

## **Effects of Digital-Game and YouTube Instructional Strategies on Achievement and Interest of Chemistry Secondary School Students' in Bida Local Government**

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### **Abstract**

*This study investigated the Effect of Digital Game and YouTube Instructional strategies on Achievement and interest of chemistry secondary school students' in Bida local government area of Niger State, two research questions were answered. The research design adopted for this research is pretest posttest control (equivalent, randomization control, experimental research design). A total number of one hundred and fifty student (150)(81 males and 69 females)for the study were purposively selected for this study from three (3)co-educational schools out of twenty three (23)schools in Bida local government were randomly assign to control and experimental groups. Chemistry achievement test and chemistry interest inventory was adapted and validated by expert in the field of chemistry and educational technology with the reliability index of 0.861 and 0.947 respectively. The chemistry achievement test was administered to students in the pretest, posttest upon treatment of test instrument and interest inventory was administered immediately; the data obtain from pretest and posttest were statistically analyzed using mean, standard deviation and analysis of variance (ANOVA) using statistical package for social sciences (SPSS) version 20.0. The result indicates that student in youtube have interest in chemistry than student in digital gamewith  $p$  value  $0.464 > 0.05$  and male students have more interest than the female student in chemistry with  $p$  value of  $0.352 > 0.05$ . It concluded digital game and YouTube instructional strategies should be employ to teach senior secondary school student in Niger State and beyond, it is recommended that prospective teachers should be expose to digital game and YouTube form of instructional strategy in the course of their training in universities and college and curriculum planners and relevant government agencies should incorporate this approach into secondary school curriculum and thus implemented*

### **Introduction**

Technology is a body of knowledge devoted to creating tools, processing actions and the extracting of materials. The term Technology is wide, and haseveryone way of understanding its meaning. We use technology to accomplish various tasks in our daily lives. In brief; we can describe technology as products and processes used to simplify our daily lives. We use technology to extend our abilities, making people the most crucial part of any technological system. Technology also means an application of science to problemsolving. But it is vital to know that technology and science are different subjects which work hand-in-hand to accomplish specific tasks or solve problems. (Franklin 2017).

Technology is applied in almost everything we do in our daily lives. We use technology at work, we use technology for communication, transportation, learning, manufacturing, securing data, scaling businesses and so much more. Technology is human knowledge which involves tools, materials, and systems. The application of technology typically results in products. If technology is well applied, it benefits humans, but the opposite is true, if used for malicious reasons. (Franklin 2017).

Educational technology is the use of physical hardware and software to facilitate learning and improve performance by creating, using, and managing appropriate technological processes and resources, it encompasses several domains including learning theory, computer-based training, online learning, and mobile technologies in m-learning. Accordingly, there are several discrete aspects of describing the intellectual and technical development of educational technology. It has been found useful in the field of mathematics, physics, biology, chemistry where these technologies have been found to enhance learning. (Robinson *et al.*, 2016).

Chemistry is the study of matter, its properties, how and why substances combine or separate to form other substances, and how substances interact with energy. Many people think of chemists as being white-coated scientists mixing strange liquids in a laboratory, but the truth is that we are all chemists. Doctors, nurses and veterinarians must study chemistry, but understanding basic chemistry concepts is important for almost every profession. Chemistry is part of everything in our lives (Bagley 2014)

The role of chemistry in the development of the scientific base of a country cannot be overemphasized and Nigeria is not an exception. Yet with the increasing importance of chemistry to the unfolding world, the performance of Nigerian students in the subject at the secondary school remains poor. However it is disappointing to note that the students performance in chemistry at internal and external examination has remained considerably poor despite teachers effort to make it better because of its relative importance. (Chief Examiners Report 2015, 2016, 2017, 2018).

Digital game based learning is a strategic and tactical guide in learning process combining content with video games to engage learners (Prensky 2011). Digital game-based learning is a research field within the wider context of technology-enhanced learning that has attracted, during the last few years, the interest of both the research and educational community (Kirriemuir and McFarlane, 2014; Sandford and Williamson 2015; Van Eck 2017; Chen and Chan, 2010; Connolly and Stansfield 2017) define digital game-based learning as “the use of a computer games-based approach to deliver, support and enhance teaching, learning, assessment, and evaluation”, whereas Prensky (2017) also stress the additional educational value of digital game-based learning by defining it as an approach based on the integration of educational content into digital games and leading to the achievement of the same or better results, in comparison to traditional instructional approaches.

Incorporation of YouTube videos into the instruction has been shown to support multimedia learning, capture students' attention, make learning more interesting and enhance the overall learning process (Eickand King 2012; Buzzetto and More 2014; Duvenger and Steffes 2012; Greenberg and Zanetis 2012; Hilner 2012; Jones and Graham 2013; Tan and Pearce 2012). More specifically, well selected, YouTube videos have been found to help students engage more deeply with subject matter, and recall the information they've learned longer and expand access to information, promote critical thinking, foster active and flexible learning environments (Burke and Snyder 2008; Buzzetto and More 2014; Duvenger and Steffes 2012; Roodt and Peier, 2013; Snelson 2011; Burke and Snyder 2008; Logan 2012; Liu 2010; Roodt and Peier, 2013).

Interest is a feeling of curiosity or concern of subject, topic (in this case chemical reaction) that makes attention towards it. It has been argued that interest is one of the factors that influence students' academic achievement. Renninger and Hiddi (2011) put interest as a critical cognitive and affective motivational variable that guides attention, facilitates learning in different content

areas, for all students of all ages, and develops through experience. Interest is significantly correlated with teaching methods to enhance students' achievement in chemistry (magwilang 2016). Espinosa et al., 2013) ascertained that the aim of teaching is to secure the students attention through arousing and maintaining interest in lessons of multidimensional instructions. Students' interest in learning is linked with their anxiety to learn. It consists of feelings and tendencies towards a concrete matter (Raymond 2016). A characteristic feature of interest is a manifestation of different preference toward actions, events or plans. A student's interest in academic achievement will induce him to behave and act in a certain way towards his studies (Ogbunanya and Owodunni 2013).

Gender has been found to affect students' achievement in chemistry. There has been contrasting opinions on gender related issues on students' achievement in chemistry by scholars. Some scholars observed that gender affects students' achievement in favour of the male. However some researchers observed no gender difference in students achievement (Hassan *et al.*, 2016; Fatoba and Aladejana 2014; Olasheinde and Olatoye 2014; Fatokun and Odagboyi 2010) viewed gender as a significant factor in students' achievement in chemistry due to interaction patterns. another study reveals that there is a high manipulating skill of males towards digital games than that of females because generally males are attached to gadgets which give them an edge over the female students (Chadoet *al.*, 2016), findings shows that 64% of teens are on YouTube instructional platform where males are more incline than females and used it more often than females 39% vs 25% (New Pew Research Center Survey, 2015).

### **Statement of the Problem**

Writing and balancing of chemical equations, knowing the types of chemical reactions are confusing concepts in chemistry because of its mathematical nature. It is the foundation on which the understanding of chemistry is built (WAEC chief examiners report 2019). In view of the usefulness of chemistry in nearly all fields of human endeavour, the poor achievement and interest of students in chemistry at the secondary school level has been a source of concern to education stake holders and government at different levels. Most of often than not, poor achievement and interest have been attributed to poor teaching methods used by chemistry teachers. In view of these, researchers in science education have been searching for better teaching methods that will enhance students' achievement, promote their interest, achievement and interest in chemistry. Although several instructional strategies have been used to teach chemistry, poor performance of students still persists, but no study have been conducted on the use of YouTube and digital game in chemistry teaching in Nigeria. Therefore there is need to employ instructional strategies that involve the use of game and YouTube video which promote active learning, such as digital game-based learning, and YouTube instructional package. Therefore this study will determine the Effect of Digital Game and YouTube Instructional strategies on the Achievement of interest in Chemistry Secondary School student in Bida local Government.

### **Research Questions**

This study will provide answers to the following research questions:

- i. What is the effect of digital game and YouTube instructional strategies on student interest in chemistry?
- ii. What is the difference in gender of students' interest taught chemistry using digital game?

### **Research Hypotheses**

**HO<sub>1</sub>:** There is no significant difference in the interest of students taught chemistry using digital game and YouTube

**HO<sub>2</sub>:** There is no significant difference between the interest of male and female students taught chemistry using digital game.

### **Methodology**

The research design adopted for this study is pretest posttest control (Equivalent, Randomization control, experimental research design).

The population for this study is made up of all Senior Secondary School chemistry students in Bida Metropolis; the target population is eleven public Senior Secondary School two (2) students with total population of two thousand and fifty-one (1580) for 2019/2020 session.

A multistage sampling technique was employed in selecting the sample for this study. Firstly a purposive sampling technique was used to select two (2) Secondary Schools which will be randomly assigned into experimental groups, and then a simple random sampling technique was used to select a school which is assigned into control group. The schools were selected because of their co-educational nature, and the presence of functioning computers in their computer lab (for experimental group). The sample for the study consisted of 150 learners who were randomly picked from the sample schools, with experimental group 1 (Digital game) having 50 students, experimental group 2 (YouTube) having 50 and control having 50 students, which is made up of 81 male and 69 females.

The instrument used for data collection is; treatment instrument and test instrument.

**Treatment Instrument:** The independent variable of the study is the digital game (DGI) and YouTube instructional strategy (YIS). The game that was selected to support the proposed educational activities was "chemical lab for chemistry", simulation game which engages players in activities requiring the use of laboratory apparatus to take out reaction, strategic thinking on the element that can react putting them in the selected apparatus, heating if necessary, to have a product. The game allows players to test various reactions between element from different groups, The digital game covered the following topics in chemistry, chemical reaction and balancing of chemical equation, which was adopted by the researcher from (Boyan MIHAILOV). The YouTube instructional strategy is a video instruction aimed at engaging weak and slow learners for pace learning, the video adopted for the study is (unit 1 chemical reaction equations CBSE class X by Digital teacher).

**Test Instrument:** The instrument used for data collection was Chemistry Achievement Test (CAT) which was adopted from past WAEC questions. The test items have thirty (30) multiple choice test questions were set on the topic taught with five optional answers (A-E) in which there is only one correct answer. The chemistry interest inventory (CII) made up of 20 items covering student's interest in Chemistry was of five-point Likert scale.

Face and content validity was done by three experts, from Federal University of Technology Minna and Government Girls' Secondary School Minna. Two of them were in science education department and one from chemistry department.

To determine the reliability of the test instrument chemistry achievement test (CAT) and chemistry interest inventory (CII) was pilot- tested on ninety SS2 students from the study population. Scores generated from their responses were used to establish the internal consistency of the test items using Pearson Product Moment Correlation (PPMC) and Cronbach's Alpha Reliability Coefficient method. Thus an internal consistency estimate of 0.861 and 0.947 respectively.

The pre-test, post-test scores collected and interest inventory answered were analysed using mean, standard deviation and analysis of variance.

## Result

**Research Question One:** What is the effect of digital game and YouTube instructional strategies on student interest in chemistry? This research question was answered using mean and standard deviation. Summary of the analysis is presented in below

**Table 1: Mean and Standard Deviation (SD) of Effect of Digital Game and YouTube Instructional Strategies on Student Interest in Chemistry**

Treatment	N	Mean	Std. Deviation	Mean Difference
Digital game instruction	50	4.17	.90267	0.142
Youtube instruction	50	4.03	1.02355	

Table 1 shows the effect of digital game and YouTube instructional strategies on student interest in learning chemistry. The result shows that students taught chemistry using Digital game and YouTube instructional strategies have the mean scores above 3.0 which indicated that the treatment has effects on the students' interest in learning chemistry. The mean difference between the strategies is 0.142. Figure 3.0 below shows the graphical representation of mean scores on the effect of digital game and YouTube instructional strategies on student interest taught chemistry.

**Research Question Two:** What is the gender difference between the interests of student taught chemistry using digital game? This research question was answered using mean and standard deviation. Summary of the analysis presented in the table below

**Table 2: Mean and Standard Deviation (SD) between Male and Female Students' interest taught chemistry using digital game instructional strategy.**

Gender	N	Mean	Std. Deviation	Mean Difference
Male	25	4.05	.98992	-0.24
Female	25	4.29	.80848	

Table 2. shows the gender difference between the interests of student taught chemistry using Digital game instructional strategy. There is an indication that male students' exposed to digital

game instructional strategy have the mean score of 4.05 while, female students exposed to digital game instructional strategy have the mean score of 4.29. Therefore, female students exposed to digital game instructional strategy have the highest interest compared to the male students with a mean difference of 0.24.

### **Hypotheses One**

There is no significant difference in the interest of students taught chemistry using digital game and YouTube instructional strategies.

**Table 3: ANOVA on the interest of students taught chemistry using digital game and YouTube instructional strategies in senior secondary schools.**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.504	1	.504	.541	.464
Within Groups	91.261	98	.931		
Total	91.765	99			

Table 11 shows the ANOVA result of students' interest using digital game and YouTube instructional strategies in senior secondary schools. The result shows the mean square between the treatment = 0.504 and within Groups to be = 0.931, F value (1, 99) = 0.541 with P value = 0.464. The p-value was greater than 0.05 alpha value of significance. This hypothesis is therefore not rejected.

### **Hypotheses Two**

There is no significant difference between the interest of male and female students taught chemistry using digital game instructional strategy.

**Table 14: ANOVA of male and female students' interest exposed to digital game instructional strategy in senior secondary schools.**

Gender	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.720	1	.720	.882	.352
Within Groups	39.206	48	.817		
Total	39.926	49			

There is no significant difference between the male and female students' interest exposed to Digital game instructional strategy. The result shows the mean square between the treatment = 0.72 and within Groups to be = 0.82, F value (1, 49) = 0.882 with P value = 0.352. The p-value was greater than 0.05 alpha value of significance. This hypothesis is therefore not rejected.

### **Discussion of Results**

Findings of the study showed that student from YouTube instruction group have more interest than those from digital game group. This implies that students from YouTube group find more learning time than those in the digital game group, this may be attributed to the fact that students in YIS learn the concept chemical reaction at their own pace, and were able to do that at home even from their cell phones. This is in agreement with the findings of (Eick and King 2012).

The finding of this study showed that the male students have more interest in chemistry than the female student in DGI, this implies that male student have high ability to manipulate digital game and know the use of internet than the female due to the fact that male students generally are been attached to gadgets which give them an edge over the female student. This is in agreement with the findings of (Silna 2015) which says at upper primary level, boys had higher interest in chemistry than girls; by higher secondary level girls are significantly higher on it than boys. Students' interest in chemistry falls by  $\frac{1}{4}$ , from upper primary to high school

### **The major findings**

1. There was a main mean difference of student interest in chemistry. The YIS have more interest than the DGI
2. There was a main mean difference of gender on student's interest in chemistry, the male have more interest than the females

### **Conclusions**

In light of the Research discoveries as identified with the speculations formed and tried, the accompanying conclusions were made: Exposing Learners to digital game and YouTube instruction will enhance easy assimilation and recall of student's memory in chemistry which will enhance their interest.

### **Recommendations**

In view of the findings of this research work, the accompanying proposals were made for the study:

- Teachers should be sent on in service training to study educational technology where they can learn the design and the use of instructional materials
- School principals ought to support and give fundamental backing to teachers for powerful utilization of additional instructional materials in showing and learning.
- Schools ought to teach the mentors and gathering patrons on the impact that digital game instruction have on understudies' live.
- There should be reinforcement of tutors dedicated to work through prize giving, scholarship awards.

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