Bridging the Gap: Exploring Regional Disparities in Access to Educational Technology

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Abstract

This study investigates the general issue of regional disparities in access to educational technology and its implications for educational equity. Literature has conducted combination of quantitative analysis and qualitative case studies in a particular area that included student access to technologies, engagements, their academic performance, and their chances on learning more using technology. Studies has shown that regional disparities usually arise due to historical, geographical, political, and economic factors which it refers to inequalities in socio-economic conditions, opportunities, resources levels between different geographical regions within a country or across different countries and it manifests in various aspects of life, including income levels, access to education, and technologies. Survey was carried out in Methodist High School distributing questionnaires to individuals aged 11-18 to assess their educational technology Using Cochran's formula. This method showed that 80% of the students experience a digital dived affecting their education. This study recommends that understanding the difficult dynamics associated with regional disparities in educational technology will help in bridging the gap between accessing educational technology and ensuring all students in every geographical area have opportunities to succeed in the growing digital age and using it to their full advantage.

Key Words: Regional disparities, Digital divide, educational technology.

Introduction

Since the early 1980s, with the onset of digital era, the digital divide, which is defined by unequal access to Information and Communication Technologies (ICT), has been a global issue. The origins and effects of digital exclusion have received considerable attention from academics, with particular attention paid to how it affects kids from different social groups. Access to digital devices, material, and networks varies significantly depending on factors

including age, gender, social status, wealth, and region. This digital divide prevents people from participating in society and from moving up the social ladder, especially those who are digitally marginalized (Liu, 2021).

Governments are implementing ICT policies all over the world to encourage the development of information societies. These regulations are directed towards a wide range of entities, such as people, corporations, and the public sector, who are either technology producers or consumers. Creating digital government applications, encouraging ICT use by Small and Medium-Sized Enterprises (SMEs), initiating local Smart City initiatives, improving broadband connection, and resolving digital inequalities between residents and businesses are common objectives of ICT policies (Lythreatis et al., 2022).

As the digital economy expands, the digital divide has become a crucial and dynamic issue. Through United Nations (UN) publications, it attracted attention on a global scale and is now a key problem for governments, organizations, and academics in a variety of sectors. The difference between those who have appropriate access to ICT and others who have little or no access is known as the "digital divide." Due to their impact on people's social and economic capital as well as their capacity to participate in society, these gaps worsen social inequities. The digital divide is frequently referred to as "digital poverty," and it is acknowledged as a 21st-century social justice issue that contributes to overall poverty (Vassilakopoulou & Hustad, 2023).

Concerns about disparities in the effectiveness, accessibility, and use of digital resources are developing in contemporary society. This is known as digital inequality. For the transition to sustainable digital societies, access to digital resources—including disruptive technologies like business analytics, big data, and artificial intelligence—is crucial. A successful digital community requires reducing digital disparities. All types of digital inequality are together referred to as the "digital divide". It was first used to highlight the difference between those who have access to contemporary technology and those who do not, in a 1999 US government report. Since then, the phrase has come to refer to the difference in how well people use modern information and communication technologies, including the Internet, compared to others who cannot. In an era of continuous social digitization, the digital gap represents difficulties related to civil rights and the economy (Adeleke, 2020). As digitization becomes more commonplace in employment and daily life, those who are unable to use digital resources successfully may feel separated from society, raising worries about continuing disparities even in technologically sophisticated nations. There are still serious access problems in low-resource communities (Kono & Taylor, 2021).

Literature Review

The digital gap reflects offline socioeconomic disparities and encompasses more than just access to technology. For digital societies to be viable, this gap must be closed. A survey of the literature on information system research in advanced technology settings conducted between 2010 and 2020 identifies important variables and countermeasures for the digital divide. The authors put out a research agenda that would strengthen the connections between studies on the digital divide and sustainability, add additional factors to the models already in use, and critically assess the results of initiatives (Vassilakopoulou & Hustad, 2023).

Access to telephones was a key factor in defining the digital divide at the close of the 20th century. After the late 1990s, the emphasis switched to differences in internet connectivity that were linked to social and economic inequality in homes, enterprises, people, and geographic areas. Over the past 20 years, the number of people using the internet has increased dramatically to over 4.39 billion worldwide, a 9% rise from 2018. Two levels of the digital gap have been identified by research: level 1, which focuses on access, and level 2, which focuses on technological ability (Moore et.al., 2018).

Rural school districts now have vital tools thanks to the development of educational technology, which helps them overcome challenges brought on by remote populations, physical isolation, and limited funding. To help students acquire 21st-century abilities like creativity and teamwork, teachers who actively employ technology can help them develop greater levels of critical thinking and communication skills. Rural schools, however, confront significant infrastructure issues, such spotty or non-existent internet connectivity (Kormos & Wisdom, 2021). Up to 28% of pupils in rural regions do not have access to the internet at home, even in linked districts. For instance, 35% of families in West Virginia's Pendleton and Mingo counties do not have access to the internet or working electronics. Rural schools with limited access to higher education collaborations and obsolete resources might benefit from having access to technology. The use of innovative technology promotes collaborative learning, allows for distance study for post-secondary courses, and moves the emphasis from teacher-centred strategies to student-centred interactive activities (Reggi & Ramon, 2021).

Methodology

The survey was conducted at a public secondary school called Methodist School 4, Baale Osuntoki Road, Jericho, Ibadan, Oyo State, Nigeria. This school was selected because its student population, which exceeds 1,000, falls within the targeted age range for the study.

Students were surveyed using questionnaires on Google Docs, which are then recorded and subjected to a quantitative analysis of the answers provided by the students. The Cochran's formula, which is frequently used to calculate the sample size for a survey, was used to calculate the population sample size. The formula is: $n = \frac{Z^2 * p * (1-p)}{e^2}$, where:

- n is the sample size.
- Z is the Z-value (the number of standard deviations from the mean). For a 95% confidence level, the Z-value is 1.96.
- p is the estimated proportion of the population that has the attribute in question. If no prior estimate is available, p is usually set to 0.5, providing the maximum sample size.
- e is the desired level of precision (the margin of error).

The calculation process involves the following steps

1. Determine the Confidence Level and Z-value: For a 95% confidence level, the Z-value is 1.96.
2. Estimate the Proportion (p): If there is no prior data, use p = 0.5.
3. Specify the Desired Precision (e): Choose a margin of error. For instance, e = 0.05, (5%).
4. Apply Cochran's Formula: Plug the values into the formula:

$$n = \frac{Z^2 * p * (1-p)}{e^2}$$

$$n = \frac{1.96^2 * 0.5 * (1-0.5)}{0.05^2}$$

$$n = \frac{3.8416 * 0.25}{0.0025}$$

$$n = \frac{0.9604}{0.0025}$$

$$n = 384$$

So, the initial sample size is approximately 384 students.

5. Adjust for Finite Population: If the population size (N) is known, use the finite population correction:

$$n = \frac{n_0}{1+(\frac{n_0-1}{N})}$$

Since the total population (N) is 1,000 students:

$$n = \frac{384}{1+(\frac{384-1}{1000})}$$

$$n = \frac{384}{1+0.383}$$

$$n = \frac{384}{1.383}$$

$$n = 277.66$$

Thus, the adjusted sample size is approximately 278 students.

The following procedures were used to distribute the questionnaire:

1. Participant selection: Using student ID cards, a random sample technique was employed to guarantee that each student had an equal chance of being chosen.
2. Informing and Encouraging Participation: Due to school regulation prohibiting students from bringing devices to class, a device was provided to a selected group of students, and the survey's objective was clarified. Details on the importance of their involvement and how it would benefit their academic endeavours were included in the correspondence.
3. Distribution Method: Google Form, an online survey tool, was used to disseminate the questionnaire electronically.

One benefit of conducting this survey within the school district is that using random sampling methods will helps ensure the sample is representative of the population.

1. A follow-up email will be sent to encourage participation. Providing rewards for completing the survey is another way to reduce the non-response rates.
2. It promotes truthful answers through anonymity, which aids in the formulation of objective and unambiguous questions.

The following morally and practically sound processes were used to safeguard student information:

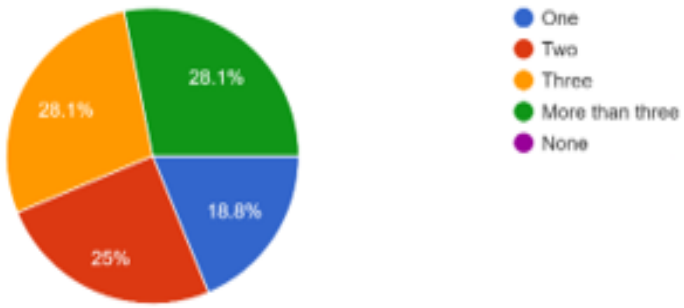
1. A pilot test of the questionnaire was administered to a limited sample of students to find and fix any problems.
2. By giving responders precise instructions to reduce miscommunications.
3. By maintaining consistency using standardized questions and scales.
4. By getting the principal of the school's consent before distributing the survey.
5. By putting a section on informed consent at the start of the survey that details the goals, methods, dangers, and advantages of the research.
6. By guaranteeing that students can opt out at any moment without facing any repercussions and that participation is entirely optional.
7. By guaranteeing confidentiality and privacy protection, personal information will be anonymized to safeguard student identity, stored securely, and accessible only to

authorized personnel. Additionally, results will be reported in aggregate form, making it impossible to link specific responses to any participant.

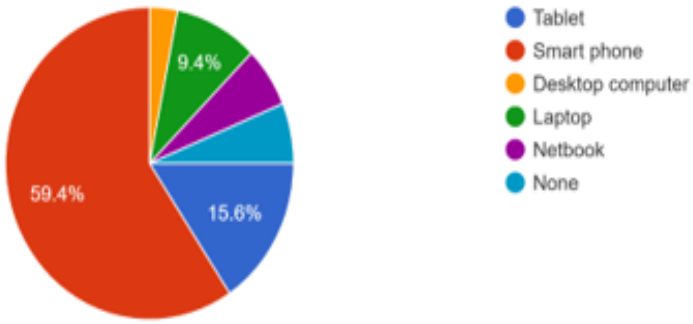
Result

The results were gotten from the questionnaire that was distributed at Methodist High School Ibadan. It shows the level of access students have to digital devices and how they utilise it, the educational level of their parents and this is done within the age range of students 10-20 years. The results also help us determine their geographical residence, ethnic group and if students use their access to some of these technologies wisely or just for entertainment. Each question and their graphical representation of the answers are shown below with the estimate of the answers.

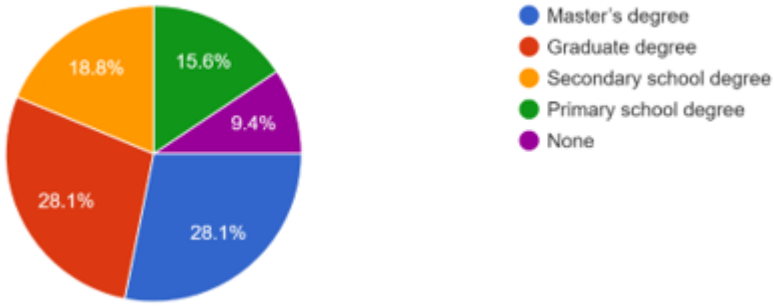
1. This result shows the number of digital devices that students have access to at home



2. This result shows the devices that students use the most

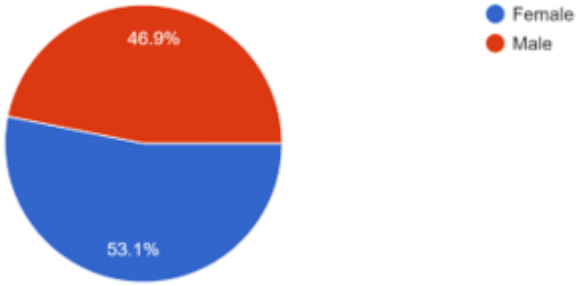


3. This result shows the level of each student parent's education; 28.1% of the parents have Master's degree, 28.1% of the parents have a graduate degree, 18.8% of the parents have a high school degree, 15.6% of the parents have primary school degree and 9.4% of the parents have no degree

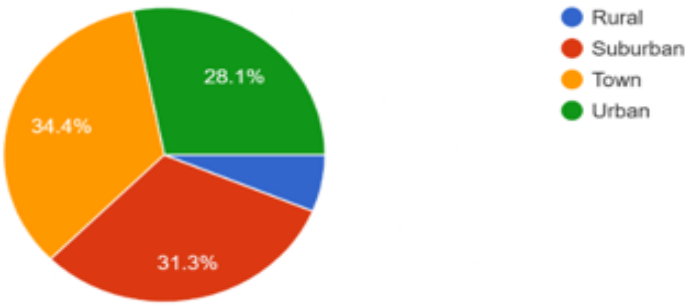


4. This result shows each of the student's race; all the students are from Africa

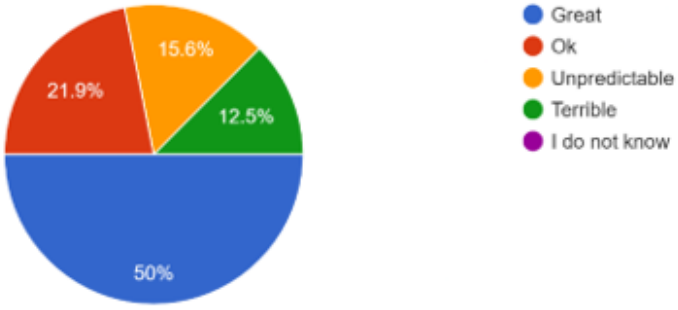
5. This result shows the gender of each student; 53.1% of the students are female, while 46.9% of the students are male



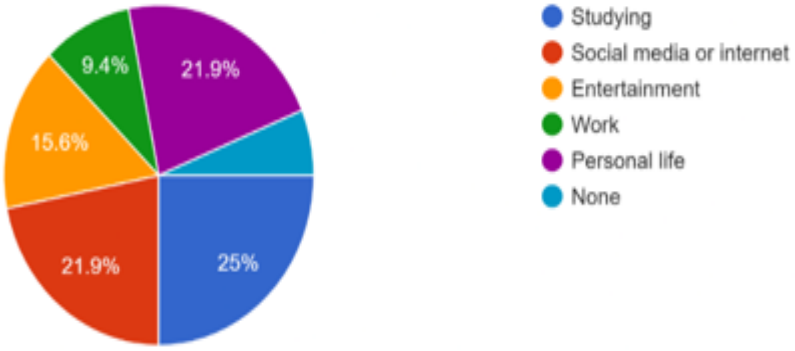
6. This result shows the geographical residence of each of the students; 6.2% of students live in rural areas, 31.3% in suburban areas, 34.4% in town areas, and 28.1% in urban areas.



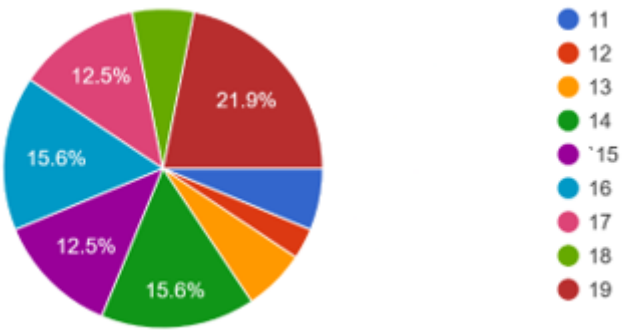
7. This result shows that 50% of students have great internet access at home, 21.9% have satisfactory internet access, 15.6% experience unreliable internet, while 12.5% have poor internet access.



8. This result shows how students primarily use their devices; 6.2% do not use their devices, 25% use them for studying, 21.9% use them for personal activities, 21.9% use theirs for the social media or internet browsing, 15.6% use them for entertainment, and 9.4% use them for work.



9. This result shows the age distribution of the students.



10. This result shows the class distribution of students at Methodist High School

Discussion and Conclusion

The study conducted at Methodist High School in Ibadan offers valuable insights into students' access to digital technologies, parental education, geographic location, gender distribution, internet access, and gadget usage. These ramifications emphasize how crucial digital literacy is to improving students' academic performance and opportunities.

1. High Access to Digital Technologies: The fact that more than 80% of students have access to digital tools suggests that there is a trend in the right direction toward the inclusion of these resources in the classroom. This access may support innovative teaching techniques, offer a wealth of materials, and improve learning experiences. By providing students with the necessary 21st-century abilities, digital literacy can improve their prospects in both higher education and the Labor market.
2. Educational Background of Parents: It is shown that parents of 90% of pupils have graduate and master's degree holders, indicating a highly educated community. Given that educated parents are probably more aware of the value of digital tools in education, this may be related to the pupils' increased access to digital technology. Students' academic performance and ambitions might be influenced by their parents' educational backgrounds, which may result in improved career and educational achievements.
3. Geographical Residences: Determining the places with different degrees of access to educational resources is made easier by knowing the geographical distribution of pupils. Targeted interventions might be designed if some regions are underrepresented in terms of access. Reducing regional inequalities guarantees all students, regardless of where they live, fair access to educational opportunities.
4. Gender Distribution and Internet Access: Understanding how different genders use digital devices and the internet might help identify any possible gender differences in digital literacy. To advance gender equality in education, it is imperative that equal

access be granted to all genders. By eliminating any gender disparities in digital access and usage, inclusive learning environments may be promoted and all students can be empowered equally.

5. Use of Digital Devices: Students utilize digital devices for a variety of purposes, including entertainment and learning. Comprehending these patterns of use can facilitate the customization of educational initiatives that utilize these devices to enhance learning outcomes. Encouraging students to utilize digital devices productively can improve their educational experiences and better equip them for a society that is driven by technology.

The outcome demonstrates that even if most Methodist High School Ibadan pupils have access to digital tools, geographical differences can still exist. These differences may result from variables including parents' and pupils' knowledge levels, infrastructural accessibility, and socioeconomic position.

1. Consequences for Regional Inequalities: Students in urban or affluent areas may have more access to digital technology than students in rural or underdeveloped places. It is possible that minority school districts need more assistance with infrastructure, teacher preparation, and student access to digital devices.
2. Broader Research Objective: The goal of the study is to comprehend how the digital divide affects educational results. The results underline the necessity of regional disparity-addressing policies and programs to guarantee that all students, wherever they may be in the world, have an equal chance to gain from digital technology.

The following groups the result:

1. Internet and Digital Technology Access: More than 80% of students have internet and digital technology access. A good trend in digital literacy and its potential advantages for education may be observed in pupils who have high access to digital technology.
2. Educational Background of Parents: Ninety percent of pupils have parents with a degree. A high degree of parental education is correlated with students' higher awareness of and access to digital technology.
3. Geographical Residences: Students live in a variety of locations. Determining the geographical differences in educational technology accessibility might facilitate the targeting of actions towards underprivileged areas.
4. Gender Distribution and Internet Usage: An examination of the gender distribution and online behaviour of students. Promoting gender equality in education involves guaranteeing that both genders have equal access to digital technology.

5. Utilize of Digital gadgets: Students utilize their digital gadgets for entertainment, learning, and other purposes. Comprehending the ways in which students utilize digital devices may aid in the creation of educational initiatives that augment learning via technology.

Comparison was made between students whose parents are literate with their access to devices and those whose parents are illiterate with access to devices:

1. Access to Digital Technologies: Students with educated parents have better access to digital technologies. Educated parents may be more aware of the importance of technology in education and more capable of providing their children with the necessary devices and internet access, while students with illiterate parents may have less access to digital technologies. Their parents may not fully understand the importance of these technologies or may lack the financial resources to provide them.
2. Use of Digital Devices: students with educated parents are more likely to use their devices for a variety of activities, including studying and entertainment. Their parents might guide them on how to use technology effectively for academic purposes, while students with illiterate parents might use their devices more for entertainment rather than academic purposes due to a lack of guidance. They may also have limited digital literacy.
3. Digital Literacy and Training: students with educated parents are likely to have higher digital literacy because their parents might be better equipped to teach them or provide access to formal training. They might also have more opportunities for digital literacy training at home, while students with illiterate parents might need more support and formal training at school to improve their digital literacy. They are less likely to receive this training at home.
4. Impact on Academic Performance: students with educated parents may perform better academically due to their higher digital literacy and better access to technology. They can use digital tools to enhance their learning and complete their schoolwork more efficiently, while students with illiterate parents might struggle academically if they lack access to technology and digital literacy. They may need additional support from the school to bridge this gap.

Summary of Results

1. High Access to Digital Technologies: A conducive atmosphere for digital literacy is demonstrated by most students' availability to digital tools.

2. Educated Parental Background: A community that prioritizes digital technology in education is shown by the high number of parents with degrees.
3. Gender and Geographical Analysis: Determining gender and geographic discrepancies aids in the development of focused initiatives that guarantee fair access.
4. Utilize of Digital Devices by Students: The many ways in which students utilize digital devices reveal opportunities to employ technology to improve educational programs.

To prepare students for future educational and employment prospects, the research highlights the significance of digital literacy by addressing inequities and fostering fair access to digital technology.

Recommendations

According to the results, over 80% of students at Methodist High School, Ibadan have access to digital devices, reflecting a high level of digital inclusion within
school. Regional differences in educational technology availability, however, most definitely occur and are driven by many factors:

1. Status Socioeconomic:
    - Wealthier Areas: Students from affluent metropolitan areas usually have easier access to dependable internet connections and digital gadgets. greater wages are frequently correlated with parents' greater levels of education, allowing them to purchase technology for their kids.
    - Less wealthy locations: Students from rural or less wealthy locations, on the other hand, can have financial limitations that prevent them from using digital gadgets and internet services. Lower household earnings may make it more difficult to pay and acquire the essential technology and consistent internet access.
2. Infrastructure Availability:
    - Urban Centres: Generally speaking, cities and towns have superior infrastructure, such as cell networks, internet connectivity, and energy, making digital technologies simpler to access.
    - Rural Areas: It may be difficult for students to access and use digital technology in rural areas due to inadequate infrastructure, such as erratic energy and spotty internet service.

3. Educational Materials:
    - Well-Resourced Schools: Pupils attending urban and affluent schools are more likely to have access to digital learning materials, well-equipped computer laboratories, and qualified instructors who can successfully incorporate technology into the classroom.
    - Under-Resourced Schools: These resources may be scarce in less developed schools, causing notable disparities in pupils' use of technology and digital literacy.
4. Awareness and Involvement of Parents:
    - Educated Parents: Parents with higher levels of education typically understand the advantages of digital literacy and take the initiative to provide their kids access to technology.
    - Parents with Lower Education Levels: On the other hand, parents with lower education levels might not be as aware of the value of digital literacy or might not have the knowledge to assist their kids in using technology.

The research objectives are included below:

1. Evaluating the pupils' access to digital tools.
2. Being aware of how parental education affects their child's ability to use technology.
3. Determining differences in access to educational technologies by location.
4. Examining how digital literacy affects students' educational opportunities and results.

The result is shown to align with the research objectives

1. Access to Digital Technologies: A high degree of digital inclusion among the assessed population is shown by the fact that over 80% of students have access to digital technologies.
2. Parental Education Background: Given that 90% of parents have degrees, educated parents significantly impact their children's access to technology.
3. Regional inequalities: The regional variations in access to and utilization of technology are highlighted by an analysis of geographic homes and the corresponding inequalities in infrastructure.

4. Digital Literacy and Future Prospects: The various ways that students utilize digital devices for learning, leisure, and other purposes highlight how important digital literacy in improving their chances for further education and employment in the future.

The following shows how the results affect the stakeholders

1. Instructors:
    - Curriculum Integration: By utilizing technology to improve teaching and learning, educators must include digital literacy into the curriculum.
    - Teacher Training: To use digital technologies to educate successfully, instructors need to get ongoing professional development.
2. Regulators:
    - Infrastructure Investment: To guarantee fair access to technology, make investments in enhancing the digital infrastructure, particularly in remote and underdeveloped areas.
    - Support Programs: Create and offer funding for initiatives that give students from low-income household's access to digital gadgets and the internet.
3. Other parties involved:
    - Community Involvement: To promote school-based digital literacy efforts, encourage collaborations with the commercial sector and community groups.
    - Parental Engagement: Put in place initiatives that inform parents about the value of digital literacy and provide them tools to assist in fostering their kids' technological use.

The following are recommendations that are needed to be followed:

1. Policy Suggestions:
    - National Digital Education Strategy: Develop a comprehensive plan that covers funding for digital resources for schools, teacher preparation, and infrastructure.
    - Subsidized Internet Access: Put in place laws that guarantee low-income families have access to subsidized internet service so that students may use online resources for studying from home.
2. Program Suggestions:
    - School Technology Grants: Create grant programs that let schools with limited resources to apply for funds to buy computers and enhance their internet access.

- Teacher Training Programs: Establish professional development initiatives that centre on teaching technology integration and digital literacy.

3. Suggestions for Intervention:
    - Digital Literacy Workshops: To improve parents' and students' comprehension and utilization of digital technology, host workshops.
    - Mobile Learning Units: Provide on-the-spot instructional support by deploying mobile learning units equipped with digital gadgets and internet access to underserved and rural locations.
4. Engagement of the Community and Private Sector:
    - Public-Private Partnerships: Promote partnerships between the public and private sectors to finance and promote digital literacy projects.
    - Community Tech Centres: Set up community technology centres where students can access training and digital resources after school.

Stakeholders may address regional differences in educational technology access by putting these ideas into practice, ensuring that all students can gain from digital literacy and enhance their chances for future study and employment.

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