

GIS, Challenges, and Opportunities for ICT Deployment in Nigerian Secondary Schools

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Abstract:

Since the 1980s, schools in Nigeria have been using information and communication technology (ICT). In the year 1999, a computer training program was launched. Some schools were chosen to 'break the mould' and move away from traditional teaching methods in favour of ICT. As a result, ongoing projects such as the Smart School Project and the School Access Center were completed. Teachers Professional Guidance in ICT Project is a specific program for in-service teachers that aims to help them use ICT in their primary teaching business. In any case, ICT usage varies by subject, and some subjects have become students' least favorites. The usage of ICT in geography is aimed towards irritating students' interest in the topic. The finest Geographical Information Technology (GIT) to be used in geography is the Geographical Information System (GIS). It is still only mentioned in Nigerian papers, articles, and proceedings papers. Educators and GIS professionals in Nigeria have pushed for the use of GIS in classrooms. As a result, this article describes and explores the challenges and potential of integrating GIS in schools, with a particular emphasis on GIS in geography teaching and learning. The goal of the research is to see how effective GIS is at increasing students' interest in the subject, this article also briefly discusses obstacles that arise with the deployment of GIS in schools, also looks into the capabilities of GIS in schools and how to teach with GIS. Articles on ICT and GIS from local and international sources were used to conduct a content analysis. The proceedings of the conference were also examined. Over 20 publications were included in the content analysis, which discussed both the benefits and drawbacks of implementing GIS in schools. The future of GIS in Nigerian schools, as well as a few options for lowering and overcoming difficulties, will be discussed in the conclusion section.

Keywords: *Information and communication Technology (ICT); geographical information system (GIS); in Nigerian education curricular.*

1. Introduction

Despite promises made at an international forum that the federal budget allocation to the education sector would be increased by at least 50% in the next few years and by around 100% by 2025, the allocation to the sector in the 2022 Budget estimates fell short of expectations, with N1.29 trillion or 7.9% of the N16.39 trillion estimates allocated to the sector[1]. Nigeria, as a developing country, must improve computer literacy and ICT among the younger generation in order to build world-class human models.

One of the Ministry of Education's key goals is to improve computer awareness among pupils, thus schools have been outfitted with computer labs and IT teachers. In schools, computer literacy has been introduced as a curriculum. Subjects with modified curricula in schools require teachers and students to use computers. Under order to meet this goal, ICT-based programmed and projects were devised in the year plan. From 2006 to 2010, the Education Development Master Plan (EDMP) was implemented as part of the education reform system in an effort to generate science-literate pupils who are also creative thinkers[2]. Nigerian Teachers' Standard is another notion introduced by the Ministry of Education. The goal of this approach is to improve the teaching quality in Nigeria.

2. Geography in Schools

There are a variety of technological products that can be used to educate geography. Internet, interactive digital television, video, web-based training, Intelligent Tutoring Systems, photography, computers/computer-assisted instruction, video conferencing, and discussion groups are just a few examples. There are capabilities that CAI can perform that other media cannot do. CAI has proven to be particularly useful in representing geographic data, cartography, remote sensing, Geographical System simulation, population forecasts, and other Geographical Information Systems. Today, automated and digital maps have supplanted the conventional maps[3]. spoke about its benefits In form six, geography is offered in fewer schools. The one and only computer literacy that students learn during their three years of geography education in lower secondary school is how to create a bar graph and a line graph using Microsoft Excel. In this subject, the use of ICT is fairly limited. It can be one of the reasons why geography is less popular among Nigerian students today. The lack of geographic knowledge among the younger generation may result in a worst-case scenario in the future, with people who will never understand or appreciate the planet[4]. There are three primary branches of geography. Students learn about longitude, latitude, the use of a compass, bearing, graphs, pie charts, topographic mapping, and other topics in the first field, Geography Skills. The second field aids students in their understanding of human and physical geography. Topics such as climate and weather, population, transportation and communication were covered in this field. The third field is local research. Field work will be carried out in the local area by a group of students under the supervision of teachers. Local research should be conducted within a few kilometres of their school or residence[5],[3].

3. GIS in Education

A geographic information system (GIS) is a computer system that collects, saves, manipulates, searches, analyses, and displays data that is spatially referenced[6]. GIS enhances the type of spatial reasoning that supports higher levels of learning among students[7]. It is more than just a simple method for storing and accessing spatial information. Even though GIS in education is still relatively young, it has a promising future in the coming decades[8],[1]. GIS is still a long way from becoming a part of Malaysia's educational system. Even while GIS has been effectively employed in a variety of fields such as crime investigation, engineering, hydrology, landslide analysis, and so on, it has yet to be introduced to Malaysian education and schools. Regardless, research and studies are ongoing to improve the benefits of GIS in education across a wide range of

departments, not only universities[9]. GIS courses for school leavers are also being introduced and offered by private colleges. Even if it is only a rudimentary course implementation, it could be a suitable starting point for GIS in the Nigerian educational system.

4. GIS in Universities

GIS is frequently used in Nigerian universities' research and is also taught as a subject to students. The leading universities in are the University of Ibadan, Oyo, Modibbo Adama University of Technology Yola (Moutect), Ahmadu Bello University Zaria (ABU), Abubakar Tafawa Belewa University, Bauchi (ATBU), Federal Universities of Technology, Akure (FUTA), Federal Universities of Technology Minna (FUTM), Federal Universities of Technology Owerri (FUTO), Federal Universities of Technology Akure (FUTA), Federal Universities of Technology Minna Most institutions were offering GIS as papers worth a few hours of credit, with topics including GIS in spatial analysis, GIS in site allocation, and so on. The School of Social Science at universities systematically introduces GIS[10]. The Principles of GIS and GIS Application is a course for geography students. The majority of universities of technology offer GIS to all students studying Geography at the bachelor's, master's, and doctoral levels. All students studying in Geography should take the basic GIS paper 'Introduction to GIS' during their degree, according to the School of Social Sciences, which has been leading GIS at all levels of studies[10].

5. GIS in Schools

In Nigeria, GIS in schools is still a hot topic. It is not used in Nigerian classrooms. Despite the fact that research on this area has been ongoing, it is still relatively new. GIS is widely used in schools in nations such as Jamaica, the United States, and Australia. Even Rwanda, which only has a few secondary schools with 20 or more computers, is enthusiastic about GIS literacy[11]. Nigeria, being a developing country, is still in the early stages of integrating ICT into educational curricula. GIS is doable to adopt in schools, according to (Kwache,2007)[12], because practically every secondary school in Nigeria is equipped with computer labs and internet connection. A study conducted[13] presented six basic methods that a teacher could utilise to integrate GIS into the teaching and learning of geography activities. Local studies are a part of the subject geography, and a simple approach of using GIS in local studies done by students has been obtained. It was demonstrated how GIS may be used to teach geography[14]. A study of using Open source GIS to teach Geography to a group of form one students at a secondary school was also undertaken. The study's findings and discussions revealed that the students' post-test achievement had improved[15].

6. GIS Implementation in Schools and Challenges

Technical, institutional, personnel, financing, and other issues affecting system development and operation are common challenges in deploying GIS in schools[16]. The primary challenge in the initial phase of GIS adoption in Rwandan schools is the limited number of computers available in secondary school[17],[18]. The

main impediments were identified as schools without electricity, frequent power outages, a lack of infrastructure, and a lack of understanding among teachers. According to research conducted in Turkey, the main difficulty is not having enough time to accomplish the work required for the experiment, followed by not having enough time to prepare their laboratories, and not having enough time to gather students and teach them how to use GIS software [8]. Preparing lab work for GIS is a difficult task. Unless a lab assistant is assigned, it takes a long time to prepare a lab with proper computer access and software. According to the results of a survey conducted earlier in Sabah on computer literacy among Geography teachers, 54.5 percent of the instructors had strong computer literacy and 40% have average computer literacy[19],[16]. Teachers with limited computer skills and IT blindness may be a hindrance to the successful use of GIS in schools[20]. As previously said, just a few universities in Nigeria offer GIS knowledge and skills to degree programme students. As a result, GIS expertise among Nigerian in-service and pre-service teachers was minimal. Obtaining data is a challenge for organisations when deploying GIS[21]. The Education Department must ensure that all schools have the same data[22].

7. Opportunities for GIS Implementation in Schools

Nigeria has numerous potential to improve GIS in schools. In Nigeria, the majority of secondary schools lack computer labs. Smart School Projects, School Access Centers, and a few more school-based IT projects have all been successful in inventing and upgrading ICT tools and components in schools. Teaching Science and Mathematics in English as a massive programme a few years ago has faded, and instead of promoting computer literacy among instructors and students in Nigeria[23], it has ushered in a new IT era in schools. Most previous studies have identified hardware as a high-cost issue, owing to the requirement for funds to establish up computer labs with entire PC sets. The existing computer lab facilities in Nigeria may easily overcome this dilemma. Teachers who were previously taught using traditional ways should be commended for their willingness to adapt to a new technological method. 94.1 percent of 180 teachers agreed and offered favourable statements about the use of GIS in the classroom[24]. Despite the fact that not all teachers are computer proficient, there is a strong desire to learn and implement GIS in their classrooms. GIS is required for all students in Nigeria's educational programmes.

As an introduction, GIS may simply be incorporated into the current geography curriculum without requiring significant adjustments. The 'local area study' component has the best likelihood of being implemented in schools. Students could effectively use the data exploration, analysis, and layout functions in GIS to prepare and produce their study-based report[25].

GIS has the potential to serve as a "data bank" for schools, benefiting not only the next generation of students, but also the general public[[26]. Data for school use might be collected by either the education department or the school. It may appear challenging at first, but after the data was collected, schools could readily update and store the information for future use.

The use of GIS in the teaching and learning process in schools is appropriate for both primary and secondary schools, and it is not restricted to geography but could be applied to any subject. In several nations,

studies involving primary school pupils, even at the pre-school / kindergarten level, have been conducted. In Nigeria, incorporating GIS in secondary schools would be a good idea. GIS implementation in geography classes in schools could be a powerful tool for improving the subject's image at school[16].

8. Conclusion

GIS has a bright chance to be implemented in schools because of its capability of extracting students' interest. Compared with many other audio video visuals and some other sophisticated method of teaching, GIS has the potency of sharpening the critical thinking among students. It also supports an innovative teaching in the classroom. GIS has the potential to enrich the teaching and learning process which is student centralized. Students can explore on their own to gain information, analyze and finally report their findings. Moreover, the capability of GIS in integrating spatial and discrete data is an ideal term for geography.

9. Recommendation:

The usage of ICT is required to improve the quality of administrative service delivery. As a result, a requirements assessment is advised in order to ease the development and deployment of ICT in secondary schools. Policies play an essential role in channelling resources; as a result, policy creation in the area of ICT adoption will provide a boost to ICT adoption. According to (Isaacs,2007)[27], donor agencies such as the World Bank's Link for Development (WorLD), the International Development Research Centre (IDRC), the International Education and Resource Network (IEARN), and the Department for International Development (DFID), Schools Online, and the Swedish International Development Cooperation Agency fund the majority of policy work on ICT in education in Africa (SIDA). The initial stage in developing the necessary capabilities for ICT use will be to train the principals through workshops, seminars, and certificate courses.

The government should investigate education financing in general, and ICT funding in particular. Inadequate education finance has been a hydra-headed hindrance to the achievement of educational aims and objectives over the years. In this era of a global economy driven by technological communications, access to information is seen as critical to progress.

References:

- [1] E. Tasoulas, G. Varras, I. Tsirogiannis, and C. Myriounis, "Development of a GIS Application for Urban Forestry Management Planning," *Procedia Technol.*, vol. 8, no. Haicta, pp. 70–80, 2013, doi: 10.1016/j.protcy.2013.11.011.
- [2] S. P. Vajjhala, "Integrating GIS and Participatory Mapping in Community," *Sustain. Dev.*, no. July 2005, p. 24, 2005, [Online]. Available: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.134.4523&rep=rep1&type=pdf>.
- [3] M. Mahant, A. Shukla, S. Dixit, and D. Patel, "Uses of ICT in Agriculture Department of CSE 1, 4 Department of IT 2 Department of Management 3 man ishmht@gmail," *Int. J. Adv. Comput. Res.*, vol. 2, no. 1, p. 46, 2012.

- [4] A. Yaakup, S. Sulaiman, R. Idris, and M. M. Yaakob, "GIS As New Tools And Approach In State Planning And Monitoring : The Experience of Negeri Sembilan , Malaysia," pp. 1–8, 2006.
- [5] M. Fargher, "Linking Lessons learnt from the Classroom with Research Findings on Pedagogies with GIS .," pp. 1–6, 2006.
- [6] T. Johansson, "GIS in Teacher Education – Facilitating GIS Applications in Secondary School Geography 2 . The Pedagogical Potentials of GIS in Secondary School," *ScanGIS'2003. 9th Scand. Res. Conf. Geogr. Inf. Sci.*, pp. 285–293, 2003.
- [7] S. K. Puri and S. Sahay, "Participation through communicative action: A case study of gis for addressing land/water development in india," *Inf. Technol. Dev.*, vol. 10, no. 3, pp. 179–199, 2003, doi: 10.1002/itdj.1590100305.
- [8] M. Milenković and D. Kekic, "Using GIS in Emergency Management," pp. 202–207, 2016, doi: 10.15308/sinteza-2016-202-207.
- [9] I. Jakab, M. Ševčík, and H. Grežo, "Model of higher GIS education," *Electron. J. e-Learning*, vol. 15, no. 3, pp. 220–234, 2017.
- [10] *Latvia University of Agriculture J Elgava , L Atvia , a Pril 10-12 , 2008.* 2008.
- [11] A. Officers, "QUT Digital Repository : © Copyright 2003 International Association of Assessing Officers (IAAO) Tan Yigitcanlar , Scott Baum and Robert Stimson," vol. 10, pp. 5–21, 2003.
- [12] E. Kurwakumire, "Towards a Public Sector GIS Evaluation Methodology," *South African J. Geomatics*, vol. 3, no. 1, pp. 33–52, 2014.
- [13] A. V. Ospina and R. Heeks, "Unveiling the Links between ICTs & Climate Change in Developing Countries : A Scoping Study," *Canada Int. Dev. Res. Cent.*, p. 59, 2010, [Online]. Available: <http://www.niccd.org/ScopingStudy.pdf>.
- [14] H. M. E. Abdelsalam and H. Elkadi, "ICT to enhance administrative performance: A case study from Egypt," *ACM Int. Conf. Proceeding Ser.*, vol. 232, pp. 129–132, 2007, doi: 10.1145/1328057.1328085.
- [15] A. Nasir, M. Shahzad, S. Anwar, and S. Rashid, "Digital governance: Improving solid waste management through ICT reform in Punjab," *ACM Int. Conf. Proceeding Ser.*, vol. Part F132087, 2017, doi: 10.1145/3136560.3136600.
- [16] M. Jepkorir, "Teachers' perceptions on ICT integration in secondary schools in Tinderet sub-county.," *J. Educ. Pract.*, vol. 8, no. 18, pp. 136–143, 2017.
- [17] P. Code, E. Date, and E. Time, "Admit Card Exam URL Exam Schedule & Login Credential Note : Please read the instructions given on the Page 2 of this Admit Card very carefully to understand the procedure of writing this Online examination . Please read the instructions carefully," no. 80819054, 2021.
- [18] M. Hasanuzzaman, *Agronomic crops*, vol. 2. 2019.

- [19] A. Yaakup, S. Sulaiman, S. Zalina, A. Bakar, and K. M. Bandar, “Evolving Concern Of ICT In Urban Planning And Monitoring,” pp. 1–13.
- [20] B. Andoh Charles, “Factors influencing teachers ’ adoption and integration of information and communication technology into teaching : A review of the literature,” *Int. J. Educ. Dev. Using Inf. Commun. Technol.*, vol. 8, no. 1, pp. 136–155, 2012.
- [21] M. Batty *et al.*, “Smart cities of the future,” *Eur. Phys. J. Spec. Top.*, vol. 214, no. 1, pp. 481–518, 2012, doi: 10.1140/epjst/e2012-01703-3.
- [22] Campagna M and Deplano G, “Public Participation GIS for re-development support in European Historic City Centres,” *CORP 2002 GeoMultimedia02*, p. 5, 2002.
- [23] S. Latu, “Sustainable Development: The Role of GIS and Visualisation,” *Electron. J. Inf. Syst. Dev. Ctries.*, vol. 38, no. 1, pp. 1–17, 2009, doi: 10.1002/j.1681-4835.2009.tb00268.x.
- [24] I. A. Alghamdi, R. Goodwin, and G. Rampersad, “E-Government Readiness Assessment for Government Organizations in Developing Countries,” *Comput. Inf. Sci.*, vol. 4, no. 3, 2011, doi: 10.5539/cis.v4n3p3.
- [25] S. S. B. Singh, B. Rathakrishnan, S. Sharif, R. Talin, and O. V. Eboy, “The effects of geography information system (GIS) based teaching on underachieving students’ mastery goal and achievement,” *Turkish Online J. Educ. Technol.*, vol. 15, no. 4, pp. 119–134, 2016.
- [26] A. Demirci, “How do Teachers Approach New Technologies: Geography Teachers’ Attitudes towards Geographic Information Systems (GIS),” *Eur. J. Educ. Stud.*, vol. 1, no. 1, pp. 43–53, 2009.
- [27] M. B. Sretenović, J. Petković, B. Jovanović, and F. O. Nauka, “Prevention of Fraud In Electronic Payment Systems,” *Ict Manag. 754*, p. 778, 2016.