Effects of Senior School Students' Use of Demo Kit on their Achievement in Biology in Omu-Aran, Nigeria

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Abstract

This study investigated the effects of senior secondary school students' use of demo kits on their achievement in biology in Omu-Aran, Nigeria. The study utilized a quasi-experimental design and followed the non-randomized, non-equivalent pre-test and post-test control group of 2x2x3 factorial matrix. Data was obtained from four intact classes in four purposively selected secondary schools in Omu-Aran, Kwara State, Nigeria. The research instruments - Biology Achievement Test (BAT) and demo kits were subjected to item analysis and validated by three science education experts from a university. The reliability of the BAT was determined using test re-test method while Cronbach alpha was used to analyze the resulting data. Descriptive statistics, standard deviation and mean gain scores were used to answer the three research questions while Analysis of Covariance (ANCOVA) was used to test the corresponding null hypotheses. Findings from the study revealed that there was a significant difference in the achievement of students who learned biology using demo kit and those who learned it without using demo kit since $F_{(1, 170)}$= 112.48, p = .000; there was, however, no significant difference in the achievement of male and female students because $F_{(1, 94)}$= 2.134, p = .147; significant difference was observed in the achievement of students in the various score levels in favour of the high scorers. Based on the findings, it was recommended, among others, that biology teachers consider exposing their students to the use of demo kits to enhance meaningful learning and retention of information by the students.

Key words: Study Technology; Mass; Demo kit; Senior School Students; Barrier; checkout

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Introduction

Science occupies a strategic place in the technological advancement of any nation and so its role in the development and growth of any nation cannot be overemphasized. In Nigeria, science is taught in senior secondary schools as biology, chemistry, and physics, which also constitute the main branches of pure science (Ababio, 2013). Biology, one of the science subjects taught in Nigerian secondary schools, is meant to acquaint learners with adequate laboratory and field skills, and then equip them with the ability to apply scientific knowledge to their everyday life through its functional contents, methods and processes (Federal Ministry of Education, 2009). Abimbola and Omosewo (2006) noted that biology had been integrated into a number of fields of specialization which include biochemistry, bioengineering, biotechnology, biomedicine, cell biology, microbiology, agricultural biology and molecular biology. Despite the importance of biological knowledge to humankind and the efforts of researchers to improve its teaching and learning, the achievement of students in the subject had consistently remained low (Effiong & Odey, 2013; Gambari, Yaki, Gana & Ughovwa, 2014; Ibe, 2015).

Studies carried out by different science educators such as (Abdulkadri, 2011; Abimbola, 2013; Ali, Toriman & Gasim, 2014; Cetin, Ertepinar & Geban, 2015; Chukwu, 2011; Olorundare, 2011; Osuafor & Okigbo, 2013) have revealed that students performed poorly in biology. Besides, the results of students in biology, chemistry, and physics in the West African Senior School Certificate Examinations (WASSCE) for five consecutive years, 2010-2014 as shown in Table 1 also corroborate the poor performances of students in the sciences, especially biology.

Table 1: *Students' performance in May/June West African Senior School Certificate Examinations in biology, chemistry and physics in Nigeria 2010 – 2014.*

Year	Biology Total Sat	Credit pass	% Pass at credit level	Chemistry Total Sat	Credit pass	% Pass at credit level	Physics Total Sat	Credit pass	% Pass at credit level
2010	1,300,418	427,644	33.90	465,643	236,059	50.70	463,755	237,756	51.30
2011	1,505,199	579,432	38.50	565,692	280,250	49.54	563,161	360,096	63.94
2012	1,646,150	587,044	35.66	627,302	270,570	43.13	624,658	429,415	68.74
2013	1,648,363	852,717	51.73	639,296	462,517	72.34	637,023	297,988	46.77
2014	1,365,384	766,971	56.17	636,268	397,649	62.49	635,729	386,270	60.76

Source: *Olorundare, A. S. (2014). Theory into practice: Beyond surface curriculum in science education and West African Examinations Council Lagos, Nigeria*

Ibe (2015) attributed students' poor performance in biology to teachers' insensitivity to the nature of biology when planning instructional activities. Ityokyaa and Adejoh (2014) also observed that biology program was not well implemented in Nigerian senior secondary schools. Nwagbo (2001) and Obiekwe (2008) linked students' underachievement to teachers' teaching method, while Gbigbadua, Abimbola, and Ahmed (2014) and Cetin, Ertepinar, and Geban (2015) identified students' misconceptions as a factor hindering high achievement level in biology. Ndioho (2007) submitted that the reoccurring poor performance recorded in biology is due to students' inability to understand some abstract concepts in the subject. Chew (2004) also observed that biology can be difficult particularly when describing things that cannot be seen or abstract concepts that cannot be fully comprehended for the first time. Applied Scholastics International also identified three major barriers to learners' study, namely: (a) Absence or lack of mass ("mass" is the actual physical object of the subject matter under treatment in a teaching-learning situation), (b) Too Steep (skipped) a gradient (a gradient is a systematic way of doing something, level by level or step by step), and (c) The misunderstood word (these are words which are not understood at all, or words that are wrongly understood) (Applied Scholastics International, n.d.).

Applied Scholastics International (whose educational methods is called study technology)has over the past forty years trained nearly 140,000 educators and helped more than 39 million individuals with study technology (Shannon, 2013). Study technology is a unique program enabling a student to overcome the basic barriers to studying and learning any subject, as it provides the materials and rules to study and learn efficiently, so that learners can apply what they have learned in school, and not just repeat it back to pass an examination (Association for Better Living and Education International, n.d.). In study technology, it is important to have an example physically present when introducing a new concept to "get its mass"(Study Tech-Essay Part 1, n.d.). Abimbola (2015) submitted that “Mass” is the actual physical object of the subject matter under treatment in a teaching-learning situation which gives the students a mental picture of what they are learning. This implies that instructors are expected to provide students with the real physical specimens or use objects to illustrate the topic under treatment.

This also tallies with the submission of Harley and Kieffer (2009) that abstractions must be illustrated physically before they can be fully understood. In order to supply mass, real specimens or photographs of the objects being studied are provided or demonstrations are done. One way of accomplishing this is with a demo kit. Abimbola (2015) defined demonstration as the act of showing something, or describing and explaining how something works. A "demo kit," as it is shown in Figure 1, is a collection of odds and ends, such as rubber bands, paperclips, corks, pen tops, thumbtacks, erasers, etc. A student is supposed to "demo" a concept by choosing several objects, assigning them significance and verbalizing or physically demonstrating the relationships between them (Touretzky, 2003).

***Figure* 1:** Researchers design demo kit and its contents

Demonstrations are usually done in study technology to show principle, idea, or datum by using small objects to represent it and to remove the incidence of the lack of mass (Hubbard, 2007). It is usually done on a table. The most common methods used for making demonstrations to supply mass in study technology is to provide the learner with the actual object being studied. It is only when this is not possible that the instructor provides the following as alternatives: pictures, movies, demonstrations, demo kits, clay demos, and sketching (Abimbola, 2015). Chapman (n.d.) noted that the use of demo kits in study technology provides a way to use manipulatives to check understanding by having the student manipulate paper clips, objects, etc; as symbolic representations of concepts. By show-and-tell the student makes a demonstration which helps to make the ideas and data more real. If a student ran into something he could not quite figure out, demonstrating the idea with a demo kit would assist him to understand it. Demo kit demonstrations are used when a student needs to visualize and add mass to what he is studying as the objects can be moved about in relation to each other to show the mechanics and actions of a given concept which can help to enhance students learning skills.

The study skill of learners is an important recipe in determining their overall achievement in any subject. In their own submission, Ewumi, Viatonu and Olagunju (2013) affirmed that study skills are fundamental to academic competence, and that effective studying is one of the elements that can help produce a self-regulated learner and guarantee good grades in schools. Thus, there is need to liberate students from reliance upon teachers so that they (the students) can sustain independent learning throughout their lives (Kyhl, 2003). Meanwhile, this study agrees with the submission of Abimbola (2013) that the educational system in Nigeria does not encourage learners to be self-regulated because they are always being taught by either teachers in schools or coaching classes, or parent and siblings at home, without knowing how to study by themselves. Therefore, this study sought a way of helping learners to be self-regulated by focusing on the first barrier to learner's study (the absence or lack of mass) and how to overcome it using the demo kit. Specifically, the study investigated the effects of senior school students' use of demo kits on their achievement in biology in Omu-Aran, Nigeria.

Theoretical Framework

The use of demo kit to supply mass (mass, in this context is not the same as it is used in science) coincides with cognitive constructivist theory of learning but the fact that the advocators of study technology were not hardcore educationists makes their works not to be popular in educational literature despite the age of the idea. Mass is the idea that concepts must be physically represented before they can be fully understood. According to cognitive constructivism, knowledge is actively constructed by learners rather than passively absorbed (Piaget, 1968; Ertmer & Newby, 1993). Knowledge is being defined as the ability to modify, transform and "operate on" an object or idea, such that it is understood by the operator through the process of transformation (Piaget, 1964). In line with constructivist theory, the use of demo kit focuses on how learners interact with information and construct their own individual meanings from it to form knowledge using concrete but odds and ends manipulatives or alternatives as a symbolic representation of knowledge with the teacher acting as a facilitator of learning. The use of demo kit in overcoming the barrier created by lack of mass dates back to the works of Hubbard (1972) who came up with the principle of learning how to learn. Hubbard, then, was interested in how students can overcome the three basic barriers to study that is, the lack of mass, too steep/skipped a gradient and the misunderstood words. The present study focuses on the first barrier to study (lack of mass) and how to overcome it using the demo kit.

Generally, demo kit in the way study technology uses it, is composed of different objects (bottle caps, pen covers, rubber bands, paper clips, used phone recharge cards, etc) which are collected together and used to carry out demonstrations (Abimbola, 2015). The demo kit being referred to here can be used to teach or learn any material unlike the content-specific demo kits which are used for specific content areas. In study technology, the use of demo kit requires students to pick objects from the kit and assign them significance as symbolic representations of concepts. The objects selected from the demo kit can also be moved about in relation to each other to show the mechanics and actions involved in a given concept. Education, in accordance with this instructional philosophy is not to impart knowledge, but instead to facilitate a child's thinking and problem solving skills which then can be transferred to a range of situations (Bruner, 1961). Chen

(2003) conclude that learning occurs only when learners are actively involved in the construction and reorganization of concepts. Lowenthal and Muth (2008) also submitted that knowledge does not exist in a book but rather produced by the reader in the process of reading which conforms with the use of demo kit to supply mass for intangible or abstract concepts.

Purpose of the Study

The main purpose of this study was to find out the effects of students' use of demo kits on their achievement in biology. Specifically, the study investigated:

1. The difference in the achievement of senior school students' who learned biology through the use of demo kits and those who learned it without the use of demo kits.
2. If there existed any difference in the achievement of male and female students who learned biology through the use of demo kits (that is, to find out if the use of demo kits is gender sensitive).
3. Influence of score levels (students' different academic ability levels) on the achievement of students in biology when they learned through the use of demo kits.

Research Questions

In this study, answers were provided to the following questions;

1. What difference exist in the achievement of senior school students' who learned biology through the use of demo kits and those who learned it without the use of demo kits?
2. Is there any difference in the achievement of male and female senior school three students when they learned biology through the use of demo kits?
3. Do the achievement of students who learned biology through the use of demo kits vary with their score levels?

Research Hypotheses

The following null hypotheses were formulated and tested at (0.05 alpha level) in this research work.

HO_1: There is no significant difference in the achievement of senior school students who learned biology using demo kits and those who learned it without the use of demo kits.

HO_2: There is no significant difference in the achievement of male and female senior school three students when they learned biology using demo kits.

HO_3: There is no significant difference in the achievement of students with high, medium and low score levels when they learned biology using demo kits.

Methodology

The target population for this study consisted of all the secondary school biology students in senior school III (SS 3) in Omu-Aran, Kwara State, Nigeria. The study is a quasi-experimental research. Therefore the pre-test and post-test, comparison group design of the 2x2x3 factorial matrix involving the use of two groups (experimental and control) was considered appropriate for the study. The experimental group consisted of a class of 97 students while the comparison group consisted of a class of 76 students. The experimental group was exposed to the use of demo kit by the researchers while the subject teachers (biology teachers) in each of the experimental schools serve as research assistant because they had earlier being exposed to the use of demo kit by the researchers. The control group, on the other hand, was taught by practicing biology teachers who were at liberty to use their usual instructional strategies. Intact classes consisting of senior secondary III (SS 3) biology students from four purposively selected co-educational senior secondary schools out of the eight public secondary schools in Omu-Aran, Kwara State, Nigeria were involved in the study. In all the schools used for the study, the allocation of students into the SS 3 classes were not gender sensitive in that most of the schools do not put the issue of gender into consideration while allocating students into classes and why the schools used for the study had more female students than males.

Biology Achievement Test (BAT) consisting of forty-nine multiple choice test items which was designed by the researchers and adapted from past WASSCE biology questions, as well as demo kit constituted the instruments used for the study. To ensure equal distribution of the test items over the content to be treated, a table of specification was prepared using Bloom's Taxonomy of educational objectives. Item analysis was carried out to ensure that the BAT was appropriate and effectively differentiates between students who do well in the overall test and those who do not. The research instruments were also validated by three science education experts in a university and two experienced senior secondary school biology teachers. The reliability of the achievement test was determined by administering the BAT items on all the biology students in SS III class in another school that did not participated in the study using the test-retest method, with an interval of three weeks between the first and the second test in order to eliminate the effect of remembering. A reliability index of 0.72 was obtained using Cronbach's alpha reliability coefficient.

The consent of the biology teachers, parents, and students in the schools (experimental and control) that participated in the study was sought before the administration of any treatment or instrument. The pre-test was administered to determine students' level of understanding of the selected topics and to categorize them as high, medium and low scorers. Those who scored 70% and above were categorized as high scorers; those who scored 41-69% were categorized as medium scorers and those who scored 40% or less were categorized as low scorers. At the commencement of treatment administration, study technology principles were explained to the experimental group to remove grey areas in their implementation and application. Students were also directed to interact with their twins (that is, the study partners) in their use of the demo kit to conceptualize each of the biology concepts through discussion between each other and any need for further clarification was directed to the researchers who serve as facilitators of learning in the classroom. The role of the facilitators (researchers) was to aid students' learning and ensure that the students come to conclusions on their own without being told.

Furthermore, each of the student participants (in experimental group) was given a demo kits and directed by the researchers to use the items in the kit to conceptualize each of the biology concepts already learned. The twin of each student did the first checkout (to verify the knowledge of the twin and tests his/her full understanding of the studied concepts) before the researchers do the star-rate checkout (to check and confirm the full understanding of the studied concepts and the ability to apply what is learned). During the checkout, the twin, researcher or teacher tried to figure out what the student had demonstrated. If the researcher or teacher can figure out the meaning of a particular concept from the demonstrations, then the student was asked to move to the next concept. After a period of three weeks of exposure to treatment, students in the control and experimental schools were post-tested to determine their achievement level. The results obtained from the BAT was used to answer the three research questions raised by using descriptive statistics, standard deviation and mean gain scores while Analysis of Covariance (ANCOVA) was used to test the three null hypotheses formulated in this study at 0.05 level of significance with the pre-test used as covariate.

Data Analysis and Results

The results are presented according to the research questions and hypotheses.

Research Question 1

What difference exists in the achievement of senior school students' who learned biology through the use of demo kit and those who learned it without the use of demo kit?

The descriptive statistics of students' achievement in BAT as shown in Table 2 reveals that a mean scores of (20.74 and 16.57) were obtained for the experimental and control groups respectively. The mean score of the experimental group was higher than that of the control group with a mean score difference of 4.17 in favor of the students exposed to the use of demo kit (experimental group).

Table 2: *Descriptive statistics of students' BAT posttest scores in term of group*

Group	N	Mean	Mean difference	Maximum Range	Std. Deviation
Control	76	16.57	4.17	29.00	5.049
Experimental	97	20.74		42.00	7.362

Hypothesis 1

There is no significant difference in the achievement of senior school students who learned biology using demo kits and those who learned it without the use of demo kits.

The ANCOVA output in Table 3 reveals that the calculated F-value is 112.481 with 1 and 170 degrees of freedom computed at alpha level of significance 0.05. Since the calculated significance 0.000 is less than the alpha level of significance 0.05 ($p<0.05$), Hypothesis 1 is hereby rejected.

Table 3: *ANCOVA showing difference in the achievement of senior school students who learned biology using demo kit and those who learned it without the use of demo kit*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	5735.524[a]	2	2867.762	229.638	.000	
Intercept	4908.481	1	4908.481	393.049	.000	
Pretest	4992.232	1	4992.232	399.756	.000	
Groups	1404.681	1	1404.681	112.481	.000	S
Error	2122.996	170	12.488			
Total	69705.000	173				
Corrected Total	7858.520	172				

a. R Squared = .730 (Adjusted R Squared = .727)

Research Question 2

Is there any difference in the achievement of male and female senior school three students when they learned biology through the use of demo kits?

Table 4 shows that there existed an observed effect of senior secondary school students' use of demo kit on their achievement in biology and this was similar for male and female students. Specifically, the achievement of male (18.55) and female (18.64) students followed the same pattern with respect to their average mean gain scores.

Table 4: *Descriptive statistics of students' BAT posttest scores in term of gender*

Gender	Group	N	Mean	Average Mean Score	Std. Deviation
Male	Control	37	16.95	18.55	5.467
	Experimental	34	20.15		6.248
Female	Control	39	16.21	18.64	4.663
	Experimental	63	21.06		7.927
Total	Control	76	16.57	18.66	5.049
	Experimental	97	20.74		7.362

Hypothesis 2

There is no significant difference in the achievement of male and female senior school three students when they learned biology using demo kits.

The ANCOVA analysis of the set of data obtained for the experimental group in the pretest and posttest as shown in Table 5 reveals that the significance probability (0.147) obtained for F-value 2.134 is more than the alpha level of significance 0.05 ($p>0.05$). Therefore, Hypothesis 2 is hereby not rejected.

Table 5: *ANCOVA showing difference in the achievement of male and female students who learned biology using demo kit*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	3599.440[a]	2	1799.720	105.528	.000	
Intercept	5604.366	1	5604.366	328.616	.000	
Pretest	3580.894	1	3580.894	209.969	.000	
Gender	36.389	1	36.389	2.134	.147	NS
Error	1603.117	94	17.054			
Total	46936.000	97				
Corrected Total	5202.557	96				

a. R Squared = .692 (Adjusted R Squared = .685)

Research Question 3

Do the achievement of students who learned biology through the use of demo kit vary with their scoring levels?

On the variable of score levels (the score levels was determined using students pre-test scores), Table 6 revealed that the high scorers benefited most in both the experimental and control groups having obtained mean scores of (35.00 and 24.50) followed by the medium scorers with mean scores of (22.25 and 17.28) and the low scorers in the experimental group benefitted least from the use of demo kit with a mean score of (16.14) which was far better than those of the control group with a mean score of (11.78).

Table 6: *Descriptive statistics of students' BAT posttest scores in term of scoring levels*

Scoring Levels	Group	N	Mean	Mean Difference	Std. Deviation
Low	Experimental	49	16.14	4.36	3.61
	Control	23	11.78		2.27
	Total	72	13.96		2.94
Medium	Experimental	36	22.25	4.97	4.36
	Control	43	17.28		3.62
	Total	79	19.77		3.99
High	Experimental	12	35.00	10.50	5.67
	Control	10	24.50		2.59
	Total	22	29.75		4.13

Hypothesis 3

There is no significant difference in the achievement of students with high, medium and low score levels when they learned biology using demo kits.

Table 7 indicates that the calculated F-value (5.822) with 2 and 93 degrees of freedom gave a calculated significance of (0.004) which is less than alpha level of significance 0.05 ($p<0.05$), Hypothesis 3 is hereby rejected which means that there is a significant difference in the achievement of students with high, medium and low scoring levels when they learned biology using the demo kits.

Table 7: *ANCOVA showing difference in the achievement of students with high, medium and low scoring levels when they learned biology using demo kit*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Decision
Corrected Model	3745.494[a]	3	1248.498	79.688	.000	
Intercept	1160.228	1	1160.228	74.054	.000	
Pretest	187.687	1	187.687	11.980	.001	
Scoring levels	182.443	2	91.221	5.822	.004	S
Error	1457.063	93	15.667			
Total	46936.000	97				
Corrected Total	5202.557	96				

a. R Squared = .720 (Adjusted R Squared = .711)

Summary of Major Findings

1. The experimental group exposed to the use of demo kit had a higher score than those in the control group taught by regular biology teachers who did not have knowledge of the treatment given to the experimental group;

2. The mean gain score of female students was not significantly higher than that of the male students when they learned with the aid of demo kit;
3. High scorers benefitted most, followed by medium scorers and the low scorers benefitted least when they learned using the demo kit;

Discussion

The present study investigated the effects of senior school three (SS 3) students' use of demo kit on their achievement in biology in Omu-Aran, Nigeria. The findings of this study revealed that students who learned with the aid of demo kit as a learning strategy had a better achievement than those that learned using the regular strategies or methods employed by other biology teachers. Hence, students' use of demo kit enhanced their achievement in biology as it was observed that the experimental group had a higher mean score in the posttest administered than the control group.

This finding could be attributed to the keen interest of the students in the use of demo kit having being exposed to the various barriers to study as embedded in study technology principles, the use of dictionaries for word clearing and the active roles played by the learners of having to concretize the abstract aspects of the topic by themselves which helped to sustain students concentration. This finding shows that students are able to construct their own knowledge of concepts even without instructions. The finding is in line with Khyl (2003) who posited that the teaching strategies of study technology first equip students with the knowledge of the barriers to learning and the specific physical and mental reactions each barrier can cause. It also tallies with the submission of Harley and Kieffer (2009) that absence of mass is the idea that abstractions must be illustrated physically before they can be fully understood. One of the students in the experimental group, for instance, demonstrated the definition of heredity (that is the transmission of characteristics from parents to their offspring) as follows:

Materials selected from the demo kit: thumb tack, big and small crown corks of the same color.

Demonstration activity: ***Thumb tack*** was used to represent the characteristics

Big crown cork was used depict the parent

Small crown cork was used to depict the offspring

Stage 1

Figure 2 explains the first stage of the meaning of heredity where by the character (thumb tack) was placed on the parent (big crown cork)

***Figure* 2:** Illustration of the meaning of heredity showing the character on the parent

Stage 2

Figure 3 shows how the character (thumb tack) was moved from the parent to the offspring (small crown cork). *This illustrates the meaning of the term heredity.*

***Figure* 3:** Illustration of the meaning of heredity showing the character on the offspring

The second finding from this study reveals that there is no significant difference in the achievement of male and female students when they learned biology using demo kit. This finding may be attributed to the fact that both male and female students in the experimental group were exposed to the use of demo kit at the same time. Also, the students had a twin (study partner) to work with and as such each of the students was paired up with a twin. Thus, the students were able to work together in groups and this, probably, facilitated the sharing of ideas among the students which translated into a better achievement of the experimental group. This finding agrees with the findings of Sakiyo and Waziri (2015) who reported a no gender difference in the achievement of secondary school students' in biology concepts. It also corroborates the findings of Umoke and Nwafor (2014) who observed no difference in the mean achievement scores of male and female students taught biology using the simulated instructional approach.

The third finding reveals that students’ use of demo kit had greater effect on all the score levels, even the control group showed substantial growth, but the high scorers in both groups benefitted most followed by the medium and low scorers as indicated in their mean gain scores. This finding could be attributed to the high cognitive demand placed on the students of having to carefully pick and assign significance on the odds and ends materials in the demo kit, which was used by each student to physically demonstrate each of the biology concepts. This third finding may also be due to the time frame of exposure of students to the treatment and the finding seems to suggest that the use of demo kit may require high cognitive ability for it to be properly understood. This finding corroborates the works of Olaniyan, Omosewo and Nwakwo (2015) who observed a significant difference in favor of the high scorers in their study of the effect of Polya problem-solving model on senior secondary school students' performance in current electricity. However, this finding is not in line with Gbigbadua, Abimbola and Ahmed(2014) who observed that the effects of pre-instructional word-clearing strategy was high for students classified as low and medium scorers than the high scorers in their biology achievement.

Conclusions

It can be concluded from this study that students achieved better when they learned biology using the demo kits than when taught using the strategies of the regular biology teachers. Gender did not also influence students’ achievement in biology when they learned using the demo kits. So also, the effects of students’ use of demo kits is not similar for students across the various score levels as all the students in the experimental group had a higher achievement than their counterparts in the control group with the high scorers benefitting most from the use of demo kits as a learning strategy. The use of demo kits tends to benefit higher achievers the most.

Recommendations

Based on the findings, the following recommendations were advanced:

(1) Biology teachers need to pay attention to students’ physical reactions in the classroom to know if there is any barrier to learning they have encountered in their study and as such use simplified strategies such as the use of demo kits to enhance their understanding and thus improve their achievement.

(2) Male and female students should be given equal consideration as far as the use of demo kits is concerned. Also, the use of twinning strategy where students are paired up should be encouraged in a typical biology classroom as this can facilitate the sharing of ideas among students' and translate into a better achievement.

(3) The use of demo kits should be encouraged among students of different score levels as it can improve their overall achievement. It may also be useful to pair students for instruction across the different score levels. This means that students' score or ability levels need to be known ahead of instruction. In addition, demonstration activities that will stimulate students’ critical thinking and problem solving abilities especially, one that involves the use of study technology demo kits in the conceptualization or concretization of concepts and processes related topics should be included in the senior secondary school biology curriculum.

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