Innovations

Possibility of Using Geographical Information Systems for Boosting Students Interest in Social Studies

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Abstract

The study was necessitated by the dwindling interest of students in upper basic school Social Studies lessons and the resultant poor academic achievements both in internal and external examinations. The study investigated the use of Geographical Information Systems (GIS) as a learning resource to boost students interest in Social Studies. The study explored a practical approach/survey research, the population comprised of two hundred and sixteen Upper Basic 3 students from two Upper Basic schools in Delta State Nigeria. A sample of twenty-six students was systematically drawn from the two schools, the twenty-six (26) students were taught with geoinquiries a GIS software for three weeks. After the practical session, survey research was used to obtain data through a carefully and diligently structured questionnaire, the items on the questionnaire were duly validated. Data were analyzed with Mean and percentages, findings showed acceptance of all items by the participants as possible benefits of geoinquiries in boosting interest of students in Social Studies. Inclusion of GIS geoinquiries software as a learning resources into the curriculum of Social Studies for instructional purpose and training of Social Studies educators on how to use GIS educational software were therefore recommended.

Keywords: 1.*Possibility; 2.Geographical Information Systems; Interest; 3.Social Studies; 4.Boosting; 5.Educational Technology 6. Upper Basic Schools*

Introduction

Since the beginning of the 80s and 90s, Geographical Information Systems (GIS) has been used in higher institutions of learning as an educational technology and a course on its own. However, GIS has not been successfully blended into primary and secondary schools' curriculum, in spite of the huge benefits it has offered post-secondary schools across the world (Kerski,2019). Because of this, stakeholder in the field of Social Studies have long expressed concern over why the physical environment in Social Studies is not being taught very well at the primary and secondary school levels with GIS (Doug,2015). This may be caused by the fact that Social Studies and GIS have not be intrinsically linked to the teaching of Social Studies, especially at these levels.

Social Studies as a school subject is interested in building the knowledge of relationship and interactions between man and the many environments he lives in. But presently, classroom interactions in Social Studies seem not to have produced the necessary knowledge, skills and changes needed by individuals to deal with environmental and societal problems (Wayne,2018). It is also very disheartening to note that students' performance in Social Studies both in internal and external examinations have been systematically poor over the years due to lack of interest in the subject. Analysis of Basic Education Certificate Examination results provided by Delta State Ministry of Basic Education Asaba reported the following results in Social Studies for a four- year period: 2016/2017 = 50%, 2017/2018= 46%, 2018/2019 = 45% and 2019/2020 = 51%. Despite the derivable benefits from the introduction of Social Studies in the National Policy on Education, poor pedagogical approach and non-usage of educational technologies in the teaching of Social Studies remains a major challenge. According to researchers such as Umudi (2012); Ekpeyong, Edem and Martins, (2015) and Wayne (2018), it is most likely that passive learning, non-application of technological and visual learning resources to the teaching of Social Studies by Social Studies teachers could be responsible for the lack of students' interest in learning Social Studies.

Ekpenyong, Edem and Martin (2015) observed that upper basic school students in Nigeria, no longer have interest in Social Studies because of the failure of teachers and instructors to apply educational technology in stimulating their interest in the subject. This failure can be held accountable for the unsatisfactory academic performance of students at all levels in Social Studies. Ekpenyong, Edem and Martin (2015) in their study revealed that Social Studies learners find it challenging understanding the abstract topics taught in Social Studies because instructions are concentrated on teacher – centered approaches and non-usage of technology to aid their understanding. The subject Social Studies is integrated, interdisciplinary, multi-dimensional and made up of a group of subjects whose themes explain the issues and problems people face as they relate to the disciplines. Accordingly, there is need to apply advanced educational technology that is integrated, interdisciplinary and multidimensional in nature like GIS to explain the issues and problems of life to its learners.

Umudi (2012) argued that from the inception of Social Studies in 1968, at Ayetoro high school in present day Ogun state Nigeria when it was introduced into the school curriculum, the problem of effective and efficient teaching of the subject has been an issue of debate among researchers and educators of Social Studies in Nigeria. This suggest that appropriate learning methods and emerging technologies have not been successfully linked to the implementation of Social Studies curriculum in Nigeria. This has caused dissatisfaction and learning boredom among learners of the subject. Daniel (2019) is of the view that the search for appropriate visual resources in teaching school subjects like Social Studies has become heightened, since it looks like the traditional resources of textbooks and chalkboard used in teaching school subjects is not producing the desired results. Social Studies researchers in Nigeria need to explore innovative educational technology like GIS that have been tested or adopted by different educators in other parts of the globe with the aim of adapting them to the researcher's environments. Thus, there have continued to be a search for educational technology in line with promoting how students can be motivated to learn the subject and boost their interest. One of such educational technology advocated by Aladag (2014) in boosting students interest in Social Studies is Geographical Information Systems, hence this author was prompted to conduct this research in order to explore this possibility.

Visual and students centered educational technologies such as simulations, satellite images, Google maps, Geographical Information Systems (GIS) and Maps have been utilized in other disciplines such as Mathematics, Biology, Geography and the Sciences, in countries of South Africa, Ethiopia, Turkey, USA, Columbia, the United Kingdom and others. These resources have proven to promote students interest, cognition and academic performance. GIS as one of the foremost learning technologies has grown and gained

rapid popularity in recent years (Demers, 2016; Lehner, Jekel and Vogler 2017; Musuakwa, 2017 and Yuan, 2017). However, these studies were carried out outside the shores of Nigeria. The very few studies on GIS in Nigeria have nothing to do with boosting Social Studies students interest with GIS. Hence such studies are non-existent. Social Studies teachers in Nigeria and Delta State in particular haven't seen the need to adopt GIS technology in the teaching of Social Studies. Therefore, this study attempts to explore the possibility of using GIS software Geoinquiries to boost the interest of Upper Basic Social Studies students in Delta State?

Theoretical Underpin

A theory helps to guide a research hence this paper adopted the Constructivism theory as a guide, constructivism theory can be traced to the works of educational psychologist Jean Piaget between 1896-1980, the constructivism theory holds that people make active construction of knowledge from their own experiences (Fox,2001). Thus the theory canvasses personal construction of meaning by the learner through personal and practical experience. The theory also believe that prior knowledge and new events also influences learning. The following are the main principles of constructivism theory

1. Knowledge is a product of construction and cannot be abstractly absorbed, knowledge in humans is constructed and new knowledge is built upon previous knowledge.
2. The learning process is an active one, this means that learners' construct meaning to learning through active engagement with methods, technologies and processes of learning.
3. Learning is an activity that is socially constructed, it is achieved by interaction with others or media technology.
4. Every individual has their own personal view of knowledge based on their previous knowledge and values. This means the same learning or activity could lead to different learning experiences for different learners based on their subjective construction of the lesson.
5. Learning is constructed by the mind, learners will continue to develop their own mental picture of the world. New experiences will continue to update their mental perceptions to update new information, thereby constructing their own meaning of reality as learning must not be directly linked to the real world (Driscoll,2000).

The implication of Constructivism theory for this study holds that knowledge is not transferable from person to person but is developed through construction. GIS technology can assist in construction of knowledge by the learner through engaging them with its resources. Secondly, the use of GIS technology will make students active in class thereby increasing their interest and constructivism, as they would be actively engaged. Furthermore, GIS utilization will enhance social interaction through guided learning as each student will be influenced by the technology and learning environment provided by GIS software when used for instructional purpose. Learners will gain through substantive construction of Social Studies lessons and their world.

Literature Review

Geographic Information System (GIS) is a technology that is used to capture data, analyze and store data that are related to human and natural environment, relationships, time properties and settings (Aytac, 2014). GIS is a technology that captures, stores and analyses all types of geographical information in computer settings. Similarly, Tecim (2008) stated that "GIS is a computer system that can collect, store in computer environment, modernize, control, analyze and do visualization of the earth's knowledge for special target". In all GIS is a computerized system which can store, analyze and transport geographical information.

GIS is broad and has many systems and components, components of GIS that can be adopted to enhance Social Studies lessons include:

Geoinquiries
Aerial photographs
Google Earth
Satellite images
Google maps

These GIS components transmit real life data with the use of radio signals gotten from space to specific destinations, the information that is collected by the GPS instruments/devices are then analyzed and used by geographic information scientists to provide data in various aspect of human life (Bennett, 2019). GIS can be applied to study the nature and spatial organization of the earth, culture, drug and human trafficking, vegetation, climate, transportation (road network), rivers, medicine, education, agriculture and many more. Therefore, GIS latest learning innovative and technological applications can be applied as resources to enhance and boost the interest of learners. There is need to place emphasis on developing GIS learning resources to meet the educational needs in Social Studies, because of the immense benefit it will bring like making lessons interesting, stimulating and enthusiastic. At the same time promoting the academic performance of learners in the long run. Yahaya and Ubayo (2014) supported the use of GIS technology across secondary schools in Nigeria. In a similar vein, Otese, Njoku and Ndiyo (2016) posited that the implementation of GIS curriculum in Nigerian classrooms has high expectations for advancing learning opportunities by stimulating the enthusiasm of learners.

Abrandi and Sarnoff (2006) discussed theoretical and conceptual advances to substantiate their support for combining Social Studies education with GIS. The study also suggested Arc 3.3 and geo references, GIS soft wares for Social Studies teachers and learners. Also Hong and Melville (2018) suggested effective designs for incorporating GIS into the professional development of Social Studies teachers through collective participation, time for practice, lesson development and lesson presentation. The study, participants were trained on how to use Arch GIS online components, Social Studies teachers were exposed to practical sessions and were able to develop inquiry based lessons with GIS. The teachers reported positive advantages of GIS in Social Studies education like boosting students interest and motivating them to learn.

Aladag (2014) substantiated the importance of GIS to Social Studies, by evaluating GIS and Social Studies lessons, Aladag maintained that GIS when used today by Social Studies teachers and students will help them access and make use of current data instead of teaching obsolete and abstract information. Since a huge portion of Social Studies lesson content and concepts are taken from the physical environment, GIS as a system of spatial data can be utilized to store, analyze, visualize and interpret these data. GIS therefore is a valuable tool in promoting the ability of Social Studies students to understand and conceptualize information (Yomrahoglu, 2002).

Aytac, (2014) noted that, in the general school curriculum, aims and objectives of Social Studies, information is paramount and appropriate, information in forms of map, diagram, image, tables, charts which are time bound are of utmost interest to Social Studies and these are the kind of information's presented by GIS. Isioye, Moses & Nzelibe, (2013) are of the view that "the world in which we live today is engulf in science and technology, and characterized by tremendous explorations and ever increasing discoveries, inventions and innovation". In this regard students need to be brought up in spatial thinking and information; therefore, there is need for GIS to provide the environment for spatial thinking, knowledge for a world of inventions and innovations in Social Studies.

Sherrose (2010) demonstrated that GIS can be used to build social values of students, this values can assist in protecting the ecosystem which is the physical environment. Geography which is a study of the

physical environment is a major component of Social Studies because it deals mainly with man and his physical environment, why Social Studies study physical and social environment majorly. However, studying and analyzing data pertaining to physical environment will make taking decisions about the physical environment easier and broaden Social Studies students' knowledge about the physical environment which is Social Studies.

The Environmental Systems Research Institute (ESRI) provides teachers with GIS programs and software's that can be used for classroom teachings (ESRI, 2017). When teachers go to ESRI website, they can see Geoinquiries (a GIS learning software) which they can obtain free of charge. With Geoinquiries they can teach map-based content that are common in school textbooks. ESRI also provides online training for interested teachers which can be accessed from online ESRI academy. Here there are short courses and strategies which are presented on ways of incorporating GIS into school lessons and interactions. Administrators and teachers especially in the United States make free requests for GIS school bundles for teaching purpose. An environmental based subject like Social Studies can make use of Geoinquiries to make inquiries, for example how social awareness influences population growth. GIS is of immense benefit to Social Studies education irrespective of which GIS program teachers decide to use in the classroom for enquiry learning or activity based learning. Likewise, the engagement of GIS can help Social Studies learners in choosing a career path in GIS for themselves (Geospatial Co-operation, (2019) & Brooklyn College Library, (2020)

Osman (2013), Atubi & Obro (2020) and Obro (2021) held that information and communication technology such as internet, mobile phones, visual screens and GIS has become increasingly important as they are taking the center stage in boosting students interest in acquisition of knowledge. Against this background, there has been an increase in research about the part played by GIS in supporting the development of Social Studies. Osman opined that visual and quality technology motivates students to learn at the same time making them attentive. In considering the effective teaching tools in Turkey, attempts of using information technologies such as GIS has been made (Bednarz and Schee, 2006). Osman further posited that GIS can be seen as a system that is based on the consolidation of a common database developed for the analyses of statistics and maps and this singular function differentiates it from the normal computer systems.

Atubi and Dania (2022) explained that using GIS technologies as instructional aids can enhance Social Studies students' ability to solve real problems by making use of real information. Schools can also benefit irrespective of their size in taking policy decisions with regards to school buildings, make safety plans and streamlining transportation routes because of the transportation network information that has been obtained with the help of GIS. On a similar note, when there is an increase in the population of a region, town or city, GIS can help in mapping out areas where new schools and other infrastructure can be developed (Bennett, 2019).

The use of GIS in Social Studies does not only provide an entire content of knowledge, it also offers a means for learners to think about their world and encourage their learning ability (Bednarz, 2004; Kerski, 2015). GIS provides a geographical perspective for all disciplines for instance epidemiologists uses GIS to study the spread and spatial location of diseases, scientists use GIS to study climate change, business people uses GPS to locate new business establishments. All these examples are of major concern to Social Studies as there are used for spatial analysis and environmental studies which are major areas of study in Social Studies.

Research Methodology

This study reported a practical and survey research procedure; the participants in the study were exposed to a practical session, after which a survey was used to collect data from them based on the treatment they were

given. In the first stage of the study, approval was sought from the administrators of two schools through a written permission by the author. After that, a sample of twenty-six (26) students ten from a privately owned school and sixteen from a government owned school were systematically drawn from a population of two hundred and sixteen (216) upper basic three social studies students in both schools. The twenty-six (26) students were exposed to a GIS education software called geoinquiries; this GIS software was used to teach a map based topic "Physical Environment" for a period of three weeks. The GIS based lesson took place twice a week and was activity based, as the software was used to display maps depicting physical features such as relief, vegetation, landscape, drainage and climate. The students from the government owned schools were always conveyed to the private school each time for the experimental session by a bus hired for that purpose by the researcher. The private school was used for the study, because the school have the facilities needed for the study especially a computer resource room as the school is a Computer Based Test (CBT) center for the Unified Tertiary Matriculation Examinations in Nigeria.

In the second stage of this study, a survey research design was used to administer a questionnaire titled "GIS and Students Interest in Social Studies". The questionnaire was diligently structured by the researcher and validated by two professors in the researcher's department, Department of Social Science Education, Delta State University, Abraka, Nigeria. Test-retest method of reliability was used for establishing the reliability of the instrument and a Pearson's Product Moment Correlation Coefficient (PPMC) of 0.70 was realized. The instrument was administered on the twenty-six students who took part in the practical session by the researcher. The aim was to collect data from the participants, to ascertain the possibility of geoinquiries a GIS software in boosting their interest and motivation during Social Studies classes. Data collected were sorted and then analyzed with mean, any item which recorded a mean of above 2.5 was accepted and adjudged significant, but any item with mean below 2.5 was rejected and therefore insignificant.

Presentation of Results

Table 1: ***GIS and Boosting Students Interest in Social Studies***

S/NO	Item: Learning with Geoinquiries GIS Software	Mean	Remark
1.	Was interesting	3.68	Accepted
2.	Was innovative	3.87	Accepted
3.	Was easy to understand	3.70	Accepted
4.	Explanation was better	3.56	Accepted
5.	Helped me to construct knowledge	2.92	Accepted
6.	Stimulated learning	3.85	Accepted
7.	Reduced academic boredom	2.93	Accepted
8.	Aided visualization	3.48	Accepted
9	Good lesson presentation	4.01	Accepted
10.	Data was current	2.95	Accepted
11.	Motivated me to learn	3.82	Accepted
12	Enhanced my spatial thinking	2.89	Accepted
13	Built cooperative values	3.88	Accepted
14	Promoted social interaction	3.63	Accepted
15	Learning was active and spontaneous	3.57	Accepted

Discussion of Results/Findings

This study is concerned with boosting students interest in Social Studies lessons with the aid of GIS geoinquiries software. The study was considered because of the nonchalant attitude of upper basic students towards the learning of Social Studies and the resultant poor academic achievement both in internal and external examinations such as the junior National Examination Council (NECO) examinations and Basic Certificate Examination (BCE) Social Studies in Nigeria. The study established that the use of GIS geoinquiries software for Social Studies can be interesting, motivating and experiential for students. Working and learning with GIS software geoinquiries was innovative for them, this was because of the visual data and in depth analysis provided by the software. This form of information presentation in a Social Studies classroom has never been seen by the participants of the study before, this explains their enthusiasm and motivation which develop their interest and knowledge. Furthermore, this form of learning can never be compared to the abstract nature of teacher's explanation of lesson topics which is the norm across upper basic schools in Delta State. The practical sessions gave students a good opportunity to construct their own knowledge about the physical environment, in such a way that whatever they have seen with the software cannot be forgotten in a long while. The result of this study is very much in line with Aladag, (2014), which evaluated the application of GIS to Social Studies, and submitted positive results about GIS and Social Studies. Kerski, (2014), who revealed that GIS aided easy understanding of Social Studies lessons; Bennett (2019) that GIS promotes better understanding and in consonance with Fox, (2001) states GIS advance the construction of knowledge, in nexus with constructivism theory.

Furthermore, the study discovered that the use of GIS in Social Studies education improved visualization in Social Studies lessons, in agreement with Tecim (2008) and Brooklyn College, (2020); that GIS reduces academic boredom, as submitted by Yahaya & Ubayo, (2014); stimulates learning in consonance with Otese et tal (2016); enhances good lesson presentation which corroborates Hong & Melville, (2016) and provides current data in tandem with Alabag, (2014). Finally, findings also revealed that GIS technology when used in Social Studies, will not only motivate and boost students interest but also significantly promote spatial thinking/information, develop cooperative skills, enhance social interactions and make learning an active exercise. These benefits of GIS to Social Studies students as revealed by this study are in nexus with Sherrose, (2010); Osman, (2013); Isioye et tal (2013) and ESRI, (2017).

Conclusion

This study was a new and innovative learning model for teaching modern Social Studies, the results of the study showed that GIS technology is a major booster to the interest and motivation of Social Studies upper basic students. In a similar vein, the study established that GIS technology provides current data for Social Studies, enhanced visualization and promote spatial information. These results and findings supported existing body of literature as well as the constructivism theory which is the theoretical framework for the study. Reasons behind these findings could be that GIS provided a visual environment that contributed to boosting the interest of students, as learning with GIS is activity based and promotes social interactions.

Recommendations

Following the discovery of the study, the researcher therefore put forward the following recommendations;

1. Curriculum planners should make emphasis on the utilization of innovative educational technology such as GIS to boost the interest of students in Social Studies.

2. For the utilization of GIS technology to be possible, Social Studies educators in Nigeria should be trained continuously and encouraged by providing GIS softwares and computers for school use.
3. More research should be carried out on the usage of other GIS components and software's to establish a connection between them and Social Studies.

Limitations

The study has some limitations, first the participants in the study are from only two upper basic schools in Delta State out of more than four hundred public schools with more than eighty thousand students. Also, there are more than six hundred private schools with a huge population of Upper Basic 3 students. Therefore, caution should be applied in generalizing its findings, there is need for further studies using a larger sample size representative of the population and larger scope. As only two schools were used because of financial and material resources constraint. Secondly, teachers could not be used for the study because they lack the technical know-how, therefore if the teachers responsible for teaching Social Studies cannot utilize the technology then adopting it becomes impossible except teachers will be trained first on the application GIS geoinquiries software.

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Conflict of Interest

The author would like to state clearly that this study has no conflict of interest whatsoever with anyone, institution or agency.

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