) in the effect of instructional materials on urban and rural senior secondary school students' achievement in Fishery. On the contrary, Fan and Chen (1999) found that students from rural schools were found to have performed better than those from metropolitan areas. The authors certified that that there was statistically significant differences among the rural/suburban/urban students when four outcome variables were considered jointly, where the multivariate effect size measures were all extremely small. In the same vein, the result of Fan (2000), showed that students from rural schools performed as well as, if not better than, their peers in metropolitan schools in mathematics, science, reading and social studies. On the other hand, Deidra (2006) found that the location of the school had a significant

effect upon student achievement, with students attending rural schools not performing as well as students from urban schools. In the same vein, Ugwuoke et al. (2018) found that no statistically significant difference ($p<0.05$) existed in the mean academic performance of agricultural science students in secondary schools based on location. In any case, the findings of the authors cited above helped to add credence to the result of this study.

CONCLUSION

The utilization of instructional materials is imperative to students' academic achievement in fishery. The use of instructional materials stimulates the senses of students and arouse their interest. However, instructional materials have no effects on students' performance based on gender but, students in urban schools perform better than the rural counterparts. When the applications of instructional materials are emphasized in schools, students will perform better.

RECOMMENDATIONS

Based on the finding from this study, the following were recommended:

1. Teachers should always make use of instructional materials in Fishery during instructions in the classrooms to enhance the students' achievement in Fishery in schools.
2. Teachers also should improvise some instructional materials where the standard ones are not available. The teacher should involve the students in the provision of local instructional materials that could be used as substitutes.
3. The school authority should provide instructional materials as recommended by the NERDC in the Fishery curriculum for senior secondary schools.
4. The principals, proprietors and officials of the Ministry of Education should maintain regular supervision to encourage effective utilization of instructional materials and resources in the teaching of Fishery in senior secondary schools.
5. Faculty of Education in Universities or Colleges of Education should place more emphasis on the use of instructional materials during teacher preparation and in-service training to equip teachers with skills and zeal for effective use of instructional materials during classroom instructions.

Table 1: Effect of Instructional Materials on Senior Secondary School Students' Achievement in Fishery

Group	N	Pre-test Mean	SD	Post-test Mean	SD	Mean Gain
With IM	77	32.76	12.91	58.29	15.97	25.53
Without IM	84	31.32	12.09	50.36	14.93	19.04
Effect						**6.49**

IM = Instructional Materials, N = Number of Students, SD = Standard Deviation

Table 2: Effect of Instructional Materials on Senior Secondary School Male and Female Students' Achievement in Fishery

Group	N	Pre-test Mean	SD	Post-test Mean	SD	Mean Gain
Male with IM	40	33.30	15.97	58.29	16.76	24.99
Female with IM	37	30.36	14.93	57.65	14.75	27.29
Difference						**2.30**

IM = Instructional Materials, N = Number of Students, SD = Standard Deviation

Table 3: Effect of Instructional Materials on Urban and Rural Senior Secondary School Students' Achievement in Fishery

Group	Number of students	Pre-test		Post-test		
		Mean	SD	Mean	SD	Mean Gain
Urban with IM	46	33.11	13.25	59.06	16.01	25.95
Rural with IM	31	32.26	12.47	57.20	15.92	24.94
Difference						**1.01**

N = Number of Students, SD = Standard Deviation

Table 4: ANCOVA Analysis of the Effects of Instructional Materials on Male and Female Senior Secondary School Students' Achievement in Fishery

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2963.143[a]	2	148.157	0.442	0.515
Intercept	16991.392	1	16991.392	50.726	0.000
Pretest	32.886	1	32.886	0.0982	0.637
Gender	142.424	2	71.212	0.212	0.502
Error	25122.577	75	334.967		
Total	217360.000	77			
Corrected Total	28085.720	76			

Table 4: ANCOVA Analysis of the Effect of Instructional Materials on Senior Secondary School Students' Achievement in Fishery

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	57.717[a]	2	28.858	0.128	0.880
Intercept	66775.987	1	66775.987	296.873	0.000
Pretest	52.923	1	52.923	0.235	0.628
Group	2.959	1	2.959	0.013	0.009
Error	42736.895	159	224.931		
Total	532320.000	161			
Corrected Total	42794.611	160			

Table 6: ANCOVA Analysis of the Effects of Instructional Materials on Urban and Rural Senior Secondary School Students' Achievement in Fishery

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	262.097[a]	2	131.049	0.418	0.699
Intercept	8382.795	1	8382.795	26.760	0.000
Pretest	808.781	1	808.781	2.582	0.120
Location	203.145	1	203.145	0.648	0.008
Error	23494.698	75	313.262		
Total	297568.000	77			
Corrected Total	28750.796	76			

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