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Effectiveness of Mobile Phones in E-learning Among Under Graduate Students

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Abstract

This study looks into how effective mobile phones are for e-learning among undergraduate students in Zambia. As smartphones and mobile internet become more accessible, many students depend on these devices for their studies. This trend grew during the COVID-19 pandemic, which pushed education toward online learning. The research aims to see how students use mobile phones for learning, what challenges they encounter, and how this affects their academic performance. Using a survey method, data were gathered from 100 randomly selected undergraduate students through a structured questionnaire with 30 Likert-scale items. The analysis showed a high overall effectiveness score (mean = 113.32), indicating that mobile phones are essential tools for e-learning in Zambia's higher education. The findings showed that, generally, there are no major differences between male and female students in most areas of mobile phone use, such as access, communication, and academic outcomes. However, males reported facing significantly more challenges with mobile learning. Similarly, students from rural and urban areas had similar views on access, communication, and performance. Yet, urban students found mobile phones easier to use, which points to differences in infrastructure. The study supports previous research that highlights how mobile technology boosts student engagement, collaboration, and access to learning resources. It also points out ongoing issues like high data costs, poor network coverage, and limited tech support, which mainly affect rural students. The results stress the need for targeted actions to tackle these challenges, such as improving infrastructure, offering digital literacy training, and creating policies to lower costs. Overall, the research confirms that mobile phones greatly aid e-learning in Zambia but highlights the need for strategic actions to close the gaps. Addressing gender-specific challenges and infrastructure issues can create a more inclusive and effective digital learning environment, ultimately improving higher education outcomes for a wide range of students.

Keywords: E-learning, mobile phones, undergraduate students, effectiveness, Zambia

INTRODUCTION

The use of mobile phones in e-learning has become crucial in higher education in Zambia, especially among undergraduate students. As smart phones and mobile internet become more accessible, many students

now rely on these devices to access educational content. This trend became even clearer during the COVID-19 pandemic, which forced many institutions to move to online and distance learning methods (Muchimba et al., 2022).

In Zambia, mobile phones provide a practical way to deliver learning materials because they are affordable and convenient. A study at Levy Mwanawasa Medical University found that over 96% of students used mobile phones to participate in online learning (Muchimba et al., 2022). However, while mobile technology allows for flexible and remote access to education, students have faced ongoing challenges such as high data costs, poor network connections, and frequent power outages. These problems limit the effectiveness of mobile-based e-learning and lead to a preference for traditional face-to-face learning formats.

Despite these issues, mobile learning has shown several positive outcomes. Research indicates that it can boost student engagement, encourage collaboration, and provide greater access to academic resources (Kalonde, 2023). Mobile devices also let students learn at their own pace and on their own schedules, which can be especially helpful in situations where physical classrooms are limited (Mutale & Chikuni, 2023).

Nonetheless, the success of mobile learning depends on various factors. These include students' digital skills, the availability of support from institutions, and reliable technological infrastructure. While mobile devices are common, inconsistent internet service and a lack of technical help can greatly impact how effectively students use these tools for their studies (Chisenga, 2023).

This study aims to explore how effective mobile phones are in e-learning for undergraduate students in Zambia. It seeks to understand how students use mobile phones for learning, what challenges they encounter, and how these experiences affect their academic performance. The findings are expected to help improve e-learning strategies and inform education policies that support mobile-based learning in higher education.

REVIEW OF LITERATURE

Sean Eom's 2022 study explores how mobile device use impacts e-learning and student outcomes in online university education. Surveying 323 students at a Midwestern U.S. university, the study (analyzed with SmartPLS 3.3.2) found that mobile devices enhance communication with instructors and peers, support self-directed learning, and improve academic results. Eom concludes that integrating mobile technology into distance education creates flexible, student-centered environments that boost learning effectiveness.

Nicholaus Mwalukasa's 2023 study at Sokoine University of Agriculture examined mobile phone use among 120 postgraduate students. Using surveys and regression analysis, the study found that students frequently used phones to access lecture materials, share notes, and download resources. Key factors influencing use were perceived usefulness, ease of use, and positive attitudes toward mobile learning. Mwalukasa concludes that mobile phones are widely used for academic purposes and recommends training to help students use them more effectively for improved performance.

Afful's 2023 study on distance learning students at the University of Ghana and the University of Education, Winneba, found that mobile technology is central to their studies. Students mainly used it for peer communication, online courses, and assignments. Key benefits included easy access to materials, flexible study anytime and anywhere, and quick retrieval of content. The study recommends that institutions design e-learning plans that prioritize these valued uses and benefits.

Mbinda et al.'s 2024 study examined smartphone use in higher education, especially in blended learning after the COVID-19 shift. Through a systematic review of studies since 2020, they found that smartphones enhance engagement, achievement, and satisfaction among students. The study recommends educators integrate digital resources to meet individual needs and promote creativity and innovation.

Esan's 2025 study of 382 Nigerian undergraduates found that most students used phones for over five hours daily, with poor usage habits negatively affecting their study habits. However, no direct link was found between phone use and time management, as many reported good time management skills. The study also suggested that mobile phone radiation (SAR) may reduce concentration. Esan concludes that students should be educated on the risks of excessive phone use to protect their well-being and academic performance.

NEED AND SIGNIFICANCE OF THE STUDY

With the rapid growth of digital technologies, mobile phones have become essential tools in modern education, especially in developing countries like Zambia. As universities increasingly use e-learning to improve access to education, it is important to understand how well students use mobile phones for academic purposes. Many undergraduate students depend on mobile devices because they have limited access to traditional computer resources. However, research on how these devices affect learning outcomes, student engagement, and overall academic performance in Zambia is still lacking. This study is significant because it sheds light on the role mobile phones play in supporting online learning for university students. By looking at the benefits, challenges, and patterns of mobile phone use in e-learning, the research can assist educators and policymakers in creating strategies that improve digital learning environments. Additionally, the findings can help enhance curriculum design, technological support, and student training, making mobile learning more effective and accessible in higher education institutions throughout Zambia.

OBJECTIVES OF THE STUDY

The researcher undertook this study with the following objectives:

- To identify the Effectiveness of Mobile Phones in E-learning Among Under Graduate Students.
- To find out the significant difference between male and female undergraduate students.
- To find out the significant difference between rural and urban undergraduate students.

HYPOTHESES OF THE STUDY

- The level of Effectiveness of Mobile Phones in E-learning Among Under Graduate Students is average.
- Male and female undergraduate students do not differ in the level of Effectiveness of Mobile Phones in E-learning.
- Rural and urban undergraduate students do not differ in the level of Effectiveness of Mobile Phones in E-learning.

METHOD OF STUDY

The present study employed the normative survey method, a widely used approach in educational research aimed at collecting data to describe existing conditions, practices, opinions, and attitudes. This method was deemed appropriate for assessing the effectiveness of mobile phones in e-learning among undergraduate students in Zambia, as it allows for the systematic collection and analysis of quantitative data

from a defined population. Through this approach, the study aimed to capture the access and convenience, communication and interaction, academic performance and learning outcomes, usability and ease of use, challenges and limitations faced by students in utilizing mobile phones for academic purposes.

SAMPLE OF THE STUDY

The sample of the study consisted of 100 undergraduate students enrolled in various academic programs. The participants were selected using simple random sampling ensuring a diverse representation in terms of gender and locality. This sample size was deemed sufficient to obtain meaningful insights into the effectiveness of mobile phones in e-learning contexts.

TOOL USED IN THE PRESENT STUDY

The tool used for data collection in the present study was a self-structured questionnaire designed to assess the effectiveness of mobile phones in e-learning among undergraduate students. The questionnaire consisted of 30 items, each focusing on various aspects of mobile phone usage in academic settings, such as access and convenience, communication and interaction, academic performance and learning outcomes, usability and ease of use, challenges and limitations. Each item was rated using a five-point Likert type scale, with response options ranging from Strongly Agree to Strongly Disagree. This scaling method allowed participants to express the extent of their agreement or disagreement with each statement. The tool was developed based on relevant literature and expert input to ensure content validity. The maximum score one can obtain is 150 and the least is 30. The higher score reveals the effectiveness of mobile phone in e-learning.

RELIABLITY AND VALIDITY OF THE TOOLS

The content validity of the questionnaire was established by consulting with subject matter experts in the fields of educational technology and research methodology. The reliability of the tool was found using test-retest method with an interval of three weeks. Thus the reliability coefficient of 0.85 was found and it indicates a high level of reliability.

STATISTICAL TECHNIQUES USED IN THE STUDY

The data collected through the questionnaire were analyzed using appropriate descriptive and inferential statistical techniques to interpret the results effectively. Descriptive statistics such as mean, standard deviation were used to summarize the responses and provide an overall picture of students' effectiveness of mobile phones in e-learning. To examine differences based on variables such as gender and locality, inferential statistics were applied.

ANALYSES OF DATA

The study included a total of 100 undergraduate students, among whom male and female participants were represented. the sample consisted of 50% male and 50% female participants. This indicates a balanced representation of both genders in the study, which allows for a fair comparison of the effectiveness of mobile phones in e-learning between male and female students.

Table – 1: The effectiveness of mobile phones in e-learning of whole group

Variable	Number	Mean	SD
Effectiveness of mobile phones in e-learning	100	113.32	19.79

The overall sample mean score is 113.32 showing the high level of effectiveness of mobile phones in e-learning for undergraduate students. The standard deviation (SD = 19.79) shows the moderate scattering of scores, i.e., students' responses are dispersed but not extremely scattered. Since the mean value is high, it shows that mobile phones are highly effective for providing e-learning to this population.

Table – 2: Mean, SD and 't' value for the effectiveness of mobile phones in e-learning based on gender

Effectiveness of Mobile Phones in E-learning	Male (N-50)		Female (N-50)		't'	Significant Level
	Mean	SD	Mean	SD		
1. Access and Convenience	23.43	4.11	23.07	6.43	0.33	NS
2. Communication and Interaction	25.36	4.31	23.64	6.38	1.58	NS
3. Academic Performance and Learning Outcomes	19.79	4.66	21.57	5.87	1.68	NS
4. Usability and Ease of Use	21.86	5.08	22.57	4.97	0.71	NS
5. Challenges and Limitations	24.71	3.09	20.64	4.07	5.63	S (0.01)

The mean, SD, and t-values for mobile phone effectiveness in e-learning by gender are presented in the table. The comparison was made between male (N=50) and female (N=50) undergraduate students on five aspects.

Access and Convenience

Males (M = 23.43) and females (M = 23.07) both indicated almost similar access and convenience in applying mobile phones for e-learning. The t-value (0.33) was not significant, indicating no gender difference.

Communication and Interaction

Males (M = 25.36) were just higher than females (M = 23.64). The t-value (1.58) was not significant, which implies both sexes learn equally in terms of communication and interaction.

Academic Performance and Learning Outcomes

Females (M = 21.57) were just higher than males (M = 19.79). The t-value (1.68) was not significant, which implies there is no significant gender difference in academic performance through mobile phones.

Ease of Use and Usability

The mean of female students (M = 22.57) was slightly higher than that of men (M = 21.86). The t-value (0.71) was not significant, showing no gender difference in ease of use.

Challenges and Limitations

Male students (M = 24.71) had a significant higher score than females (M = 20.64). The t-value (5.63) was significant at the 0.01 level, and it implies that males encounter significantly more difficulties and constraints in using mobile phones for e-learning than females.

Overall Conclusion

In all except one dimension (Challenges and Limitations), male and female students are not appreciably different from each other in their assessment of the effectiveness of mobile phones for e-learning. In Challenges and Limitations, male students have more problems than females, and the difference is statistically significant at the 0.01 level.

Thus, it found that male and female undergraduate students are not dissimilar in that the level of effectiveness of the application of mobile phones in e-learning is partially accepted in access and convenience, communication and interaction, learning outcomes and academic performance, usability and ease of use and partially rejected in the aspect of challenges and limitations.

Table – 3: Mean, SD and 't' value for the effectiveness of mobile phones in e-learning based on locality

Effectiveness of Mobile Phones in E-learning	Rural (N-45)		Urban (N-55)		't'	Significant Level
	Mean	SD	Mean	SD		
1. Access and Convenience	23	2.83	23.32	5.84	0.34	NS
2. Communication and Interaction	23.5	8.09	24.77	4.66	0.98	NS
3. Academic Performance and Learning Outcomes	19	6.92	21.14	4.83	1.82	NS
4. Usability and Ease of Use	20.5	6.12	22.68	4.63	2.03	S (0.05)
5. Challenges and Limitations	24	5.06	22.32	3.87	1.88	NS

From Table 3 the following conclusions are derived

Access and Convenience

There is no difference in the mean scores of rural students (M = 23.00, SD = 2.83) and urban students (M = 23.32, SD = 5.84). The 't' value (0.34) is not significant, indicating that there is no significant difference between rural and urban students in terms of how mobile phones provide access and convenience to e-learning.

Communication and Interaction

The rural students (M = 23.50, SD = 8.09) and the urban students (M = 24.77, SD = 4.66) share similar perceptions. The 't' value (0.98) is not significant, meaning that both groups are equally supported by mobile phones in communication and interaction for learning.

Academic Performance and Learning Outcomes

Rural students scored less (M = 19.00, SD = 6.92) than urban students (M = 21.14, SD = 4.83). The difference ('t' = 1.82) is not significant. Mobile phones therefore improve academic performance and outcomes to the same extent for rural and urban students, even though urban students have higher mean scores.

Ease of Use and Usability

Rural students scored lower compared to urban students (M = 20.50, SD = 6.12 < M = 22.68, SD = 4.63). The 't' value of 2.03 is significant at the 0.05 level, and it suggests that urban students find mobile phones considerably more convenient and easy to use for e-learning compared to rural students. This may be due to higher exposure, computer literacy, and infrastructure in urban areas.

Challenges and Limitations

Rural students (M = 24.00, SD = 5.06) experienced more difficulties than urban students (M = 22.32, SD = 3.87). The 't' value (1.88) is insignificant, but the trend suggests that rural students experience slightly more difficulties and limitations in using mobile phones for e-learning, which are perhaps related to connectivity and resource issues.

Overall Conclusion

With respect to all aspects (access, communication, performance, challenges), urban and rural students do not reveal any significant difference in perceiving the role of mobile phones in e-learning. The only significant difference is usability and ease of use, for which urban students find greater ease of use compared to rural students. This reflects the requirement of targeted training and facilitation of infrastructure in rural areas to bridge the digital divide and create more usability experiences in e-learning.

Thus, it reached the conclusion that rural and urban undergraduate students differ not at all in the extent to which mobile phones can facilitate e-learning. To an extent, its acceptability in the dimensions of access and convenience, communication and interaction, learning and academic achievement is accepted, while to an extent it is rejected in the dimension of usability and ease of use.

DISCUSSION ON THE FINDINGS

The present study found that mobile phones are very effective for e-learning among undergraduate students in Zambia. The overall mean score of 113.32 indicates their positive role in supporting online education. This agrees with Muchimba et al. (2022), who reported that over 96% of students at Levy Mwanawasa Medical University used mobile phones for online learning. Similarly, Mbinda et al. (2024)

pointed out that smartphones significantly improve student engagement, academic performance, and overall satisfaction in higher education. Together, these findings confirm that mobile phones are essential tools for e-learning in higher education.

In terms of gender differences, the study showed no significant variation between male and female students regarding access and convenience, communication and interaction, academic performance, and usability of mobile phones. This outcome supports the findings of Mwalukasa (2023) and Afful (2023), who also found that both male and female students benefit equally from mobile learning opportunities. However, the present study adds a unique perspective by showing that male students face significantly more challenges than their female peers. This observation aligns with Esan (2025), who noted that excessive phone usage among male students often led to poor study habits and concentration issues. Thus, while gender does not affect the overall effectiveness of mobile learning, it does influence the extent to which students face challenges, particularly for male learners.

Regarding locality, the study found that rural and urban students showed no significant differences in access, communication, or academic performance. This suggests that mobile phones provide equal learning opportunities across different geographical areas. These results resonate with Kalonde (2023), who highlighted that mobile learning can promote collaboration and broaden access regardless of location. However, the current study revealed that urban students reported significantly higher ease of use and usability compared to rural students, while rural students faced slightly more challenges. These findings correspond with Muchimba et al. (2022) and Chisenga (2023), who highlighted infrastructure issues like poor network connectivity, high data costs, and lack of technical support as major barriers to mobile learning in rural areas. Therefore, while mobile phones are effective in both contexts, infrastructure inequalities continue to impact rural students' experiences with e-learning.

In terms of academic performance, the study found that while females and urban students reported slightly higher mean scores than their counterparts, these differences were not statistically significant. This backs the conclusions of Eom (2022) and Mwalukasa (2023), who established that mobile devices improve self-directed learning and academic performance regardless of demographic factors. The implication is that mobile phones enhance academic outcomes for students across gender and locality, with only minor differences.

Lastly, challenges and limitations were found to be an essential area of concern. Male students faced significantly more difficulties compared to females, while rural students, though not significantly different from urban peers, still reported more challenges in mobile learning. This is consistent with Muchimba et al. (2022), who cited ongoing issues like high data costs and unreliable networks, and Esan (2025), who found that poor mobile usage habits negatively affected academic behavior. The current study therefore confirms that while mobile phones are effective learning tools, their potential is limited by infrastructure and behavioral barriers that differ by gender and locality.

In summary, the findings of this study largely agree with earlier research on the effectiveness of mobile phones in e-learning. However, it offers new insights by highlighting how gender and locality shape students' challenges, even when overall effectiveness remains unchanged. These findings indicate that while mobile phones provide equal learning opportunities in theory, policies and strategies need to address the specific needs of male students, who face more challenges related to usage, and rural students, who suffer from infrastructure inequalities.

CONCLUSION

The aim of this study was to identify whether mobile phones are effective in e-learning for undergraduate students in Zambia. As indicated by the general mean score of 113.32, this showed very high effectiveness, which mirrors the high level of effectiveness. This concurs with earlier research that highlights the positive impact of mobile technology on student engagement as well as access to learning resources.

The study also tested variations that could be present by gender and place. Generally, the findings indicate that there are no significant variations by gender in how students perceive the efficacy of mobile phones in e-learning in the areas of access, communication, performance, and usability. This supports the hypothesis that male and female students have no different perceptions regarding the efficacy of mobile learning. Nevertheless, under the "Challenges and Limitations" factor, male learners had a significant difference in the number of challenges they faced with respect to the females. In other words, there are more studies to be conducted to find out what specific issues male students need to contend with in mobile learning, whether socioeconomic, technical, or behavioral.

Similarly, student locality analysis (rural or urban) found no variation in accessing most of the access dimensions, communication, academic achievement, and obstacles. This shows that the advantage of mobile learning is observed to be reasonably leveled across these geographical divisions. Students in urban areas did find mobile phones much simpler to use for e-learning compared to rural students. This sharp contrast in usability and ease of use indicates the continuing challenge of the digital divide. While both groups of students have mobile phones, disparities in infrastructure, such as access to the internet and a reliable power supply, and varying digital skills probably determine the rural-urban divide in the user experience.

Finally, though mobile phones are overall very effective for e-learning among Zambian undergraduate students, there are areas of concern which must be looked into as the study uncovers. The high general level of effectiveness and the lack of significant gender or locality variations across most of the dimensions indicate the potential of mobile technology to democratize learning. However, the differences in the issues confronting males and usability issues for rural students necessitate interventions. Policymakers and the education system in Zambia must prioritize efforts to set strategies that aim at specific issues, such as providing enhanced technical assistance, subsidizing data costs, and offering digital literacy training aimed at addressing the needs of diverse student populations, particularly rural students. By bridging these gaps, mobile learning can be maximized to deliver a more inclusive and equitable learning experience for everyone.

Declaration of Conflicting Interests

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