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Assessment of Digital Integration in Learning

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ABSTRACT

This research explores the integration of digital tools, particularly mobile learning, in educational contexts in Nepal, aiming to optimize their effectiveness. Employing a questionnaire-based methodology, data was collected from students across all over Nepal using a Google Form distributed through online media. Insights were gathered from 1104 students, revealing widespread ownership and usage of mobile devices for studying. Findings indicate a preference for laptops and smartphones, with web pages and applications being the most utilized resources. Significant associations were observed between the type of mobile device, academic major, and preference for mobile learning. The study concludes that digital tools play a critical role in modern education, emphasizing the need for comprehensive policies to promote their integration. Recommendations include government initiatives to enhance access to educational devices, conduct proper trainings to learners, expand internet connectivity, address technical challenges, and distribute digital equipment to enhance mobile learning experiences for equity of access to technology all over Nepal.

1. INTRODUCTION

The rapid advancement of digital technologies has significantly transformed the landscape of education worldwide (Haleem et al., 2022). Introduction of digital learning tools such as mobile devices, smart boards, online courses, tablets, laptops, simulations, and dynamic visualizations has revolutionized the way students learn and acquire knowledge. Digital learning allows educators to focus on the individual student's journey, providing a more flexible and personalized approach to education. In the modern era of education, the integration of technology has revolutionized traditional learning methods. Among these technological advancements, mobile devices have emerged as powerful tools facilitating learning beyond the confines of traditional classrooms (Cruz et al., 2017). This study delves into the intricate relationship between different students' preferences for mobile learning. By understanding how students perceive mobile learning, educators can tailor educational strategies to better suit the diverse needs of learners.

In recent years, the widespread adoption of mobile devices, including smartphones, tablets, laptops, and

notebooks, has revolutionized how we access information and engage in learning. These portable gadgets have become essential tools in our daily lives, offering unparalleled convenience and flexibility. This surge in mobile technology usage has also reached the education sector, giving rise to the concept of mobile learning or "m-learning." Mobile learning refers to the utilization of mobile devices to facilitate learning anytime, anywhere, transcending the traditional confines of classrooms and desktop computers (Crompton & Burke, 2018). In the context of Nepal, where access to traditional educational resources may be limited, the potential of mobile learning to bridge the gap and provide equitable access to education is particularly significant. As more students and educators in Nepal embrace mobile learning, there is a growing need to understand its impact and effectiveness in educational settings (Shrestha, 2016).

Mobile learning holds immense promise in Nepal as a means to democratize access to education and empower learners from diverse backgrounds. By leveraging mobile devices, students in Nepal can overcome barriers such as geographical remoteness, limited infrastructure, and resource constraints to engage in meaningful learning experiences (Parajuli, 2016). Whether it's accessing educational content, participating in interactive lessons, or collaborating with peers, mobile learning offers unprecedented opportunities for personalized and flexible learning. However, to fully realize the potential of mobile learning in Nepal, it is essential to conduct rigorous research that examines its efficacy, challenges, and best practices.

In Nepal, the integration of digital technologies into the education system has been a gradual process, marked by both progress and challenges (Upadhyay, 2018). While progress have been made in previous years, particularly with initiatives such as the "One Laptop per Child" program, which aims to equip primary school students with laptops, significant obstacles persist (Bhatta, 2008). In many rural education institutions, there's a problem with not having enough electricity and fast internet. This makes it hard for teachers and students to use digital tools for learning. Despite these challenges, the Government of Nepal recognizes the importance of digital education and has taken steps to promote its adoption. Efforts to improve ICT infrastructure in institutions and provide access to digital resources underscore the commitment to enhancing educational opportunities through technology. However, barriers such as insufficient teacher training, financial constraints, and cultural resistance to change continue to delay the widespread implementation of digital learning initiatives (Laudari, 2019).

This study aims to address challenges in digital learning by conducting a comprehensive data-driven analysis of mobile learning in Nepal, with a specific focus on visualization. Leveraging the power of data analytics, this research seeks to get insights into how students engage with mobile learning platforms, how their performance is influenced, and the determinants of successful learning outcomes. Through visualization techniques, we endeavor to discern patterns, trends, and correlations within the data, offering actionable insights for educators, policymakers, and stakeholders. By illuminating the landscape of mobile learning in Nepal, this research endeavors to inform evidence-based decision-making and pedagogical strategies, thereby maximizing the potential of mobile technology to enrich learning experiences and outcomes for all students in the country.

1.1 LITERATURE REVIEW

The study by NELTA (2011), investigated the potential of mobile technologies for language learning in Nepal, proposing strategies for their effective deployment in both language learning and teacher professional development. The study emphasized the promising opportunities mobile technologies offer for English language learning in Nepal, advocating for further research and

practical implementation to maximize their benefits.

According to the study by Al-Emran, Elsherif, and Shaalan (2016), the attitudes of students and educators towards mobile learning (M-learning) in higher education institutions in Oman and UAE. Conducted surveys among 383 students and 54 instructors from five universities revealed significant differences in students' attitudes towards M-learning based on factors like smartphone ownership, country, and age. The findings underscore M-learning's potential as a promising pedagogical technology in Arab Gulf higher education, highlighting its role in facilitating learning and collaboration among students.

In study done by Parajuli (2016), explores mobile learning practices among undergraduate students in Nepal's Gorkha district, covering device availability, costs, learning trends, institutional policies, and attitudes. The study reveals widespread mobile phone ownership among students, often used informally for learning. While most students view mobile learning favorably, concerns persist about efficacy and institutional support. The study advocates for gradual integration of mobile devices into education, emphasizing the importance of pedagogical strategies and teacher support for maximizing educational benefits.

According to the study by Shrestha (2016), explores the challenges of implementing mobile learning in Nepal's education system and evaluates the feasibility of offline mobile learning solutions using open-source devices. It addresses the complexities of deploying technology in resource-constrained environments and emphasizes the need for simple, innovative solutions and teacher training. The study aims to inform the design of sustainable mobile learning initiatives tailored to Nepal's unique socio-cultural context.

As per Klimova, Poulová, and Poulova (2016) highlights the potential benefits and challenges of integrating mobile learning into higher education settings. They emphasize that mobile learning has the capacity to boost student engagement, improve learning outcomes, and enhance accessibility to educational resources. The flexibility and personalization afforded by mobile learning are recognized as key advantages, catering to diverse learning styles. However, the study also acknowledges the hurdles faced in implementing mobile learning, such as the need for robust infrastructure and concerns surrounding the quality of learning content. Research underscores the importance of carefully navigating these challenges while leveraging the transformative potential of mobile learning in higher education.

The paper by Shakya, Sharma, and Thapa (2017) explores the evolving landscape of education in Nepal, particularly the transition from conventional learning to E-learning. It investigates the educational scenario in rural and urban areas, highlighting the barriers to E-learning adoption. The study aims to assess the impact and challenges of E-learning in Nepal's higher education institutions, shedding light on why many are embracing this strategy. Through a literature review, it provides insights into the changing dynamics of the education system and the growing importance of E-learning in the rapidly evolving global context.

According to Burden, K., Kearney, M., Schuck, S., & Hall, T. (2019) delved into the realm of innovative mobile pedagogies tailored for school-aged students. By conducting a systematic literature review, the research examined various mobile learning strategies and their effectiveness within educational settings. The study aimed to shed light on the evolving landscape of mobile pedagogies, assessing their potential to enhance learning outcomes and engagement among school-aged students. Through a comprehensive review of existing literature, provided insights into the efficacy of innovative mobile learning approaches, contributing valuable perspectives to the ongoing discourse on educational technology integration.

The study by Kunwar and Kumar Poudel (2020) provides an in-depth analysis

of online education within higher education institutions in Nepal. It reveals challenges and issues, noting effective implementation in M Phil classes and training programs but irregularities and low attendance in undergraduate classes. Through observation, surveys, and literature reviews, the research identifies various concerns related to students, teachers, and curriculum delivery, pinpointing seven overarching challenges including technology, guidance, equity, pedagogy, access, time, and attitude. Recommendations stress the importance of infrastructural development, technical support, and access to digital resources by both government and educational institutions to effectively tackle these challenges.

A paper by Kumar and Sharma (2020) conducted a systematic literature review to investigate the development of context-aware mobile learning applications. Their study explored the integration of context-aware technologies into mobile learning applications and examined their impact on learning outcomes. By synthesizing existing research, Kumar and Sharma aimed to provide insights into the design, implementation, and effectiveness of context-aware mobile learning applications. The findings of their study contribute to a deeper understanding of how context-aware technologies can enhance the learning experience and improve educational outcomes in mobile learning environments.

1.2 RESEARCH GAP

The existing literature on mobile learning in education highlights its potential benefits and challenges, but there's a significant research gap in Nepal regarding the correlation between students' preferences, challenges, and outcomes in mobile learning environments, particularly in the context of their perceptions of comfort and helpfulness. While previous qualitative studies have explored student attitudes and implementation issues, there's a lack of comprehensive data-driven analysis utilizing advanced analytics techniques like data visualization. This gap limits our understanding of the concerned factors influencing student engagement and success in mobile learning. Addressing this gap requires rigorous quantitative research that incorporates visualization techniques to uncover underlying patterns and correlations, providing empirical evidence to guide the development of effective educational strategies that fit to the needs of Nepalese students.

1.3 RESEARCH OBJECTIVE

The primary objective of this study is to explore the implications of digital tools, particularly mobile learning, in educational contexts, and propose strategies for optimizing their effectiveness.

1.4 RESEARCH QUESTION

RQ: Does the integration of digital learning technologies influence student learning outcomes and educational experiences in Nepal?

2. METHODS AND MATERIALS

The research employed a questionnaire-based methodology to gather insights from students representing diverse academic disciplines. This survey covered aspects such as mobile device usage patterns, preferences for learning resources on mobile platforms, and participants' academic backgrounds. Analytical techniques including descriptive data analysis and chi-squared tests were applied to investigate potential correlations between various factors and the adoption of mobile learning, aiming to enhance its effectiveness and convenience.

2.1 SURVEY QUESTIONNAIRE DEVELOPMENT

A comprehensive survey consisting of 14 questions, detailed in Appendix I, was developed to capture insights into mobile learning practices, preferences, and challenges. It covered areas such as device ownership, usage patterns, resource perceptions, and associated obstacles.

2.2 DATA COLLECTION

A structured questionnaire, encompassing the 14 variables, was administered to collect data from students across all over the Nepal using a Google Form distributed through online media, constitutes a dataset of 1109 respondents. After the data was collected, preprocessing was done to maintain data quality by fixing any missing information, mistakes, or strange values in the data. Among all, five rows of data had to be removed due to some inconsistencies. Remaining 1104 rows of data were ready for further analysis. This preprocessing step helps to make sure that the results from analyzing the data are fair and accurate information regarding students' perspectives on mobile learning.

3. DATA ANALYSIS

3.1 DESCRIPTIVE DATA ANALYSIS

Descriptive data analysis involves summarizing and describing the characteristics of a dataset to gain insights into its central tendencies, variability, and distribution (Thompson, 2009). In this research, the utilization of descriptive data analysis, is implemented by employing data visualization methods such as pie charts. These visualizations play a pivotal role in comprehensively examining the dataset, offering a clear depiction of the frequency distribution of categorical variables. Utilizing pie charts, the research gains invaluable insights into the distribution patterns of key variables, enhancing the interpretation and communication of findings.

3.2 DATA STATISTICS

According to Greenwood and Nikulin (1996), chi-squared test can be utilized as a crucial statistical method for analyzing categorical data, enabling the examination of relationships between variables and the assessment of their independence within the dataset. Through the application of this test, the study aimed to determine whether observed frequencies significantly differed from their expected counterparts, thus providing insights into the associations between the variables under investigation. By employing the chi-squared test, the research was able to uncover any significant differences between observed and expected frequencies, allowing for the identification of patterns or dependencies within the data. As such, the chi-squared test played a fundamental role in shaping the analytical framework of this study, contributing to the depth and accuracy of its findings.

$$X^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where,

X2 represents the chi-squared test statistic

Oi is the observed frequency for each category.

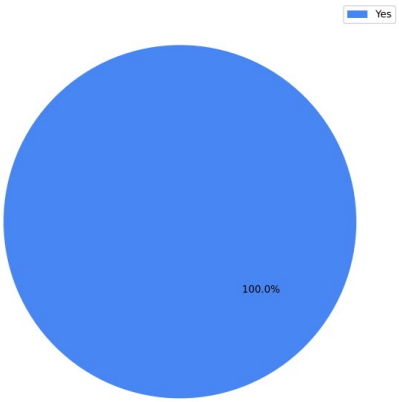
Ei is the expected frequency for each category under the null hypothesis.

4. RESULTS AND DISCUSSIONS

As above mentioned, students were asked 14 questions, which were as follows:

1. Do you have a mobile device with Internet connection?
   a. Yes
   b. No

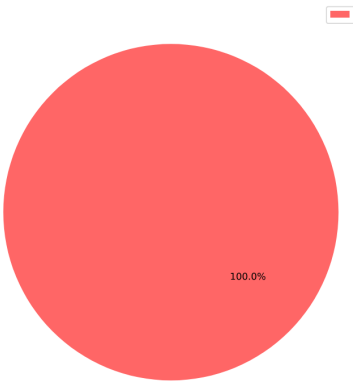
Figure 1: *Mobile device with internet connection*



All respondents, 100%, reported owning a mobile device with internet access. This result shows the ubiquitous presence of digital tools in learning environments, emphasizing their critical role in modern education.

2. Do you use the mobile device for your studies?
a. Yes
b. No

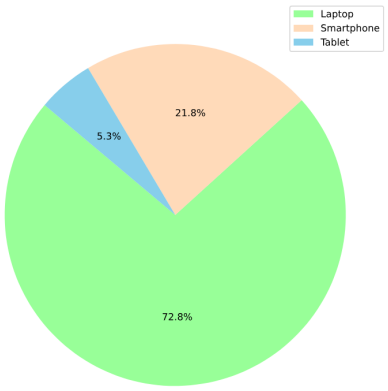
Figure 2: *Use of mobile device for studies*



All participants, 100%, said they use their mobile devices for studying. This shows how much students rely on mobile learning.

3. What type of mobile device do you use for learning?
a. Laptop
b. Smartphone
c. Tablet

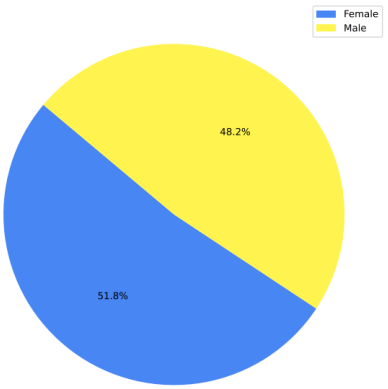
Figure 3: *Type of mobile device use for learning*



Results shows that, majority 72.8%, favor laptops, followed by smartphones at 21.8%, and tablets at 5.3%. This breakdown reveals laptops as the preferred choice for learning, with smartphones also being popular among some users.

4. Gender
a. Male
b. Female

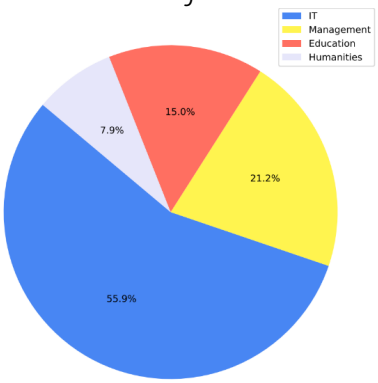
Figure 4: *Gender*



The survey shows a nearly equal split, with 48.2% identifying as male and 51.8% as female. From the random selection of participants, it seems like balanced distribution among the respondents.

5. Academic Major
a. Management
b. Education
c. Humanities
d. IT
e. Others

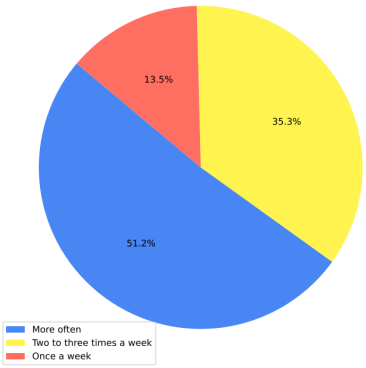
Figure 5: *Academic Major*



The majority, 55.9%, belong to the Information Technology (IT) field, followed by Management at 21.2%, Education at 15%, and Humanities at 7.9%. None of the respondents reported belonging to other academic majors. This breakdown reflects a significant representation from the IT sector, indicating a focused interest in digital implications in learning among IT professionals.

6. How often do you use the mobile device for your studies?
a. Once a week
b. Two to three times a week
c. More often

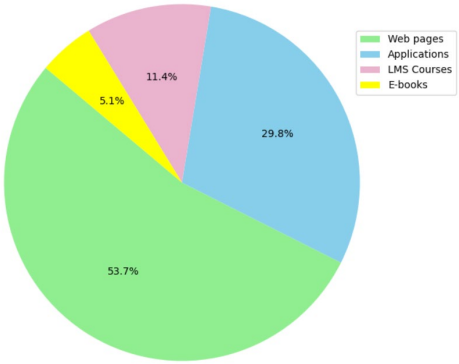
Figure 6: *Usage of mobile device for studies*



The majority, 51.2%, use their mobile devices for studying most often, followed by 35.3% who use them two to three times a week, and 13.5% who use them once a week. This indicates a significant reliance on mobile devices for regular study purposes among respondents.

7. What materials do you use for mobile learning?
a. Web pages
b. Applications
c. LMS courses
d. E books

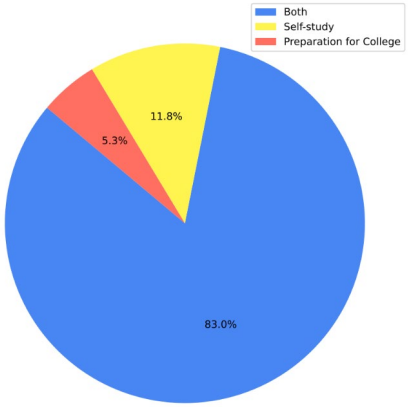
Figure 7: *Materials use for mobile learning*



The results indicate that the most commonly used materials for mobile learning are web pages (53.7%) and applications (29.8%), followed by LMS courses (11.4%) and e-books (5.1%).

8. Do you use mobile learning for college studies or self-study?
a. Preparation for College
b. Self-study
c. Both

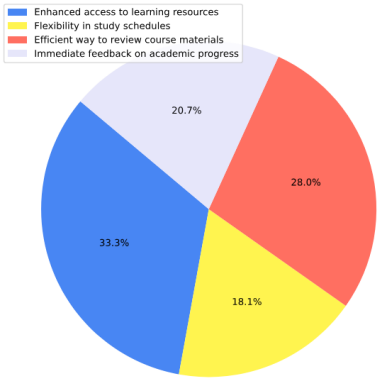
Figure 8: *Mobile learning for college or self-study*



The vast majority, 83.0%, reported using mobile learning for both college studies and self-study, while 11.8% use it solely for self-study, and 5.3% use it exclusively for college preparation only. This indicates a widespread adoption of mobile learning for diverse educational purposes.

9. If you use mobile learning for college preparation, what is the main reason?
a. Enhanced access to learning resources
b. Flexibility in study schedules
c. Efficient way to review course materials
d. Immediate feedback on academic progress

Figure 9: *Main reason of using mobile resources*

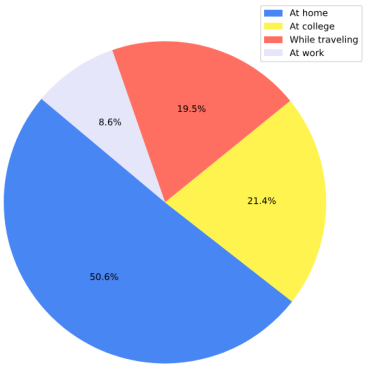


The results of the study suggest that the majority of respondents utilize mobile

learning primarily to gain enhanced access to learning resources, accounting for 33.3% of the responses. This is followed by 28% of respondents who use mobile learning for the efficient review of course materials. Additionally, 20.7% of respondents reported using mobile learning to receive immediate feedback on their academic progress. Finally, 18.1% of respondents mentioned using mobile learning for the flexibility it offers in managing their study schedules. This indicates that the main drivers for adopting mobile learning are its ability to provide accessible resources, streamline study processes, and offer a flexible learning environment.

10. Where do you typically use your mobile device for your studies?
a. While travelling
b. At home
c. At college
d. At work

Figure 10: *Place to use mobile devices for studies*



Through the responses, it is concluded that the majority of respondents typically use their mobile devices for studies primarily at home, representing 50.6% of the responses. This is followed by 21.4% of respondents who reported using their mobile devices for studies at college. Additionally, 19.5% of respondents mentioned using their mobile devices while traveling. Finally, 8.6% of respondents reported using their mobile devices for studies at work.

11. What do you consider as negative features of mobile devices? (Select all that apply)
a. Hardware limitations (e.g., screen size, touch screen interface, short battery life)
b. Health issues (e.g., eye strain, posture problems)
c. Social issues (e.g., distraction, addiction)
d. Family issues (e.g., conflicts over usage)

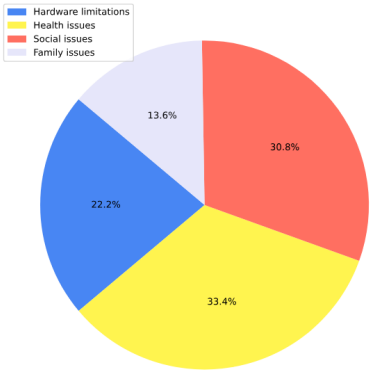
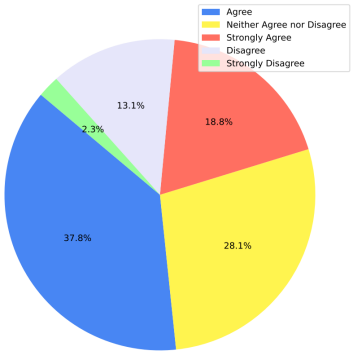


Figure 11: *Negative features of mobile devices*

Here, the survey on the negative features of mobile devices, it is found that 33.4% of the respondents reported health issues such as eye strain and posture problems. Social issues like distraction and addiction were mentioned by 30.8% of the participants. Additionally, 22.2% of the respondents cited hardware limitations, including screen size and battery life, as concerns. Family conflicts over usage were identified by 13.6% of the participants. These results underscore the diverse challenges associated with mobile technology usage among the respondents.

12. I prefer mobile learning over traditional classroom methods.
a. Strongly Agree
b. Agree
c. Neither Agree nor Disagree
d. Disagree
e. Strongly Disagree

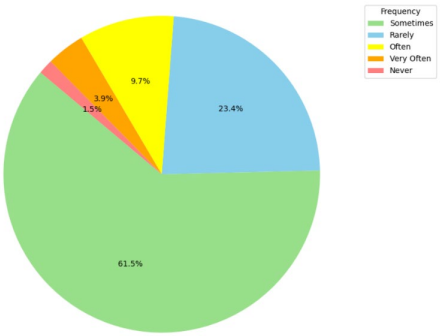
Figure 12: *Prefer mobile learning over traditional classroom methods*



A combined 56.6% of respondents either strongly agree (18.8%) or agree (37.8%) with preferring mobile learning, while 13.1% disagree and 2.3% strongly disagree. Additionally, 28.1% neither agree nor disagree. This indicates a significant level of acceptance and preference for mobile learning among the surveyed population.

13. I encounter technical difficulties while using mobile learning platforms.
a. Very Often
b. Often
c. Sometimes
d. Rarely
e. Never

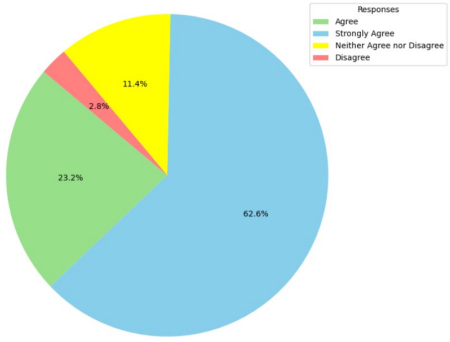
Figure 13: *Encounter technical difficulties while using mobile learning platforms*



Based on the provided chart, the majority, 61.5%, encounter technical issues sometimes, while 23.4% rarely face them, and 9.7% often do. A small percentage, 3.9%, experience technical difficulties very often, and only 1.5% report never encountering them. This indicates that technical challenges are common but not common among users of mobile learning platforms.

14. I feel mobile learning resources is helpful and comfortable for my educational purposes.
a. Strongly Agree
b. Agree
c. Neither Agree nor Disagree
d. Disagree
e. Strongly Disagree

Figure 14: *Mobile learning resources is helpful and comfortable for educational purposes*



A substantial majority, 85.8%, either agree (23.2%) or strongly agree (62.6%) that mobile learning resources are helpful and comfortable for their educational purposes. Merely 2.8% disagree, while 11.4% neither agree nor disagree. This indicates a high level of satisfaction and acceptance of mobile learning resources among respondents. Therefore, it can be concluded that mobile learning resources play a pivotal role in facilitating learning experiences, garnering considerable support and acknowledgment from the surveyed population.

4.1 CHI-SQUARED TEST RESULTS

Using the Chi-squared test, it can be examined that if there is significant association of all other variables with the perception of feeling comfortable and helpful using mobile devices for study. This statistical method allows to know to which extent the factors such as demographics, usage patterns, and device preferences contribute to individuals' comfort and perceived utility of mobile devices in educational settings.

Table 1: *Chi-squared Test Results*

Columns Variables	P-value	Message
Gender	0.820276	Fail to reject the null hypothesis: There is no significant association between 'Gender' and 'feel comfortable and helpful using mobile devices for study'.
Type of mobile device	0.00007763978	Reject the null hypothesis: There is a significant association between 'Type of mobile device' and 'feel comfortable and helpful using mobile devices for study'.
Academic Major	0.00127361	Reject the null hypothesis: There is a significant association between 'Academic Major' and 'feel comfortable and helpful using mobile devices for study'.
Materials use for mobile learning	0.573548	Fail to reject the null hypothesis: There is no significant association between 'Materials use for mobile learning' and 'feel comfortable and helpful using mobile devices for study'.
Mobile learning for college studies or self-study	0.569264	Fail to reject the null hypothesis: There is no significant association between 'Mobile learning for college studies or self-study' and 'feel comfortable and helpful using mobile devices for study'.
Main reason of mobile learning	0.722629	Fail to reject the null hypothesis: There is no significant association between 'Main reason of mobile learning' and 'feel comfortable and helpful using mobile devices for study'.
Mobile device uses at	0.866011	Fail to reject the null hypothesis: There is no significant association between 'Mobile device uses at' and 'feel comfortable and helpful using mobile devices for study'.
Negative features of mobile devices	0.845275	Fail to reject the null hypothesis: There is no significant association between 'Negative features of mobile devices' and 'feel comfortable and helpful using mobile devices for study'.
Prefer mobile learning over traditional classroom methods	0.0393574	Reject the null hypothesis: There is a significant association between 'Prefer mobile learning over traditional classroom methods' and 'feel comfortable and helpful using mobile devices for study'.
Technical difficulties while using mobile learning platforms	0.51786	Fail to reject the null hypothesis: There is no significant association between 'Technical difficulties while using mobile learning platforms' and 'feel comfortable and helpful using mobile devices for study'.

Based on the Chi-squared test results, several variables show a significant association with the perception of feeling comfortable and helpful using mobile devices for study.

Variables such as 'type of mobile device' and 'Academic Major' demonstrate a significant relationship, suggesting that the type of mobile device used and the academic major pursued impact students' comfort and perceived usefulness of mobile devices for studying. Additionally, the variable 'prefer mobile learning over traditional classroom methods' also shows a significant association, indicating that students who prefer mobile learning are more likely to feel comfortable and find it helpful for studying.

The variables 'student with mobile device and Internet' and 'use of mobile device for studies' do not exhibit a significant association, indicating that simply possessing a mobile device or using it for studies may not directly impact students' perceptions of comfort and usefulness. Conversely, other variables such as Gender, mobile device uses at, materials use for mobile learning, mobile learning for college studies or self-study, main reason of mobile learning, and negative features of mobile devices, also fail to reject the null hypothesis, “There is no significant association between the examined variables and students' perceptions of comfort and usefulness when using mobile devices for studying.” suggesting that factors like gender, usage context, materials utilized, purposes of mobile learning, and perceived negative features of mobile devices may not significantly influence students' perceptions of comfort and usefulness in mobile learning scenarios. Overall, these findings highlight the importance of considering specific factors such as the type of mobile device, academic major, and preference for mobile learning when assessing the digital implications in learning, and understanding students' attitudes towards using mobile devices for studying.

5. CONCLUSION

Based on the findings and discussions presented in this study, it can be concluded that digital implications in learning, particularly through mobile devices, are profoundly significant in the context of education in Nepal. It seems that the presence of mobile devices with internet connectivity among students, coupled with their widespread usage for studying, highlights the critical role of digital tools in modern education. The preference for laptops and smartphones for learning, as well as the high reliance on mobile devices for accessing learning resources, underscores the need for latest technology to enhance educational outcomes. Additionally, the study reveals significant associations between factors such as the type of mobile device used, academic major pursued, and preference for mobile learning, emphasizing the importance of considering these factors in educational policies and practices.

In light of these findings, several recommendations can be made to further enhance digital learning among students in Nepal. Firstly, there is a need for comprehensive policies and initiatives by the government to promote the integration of mobile learning technologies in educational institutions. This could involve initiatives such as providing subsidies or incentives for purchasing educational devices, expanding internet connectivity in rural areas, and offering training programs for both students and educators to effectively utilize digital tools in teaching. As our results show, the predominant use of laptops for mobile learning suggests the government should consider initiatives to distribute laptops or other suitable devices to students, especially those from disadvantaged backgrounds, to ensure equitable access to digital learning opportunities. Additionally, efforts should be made to address technical challenges and improve the usability of mobile learning platforms to enhance the overall learning experience. By implementing these recommendations, Nepal can harness the full potential of digital technologies to revolutionize education and empower learners across the country.

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