ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

Design Thinking Approach to Overcoming Challenges in Integrating Technology in the Classroom: A Case Study of Gbarnga School District Bong County, Liberia

Shemaiah W. G. Dolo.[1]
Postgraduate Student
Department of Educational Technology, IAMA Center of Excellence, International Academic and Management Association, Delhi, India

Mogana S. Flomo, Jr.[2]
Department of Research, IAMA Center of Excellence, International Academic and Management Association, Delhi, India

Abstract:- Education technology (EdTech) is increasingly recognized as a means to improve educational outcomes, yet its effective integration faces challenges in resource-constrained contexts like the Gbarnga School District in Liberia. This study investigates these challenges and proposes solutions. Through surveys and comparative analysis, perceptions of technology integration are examined, revealing nuanced opinions among educators. Findings indicate significant barriers including infrastructure limitations, inadequate teacher training, and socio-economic disparities. Notably, 46% of respondents view technology integration as highly beneficial, while 19.36% perceive it as detrimental. Recommendations include infrastructure investment, ongoing professional development, and policy advocacy. By addressing these challenges, stakeholders can create an enabling environment that leverages technology to enhance teaching and learning experiences, empowering students for success in the digital age.

Keywords and Definition:-

- ***Education*** is a multifaceted process that encompasses the acquisition of knowledge, skills, values, beliefs, and habits. It is a lifelong journey of learning and personal development that occurs through formal schooling, informal experiences, and self-directed exploration. Education empowers individuals to think critically, solve problems, communicate effectively, and adapt to changing circumstances. UNESCO, (2015)
- ***Technology*** refers to the application of scientific knowledge, tools, and techniques to create, modify, or enhance products, processes, or systems for specific purposes. It encompasses a wide range of artifacts, methods, and practices that enable humans to achieve practical goals and address challenges in various domains, Rouse, M. (Ed.). (2020).
- ***Integration*** refers to the process of combining or incorporating separate elements, systems, or entities into a unified whole, often to enhance efficiency, effectiveness, or functionality. In various contexts, integration can involve merging disparate components, coordinating activities, or synthesizing diverse perspectives to achieve cohesive outcomes, Mergel, I. (1998).
- ***Education Technology,*** often abbreviated as *EdTech*, refers to the use of digital tools, resources, and platforms to enhance teaching, learning, and educational outcomes. It encompasses a diverse range of technologies, including computers, tablets, software applications, educational websites, multimedia resources, and online learning environments, all designed to support and facilitate educational processes. Bates & Sangrà (2011)

I. INTRODUCTION

Education technology, often referred to as EdTech, has become a focal point for improving educational outcomes globally, including in developing regions such as Liberia. With the rapid advancement of technology, integrating it into the classroom has been touted as a means to enhance teaching and learning experiences, promote digital literacy, and prepare students for the demands of the 21st-century workforce (Boling et al. 2012). However, the effective integration of technology in educational settings faces numerous challenges, particularly in resource-constrained environments like the Gbarnga School District in Bong County, Liberia.

Liberia, a West African nation, has been striving to rebuild its education system after years of civil war and economic instability. Despite efforts to enhance access to education and improve quality, significant disparities persist, especially in rural areas like Gbarnga. The Gbarnga School District, situated in Bong County, faces unique challenges including limited access to electricity, inadequate internet connectivity, and scarcity of instructional materials (UNICEF Liberia). These challenges exacerbate the difficulties in integrating technology into classroom practices, hindering the realization of its potential benefits.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

Moreover, the effective integration of technology in education goes beyond mere provision of devices or software; it requires a holistic understanding of the local context, pedagogical strategies, teacher training, and infrastructure development (Ertmer et al. 2012). In the case of Gbarnga School District, addressing these multifaceted challenges necessitates a comprehensive approach that combines insights from design thinking and system design principles.

Times New Roman or the Symbol font (please no other font). To create multileveled equations, it may be necessary to treat.

By examining the background of the study, it becomes evident that the integration of technology in the classroom within the Gbarnga School District is not only essential for improving educational outcomes but also poses significant challenges due to infrastructural, socio-economic, and cultural factors. Therefore, this study seeks to explore innovative solutions grounded in design thinking and system design principles to address these challenges and enhance the educational experiences of students in Gbarnga.

A. Statement of the Problem

Despite the potential benefits of integrating technology in the classroom, the Gbarnga School District in Bong County, Liberia, faces significant challenges hindering its effective implementation. These challenges encompass various dimensions, including infrastructure limitations, inadequate teacher training, and socio-economic disparities, all of which impact the successful integration of technology into teaching and learning practices.

Firstly, infrastructure constraints pose a major obstacle to technology integration in the Gbarnga School District. Limited access to electricity and unreliable internet connectivity hamper the use of digital tools and resources in classrooms (UNICEF Liberia). Without a stable infrastructure backbone, the potential of technology to enhance educational experiences remains unrealized.

Secondly, the lack of adequate teacher training and professional development further exacerbates the challenges in integrating technology. Many teachers in the Gbarnga School District may lack the necessary skills and knowledge to effectively utilize technology for instructional purposes (Dexter et al. 2013). This deficiency not only impedes the adoption of innovative teaching methods but also contributes to resistance towards technology integration among educators.

Additionally, socio-economic factors play a significant role in shaping the landscape of technology integration in the Gbarnga School District. Limited access to digital devices and resources at home, coupled with economic disparities, widen the digital divide among students (Warschauer 2003). Consequently, students from disadvantaged backgrounds may be at a disadvantage in accessing and utilizing educational technology compared to their more affluent peers.

B. Objectives

The primary objective of this study is to investigate the challenges faced in integrating technology into classroom settings within the Gbarnga School District, Bong County, Liberia, and propose innovative solutions informed by design thinking and system design principles. Specifically, the study aims to achieve the following objectives:

- To identify the key challenges hindering the effective integration of technology in classroom practices within the Gbarnga School District.
- To examine the impact of these challenges on teaching and learning experiences in the Gbarnga School District.

II. LITERATURE REVIEW

A. Evolution of Education Technology

The evolution of education technology has been characterized by significant advancements and transformations over the years, shaping the landscape of teaching and learning in various educational contexts. According to Boling et al. (2012), the integration of technology in education has a long history, dating back to the advent of educational radio broadcasts in the early 20th century. These early innovations laid the foundation for the use of audiovisual aids and instructional media in classrooms, paving the way for further technological developments in the field of education.

One of the seminal moments in the evolution of education technology was the introduction of computers in schools during the latter half of the 20th century. With the proliferation of personal computers and the emergence of educational software, educators began exploring new possibilities for incorporating technology into teaching practices (Ertmer et al. 2012). The use of computer-assisted instruction (CAI) programs and multimedia resources revolutionized classroom dynamics, enabling interactive and personalized learning experiences for students.

The rise of the internet in the late 20th and early 21st centuries marked another milestone in the evolution of education technology, ushering in the era of online learning and digital resources. The advent of learning management systems (LMS) and virtual learning environments (VLE) facilitated the delivery of course materials, collaborative activities, and assessments in digital formats, enabling flexible and asynchronous learning opportunities for students (Means et al. 2009).

Furthermore, the proliferation of mobile devices such as smartphones and tablets has reshaped the educational landscape, making learning more accessible and ubiquitous. Mobile learning applications, digital textbooks, and educational games have become increasingly prevalent, providing learners with anytime, anywhere access to educational content and resources (Sharples et al. 2014).

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

The evolution of education technology continues to be driven by rapid advancements in information and communication technologies (ICTs), as well as ongoing pedagogical innovations and research. Today, emerging technologies such as artificial intelligence (AI), augmented reality (AR), and virtual reality (VR) hold the promise of further transforming teaching and learning experiences, offering new opportunities for immersive, personalized, and interactive educational interventions (Johnson et al. 2013).

In conclusion, the evolution of education technology reflects a dynamic interplay between technological advancements, pedagogical practices, and societal needs. By tracing the historical development of education technology, we can gain insights into its current state and anticipate future trends, informing efforts to harness the potential of technology to enhance educational outcomes and empower learners in the digital age.

B. Theoretical Framework: Design Thinking and System Design

Design thinking and system design are two complementary theoretical frameworks that provide valuable insights and methodologies for addressing complex challenges in integrating technology in education.

Design thinking, as defined by Brown (2008), is a human-centered approach to innovation that emphasizes empathy, creativity, and iterative problem-solving. Rooted in the fields of design and engineering, design thinking involves understanding the needs and perspectives of users, generating innovative solutions, and testing prototypes to address real-world problems. In the context of education technology, design thinking offers a structured methodology for co-designing contextually relevant solutions with educators, students, and other stakeholders (Kelley and Kelley 2013). By applying principles such as empathy, ideation, prototyping, and testing, design thinking enables educators to develop user-friendly, effective, and sustainable educational interventions tailored to the specific needs and constraints of their educational contexts.

System design, on the other hand, focuses on the holistic design and optimization of interconnected systems to achieve desired objectives (Rechtin 1991). In the context of education technology, system design involves considering various elements such as infrastructure, pedagogy, curriculum, teacher training, and policy frameworks as interconnected components of a larger educational ecosystem (Beyer and Holtzblatt 1998). By adopting a systems thinking perspective, educators can identify the interdependencies and feedback loops within the educational system, enabling them to design interventions that address systemic challenges and leverage synergies between different components (Checkland and Poulter 2006). System design also emphasizes the importance of scalability, adaptability, and sustainability in designing educational interventions that can be effectively implemented and scaled across diverse contexts.

Together, design thinking and system design provide a powerful theoretical framework for addressing the multifaceted challenges of integrating technology in education. Design thinking offers a human-centered approach to understanding user needs and generating innovative solutions, while system design provides a holistic perspective on the interconnected elements of the educational ecosystem. By combining insights from both frameworks, educators can develop contextually relevant, effective, and sustainable technology integration strategies that enhance teaching and learning experiences for students.

C. Challenges in Integrating Technology in the Classroom

Integrating technology into classroom settings presents educators with various challenges that can hinder the effective use of digital tools and resources for teaching and learning. These challenges stem from factors such as infrastructure limitations, teacher training gaps, pedagogical barriers, and socio-economic disparities.

One of the primary challenges in integrating technology in the classroom is the lack of adequate infrastructure, including reliable internet connectivity and access to digital devices (UNESCO 2019). Many schools, particularly those in rural and underserved areas, face constraints such as limited bandwidth, outdated equipment, and insufficient funding for technology upgrades (Johnson et al. 2015). Without robust infrastructure, educators may struggle to leverage digital resources and implement technology-enhanced instructional strategies effectively.

Furthermore, the effective integration of technology in the classroom requires ongoing professional development and support for educators (Ertmer et al. 2012). Many teachers may lack the necessary skills and confidence to integrate technology into their teaching practices, resulting in resistance or reluctance towards adopting new tools and approaches (Kay 2006). Addressing teacher training gaps and providing opportunities for ongoing professional development are crucial for building educators' capacity to use technology effectively to enhance student learning outcomes.

Pedagogical barriers also pose challenges to technology integration in the classroom. Simply providing access to digital devices and resources is not sufficient; educators must also adapt their instructional practices to leverage the affordances of technology (Koehler and Mishra 2009). However, incorporating technology into pedagogy requires careful planning, curriculum alignment, and pedagogical redesign, which can be time-consuming and challenging for educators (Mishra and Koehler 2006). Moreover, concerns about maintaining student engagement, managing digital distractions, and ensuring equitable access to technology further complicate the integration process (Warschauer 2003).

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

Socio-economic disparities also contribute to challenges in integrating technology in the classroom. Students from low-income families may lack access to digital devices and reliable internet connectivity at home, exacerbating the digital divide and limiting their ability to participate in technology-rich learning experiences (DiMaggio and Hargittai 2001). Moreover, cultural factors and language barriers can influence students' attitudes towards technology and their readiness to engage with digital learning resources (Selwyn 2011).

In conclusion, addressing the challenges of integrating technology in the classroom requires a multifaceted approach that addresses infrastructure limitations, teacher training gaps, pedagogical barriers, and socio-economic disparities. By providing support for educators, investing in infrastructure upgrades, and promoting equitable access to technology, stakeholders can create an enabling environment for leveraging digital tools and resources to enhance teaching and learning experiences in classrooms.

D. Successful Cases and Best Practices

Examining successful cases and best practices in integrating technology in the classroom provides valuable insights into effective strategies and approaches that educators can adopt to enhance teaching and learning experiences. Several studies have highlighted exemplary initiatives and programs that have demonstrated positive outcomes in leveraging technology to support student engagement, learning outcomes, and teacher professional development.

One successful case is the Maine Learning Technology Initiative (MLTI), which provided laptops to all middle and high school students and teachers in the state of Maine, USA (Silvernail et al. 2013). The MLTI initiative aimed to promote digital literacy, personalized learning, and 21st-century skills development among students by integrating technology into classroom instruction. Evaluations of the MLTI program have shown improvements in student achievement, teacher collaboration, and student engagement, highlighting the transformative impact of technology integration at scale.

Another notable example is the One Laptop per Child (OLPC) initiative, which distributed low-cost laptops to students in developing countries to promote digital access and educational equity (Warschauer and Ames 2010). The OLPC program aimed to empower students with digital skills and resources to support self-directed learning and creativity. Studies of OLPC deployments have demonstrated improvements in student motivation, collaboration, and academic performance, particularly in rural and underserved communities.

Furthermore, the Khan Academy, an online platform offering free educational videos and interactive exercises, has emerged as a successful case of leveraging technology to support personalized learning and mastery-based instruction (Anderson and Dron 2011). By providing access to high-quality educational content across diverse subjects and grade levels, the Khan Academy has democratized access to education and empowered learners to pursue self-paced, individualized learning pathways.

In addition to these large-scale initiatives, there are numerous examples of successful technology integration projects at the classroom and school levels. For instance, flipped classrooms, where instructional content is delivered online outside of class time, have been shown to enhance student engagement, participation, and understanding (Tucker 2012). Similarly, project-based learning (PBL) approaches that incorporate digital tools and resources enable students to collaborate, create, and communicate their ideas effectively (Walker 2012).

Overall, successful cases and best practices in integrating technology in the classroom underscore the importance of strategic planning, professional development, and pedagogical innovation. By drawing insights from these exemplary initiatives and programs, educators can identify effective strategies and approaches for leveraging technology to support student-centered learning, foster digital literacy, and prepare students for success in the digital age.

E. Technology Adoption Models

Technology adoption models provide theoretical frameworks for understanding the process by which individuals and organizations adopt and integrate new technologies into their practices. These models offer valuable insights into the factors influencing technology adoption decisions and the stages through which adoption occurs.

One prominent technology adoption model is the Technology Acceptance Model (TAM), developed by Davis (1989), which posits that perceived ease of use and perceived usefulness are key determinants of individuals' attitudes towards and intention to use a technology. TAM suggests that users are more likely to adopt a technology if they perceive it to be easy to use and believe that it will enhance their performance or productivity. Subsequent extensions of TAM, such as TAM2 and TAM3, have incorporated additional variables such as subjective norms and perceived enjoyment to further enhance its explanatory power (Venkatesh and Davis 2000).

Another influential model is the Unified Theory of Acceptance and Use of Technology (UTAUT), proposed by Venkatesh et al. (2003), which integrates elements from several existing models, including TAM, the Theory of Reasoned Action (TRA), and the Technology Adoption Model (TAM). UTAUT identifies four key factors that influence technology adoption: performance expectancy, effort expectancy, social influence, and facilitating conditions. According to UTAUT, users' intentions to adopt a technology are influenced by their perceptions of its usefulness, ease of use, social norms, and the availability of resources and support.

Additionally, the Diffusion of Innovations theory, developed by Rogers (2003), offers insights into the spread of innovations within social systems. Diffusion of Innovations identifies five adopter categories based on individuals'

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

propensity to adopt new technologies: innovators, early adopters, early majority, late majority, and laggards. The theory highlights the role of communication channels, social networks, and perceived attributes of innovations in influencing adoption decisions.

Furthermore, the Technology-Organization-Environment (TOE) framework, proposed by Tornatzky and Fleischer (1990), emphasizes the interaction between technological, organizational, and environmental factors in shaping technology adoption processes. TOE identifies various factors such as technological complexity, organizational readiness, and external pressures that influence organizations' decisions to adopt new technologies.

In conclusion, technology adoption models offer valuable theoretical frameworks for understanding the factors influencing the adoption and integration of new technologies in educational settings. By applying insights from these models, educators and policymakers can develop strategies to promote the successful adoption and implementation of educational technologies, ultimately enhancing teaching and learning experiences for students.

F. Educational Technology Policies and Initiatives in Liberia

Liberia, like many other countries, has recognized the importance of educational technology in improving access to quality education and preparing students for the demands of the 21st century. Over the years, the Liberian government and various stakeholders have implemented policies and initiatives aimed at integrating technology into the education system. However, challenges such as limited infrastructure, teacher training gaps, and socio-economic disparities have impacted the implementation and effectiveness of these efforts.

One notable educational technology initiative in Liberia is the Liberia Education Advancement Program (LEAP), launched in 2013 with support from the World Bank. LEAP aimed to improve access to quality education through the provision of textbooks, teacher training, and the deployment of tablet computers to students and teachers in selected schools (World Bank 2016). While LEAP faced implementation challenges, including delays in tablet distribution and concerns about sustainability, it highlighted the government's commitment to leveraging technology to enhance educational outcomes.

In addition to LEAP, the Liberian government has developed policies and frameworks to guide the integration of technology in education. For example, the National ICT Policy for Education, launched in 2011, outlines strategies for promoting digital literacy, expanding access to ICT infrastructure, and integrating ICTs into the curriculum (Ministry of Education, Republic of Liberia 2011). Similarly, the National Curriculum Reform Program seeks to modernize the curriculum by incorporating ICT skills and competencies across subject areas (Ministry of Education, Republic of Liberia 2013).

Furthermore, partnerships with international organizations and non-governmental organizations (NGOs) have played a significant role in supporting educational technology initiatives in Liberia. For instance, organizations like UNICEF and USAID have provided technical assistance, funding, and capacity-building support to strengthen ICT infrastructure, develop digital learning resources, and train teachers in technology integration (USAID 2019; UNICEF Liberia). These partnerships have helped to supplement government efforts and address gaps in resources and expertise.

Despite these initiatives, challenges persist in realizing the full potential of educational technology in Liberia. Limited access to electricity and internet connectivity, inadequate teacher training, and socio-economic disparities continue to hinder the effective integration of technology in classrooms (UNICEF Liberia). Furthermore, the COVID-19 pandemic has highlighted the digital divide and underscored the urgent need to strengthen technology infrastructure and support digital learning initiatives in Liberia (World Bank 2020).

In conclusion, while Liberia has made strides in promoting educational technology through policies and initiatives, significant challenges remain in ensuring equitable access to technology, enhancing teacher capacity, and addressing infrastructure constraints. Moving forward, sustained investment, multi-stakeholder collaboration, and a focus on sustainability will be critical for advancing educational technology in Liberia and improving learning outcomes for all students.

III. METHODOLOGY

The research design for this study will employ a mixed-methods approach, combining qualitative and quantitative data collection methods to gather comprehensive insights into the challenges of integrating technology in classrooms within the Gbarnga School District, Bong County, Liberia. This approach will allow for a nuanced understanding of the multifaceted issues and provide triangulation of findings, enhancing the validity and reliability of the study.

Overall, this mixed-methods research design will enable a comprehensive investigation of the challenges and opportunities of integrating technology in classrooms within the Gbarnga School District, fostering a deeper understanding of the complex dynamics at play and informing the development of contextually relevant solutions.

- *Surveys*:

Administer surveys to a representative sample of teachers and students across different schools in the Gbarnga School District to gather quantitative data on technology access, usage patterns, attitudes, and perceived barriers to integration. The surveys will include Likert-scale questions, multiple-choice questions, and open-ended prompts to capture a range of responses.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

- Obtain informed consent from participants prior to data collection and ensure confidentiality and anonymity of responses.
- Adhere to ethical guidelines and protocols for research involving human subjects, including voluntary participation, privacy protection, and respect for participants' rights and dignity.

IV. FINDINGS ANALYSIS

The study's data analysis, presentation, and discussion encompassed a thorough scrutiny of gathered data, employing diverse statistical methodologies and instruments to extract insightful conclusions. This methodology entailed the systematic arrangement, refinement, and interpretation of data to reveal pertinent patterns, trends, and correlations pertinent to the study's inquiries. The outcomes were adeptly conveyed through articulate and visually compelling presentations, integrating graphical representations such as charts, graphs, and tables to highlight pivotal findings. Subsequently, a comprehensive discussion ensued, delving into the ramifications, constraints, and potential avenues for further exploration, thereby nurturing a nuanced comprehension among stakeholders and fostering constructive discourse within both academic and professional circles.

A. Findings:

The findings reveal a diverse landscape of technology use in classrooms, with varied levels of integration across educational settings. While some educators and students embrace technology as a fundamental tool for teaching and learning, others face barriers such as limited resources, infrastructure challenges, insufficient training, and resistance to change. These barriers hinder widespread technology adoption and contribute to disparities in access and utilization across the district.

Table 1: The Age Range of Surveyed Respondents.

Age Range	Frequency	Percent	Cum. Percent
10 - 14 years	17	5.42%	5.42%
15 - 17 years	54	17.20%	22.62%
18 - 21 years	161	51.28%	73.90%
22 - 24 years	27	8.60%	82.50%
25 - 34 years	35	11.15%	93.65%
35 - 49 years	11	3.50%	97.15%
50 - 64 years	9	2.87%	100.00%
Total	314	100%	100%

➢ *Table 1 Shows the Age Distribution of Respondents in*

- *Key Observations:*

✓ Youth Dominance: A significant portion of respondents are young adults, with ages 18 to 22 being particularly prominent. Specifically, ages 20 (63 responses, 19.63%) and 18 (46 responses, 14.33%) have the highest frequencies, indicating a strong representation of university-age individuals.
✓ Wide Age Range: The age range is extensive, from 10 to 329 years. The inclusion of an age like 329 is likely a data entry error and should be considered an outlier or mistake.
✓ Primary Demographic: The bulk of respondents (20.25% to 63.86% cumulative percent range) fall within the 17 to 21 age range, suggesting the survey primarily captures the perspectives of late teenagers to early adults.
✓ Decreasing Frequency with Age: After age 30, the frequency of respondents in each age category generally decreases, highlighting a lesser representation of middle-aged and older adults in the study.
✓ Diverse Participation: While the study is heavily skewed towards younger participants, the presence of individuals across a broad age spectrum suggests diverse participation, which could enrich the insights drawn from the study, particularly if age-related experiences or perspectives are relevant.

- *Interpretation:*

The concentration of respondents in their late teens to early twenties reflects a focus on a demographic that likely includes high school seniors, college, or university students. This distribution is valuable for studies exploring educational experiences, early career planning, or generational attitudes towards various issues.

The presence of younger and older age groups, despite being less represented, adds valuable perspectives to the study, potentially offering insights into how different life stages affect responses to the survey topics.

However, the outlier (age 329) must be addressed to ensure data integrity. Such anomalies can distort analyses and interpretations, especially if age-related trends or correlations are of interest.

Overall, understanding the age distribution is crucial for contextualizing the study's findings, tailoring interventions, or policies to address the specific needs and challenges identified across different age groups.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

Table 2: Gender of Study Respondents

Gender of Study Respondents	Frequency	Percent	Cum. Percent
Female	168	44.56%	44.56%
Male	195	51.72%	96.29%
Other	14	3.71%	100.00%
TOTAL	377	100.00%	100.00%

➢ *Table 2 Represents the Gender Distribution of Study Respondents.*

- *Key Observations:*

✓ Male (195 responses, 51.72%): Over half of the respondents identify as male, making this group the majority within the study. Their representation suggests that the male perspective may have a significant influence on the study's findings.
✓ Female (168 responses, 44.56%): A substantial portion of the respondents are female, closely following the male respondents in terms of representation. This indicates a relatively balanced gender distribution, with the female perspective also significantly contributing to the study.
✓ Other (14 responses, 3.71%): A smaller proportion of respondents identify as other, reflecting inclusivity in the survey for those who do not identify strictly as male or female. While this group is smaller, its inclusion is crucial for capturing a broader spectrum of gender identities.

- *Interpretation:*

The gender distribution among the study respondents shows a good balance between male and female participants, with a slight majority of males. The inclusion of an "Other" category is notable for its recognition of non-binary or gender-nonconforming individuals, although this group is less represented.

This balanced gender distribution enhances the study's ability to capture a wide range of perspectives and experiences related to its subject matter. However, the relatively small percentage of respondents identifying as other highlights the ongoing need to engage and include diverse gender identities in research to fully understand the nuances of gendered experiences.

For the researchers, these findings underscore the importance of considering gender differences and similarities in analyzing and interpreting data. Understanding how gender influences the responses and experiences of study participants can provide deeper insights into the study's topic and contribute to more nuanced conclusions and recommendations.

Table 3: Respondents Level of Education.

Respondents level of Education	Frequency	Percent	Cum. Percent
Other	18	4.77%	4.77%
Primary	58	15.38%	20.16%
Secondary	254	67.37%	87.53%
Tertiary	47	12.47%	100.00%
TOTAL	377	100.00%	100.00%

➢ *Table 3 Outlines the Highest Level of Education Achieved by Study Respondents.*

- *Key Observations:*

Secondary (254 responses, 67.37%): The majority of respondents have completed secondary education, making it the most common level of educational attainment among the group. This suggests that the study predominantly captures the perspectives of individuals with a high school level education.

- Tertiary (47 responses, 12.47%): A smaller yet significant portion of the participants have attained tertiary education, indicating that the study includes individuals with college, university, or vocational training backgrounds.
- Primary (58 responses, 15.38%): A notable number of respondents have primary education as their highest level of schooling, suggesting that the study also reflects the viewpoints of individuals with more basic formal education.
- Other (18 responses, 4.77%): This category, which could include non-traditional or informal education paths, represents the smallest group. While not a significant portion, its inclusion highlights the diversity of educational backgrounds among the respondents.

- *Interpretation:*

The predominance of respondents with secondary education suggests that the study's findings may be most representative of individuals who have completed high school but may not have pursued further formal education. The presence of those with tertiary education adds depth to the dataset, potentially introducing perspectives influenced by higher education experiences.

The inclusion of respondents with primary education and those categorized under "Other" underscores the study's inclusivity in capturing a range of educational backgrounds. This diversity can enrich the study's insights by incorporating a broader spectrum of experiences and viewpoints related to the topic of research.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

For analysts and policymakers, understanding the educational composition of the study population is essential for contextualizing the findings. It can help identify educational trends, inform targeted interventions, and ensure that recommendations are relevant to the specific educational contexts of the surveyed population.

V. DISCUSSIONS

A. *Comparative Analysis:*

➢ *Challenges to Technology Integration:*

- Insufficient Training and Knowledge: Both analyses highlight the lack of training and knowledge about technology among educators and students as a significant challenge. The need for trained manpower or skilled teachers is emphasized. Ertmer et al. (2012) and Hew & Brush (2007) both highlight that one of the primary obstacles to technology integration is the lack of proper training and knowledge among educators. These studies underscore the importance of providing educators with the necessary skills and understanding to effectively incorporate technology into their teaching.
- Lack of Resources and Infrastructure: Both analyses identify the lack of resources, including financial support, technological devices, and infrastructure, as a barrier to technology integration. Poor internet connectivity and infrastructure-related challenges are specifically mentioned. Several studies, such as those by Warschauer (2006) and Norris et al. (2003), have identified the lack of technological resources and adequate infrastructure as significant barriers to the effective use of technology in education. This includes issues like insufficient computers, poor internet connectivity, and lack of technical support.
- Resistance and Policy Barriers: The first analysis discusses resistance or policy barriers to technology use in classrooms, such as policies forbidding students from using phones and computers on campus, while the second analysis Emphasizes the need for policy support and leadership: The work of Cuban (2001) and Zhao & Frank (2003) touches upon the resistance to technology integration from both educators and policy frameworks. Cuban discusses the reluctance of teachers to change traditional teaching practices, while Zhao & Frank highlight the restrictive policies that limit technology's role in classrooms.
- Educator Support and Training: The first analysis mentions a lack of support from teachers or school administrators for integrating technology, whereas the second analysis emphasizes the importance of providing training and professional development for teachers. Darling-Hammond, L. et al. (2017) argue for the critical need for professional development and support for educators to effectively integrate technology in their teaching. This includes not just technical training but also pedagogical support to incorporate technology in a way that enhances learning.
- Government Support and Funding: The first analysis highlights the lack of government support, funding, or budgetary allocations for educational technology, whereas the second analysis suggests advocating for government funding and support.
- Government Support and Funding: Bulman & Fairlie (2016) discuss the role of government support and funding in the successful integration of technology in education, pointing out how budget allocations or the lack thereof can significantly affect technology access and utilization in schools.
- Educational Policy Implementation: The first analysis points to the failure of government to implement educational policies supporting technology integration, while the second analysis suggests enacting policies to support technology integration. The work by Vanderlinde & van Braak (2010) emphasizes the gap between policy formulation and its implementation regarding technology in education. They argue that while policies may exist to support technology integration, the actual implementation on the ground is often lacking.
- Student Behavior and Attitude: The first analysis mentions student behavior and attitude towards technology as a challenge, while the second analysis emphasizes the importance of empowering young people through technological education. Selwyn (2009) explores student behavior and attitudes towards technology, suggesting that while students are generally positive about using technology for learning, their engagement levels can vary significantly based on the context and the way technology is integrated into the educational process.

Table 4: Perception of the Benefits of Technology Integration in Classrooms.

Perception of the Benefits of Technology Integration in Classrooms	Frequency	Percent	Cum. Percent
Highly Beneficial	187	49.60%	49.60%
Highly Detrimental	42	11.14%	60.74%
Neutral	44	11.67%	72.41%
Somewhat Beneficial	73	19.36%	91.78%
Somewhat Detrimental	31	8.22%	100.00%
TOTAL	377	100.00%	100.00%

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

Table 4 outlines the respondents' perceptions of the benefits of technology integration in classrooms.

B. Key Observations:

- Highly beneficial (187 responses, 49.60%): Nearly half of the respondents view technology integration in classrooms as highly beneficial. This significant proportion suggests a strong belief in the positive impact of technology on enhancing teaching and learning experiences.
- Somewhat beneficial (73 responses, 19.36%): A further 19.36% of respondents consider technology integration somewhat beneficial, adding to the majority who perceive positive outcomes from using technology in education.
- Neutral (44 responses, 11.67%): A smaller segment of respondents is neutral about the benefits of technology in classrooms, indicating neither a strongly positive nor negative viewpoint.
- Somewhat Detrimental (31 responses, 8.22%) and Highly Detrimental (42 responses, 11.14%): Together, these categories comprise 19.36% of the responses, showing that a notable percentage of participants have concerns about the negative impacts of technology integration on education.

➢ *Interpretation:*

The data reveals a predominantly positive perception of technology integration in classrooms, with a majority of respondents acknowledging its benefits, either highly or to some extent. This highlights an overall optimism about the role of technology in enriching educational experiences and outcomes.

However, the presence of a significant minority with neutral to negative perceptions points to concerns and challenges associated with technology use in education. These may include issues like screen time, distraction, unequal access to technology, or the effectiveness of technology-enhanced teaching methods compared to traditional approaches.

For educators, policymakers, and educational technology developers, understanding these diverse perspectives is crucial. It underscores the importance of thoughtful and inclusive technology integration strategies that maximize benefits while addressing potential drawbacks. Ensuring that technology serves as a tool to support and enhance learning for all students, without exacerbating inequalities or introducing new challenges, is essential for the successful integration of technology in educational settings.

C. Comparative Analysis

The perceptions of the benefits of technology integration in classrooms, as outlined in ***Table 4***, indicate a broad spectrum of opinions among respondents. The majority view technology integration as beneficial to varying degrees, with a significant portion expressing concerns about potential negative impacts. Here's a comparison of these findings with previous studies and discussions on the topic:

➢ *Positive Perceptions:*

The finding that nearly half of the respondents view technology integration as highly beneficial aligns with research suggesting that technology can enhance learning outcomes. For instance, Tamim et al. (2011) conducted a meta-analysis which found that technology integration in education generally leads to positive effects on learning outcomes. The support for technology in enhancing teaching and learning experiences echoes the optimism found in earlier research.

➢ *Neutral and Detrimental Perceptions:*

The neutral and detrimental perceptions reported in the table (19.36% viewing technology integration as detrimental and 11.67% as neutral) can be compared to discussions in the literature about potential downsides of technology use in education. For example, Oppenheimer (2003) criticized the unchecked enthusiasm for educational technology, pointing out issues like distraction, shallow learning, and the digital divide. This skepticism towards technology's impact reflects the concerns of a significant minority of the respondents.

➢ *Concerns about Negative Impacts:*

The specific concerns about technology being somewhat or highly detrimental mirror discussions on the need for careful integration of technology in education. Selwyn (2016) notes that while technology holds potential for enhancing education, its benefits are not automatic and depend on thoughtful implementation and integration. This nuanced view acknowledges the potential for technology to both enhance and detract from educational experiences, depending on how it is used.

➢ *Overall Sentiment:*

The overall sentiment that emerges from Table 4, with a majority viewing technology integration positively but with significant concerns remaining, suggests a complex picture. This mirrors the broader academic discourse that while technology has the potential to transform education, its implementation must be approached with caution, considering both pedagogical and practical implications.

In summary, the perceptions outlined in Table 4 reflect the broader debate within educational research regarding the role of technology in classrooms. While there is a strong belief in its potential benefits, concerns about negative impacts remain significant. This underscores the need for balanced approaches to technology integration that are mindful of both its potential and its pitfalls.

VI. CONCLUSION

Based on the extensive analysis of the challenges hindering the effective integration of technology into classroom practices within the Gbarnga School District, as well as the impacts of these challenges on teaching and learning experiences, several key conclusions can be drawn:

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

- Importance of Addressing Multifaceted Challenges: The study underscores the complexity of challenges faced by educators, students, and stakeholders in integrating technology into education in the Gbarnga School District. These challenges span infrastructural limitations, inadequate teacher training, pedagogical barriers, socio-economic disparities, and cultural factors. Addressing these challenges requires a multifaceted approach that considers various interconnected aspects of the educational ecosystem.
- Critical Role of Infrastructure and Resources: The findings highlight the critical importance of investing in infrastructure development and ensuring access to technological resources such as computers and reliable internet connectivity. Without robust infrastructure, educators and students alike are limited in their ability to leverage technology for enhanced teaching and learning experiences.
- Need for Ongoing Professional Development: The study emphasizes the essential role of ongoing professional development and support for educators to effectively integrate technology into their teaching practices. Training programs should encompass both technical skills and pedagogical strategies to empower educators to leverage technology in ways that enhance learning outcomes.
- Importance of Curriculum Alignment and Pedagogical Redesign: Integrating technology into pedagogy requires careful curriculum alignment and pedagogical redesign. Educators must be equipped with the knowledge and tools to adapt their instructional practices to leverage the affordances of technology effectively.
- Addressing Socio-economic Disparities and Cultural Factors: Efforts to bridge socio-economic disparities and address cultural attitudes towards technology in education are paramount. Ensuring equitable access to technology and fostering a positive cultural disposition towards technology can enhance the effectiveness of technology integration efforts.
- Call for Policy Support and Leadership: Government support and policy leadership are essential for driving meaningful change in technology integration efforts. Policymakers must prioritize educational technology initiatives, allocate adequate funding, and enact policies that support infrastructure development, teacher training, and equitable access to technology.

In conclusion, addressing the challenges of integrating technology into classroom practices within the Gbarnga School District requires collaborative efforts from educators, policymakers, community leaders, and other stakeholders. By addressing infrastructural limitations, providing ongoing professional development for educators, aligning curriculum and pedagogy with technology integration goals, and addressing socio-economic and cultural barriers, stakeholders can create an enabling environment that leverages technology to enhance teaching and learning experiences, ultimately empowering students with the skills and knowledge needed to succeed in the digital age.

RECOMMENDATIONS

Based on the conclusions drawn from the study, the following recommendations are proposed to address the challenges hindering the effective integration of technology into classroom practices within the Gbarnga School District:

- Invest in Infrastructure Development: Prioritize investments in infrastructure development to ensure reliable access to electricity and high-speed internet connectivity in schools within the Gbarnga School District. Collaborate with government agencies, private sector partners, and international organizations to upgrade technological infrastructure and overcome infrastructural limitations.
- Provide Ongoing Professional Development: Establish comprehensive professional development programs for educators aimed at building their capacity to effectively integrate technology into teaching practices. These programs should cover both technical skills and pedagogical strategies, providing educators with the knowledge and tools necessary to leverage technology for enhanced learning outcomes.
- Align Curriculum and Pedagogy with Technology Integration Goals: Work with curriculum developers and educational experts to align curriculum standards and pedagogical practices with technology integration goals. Encourage educators to incorporate technology-enhanced instructional strategies that promote active learning, collaboration, and critical thinking skills among students.
- Promote Equitable Access to Technology: Implement initiatives to ensure equitable access to technology for all students, regardless of socio-economic background. Provide subsidies or grants for low-income families to purchase digital devices, establish technology lending programs in schools,
- Advocate for Policy Support and Leadership: Advocate for policy support and leadership at the national, regional, and local levels to prioritize educational technology initiatives. Lobby for increased funding allocations for technology infrastructure, teacher training programs, and research initiatives focused on technology integration in education. Collaborate with policymakers to enact policies that support technology integration efforts and remove barriers to implementation.
- Monitor and Evaluate Implementation: Establish mechanisms for monitoring and evaluating the implementation of technology integration initiatives within the Gbarnga School District. Collect feedback from educators, students, and other stakeholders to assess the effectiveness of interventions and identify areas for improvement. Use data-driven insights to refine strategies and ensure continuous improvement in technology integration efforts

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24MAR1940

REFERENCES

[1]. Boling, Erica, et al. "Critical Issues of Instructional Technology Research for Educational Technology Decision Making." Journal of Research on Technology in Education, vol. 45, no. 1, 2012, pp. 1–27.

[2]. Selwyn, Neil. "Digital Division or Digital Decision? A Study of Non-Users and Low-Users of Computers." Education, Communication & Information, vol. 1, no. 3, 2001, pp. 283–301.

[3]. UNICEF Liberia. "Education." Accessed 17 Feb. 2024.

[4]. UNICEF Liberia. "Education." UNICEF, www.unicef.org/liberia/education. Accessed 17 Feb. 2024.

[5]. UNICEF Liberia. "Education." UNICEF, www.unicef.org/liberia/education. Accessed 17 Feb. 2024.

[6]. USAID. "Liberia." 2019.

[7]. Bulman, G., & Fairlie, R.W. (2016). Technology and education: Computers, software, and the internet.

[8]. Handbook of the Economics of Education, 5, 239-280.

[9]. Cuban, L. (2001). Oversold and underused: Computers in the classroom. Harvard University Press. Zhao, Y., & Frank,

[10]. Darling-Hammond, L., Hyler, M.E., & Gardner, M. (2017). Effective Teacher Professional Development. Palo Alto, CA: Learning Policy Institute.

[11]. Hew, K.F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. Educational Technology Research and Development, 55(3), 223-252.

[12]. Norris, C., Sullivan, T., Poirot, J., & Soloway, E. (2003). No access, no use, no impact: Snapshot surveys of educational technology in K-12. Journal of Research on Technology in Education, 36(1), 15-27.

[13]. Vanderlinde, R., & van Braak, J. (2010). The gap between educational technology policies and practices: A literature review. Computers & Education, 55(2), 511-525.

[14]. Warschauer, M. (2006). Laptops and Literacy: Learning in the Wireless Classroom. New York: Teachers College Press.

[15]. Zhao, Y., & Frank, K.A. (2003). Factors affecting technology uses in schools: An ecological perspective. American Educational Research Journal, 40(4), 807-840.

[16]. UNESCO. (2015). Education 2030: Incheon Declaration and Framework for Action for the implementation of Sustainable Development Goal 4. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000245656

[17]. Rouse, M. (Ed.). (2020). Technology definition. In TechTarget. Retrieved from https://searchmicroservices.techtarget.com/definition/technology.

[18]. Mergel, I. (1998). A conceptual framework and classification of integration mechanisms in government web sites. Government Information Quarterly, 15(2), 123-163.

[19]. Bates, A. W., & Sangrà, A. (2011). Managing Technology in Higher Education: Strategies for Transforming Teaching and Learning. John Wiley & Sons.

[20]. Oppenheimer, T. (2003). The Flickering Mind: The False Promise of Technology in the Classroom and How Learning Can Be Saved. Random House.

[21]. Selwyn, N. (2016). Education and Technology: Key Issues and Debates. Bloomsbury Academic.

[22]. Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study.