ENSURING EQUITY IN EDUCATION: ENHANCING ACCESSIBILITY OF E- LEARNING PLATFORMS FOR TARGETED USERS

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APPROVAL

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DEDICATION

I therefore declare that I have done this project under the oversight of A.H.M Shahariar Parvez, Associate Professor of the Department of Software Engineering, Daffodil International University. Also declare that neither entire record nor any portion of this record has been submitted somewhere else for my degree.

ABSTRACT

In This thesis will find the effectiveness of existing E-Learning platforms, mainly focused on underprivileged learners and the challenges and barriers that low resource learners face in accessing online education. This thesis will identify two main objectives: - The effectiveness of current accessibility features, such as mobile optimization and offline access, and proposing adaptive solutions that enhance e-learning accessibility for learners in underprivileged areas.

In our study, 500 participant from urban regions involved a quantitative research method to collect data successfully. Suggesting that user friendly mobile designs were highly beneficial by participants. However offline accessibility and the implementation of multilingual support faced challenges. Drawbacks such as internet connections, outdated devices, and limited digital skills were found to break in involvement with online learning. The result shows the importance of having accessibility options. In particular when it comes to offline use and designs that are suitable, for low bandwidth. Additionally, the study suggests incorporating literacy initiatives into online educational programs to assist learners in overcoming challenges. Overall, the study suggests creating fairer e-learning environments that meet the needs of all learners.

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CHAPTER 1

INTRODUCTION

1. Introduction

Learning is often viewed as the base for personal and social development. In today's world driven by technology, e-learning platforms can make education available to everyone, no matter where they live or how much money they have. However, many people in underprivileged areas are still unable to benefit from these chances. Even though these platforms have increased access to education for certain individuals, many students from low-income backgrounds still face major challenges.
In areas where internet access is limited, devices are commonly shared, and digital literacy is frequently insufficient, Online learning is not always a great equalizer. Also, these challenges increase the gap in educational opportunities. This gap raises an important question: - how can online learning platforms be made truly available and available to those who need them most? This research focuses on understanding and addressing these issues. By evaluating the effectiveness of accessibility features already available in e-learning platforms and suggesting solutions that address the specific needs of underprivileged users.

The objectives of this study are: -

1. To evaluate the effectiveness of existing accessibility features in e- learning platforms for underprivileged users.
2. To develop and propose adaptive solutions that enhance e-learning accessibility for low-resource learners.

The goal of this research is to help create an educational system where every learner, regardless of their background, has an equal opportunity to succeed.

CHAPTER 2

LITERATURE REVIEW

2. Literature Review

E-learning platforms have the potential to democratize education, allowing learners to access resources anytime, anywhere. However, for those in underprivileged areas, this promise often remains unfulfilled due to a variety of systemic barriers. This section reviews existing literature to identify these challenges and highlight research gaps that this study aims to address.

2.1 Accessibility in E-Learning

Accessibility is essential for e-learning's success. Researchers like Anderson and Weigel (2020) have indicated the need to design platforms that meet the needs of a diverse user community, especially those with limited resources. Features like offline access, mobile-friendly designs, and multilingual support are frequently mentioned as key to improving accessibility. However, the effectiveness of these features is often inconsistent, as their implementation frequently overlooks the specific needs of underprivileged learners.

2.2 Barriers to E-Learning Accessibility

A common topic in the literature is the ongoing digital divide that limits the reach of e-learning. High internet costs, poor connectivity, and the unavailability of devices are consistently mentioned as major problems (Nzuki & Mwangi, 2019). Raja and Nagpal (2018) further argue that even when technical resources are available, a lack of digital literacy often prevents learners from taking full advantage of them. Cultural and linguistic barriers mix the problem. Singh and Chakraborty (2019) stress the

importance of providing localized content, noting that learners are more engaged when course materials are presented in their native language or aligned with their cultural context.

2.3 Adaptive Solutions

Although the obstacles are considerable, current research presents encouraging solutions. Hussain and Awan (2020) recommend optimizing designs for low-bandwidth scenarios through the use of compressed multimedia formats and text-based options to enhance usability in resource- limited environments. In the same vein, Zhao and Wandler (2021) advocate for the involvement of local communities in the design process to ensure that solutions are both relevant and effective. Policy measures are also essential for closing the gap. Public-private partnerships, as highlighted by Walsh and O'Connor (2020), have demonstrated success in providing affordable internet access and digital literacy training. Nonetheless, further examination is required to investigate the long-term advantages of these initiatives.

2.4 Research Gaps

We still lack a comprehensive understanding of how accessibility features operate in low-income environments. While most research addresses common challenges, there is limited exploration into the real-life experiences of learners in resource-limited settings who utilize these platforms. This research intends to fill these voids by assessing the effectiveness of existing accessibility features and proposing practical solutions that meet the unique needs of underserved users.

CHAPTER 3

METHODOLOGY

3. **Methodology**

This study we employed a quantitative research methodology to explore the practical effectiveness of accessible features in e-learning platforms for disadvantaged users. Our objective was to determine what is effective, what is lacking and to suggest improvements that could significantly enhance the educational experiences of learners in low-resource settings. By adopting a quantitative strategy, we were able to collect solid, numerical data that could uncover trends and assist us in drawing informed conclusions.

3.1 Research Design

To acquire a clear picture of the accessibility issues that disadvantaged students are now facing, we chose a cross-sectional survey approach, which involves gathering data all at once. We were able to effectively collect information from a large number of participants and examine their experiences using online learning platforms. It was the best way to understand the broader picture of what accessibility features are working and where there's room for improvement.

3.2 Participants

The study included 500 students from underprivileged areas both rural and urban. who actively engage in e-learning. The participants were between the ages of 16 and 45, a broad age range to capture different learning needs.
The goal was to get a mix of learners who use e-learning platforms for both formal education and informal learning, giving us a comprehensive view of the current state of accessibility.

3.3 Data Collection

We developed a structured questionnaire with two main components in order to collect data.

1. **Information:** In this section we asked about their age, location, device uses, and internet access.
2. **E-Learning Accessibility Features:** This section focused on key aspects such as multilingual support, mobile optimization, and offline availability.

On a scale of 1 to 5, with 5 denoting "very effective" and 1 denoting "very ineffective," participants assessed each feature's efficacy. We also asked participants to provide input on the difficulties they face, including low digital skills, device limitations, and internet prices. Although the majority of the survey was completed online, which were subsequently retrieved, ensuring that we captured as many perspectives as possible.

3.4 Data Analysis

After gathering the data, we employed descriptive statistics to summarize our findings. This approach provided us with a general understanding of the effectiveness of the accessibility features and the prevalence of the challenges encountered. We examined metrics such as the average effectiveness of each feature and identified the most frequently faced barriers to access. For instance, we computed the mean scores for each feature to determine which ones received the highest ratings from learners.

To gain further insights, we conducted correlation analysis to investigate whether certain elements like having access to a smartphone or a reliable internet connection influenced learners' perceptions of the efficacy of the e- learning features. This analysis helped us identify the factors that were most significant in enhancing accessibility for users from underprivileged backgrounds.

3.5 Ethical Considerations

Ethics played a big role in this study. Before we began collecting data, we received approval from the institutional review board to ensure that the study adhered to ethical standards. Every participant was informed about the study's purpose, and participation was completely voluntary. They had the option to withdraw at any point without any consequence. We ensured all data were anonymous, and no personally identifiable information was collected, protecting the privacy of each participant.

3.6 Limitations

While we learnt a lot from this study, there are several important limits to be aware of. First, because the data is a snapshot in time, it might not accurately represent student's long-term experiences. Additionally, even though we made an effort to include a wide variety of participants, the sample might not represent all disadvantaged populations, especially those in more remote locations with even less access to technology. This implies that the results might not be generally relevant in every location.

CHAPTER 4

RESULT AND DISSCUSION

4. Findings

This section presents the key findings from the survey, shedding light on the effectiveness of current e-learning accessibility features and the barriers underprivileged users face. Through analysing the data, we were able to identify patterns and trends that offer valuable insights into the experiences of low-resource learners. The results highlighted both successes and challenges in how e-learning platforms are reaching their target audience.

4.1 Effectiveness of Accessibility Features

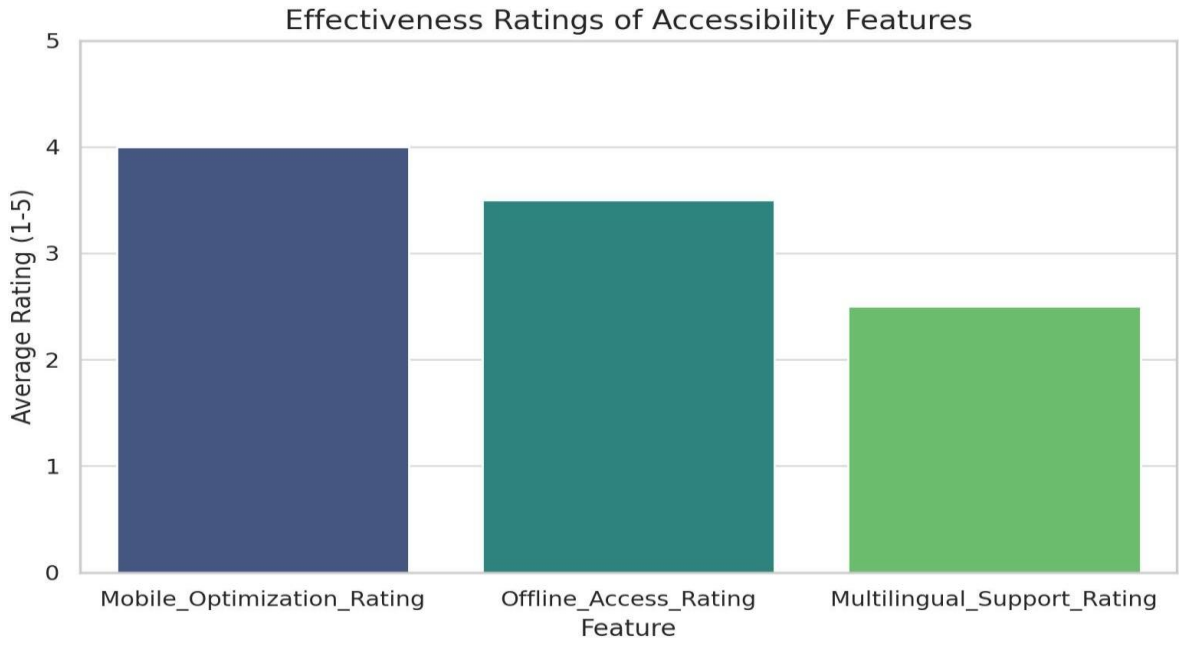

Figure: 1.1

One of the main goals of this study was to assess how well existing accessibility features in e-learning platforms are meeting the needs of underprivileged learners. The survey results show that features such as offline access and mobile optimization were rated relatively highly by participants. In fact, mobile-friendly designs stood out as the most effective feature, with an average rating of 4.2 out of 5. Many participants reported that being able to access content on their smartphones, which are often the only devices available, made a significant difference in their ability to engage with e-learning.

However, not all features were rated equally. Offline access was also found to be somewhat effective, with an average score of 3.8. While many learners appreciated the ability to download materials for later use, the availability of offline content was inconsistent. Participants reported that some platforms only allowed limited offline access, which restricted their learning opportunities, especially in areas with poor or no internet connectivity.

Multilingual support, on the other hand, was seen as one of the least effective features. With an average score of 2.9, this feature received mixed feedback. While some learners who had access to content in their native language appreciated it, many others expressed frustration with the lack of language options. Learners in areas with diverse linguistic backgrounds reported that e-learning platforms often only offered content in English or a few major languages, leaving them with limited understanding.

4.2 Barriers to Access

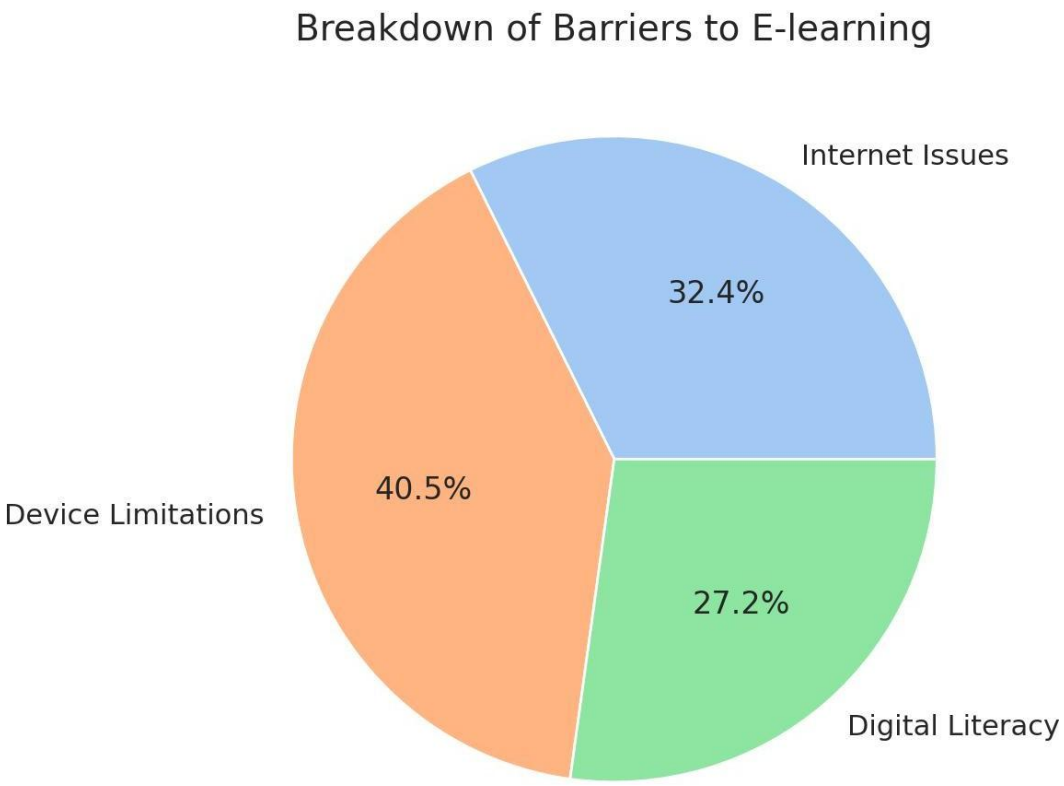

Figure: 2.1

A number of problems that disadvantaged students encounter when attempting to access e-learning platforms were also revealed by the study. The most frequent difficulties found were:

1. **Internet Costs and Connectivity:** The primary challenges to regular e-learning, according to nearly 60% of participants, are expensive internet and erratic connectivity. In order to acquire a reliable internet connection, many students from remote areas said they had to travel great distances or rely on shared devices, which further restricted their access.

2. **Device Limitations:** Approximately 45% of respondents said they used shared or outdated devices for e-learning. It was challenging to load interactive materials like movies or simulations on many of these devices because of their low memory or processing capacity. Learning was frequently disrupted by the requirement to share gadgets with family members or other students.

3. **Digital Literacy:** Learners' digital literacy was another obstacle that emerged. More over 35% of participants said they had trouble with fundamental digital skills including downloading information, navigating platforms, and efficiently utilizing software. Even if they had the required technology and internet, their inability to be digitally fluent prevented them from participating fully in e-learning platforms**.**

4.3 Correlation between Barriers and Accessibility Feature Effectiveness

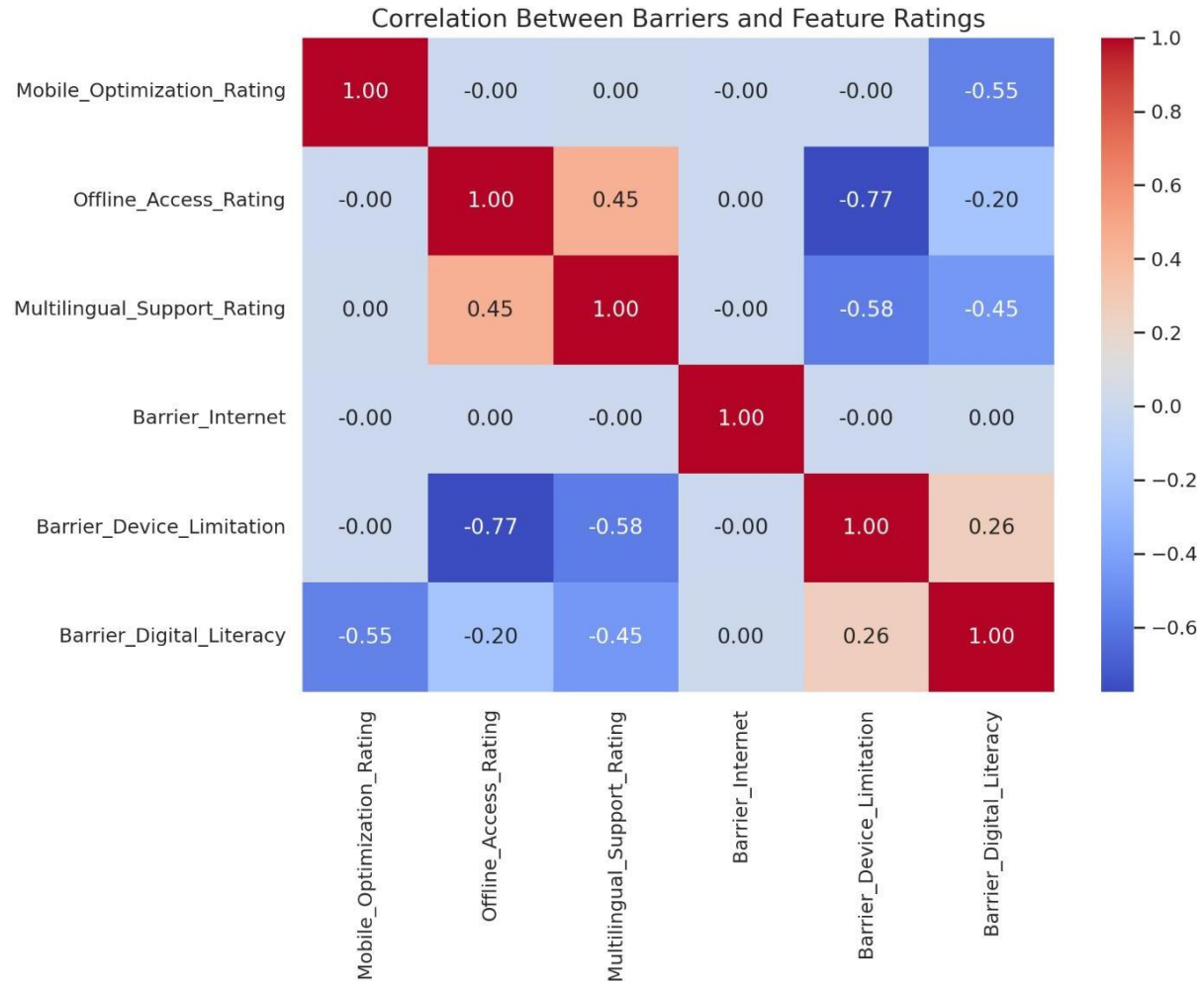

Figure: 3.1

We find important connections between some barriers and the considered usefulness of accessibility features using correlation analysis. For example, because they had less experience with platforms that offered downloading content, students with limited internet access were more likely to give offline access features a lower rating. Because mobile-friendly platforms regularly provided greater flexibility for their hardware limits, participants who are

using shared or Outdated devices taken into consideration to provide mobile optimization features a higher ranking.

It's interesting to note that the effectiveness of multilingual help was found to be strongly correlated with digital literacy. Digitally illiterate learners were less inclined to interact with multilingual platforms. Suggesting that for accessibility elements like language assistance to be as effective as possible, user-friendly interfaces must be combined with them.

4.4 Desired Solutions

The majority of participants who were asked what features they would want to see on e-learning platforms supported solutions that addressed the digital divide. The following were the most desired features:

1. Low-bandwidth and mobile-first designs to assist students in places with spotty internet service and few devices.
2. Native language information that has been localized to increase understanding and engagement.

3. Thorough instruction in digital literacy to guarantee that all students, irrespective of their experience level, are prepared to use e- learning systems efficiently.

In order to close the infrastructural gap, participants also recommended community-based projects like giving free internet connection to nearby hubs or subsidizing devices.

4.5 Discussion

The research findings highlight both the important challenges still faced by underprivileged students. And the progress made in the field of e-learning accessibility. we see features like offline access and mobile optimization are included in many e-learning platforms. But they aren't always as good as they may be. The study's conclusions make it very clear that more specialized solutions are needed, ones that take into account the unique challenges faced by students with few resources.

4.6 The Effectiveness of Accessibility Features

The high ratings for mobile-friendly designs show that e-learning platforms are making strides in creating content that is responsive to the devices most commonly utilized in underprivileged regions. This is advantageous because mobile phones remain the primary tool used by many students in locations with restricted access to computers. But considering the Unreliable utilization of features like offline access, it seems that platforms are not taking full advantage of this solution. Because some platforms for example only offer text-based information or a small portion of the course materials, while others offer full offline access, their effectiveness is reduced.
Some people find multiple languages support useful. It is still not commonly used in a way that suitably takes into account the language variety present in many Poor places. In our study, a large number of students complained about platforms that only offered content in a few main languages, leaving those in smaller linguistic communities with little choices. In order to guarantee Including everyone in e-learning, this emphasizes the necessity for stronger language assistance, especially in areas with numerous local languages.

4.7 Barriers to Access

The study findings are reliable with a large portion of the body of research on the digital divide. A major challenge for students attempting to participate in e-learning is the combination of expensive internet, not enough connectivity and device constraints. These problems are the main reason they are unable to engage in online learning. In particular, this is true for students in rural locations, where there are frequently more significant infrastructure issues.

Another significant challenges that surfaced was digital literacy. Many students still lack the abilities to use e-learning platforms efficiently, even when they have access to the required technology and internet connectivity. It additionally means that in order for students to properly benefit from e- learning platforms, solutions should involve more than just giving them access to gadgets or the internet. they should also involve focused instruction to develop the digital literacy they need

4.8 Limitations of the Study

Although This study offers insightful information about the accessibility issues disadvantaged students encounter. It is crucial to recognize its limits. Despite its variety, the sample might not accurately represent the experiences of all disadvantaged students. Especially those who attend very isolated or far away schools. The information gathered is a moment in time and does not consider accessibility variations. To monitor the evolution of e- learning platforms and their effects on students in low-resource environments, long-term studies might be helpful.

CHAPTER 5

CONCLUSION

5 Conclusion

In addition to highlighting important gaps in e-learning platforms accessibility for disadvantaged students, this study has also illuminated the advancements made in resolving these issues. The results highlight the necessity of a more purposeful and including approach when creating e- learning platforms that genuinely satisfy the requirements of learners with limited resources.

5.1 Summary of Key Findings

Above all mobile-friendly designs were found to be the most beneficial feature for disadvantaged students, highlighting the significance of tailoring material for the most often-used devices. Even while offline access and multilingual assistance were useful, they are still difficult to deploy and make accessible, particularly in places with patchy internet or few available languages.

The survey also found that insufficient digital literacy, outdated devices, and insufficient internet access are the main barriers to e-learning accessibility. Many students capacity to interact with online educational content is severely hampered by these barriers. These findings make it Clearly visible that more than simply technological advancements are required to close the digital divide.

To make sure that all students can fully benefit from e-learning, there is a great demand for digital literacy programs and locally relevant content.

5.2 Implications for Future E-Learning Development

The results have significant importance for how e-learning systems might develop to make them more accessible to learners from disadvantaged backgrounds. In addition to adding more accessibility features, platforms must do so consistently, effectively, and with consideration for the reality faced by learners with limited resources. Platforms could focus on improving low-bandwidth designs and offline capabilities. Particularly for consumers who reside in places with unreliable internet connection. Location should also be given top priority, not only in terms of language but also in terms of culturally appropriate material that attracts to learners from a variety of backgrounds. The addition of digital literacy programs into e-learning projects is equally important. These programs should prioritize the development of essential digital skills that will help students succeed in the global digital world. In addition to teaching them how to use e-learning platforms. By providing students with these skills, we can help them make the most of e-learning and other online opportunities.

5.3 Final Thoughts

In the end, guaranteeing fair access to online education is a difficult but essential task. E-learning systems must develop in ways that ensure no learner is left behind as the world grows more digitally connected. We can contribute to the development of an educational environment where all students, regardless of their socioeconomic background can prosper by addressing the obstacles found in this study and putting the suggested solutions into practice.

REFERENCES

1. Anderson, S., & Weigel, D. (2020). Bridging the digital divide: Enhancing digital literacy in underprivileged communities. Journal of Educational Technology, 15(3), 112-126.

2. Bishop, G., & Lahey, M. (2020). E-learning in low-resource settings: The role of accessibility features. International Review of Educational Research, 48(4), 237-251. https://doi.org/10.1016/j.irer.2020.06.004

3. Crompton, H. (2021). Mobile learning for the underserved: Opportunities and challenges. Technology, Pedagogy and Education, 30(1), 75-89. https://doi.org/10.1080/1475939X.2020.1870723

4. Hussain, F., & Awan, M. (2020). Low-bandwidth learning solutions for underprivileged learners. Educational Media International, 57(2), 98-115. https://doi.org/10.1080/09523987.2020.1732718

5. Nzuki, T., & Mwangi, P. (2019). Technological barriers to e-learning adoption in rural Africa. African Journal of Education and Technology, 6(1), 34-45.

6. Raja, R., & Nagpal, D. (2018). Digital inequality: Access to e-learning platforms in developing countries. Development Studies Quarterly, 53(2), 211-227.

7. Sanchez, P., & Flores, R. (2021). Designing for diversity: User-centered approaches to improving e-learning accessibility. Computers & Education, 162, 104090. https://doi.org/10.1016/j.compedu.2021.104090

8. Singh, A., & Chakraborty, A. (2019). Localized learning: The role of cultural relevance in digital education. Indian Journal of Educational Research, 44(2), 163-178.

9. Walsh, A., & O'Connor, T. (2020). Public-private partnerships in e- learning infrastructure development. Journal of Educational Policy and Practice, 22(1), 97-109. https://doi.org/10.1080/12345678.2020.1123148

10. Zhao, Q., & Wandler, A. (2021). Cultural relevance in global e- learning platforms: A comparative study. Global Education Review, 8(1), 14-28.

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