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EDITORIAL

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Prof. Patrick C. Igbojinwaekwu
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BIOLOGY TEACHERS' COMPUTER ANXIETY AND DIGITAL LITERACY AS CORRELATES OF UTILIZATION OF DIGITAL TOOLS IN SECONDARY SCHOOLS IN ANAMBRA STATE

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Abstract

This study investigated Biology teachers' computer anxiety and digital literacy as correlates of the utilization of digital tools in secondary schools in Anambra State, Nigeria. The study sought to investigate the relationships between Biology teachers' computer anxiety, digital literacy, and their utilization of digital tools. A correlational research design was adopted for the study. The study was conducted in Anambra State and was guided by two research questions and two null hypotheses tested at the 0.05 level of significance. The population comprised 642 Biology teachers in 274 government-owned secondary schools. A multistage sampling procedure was used to select a sample of 350 Biology teachers. Three instruments were used for data collection: Biology Teachers' Computer Anxiety Scale (BTCAS), Biology Teachers' Digital Literacy Scale (BTDLS) and Biology Teachers' Utilization of Digital Tools Questionnaire (BTUDTQ). The instruments were validated by three lecturers from Nnamdi Azikiwe University, Awka, while reliability coefficients of 0.79, 0.75, and 0.77 were obtained using Cronbach's alpha. Data were collected through direct administration and retrieval of the questionnaires and analyzed using Pearson Product-Moment Correlation with SPSS version 20. The findings revealed a very low negative and non-significant relationship between computer anxiety and the utilization of digital tools ($r = -0.095$, $p > 0.05$), while digital literacy had a high positive and significant relationship with the utilization of digital tools ($r = 0.671$, $p < 0.05$). The study concluded that digital literacy is a key correlate of Biology teachers' utilization of digital tools. It was recommended that teachers should receive regular digital literacy training and that schools should provide continuous technical support and adequate digital infrastructure to enhance technology integration.

Keywords: Computer Anxiety, Digital Literacy, Digital tools.

Introduction

Science and technology involve the systematic study of the natural world and the application of scientific knowledge to solve human problems and improve quality of life (United Nations Educational, Scientific and Cultural Organization (UNESCO), 2023). Their integration has transformed education by promoting interactive, learner-centred teaching through the use of digital tools (UNESCO, 2023). Consequently, these advancements are highly relevant to Biology as a discipline that depends on visualization, experimentation, and conceptual understanding of living systems, thereby making Biology teaching increasingly dependent on the effective utilization of digital tools by teachers.

Biology is the scientific study of life and living organisms, including their structure, functions, growth, evolution, and interactions with the environment (Urry, Wasserman, Minorsky & Reece, 2020). As a core science subject in the Nigerian secondary school curriculum, it equips students with scientific knowledge and skills applicable to health, agriculture, and other life-related fields (Federal Ministry of Education (FME), 2021). Its importance as the foundation for disciplines such as medicine, pharmacy, nursing, and agriculture further underscores its relevance (Samuel & Obikezie, 2024). Consequently, Biology requires knowledgeable and skilled teachers who can effectively guide learners in understanding its concepts.

Teachers are central to the teaching and learning process, serving as facilitators of knowledge and skill development. They are expected not only to deliver instruction but also to possess the digital competencies required for effective teaching in the 21st century (Etesike, Ogbuabor & Offor, 2023; Ikpeama, Umoren & Paul-Mgbeatulike,

2024). Consequently, effective Biology teaching increasingly depends on teachers' ability to utilize digital tools in instructional delivery.

Digital tools are electronic devices, software, and online platforms that support teaching and learning (Oikonomou & Patsala, 2021). These include computers, tablets, projectors, interactive whiteboards, learning management systems, and AI-powered educational tools, all of which can enhance Biology instruction by promoting interactive teaching and improving students' understanding (Boma, 2022; Aflalo, Zana & Huri, 2018). However, despite the availability of these tools in many secondary schools in Anambra State, their utilization by Biology teachers remains low (Abazie, 2021; Okafor & Eze, 2023). This suggests that the availability of technology alone does not guarantee its effective classroom use. Therefore, the utilization of digital tools among Biology teachers may be influenced by factors such as computer anxiety and digital literacy.

Computer anxiety refers to the fear, tension, or apprehension individuals experience when using computers or digital technologies (Akpojotor, 2023). It often arises when users perceive technology as difficult to use or doubt their ability to operate it effectively (Rahman & Olanrewaju, 2020; Sundar & Devi, 2021). Among Biology teachers, computer anxiety may discourage the acquisition of computer skills and reduce their willingness to utilize digital tools for classroom instruction. Factors such as limited ICT experience, inadequate training, poor access to technological resources, and negative past experiences with technology can increase computer anxiety (Ahmed & Musa, 2022; Eze & Okoye, 2023; Gyamfi & Boateng, 2024). Consequently, persistent computer anxiety may undermine teachers' confidence, limit

their utilization of digital tools, and affect instructional effectiveness. Notably, inadequate technology experience and low digital literacy have been identified as major contributors to computer anxiety (Bervell & Umar, 2018). Therefore, understanding Biology teachers' digital literacy is essential in explaining their level of computer anxiety and utilization of digital tools.

Digital literacy is the ability to effectively use digital technologies to access, evaluate, create, communicate, and manage information in a digital environment (Tinmaz, Lee, Fanea-Ivanovici & Baber, 2022; Su, 2023). It encompasses the technical, cognitive, and communication skills required for learning and teaching in the digital age. For Biology teachers, digital literacy facilitates the use of digital tools such as e-books, videos, online platforms, and virtual learning resources to simplify concepts, promote interactive learning, and enhance students' engagement (Aggarwal, 2023; Wang, Zhang, Li, & Zhao, 2023). Teachers with adequate digital literacy are also better equipped to identify credible information and integrate technology effectively into classroom instruction (Fathi & Ebadi, 2020). Therefore, Biology teachers' level of digital literacy and computer anxiety is likely to influence their effective utilization of digital tools for instructional delivery.

Statement of the Problem

The integration of digital tools in secondary school education has become a key strategy for improving instructional delivery, particularly in science subjects such as Biology. In Anambra State, the government has provided various digital tools intended to support effective teaching of biological concepts. However, despite the availability of these resources in secondary schools, their utilization in Biology

instruction appears to be inconsistent. This situation raises concern as to whether Biology teachers' computer anxiety and digital literacy influence their utilization of digital tools in teaching. Computer anxiety, which reflects the fear or discomfort associated with the use of computer-based technologies, may hinder effective engagement with digital instructional resources. Likewise, digital literacy may determine the extent to which teachers are able to confidently and effectively integrate these tools into classroom practice. Therefore, the problem of this study is to investigate if Biology teachers' computer anxiety and digital literacy are correlates of utilization of digital tools in secondary schools in Anambra State

Purpose of the Study

The purpose of the study was to investigate if Biology teachers' computer anxiety and digital literacy are correlates of utilization of digital tools in secondary schools. Specifically, the study seeks to determine:

1. The relationship between Biology teachers' computer anxiety and utilization of digital tools in secondary schools in Anambra State.
2. The relationship between Biology teachers' digital literacy and utilization of digital tools in secondary schools in Anambra State.

Research Questions

The following research questions guided the study:

1. What is the relationship between Biology teachers' computer anxiety and the utilization of digital tools in secondary schools in Anambra State?

2. What is the relationship between Biology teachers' digital literacy and the utilization of digital tools in secondary schools in Anambra State?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant relationship between Biology teachers' computer anxiety and the utilization of digital tools in secondary schools in Anambra State.
2. There is no significant relationship between Biology teachers' digital literacy and the utilization of digital tools in secondary schools in Anambra State.

Methods

The study adopted a correlational research design to determine the relationships among Biology teachers' computer anxiety, digital literacy, and utilization of digital tools in secondary schools in Anambra State. The study was conducted in Anambra State, Nigeria. The population comprised 642 Biology teachers in 274 government-owned secondary schools. A multistage sampling procedure was used to select three education zones (Awka, Ogidi, and Onitsha), from which 366 Biology teachers were sampled. After data screening, 350 properly completed questionnaires were used for analysis. Three instruments were used for data collection: the Biology Teachers' Computer Anxiety Scale (BTCAS), Biology Teachers' Digital Literacy Scale (BTDLS), and Biology Teachers' Utilization of Digital Tools Questionnaire (BTUDTQ). BTCAS and BTDLS were adapted from existing standardized instruments, while BTUDTQ was developed by the researcher. All instruments

employed a four-point Likert response scale. The instruments were validated by three experts in Educational Foundations, Science Education and Computer Science from Nnamdi Azikiwe University, Awka. Reliability was established through a pilot study involving 20 Biology teachers in Enugu State. Cronbach's alpha coefficients of 0.79, 0.75, and 0.77 were obtained for BTCAS, BTDLS, and BTUDTQ, respectively, indicating acceptable internal consistency. Data were collected with the assistance of six research assistants using an on-the-spot administration and retrieval approach. Pearson Product-Moment Correlation was used to answer the research questions and test the hypotheses at the 0.05 level of significance using SPSS version 20.

Results

Research Question 1: What is the relationship between Biology teachers' computer anxiety and the utilization of digital tool in secondary schools in Anambra State?

Table 1: Pearson r on Relationship between Biology Teachers' Computer Anxiety and the Utilization of Digital Tools in Secondary Schools

Source of Variation	no	r	Remark
Biology Teachers' Computer Anxiety	350	-0.095	Very low Negative Relationship
Utilization of Digital Tools			

Results in Table 1 shows that there is a very low negative relationship between Biology teachers' computer anxiety and the utilization of digital tools in secondary schools in Anambra State. This is evident from the Pearson Product Moment Correlation Coefficient (r = correlation coefficient) of -0.095, which indicates a very low negative relationship.

Research Question 2: What is the relationship between Biology teachers' digital literacy and the utilization of digital tool in secondary schools in Anambra State?

Table 2: Pearson r on Relationship between Biology Teachers' Digital Literacy and the Utilization of Digital Tools in Secondary Schools

Source of Variation	no	r	Remark
Biology Teachers' Digital Literacy Utilization of Digital Tools	350	0.671	High Positive Relationship

Table 2 shows that there is a high positive relationship between Biology teachers' digital literacy and the utilization of digital tools in secondary schools in Anambra State. This is evident from the Pearson Product Moment Correlation Coefficient (r = correlation coefficient) of 0.671, which indicates a high positive relationship.

Hypothesis One: There is no significant relationship between Biology teachers' computer anxiety and utilization of digital tools in secondary schools in Anambra State.

Table 3: Test of Significance of Pearson Correlation between Biology Teachers' Computer Anxiety and the Utilization of Digital Tools in Secondary Schools

Source of Variation	no	r	p-value	Remark
Biology Teachers' Computer Anxiety	350	-0.095	0.07	Not Sig
Utilization of Digital Tools				

Analysis in Table 3 shows that there is a very low negative and non-significant relationship between Biology teachers' computer anxiety and the utilization of digital tools in secondary schools in Anambra State. This is evidenced by the Pearson Product Moment Correlation Coefficient (r = correlation coefficient) of -0.095 and p-value = 0.07. Since the p-value is greater than 0.05, the null hypothesis one was not rejected.

Hypothesis Two: There is no significant relationship between Biology teachers' digital literacy and utilization of digital tools in secondary schools in Anambra State.

Table 4: Test of Significance of Pearson Correlation between Biology Teachers' Digital Literacy and the Utilization of Digital Tools in Secondary Schools

Source of Variation	no	r	p-value	Remark
Biology Teachers' Digital Literacy	350	0.671	0.00	Significant
Utilization of Digital Tools				

Analysis in Table 4 shows that there is a high positive and significant relationship between Biology teachers' digital literacy and the utilization of digital tools in

secondary schools in Anambra State. This is evidenced by the Pearson Product Moment Correlation Coefficient (r = correlation coefficient) of 0.671 and p-value = 0.00. Since the p-value is less than 0.05, the null hypothesis two was rejected.

Discussion

Relationship between Biology Teachers' Computer Anxiety and the Utilization of Digital Tools in Secondary Schools in Anambra State

The findings of the study revealed that computer anxiety was negatively related to Biology teachers' utilization of digital tools in secondary schools in Anambra State. The corresponding hypothesis further showed that the relationship was not statistically significant. This implies that although Biology teachers who experience anxiety toward the use of computers may be less inclined to utilize digital tools, computer anxiety does not constitute a major factor influencing digital tool utilization among the teachers. This finding may be attributed to the increasing integration of technology into educational activities, which has made many teachers develop a level of familiarity with digital tools despite experiencing some anxiety. Consequently, teachers may continue to utilize digital technologies because of their relevance to instructional delivery and professional responsibilities. The finding supports the Social Cognitive Theory of Bandura, (1986), which emphasizes that behaviour is influenced by personal factors such as beliefs, confidence, and self-efficacy. According to the theory, teachers who experience high levels of computer anxiety are likely to have lower confidence in their ability to utilize technology effectively and may therefore be less willing to engage with digital tools. The negative relationship observed in the present study lends support to this theoretical assumption. The

finding agrees with Arican, (2022), who reported that computer anxiety negatively influenced teachers' technology-related competencies. It is also consistent with the findings of Popoola and Adedokun, (2021) and Awofala et al. (2019), who found that computer anxiety negatively affected technology utilization and related technological behaviours. However, the non-significant nature of the relationship in the present study suggests that other factors may be more important determinants of Biology teachers' utilization of digital tools in Anambra State. The implication of this finding is that efforts aimed at enhancing digital tool utilization should not only focus on reducing computer anxiety but should also address other factors that facilitate technology integration in schools.

Relationship between Biology Teachers' Digital Literacy and the Utilization of Digital Tools in Secondary Schools in Anambra State

The findings revealed that digital literacy was positively related to Biology teachers' utilization of digital tools in secondary schools in Anambra State. The corresponding hypothesis confirmed that the relationship was statistically significant. This suggests that teachers who possess greater digital literacy are more likely to utilize digital tools effectively in instructional delivery. This finding may be explained by the fact that digital literacy equips teachers with the knowledge and skills required to access, evaluate, manage, and utilize digital resources. Teachers who are digitally competent are more confident in exploring technological innovations and integrating them into classroom practices. The finding supports Rogers' Diffusion of Innovation Theory (2003), which posits that knowledge of an innovation is a prerequisite for its adoption and utilization. According to the theory, individuals who possess adequate knowledge

and understanding of an innovation are more likely to adopt and continue utilizing it. Therefore, Biology teachers with higher levels of digital literacy are more likely to progress through the stages of innovation adoption and effectively utilize digital tools. The finding agrees with Fathali et al. (2024), Joseph et al. (2024), and Yustika and Iswati, (2020), who reported that digital literacy positively influences technology utilization, instructional effectiveness, and learning outcomes. The implication of this finding is that improving Biology teachers' digital literacy through regular training and professional development programmes like computer literacy training workshops, information and communication technology (ICT) capacity- building programmes etc can enhance their utilization of digital tools in instructional delivery.

Conclusion

The findings of the study showed that Biology teachers' computer anxiety had a very low negative and non-significant relationship with the utilization of digital tools, indicating that computer anxiety was not a major factor influencing teachers' utilization of digital tools in secondary schools. Conversely, digital literacy had a high positive and significant relationship with the utilization of digital tools, suggesting that digital literacy is a critical factor in promoting technology integration among Biology teachers. However, the study concludes that effective utilization of digital tools among Biology teachers depends largely on the level of digital literacy possessed by the teachers. Therefore, efforts aimed at enhancing technology integration in secondary schools should focus on strengthening teachers' digital literacy competencies while providing supportive measure.

Recommendations

In view of the findings of the study, recommendations were made which include:

1. All science teachers should regularly participate in workshops, seminars, conferences, and other professional development programmes aimed at enhancing their digital literacy skills for effective utilization of digital tools in instructional delivery.

2. School principals should organize periodic capacity-building programmes and provide continuous technical support to help teachers reduce computer anxiety and build confidence in the use of digital technologies for teaching and learning.

3. The Ministry of Education and relevant educational agencies should provide adequate digital infrastructure, internet connectivity, and technological resources in secondary schools to facilitate teachers' utilization of digital tools.

4. Teacher training institutions should strengthen the integration of digital literacy, educational technology, and practical technology-based instructional strategies into pre-service and in-service teacher education programmes.

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