



Assessment of STEM student's Technological Literacy on the societal impact of technology in Federal College of Education (Technical), Asaba, Delta State

Justin Afolabi Okhueleigbe

Department of electrical/electronic Technology
School of secondary education(Technical), Federal College of Education (Technical),
Asaba, Delta State
Email: firstjay24@gmail.com

Obed Obinna Okoh

Department of electrical/electronic Technology
School of secondary education(Technical) Federal College of Education (Technical),
Asaba, Delta State
Email: Okohobed@gmail.com

Dare Micheal Ogunyemi

Department of electrical/electronic Technology
School of secondary education(Technical), Federal College of Education (Technical),
Asaba, Delta State
Email: Daremichael760@gmail.com

Abstract

Technological literacy is essential for individuals to navigate and evaluate the benefits and risks associated with modern technologies. However, the extent to which STEM students in Nigerian colleges possess this literacy remains unclear. This study assessed the level of knowledge regarding the societal impact of technology among STEM students at the Federal College of Education (Technical), Asaba, Delta State. A descriptive survey design was adopted, involving the entire population of 70 STEM students. Data were collected using a validated questionnaire with a five-point Likert scale. The instrument's reliability was established using the Cronbach Alpha method, yielding a coefficient of 0.84. Descriptive statistics (mean and standard deviation) and inferential statistics (t-test) were employed for data analysis. Findings revealed that students possessed a high level of knowledge regarding the impact of technology on society. However, a significant difference was found between male and female students, with male students exhibiting higher technological literacy. The study recommends integrating practical technology-related content into STEM curricula and providing continuous professional development for educators to foster deeper technological understanding.



Introduction

Technology plays a central role in shaping modern life by improving living standards, enhancing productivity, and enabling scientific and societal advancements. Innovations such as automobiles, nuclear energy, genetic engineering, and automation have transformed how people live and work, offering both benefits and challenges. While these technologies provide mobility, increase food production, reduce disease, and improve communication, they also pose environmental and social risks. Therefore, it is essential that individuals, especially students in Science, Technology, Engineering, and Mathematics (STEM), understand both the positive and negative impacts of technology on society.

Contrary to common misconceptions, technology itself is neither inherently good nor bad; rather, its impact depends on how it is used and the context in which it is applied. Technological decisions must be made with a clear understanding of their intended and unintended consequences. As technological systems become increasingly complex, it is imperative that citizens are equipped with the skills to evaluate, make informed judgments, and act responsibly.

Recent research in Nigeria highlights this need in STEM education. Familoni and Onyebuchi (2024) conducted a systematic review on AI integration and concluded that while artificial intelligence has great potential to personalize and enhance technical literacy, its effective use depends on equitable access, ethical considerations, and robust teacher training. Similarly, Ekwu, Ikwuanusi, and Okonkwo (2024) emphasized that integrating AI-driven tools such as virtual labs and intelligent tutoring systems into STEM curricula is essential for developing critical thinking, problem-solving skills, and innovation among Nigerian students. This aligns with Solomon and Chidinma's (2023)



survey of Nigerian secondary teachers, which found a strong belief that digital literacy should be embedded in the curriculum to prepare students for future challenges.

In the Nigerian higher education context, Ezeani and Obiora-Dimson (2023) reported that students show improved engagement and skill acquisition when digital technologies are integrated into STEM instruction, although challenges remain around infrastructure, teacher readiness, and consistent power supply. Meanwhile, Ajayi, Lawal, and Salaudeen (2023) noted the transformative role of STEM pedagogy in addressing societal issues such as climate change and sustainable resource management. Therefore, assessing the level of technological literacy among STEM students at the Federal College of Education (Technical), Asaba, is essential. Such an evaluation can provide empirical evidence to inform curriculum design, teacher training, and policy reform, preparing students not only to use technology but also to understand its broader consequences for society and the environment.

Statement of the Problem

Despite the pervasive role of technology in modern society, many STEM students at the Federal College of Education (Technical), Asaba, appear to lack a comprehensive understanding of the societal implications of technology. This knowledge gap may hinder their ability to make informed decisions, critically assess technological advancements, and apply technology effectively to solve real-world problems. Without sufficient technological literacy, these students may struggle to evaluate the benefits and risks associated with emerging technologies, potentially limiting their contributions to national development and innovation. A thorough assessment of the level of technological literacy, specifically the ability to understand and evaluate the impact of technology on



society is necessary. Such an assessment will provide evidence to support the development of targeted educational interventions aimed at improving students' readiness for the technological demands of the 21st century.

Purpose of the Study

The main purpose of this study is to assess the level of knowledge regarding the societal impact of technology possessed by STEM students at the Federal College of Education (Technical), Asaba, Delta State. Specifically, the study aims to:

- Determine the extent to which STEM students understand the positive and negative impacts of technology on society.

Research Question

This study is guided by the following research question:

- What is the level of knowledge possessed by STEM students in Delta State regarding the impact of technology on society?

Hypothesis

The following null hypothesis was tested at the 0.05 level of significance:

- **H₀:** There is no significant difference between the mean ratings of male and female STEM students regarding their knowledge of the impact of technology on society.

Methodology

This study adopted a descriptive survey research design, which is suitable for collecting and analyzing data from a defined population without manipulating any variables.

The study was conducted at the Federal College of Education (Technical), Asaba, located in Delta State, Nigeria. The population comprised all 70 STEM students enrolled



in the 2023/2024 academic session. Given the manageable size, the entire population was used as the study sample. Data were collected using a structured questionnaire titled STEM Students' Technological Literacy Questionnaire (STEMSTLQ). The instrument was based on a five-point Likert scale and was validated by three experts, two from the Department of Vocational Education, Nnamdi Azikiwe University, Awka, and one from the Department of Educational Foundations (Measurement and Evaluation Unit), Federal College of Education (Technical), Asaba. Reliability testing using the Cronbach Alpha method yielded a coefficient of 0.84, indicating high internal consistency. The researcher administered and retrieved all 70 copies of the questionnaire, achieving a 100% response rate. Data were analyzed using mean and standard deviation for the research question, and an independent samples t-test was used to test the hypothesis at the 0.05 significance level.

Results and Discussion

Research Question

What level of knowledge of the impact of technology on society do STEM students in Delta State possess?

Data collected in respect of research question 3 are presented in Table 1.

Table 1: Mean Rating and Standard Deviation on STEM Students knowledge of the impact of Technology on Society.

N = 70				
S/No	Item description	Mean(X)	SD	Decision
Ability to...				
1	Explain how existing technologies make life and work easier	3.99	0.88	High
2	Assess the impact of new/improved products and services on the quality of life of the people	3.25	1.16	Moderate
3	Identify the advantages and disadvantages of given technologies.	4.23	0.74	High



4	Explain the importance of decisions on the direct and indirect effect of technology for the future.	3.56	0.82	High
5	Evaluate the relative appropriateness of given technology by comparing the risks with the benefits.	4.26	1.27	High
6	Explain why a given technology may be acceptable or unacceptable under certain circumstances	2.44	1.59	low
7	Explain why people must understand how a new technology might affect human or society.	3.35	0.89	Moderate
8	Explain that all technologies involve risks, some of which can only be anticipated.	3.51	1.40	High
9	Understand that technology results in both planned and unplanned consequences.	3.11	0.92	Moderate
Cluster Mean		3.52		High level

The results indicate that STEM students in Federal College Of Education (Technical) Asaba, Delta State possess a high level of knowledge of the societal impact of technology, as evidenced by the cluster mean of 3.52. Students demonstrated strong understanding in areas such as identifying risks and benefits, assessing impacts, and recognizing unintended consequences. However, their ability to assess acceptability under specific circumstances was rated low.

Hypothesis Testing

H₀: There is no significant difference between the mean ratings of male and female STEM students regarding their knowledge of the impact of technology on society.

Table 2: Independent Samples t-Test Comparing Male and Female Students' Technological Knowledge

Gender	N	Mean	SD	df	Standard Error	α -level	t-cal	t-crit	Decision
Male student	15	4.07	0.80						
Female student	55	3.37	1.02	70	0.3628	0.05	8.43	1.960	Rejected



Since the calculated t-value (3.05) exceeds the critical t-value (1.96) at 0.05 significance level, the null hypothesis is rejected. This indicates a statistically significant difference between male and female students in their knowledge levels, with male students demonstrating higher technological literacy. This suggests a gender gap in technological literacy among STEM students in the institution.

Discussion of Findings

The findings reveal that STEM students generally possess a high level of understanding regarding the impact of technology on society. Students demonstrated the ability to identify both benefits and risks, assess technological impacts, and make informed evaluations—aligning with Nebo's (2010) assertion that technical students in Anambra and Enugu states possessed similarly high levels of technological awareness. The findings also corroborate Ogbimi's (1994) perspective that technological literacy is anchored in the ability to combine theoretical understanding with independent critical thinking.

However, the study also uncovered a notable gender disparity. Male students showed significantly higher levels of technological knowledge compared to their female counterparts. This may be attributed to varying levels of exposure, confidence, or participation in hands-on technological activities—a trend that has been noted in related research.

Conclusion

Based on the data analyzed, it can be concluded that STEM students at the Federal College of Education (Technical), Asaba, possess a high level of knowledge regarding the societal impact of technology. They demonstrate the ability to assess the



benefits and risks associated with technological innovations and understand how these innovations influence daily life and societal development. However, the observed gender disparity suggests a need for targeted strategies to promote equal opportunities for technological literacy acquisition among all students.

Recommendations

In light of the findings, the following recommendations are proposed:

1. Curriculum developers should integrate practical, technology-focused content into STEM courses, using real-world problem-solving contexts.
2. Teachers should implement inclusive pedagogical strategies that support equal participation by male and female students.
3. Continuous professional development should be provided to educators to enhance their technological and instructional competencies.
4. Workshops and seminars on technological literacy should be organized regularly for students, emphasizing social, ethical, and environmental impacts.
5. Further research should be conducted across multiple institutions to validate findings and explore broader national trends



References

- Ajayi, A. A., Lawal, M. O., & Salaudeen, A. A. (2023). Integrating STEM education for sustainable development in Nigeria: A pedagogical perspective. *African Journal of Humanities and Contemporary Education Research*, 5(1), 101–110. <https://publications.afropolitanjournals.com/index.php/ajhcer/article/view/385>
- Ekwu, F. O., Ikwuanusi, E. C., & Okonkwo, P. I. (2024). Artificial intelligence applications in STEM education: Potentials and challenges in Nigerian tertiary institutions. *FNAS Journal of Mathematics, Science, and Education*, 6(1), 45–58. <https://fnasjournals.com/index.php/FNAS-JMSE/article/view/697>
- Ezeani, N. S., & Obiora-Dimson, D. (2023). Improving STEM learning through digital technology in Nigerian universities. Retrieved from https://www.researchgate.net/publication/372535591_IMPROVING_STEM_LEARNING_THROUGH_DIGITAL_TECHNOLOGY
- Familoni, M. O., & Onyebuchi, F. C. (2024). Enhancing technical education in Nigeria through AI integration: A systematic review. *Eurasian Society of Technology Journal*, 8(2), 78–88. <https://www.fepbl.com/index.php/estj/article/view/1042>
- Nebo, J. C. (2010). *Assessment of technological literacy of technical college students in Anambra and Enugu states of Nigeria* (Unpublished M.Sc Thesis). Nnamdi Azikiwe University, Aawka, Nigeria
- Ogbimi, F. E. (1994). A twenty year development plan for establishing firm scientific and engineering bases for manufacturing affordable automobiles in Nigeria. *Tradev*, 1(2), 36 – 44.
- Solomon, C., & Chidinma, A. (2023). Incorporating digital literacy into the curriculum for 21st-century Nigerian teachers: Perceptions and policy implications. *International Journal of Research and Innovation in Social Science*, 7(11), 321–330. <https://rsisinternational.org/journals/ijriss/articles/incorporating-digital-literacy-into-the-curriculum-for-21st-century-nigerian-teachers-perception/>