



Use of Digital Technologies for Learning: Reflections on Students' Experiences at the University of Dar es Salaam

Lulu Simon Mahai^(✉) 

University of Dar es Salaam, Dar es Salaam, Tanzania
Mahai.lulu@udsm.ac.tz

Abstract. This study explored the students' experiences with using digital technologies to enhance learning in a conventional system of a higher learning institution. Specifically, it examined the types of digital technologies, usage and challenges students encountered. The study engaged second-year students taking Bachelor of Education in Adult and Community Education (BED ACE) at the University of Dar es Salaam. It applied questionnaires and semi-structured interviews to obtain requisite data. The study findings indicate that students mostly used mobile phones, laptops and USB flash/external drive to further their learning. Moreover, their use of applications such as Moodle enabled them to interact, access learning materials, get feedback on their assignments, and participate in discussion forums. Similarly, students used social media platforms such as WhatsApp and Facebook for academic and social purposes. Human and technology-related challenges limited students' engagement in learning, especially off-campus. Despite the challenges the students faced, they still expressed their readiness to harness potentials associated with technology to add value and boost the quality of their learning. The study, therefore, calls for continuous improvement of human and digital infrastructure to support widely and further upscale intake of the applications of digital technologies among students.

Keywords: Digital technologies · Students' experiences · Digital challenges

1 Introduction

Advances in technologies have induced the transformation of teaching and learning in universities globally. Digital technologies such as electronic devices, systems and resources help to improve students' learning in various universities. The capacity to create, store, process, transmit and display information using digital technologies has simplified the teaching and learning process and enabled students to study at their own pace and space [16, 18]. In fact, digital education supports universities to widen access to education within and outside the university, reduce costs, enhance effective collaboration among students, and support knowledge sharing [4, 18]. Similarly, it contributes to improving students' engagement in learning as well as in socio-economic activities [7].

The benefits of digital technologies include improving the quality of face-to-face offered under traditional systems, blended learning and online learning [1, 5, 18]. Indeed, digital technologies permit students and teachers to enhance learning in different contexts. The University of Dar es Salaam, for example, is increasingly applying digital technologies to enhance effective teaching in both face-to-face conventional and blended learning modes. In this regard, the university uses technologies such as zoom meetings and Moodle [10] to support the teaching of both undergraduates and postgraduates. In fact, some programmes such as the Postgraduate Diploma in Education (PGDE), Postgraduate Diploma in Engineering Management (PGDEM), and Master in Engineering Management (MEM) fully use the blended mode [11] with recourse to the emergent teaching and learning technologies. Course instructors at the University of Dar es Salaam also apply Moodle to enhance learning in the conventional mode. This study, therefore, focuses to expand the use of digital technologies to prepare students to tap available potentials and integrate them in the conventional system for better learning.

The use of digital technologies in learning is applied in many universities worldwide whether in developed or developing countries. The Prince Sattam bin Abdulaziz University in Saudi Arabia, for example, applies digital technology to enable students to access quality learning materials, academic services, email, examination results, information updates, certificates and recommendations for further studies [1]. Similarly, universities in South Africa, Kenya, Uganda, Mozambique and Sudan use various digital applications to help students interact, avail feedback from instructors, access to online learning resources, participate in discussion forums, and submit assignments [14, 21].

Universities in Tanzania particularly deploy Moodle in learning. This application is evident at Mzumbe, Muhimbili, and University of Dar es Salaam, all public institutions [10, 12]. The University of Dar es Salaam, for instance, from 2016 started using Moodle to enable students to access online services in a flexible manner [10]. This application augurs well with the UDSM vision 2061, which aims to transform its institutional digital infrastructure by creating an e-university as an integral part of its education system [20]. The university is committed to applying digital technologies to add value to teaching and learning in line with the demands of the twenty-first century. This drive also complements global efforts aimed to ensure students continue with studies even during the Covid-19 pandemic [10], which discourages close-knit learning by encouraging social distancing. The university campus has recourse to computer laboratories with internet connectivity, Wi-Fi, Zoom technology, and the Moodle system [10, 11]. These technologies facilitate the emergence of a conducive environment for dealing with emerging pandemics such as Covid-19, which is not only disruptive to but also frustrating the traditional face-to-face interactivity between the teacher and the learner. In consequence, universities ought to transform the traditional teachings to accommodate technology-based alternatives that function even with social distancing and stay-at-home demands. Yet less is known on students' readiness to use the digital technologies for learning particularly in the developing country's context of, for example, Tanzania.

In fact, the Covid-19 restrictions currently hitting hard the entire globe has underscored and reinvigorated the need and use of digital technologies among students in higher education [5]. Inevitably, universities continue exploring various applications to

ensure effective use of such digital technologies in teaching and learning. This expansion in technology application also extends to social media platforms such as WhatsApp and Facebook, which influence synchronous and asynchronous learning [3, 5, 7]. Moreover, students use laptops, computers and mobile phones for learning [1, 6]. The use of these digital devices requires access to the internet and reliable electricity supply. This orientation partly challenges the digital technology application in Africa. Students in Africa, especially in rural areas, experience lack of internet connectivity within and outside the university, low bandwidth, rationed electricity, lack of ICT knowledge, poor access to digital devices and limited interactions [10, 14]. The same challenges exist in rural and urban areas in Tanzania [9, 11, 12]. As students' experiences with the use of digital technologies in conventional universities during this novel Covid-19 epidemic remains largely undocumented and lacking scholarly approbation, this study seeks to enrich literature on the application of digital technologies from students' perspectives in the developing world's context of Tanzania. In this regard, the study explores the types of digital technologies students at the UDSM commonly apply, their usage and attendant challenges.

2 Literature Review

The advancement of technologies has enabled students in universities to apply digital technologies to enhance learning. Enhanced university infrastructures now support the application of digital technologies. Moodle and Sakai, for example, have become staple applications at the universities of Dar es Salaam and South Africa, respectively, for providing unfettered learning resources and enhancing interactions with students [10, 21]. These technologies allow students to access live interactions with course instructors, real-time instruction, online chats, online discussion forums, emails, and online books and social media [7, 21]. For the students to access the potential services in a digital form, they use laptops, smartphones and computers [1, 6, 7]. The students also use tablets, kindles, external hard drives and USB flash drives [5, 18].

A study conducted at two universities in Australia found that more than 90% of the students sampled use laptops and computers, smartphones (80%) and tablets [5]. The use of laptops and smartphones is dominant among students. They enable students to access academic schedules, individual and group assignments, lectures in audio and videos, administrative support and learning materials [1, 5]. However, a study by UNESCO indicates that more than 80% of the students in sub-Saharan Africa do not have access to household computers [20]. Similarly, findings from Makerere University in Uganda also indicate that students had limited access to personal computers and mobile devices despite their heightened need and appreciation of such digital technologies [18]. Implicitly, there are challenges that the students face when it comes to possessing, accessing and using proper and facilitative digital learning devices.

The advancement of digital technologies also enables students to use social media for learning [7]. Consensus indicates that social media platforms such as Facebook and WhatsApp enable students to engage in learning, and support decision-making in addition to enhancing collaboration and problem-solving [3, 5]. Students also access subject-related videos on YouTube [5]. Furthermore, students access learning resources

through Google and Learning Management System [5, 10]. The use of social media, search engines and Learning Management System give students impetus to sustain learning as they can access learning materials in various formats including texts, PDFs, PPT, Video and audio. The same digital technologies help students to develop critical thinking skills, share learning materials, participate in discussion, and engage in chat forums [5, 12]. These advantages tend to sustain students' interest in learning even in disruptive circumstances of, for example, the Covid-19 pandemic. However, proper accessibility to potential devices, tools and applications are needed to allow students to navigate seamlessly in the digital world.

Numerous studies indicate that students face various challenges when using digital technologies. Students' knowledge on using digital technologies is crucial for learning process. It is documented that most of the students experience digital illiteracy, which hinders their capacity to use various devices [10, 18]. Improving their digital literacy is, therefore, vital to facilitate their application of technology in the 21st Century.

The issue of costs appears to take a toll in this context [10, 12, 18]. The cost of these devices and internet services, sometimes, exclude largely poor students from tapping into the potentials associated with such digital technologies. In consequence, inequalities emerge on the use of digital technologies as only those who are financially secure can harness these digital potentials.

Moreover, students experience limited interactions with instructors [12] primarily because of poor infrastructure, ill-preparedness, and rigidity on the part of some of the course instructors. Also, students tend to contend with low bandwidth, lack of Wi-Fi connectivity, rationed electricity and blackouts [12, 13, 18, 21]. These challenges deter their full application of the digital technologies for learning. Furthermore, such challenges limit smooth interactions and communications among students and instructors. Though the University of Dar es Salaam has standby generators and internet with good speed in all campuses [10, 11], it has also at times experienced connectivity problems in some parts of its campuses, particularly when there was a power-cut, or erratic electricity supply. Generators do not cover every part of its numerous campuses. Unreliable access to internet services and erratic power supply are seemingly intractable problems in many parts of sub-Saharan Africa [19]. As such, a research on students' experiences with using digital technologies and the attendant challenges can help establish their readiness and support necessary for digital transformation in universities, particularly in the developing world context of Tanzania using the University of Dar es Salaam as a case study. To realise the purpose and achieve the specific research objectives, the following research questions guided the study:

1. What types of digital devices do university students own and use to facilitate their learning?
2. How do university students apply these digital devices to enhance their engagement in the learning process?
3. What challenges do they face when using digital technologies for learning purposes?

3 Methodology

3.1 Study Approach and Design

The study applied a qualitative research approach, specifically a case study of undergraduate students in Adult and Community Education programme to generate the required data. The capacity to generate information from the natural context, access to personal views and the need to generate in-depth information justified the selection of this study approach and design.

3.2 Study Population and Sample Size

The study involved a class of second-year undergraduate students taking a Bachelor of Education in Adult and Community Education (BED ACE) at the University of Dar es Salaam. In all, 60 students participated in the study. The selection criterion was influenced by their taking a core course in Open and Distance Learning. Their knowledge on online learning and their understanding of potential devices formed a basis for exploring their experiences at UDSM where conventional and digital learning occurs.

3.3 Data Collection and Ethical Procedure

The study used semi-structured interviews and questionnaires to generate information from student participants. Semi-structured interviews were held with 10 students to supplement information obtained from the questionnaires. All the interviews were conducted within the university. Students were free to select a meeting point. Interview questions were administered to gather in-depth information. Additionally, 60 questionnaires were distributed in person to all the students. However, only 50 questionnaires were returned duly filled out. The participants' freedom to participate, social and personal issues influenced the questionnaire return rate. A reminder to submit the filled-out questionnaires for collection was passed on to students through their class representatives.

3.4 Data Analysis

The study employed thematic and simple statistical analyses. The data obtained from interviews was transcribed prior to the inductive and deductive generation of emerging themes and sub-themes in accordance with the research objectives and attendant research questions. Significantly, the study also observed ethical considerations to reduce research harm, maintain the research vigour, and ensure the study respected all research protocols to boost its validity and reliability. As such, the study sought prior informed consent from participating students after briefing them on the purpose of the study. Confidentiality and privacy were guaranteed as the study did not disclose the students' identity. Also, data was properly and securely stored with no access to unauthorized persons.

Table 1. Kind/types of digital technologies used by students

Type of digital technology used by students	Number of students = 50	Percentage (%)
Computer desktop	19	38
Tablet	5	10
Smart phone	46	92
USB flash/external drive	25	50
Laptop	31	62
Moodle	26	52

4 Study Findings

4.1 Types of Digital Technologies Students Used

The study found that students used several types of digital technologies in learning as Table 1 illustrates:

Table 1 shows that 46 (92%) of the students used Smartphones to be specific—to support their learning. The flexibility of smartphones to facilitate access regardless of potential space and time barriers appears to have been a push factor towards such usage. Among the respondents, only five (10%) students used tablets for learning. Apparently, the owning and use of tablets in Tanzania has yet to catch up even among university students, who are demographically expected to be more digital technology use-savvy than the general population. Indeed, limited popularity—and use—of this device essential in reading e-books (to which the University of Dar es Salaam ironically subscribes) signal the need to popularise such devices. Testimonies further affirm the limited range of the digital technologies that students at the UDSM used. In this regard, one of the students said:

I mostly use my phone as I can continue studying anywhere and anytime. In fact, it has everything one requires to support learning. I use it for interacting with lecturers and my friends. I also access learning materials, which I use for learning and doing my assignments.

Another student said:

We have access to online learning resources. So I use USB flash just to serve the downloaded materials which I use them at home. I also use my smart phone for reading, getting pictures and for chatting with my friends.

Overall, students use several types of devices for learning purposes, particularly those that were within their budget ambit. The functions of these devices coupled with the cost element influence the students' selection of the types of devices at the UDSM. Most of them used smartphones, which also demonstrate the potentials of the devices in enhancing learning, particularly in the resource-poor context of Tanzania. Thus, the ability to manage learning at hand seems quite ideal in this context. Additionally students' use of Moodle, as Table 1 illustrates, supports the UDSM mission of transforming teaching and learning processes. Furthermore, such usage reveals potential grounds for enhancing learning beyond the confines of the Covid-19 pandemic. Having more than 50% of the

students using the Moodle application implies appreciation and readiness to harness its potentials. Computers, including laptops, though in use appeared not that widespread, which was surprising. The low use of other devices such as Tablets (10%) might be attributable to exposure, the cost element and accessibility, let alone the functionality of the device for learning.

4.2 Students' Possessions of Digital Devices

The study found that students preferred owning types of digital devices whose usage flexible in learning was applicable both within and outside the university campuses, a Table 2 demonstrates:

Table 2. Digital devices students owned

Possessions	Number of students = 50	Percentage (%)
Desktop computers	2	4
Tablet	2	4
Smart phone	45	90
USB flash/external drive	18	36
Laptops	23	46

The results presented in Table 2 affirm that most of the students (90%) owned a mobile (smart) phone. The high use of mobile phone in learning also influenced by the possession of these devices and mobile service providers offering students special packages in form of internet bundles at concessionary rates. Desktop computers and laptops, on the other hand, commanded less than 50% ownership. Further analysis shows that the 46% laptop ownership relative to a paltry four percent for computers has to do with the formers' versatility and portability, which allowed the students to use them both on and off-campus. Nevertheless, the relative overall low ownership of PCs and laptops could be attributable to the excessive costs associated with such digital technologies.

4.3 Students' Use of Digital Technologies

Students demonstrated that they varyingly used digital devices for both academic and social purpose. Table 3 presents results on how students deploy digital technologies:

As Table 3 illustrates, students dominantly use digital technologies for managing academic issues. Implicitly, the use of digital technologies has an immense potential of enhancing students' learning at the university. The more than 90% of the students who reported using digital technologies for searching for learning materials, doing and submitting assignments affirms the value attached to digital technologies. In fact, access to both e-books and online resources compensates for the students' failure to access physical resources in the library. In fact, the University of Dar es Salaam through COTUL

Table 3. Students' use of digital technologies

Use of digital technologies	Number of students = 50	Percentage (%)
Searching and accessing Learning materials (largely online resources)	49	98
Interacting with colleagues and sharing academic issues/assignments/activities	30	60
Participating in online discussion via Moodle and WhatsApp	32	64
Downloading, doing and submitting assignments online	45	90
Interaction for academic support from instructors	28	56
Chatting on social issues	42	84

(Consortium of Tanzania University and Research Libraries) has subscribed to huge mega-data bases for both electronically accessible digitised journals and e-books. The study results show that students engage in profound learning and use the devices for accessing materials that inform their written assignments, particularly research-based take-home essays. This thrust has, consequently, enhanced cognitive development, study skills, and academic progression at the universities. The findings also indicate that 84% of the students used digital devices to chat on social issues. This sharing of social issues can also help address psychological as well as students' social issues, though this was not the impetus of the current study.

The results also indicate that 56% of the students used digital technologies for academic interaction with course instructors. Table 4 accounts for the interaction and support the students obtained from instructors:

Table 4. Students' areas of interaction with tutors

Areas for interaction with tutors	Number of students = 50	Percentage (%)
Request for learning materials in form of PPT, text, video and audio	45	90
Clarification on difficult content/topic areas	25	50
Support on study skills	30	60
Support on writing skills	21	42
Feedback on assignment	38	76

Table 4 shows that more than 70% of the students looked for learning materials and instructor's feedback on assignments. This finding is congruent with the main goal

of developing skills for the mastery of the subject matter as well as the acquisition of intellectual capability. The request for learning materials could imply the urge to get quality learning materials from authentic sources available from online resources, assuming that the students were information literate and capable of separating chaff from rice on the web swamped with all kinds of e-resources. Students quest for study skills, writing skills and content clarification, which are crucial in accessing and gaining knowledge and developing requisite skills. In this regard, Table 4 exposes the potential and special role of the interactions of the students and instructors in the teaching and learning context.

The various forms of interactions students rely on particularly via social media have been presented in Table 5:

Table 5. Applications students use for chatting and interaction

Applications for chatting and interaction	Number of students = 50	Percentage (%)
WhatsApp	47	94
Facebook	24	48
Telegram	12	24
Snapchat	16	32
WeChat	5	10
Imo	3	6
YouTube	29	58

The use of WhatsApp ranks high as it accounts for 94% of the social media usage. The high use could also be attributable to the popularity and interactive features of this application. The findings also indicate that less than 60% of the students also used other applications for learning. Generally, students were exposed to various applications. As such, the students had opportunities for interacting, sharing learning materials and learning from each other. In this regard, one of the students said: *We have a Class WhatsApp group, which we use for academic purposes. We receive assignments, reference materials and coursework. We sometimes initiate group discussions on a particular topic or an assignment if we need further clarifications. Some of the lecturers communicate with us through our groups.* One could easily note a formal use of social media for learning. The group seems to have whatsApp group in which all the information related to academics and development are communicated. This scenario signals the ability of locating students in their proper space.

Another student said: *I often use YouTube for learning. When I have some difficulty in understanding a particular topic, I go to you tube and look for topics on the subject matter. I listen to the videos posted. They help to understand the subject matter. But you need to get an expert in the specific area.* Access to free YouTube videos influenced students to find detailed explanations on diverse topics. This could be likened to looking for a second teacher to support content understanding. Students also seemed to appreciate

the materials available on YouTube. However, they also understand the importance of checking the relevancy of the content on YouTube to their education needs for quality control purposes. Indeed, one must determine the quality of the content availed in the educational videos made by subject experts.

4.4 Students' Challenges

The findings on the challenges students experienced when using digital technologies for learning are as presented in Table 6:

Table 6. Challenges to using digital technologies for learning among students

Challenges	Number of students = 50	Percentage (%)
Limited access to internet services outside University campus	35	70
Limited access to internet services within the University campus	22	44
Excessive costs of digital devices (Laptops, high-end smart phones and computers)	37	74
Excessive costs of Internet Bundle	25	50
Limited ICT-based knowledge and application	19	38
Limited interactions with lecturers in online space	20	40
Low bandwidth	15	30
Restricted off-campus access to online materials	38	76
Limited access to technical Support	16	32
Lack of access to proper ICT facilities for learning	26	52

Table 6 indicates that more than 50% of the students had limited access to internet services, restricted access to online resources when off-campus and had lack of access to proper ICT facilities. They reported these challenges to be detrimental to their learning in this digital age. In this regard, one of the students said: *Sometimes, I use Google search to access learning materials. I can access online books and journals. But it is easy to get relevant sources of materials while on campus. I hardly get the same when I am at home [off-campus].* Implicitly, the students fail to access university-subscribed materials when

out of campus. When on-campus the university's Wi-Fi and LAN connections allow them to access resources that they read courtesy of the UDSM's subscription. Indeed, this is true when they also access such resources from their ultra-modern new university library.

Yet it is a different story when off-campus. The UDSM has yet to provide a way for students to access the online resources to which it subscribes. This is contrary to what happens in the developed countries such as the US where universities have portals that both faculty and students can use to access such resources off-campus using their respective universities' gateways. At the UDSM, though there are user-names and passwords students can use on a limited scale to access university-subscribed to materials, these options are as remotely known to both students and faculty as their use of the intended resources off-campus. Simply put, these subscribed to resources are optimally accessible at the University's Main Library. Overall, the general challenges recorded here tend to limit students' capacity to fully use digital technologies to support their learning, particularly off-campus. Impliedly, the UDSM needs strategies to foster students' learning both within and outside the campus to overcome the existing challenges and optimise the application of digital technologies in learning in line with the changing times.

5 Discussion

The use of digital technologies by students at the University of Dar es Salaam conformed to the global needs of utilising digital space for learning and teaching. Students use distinct types of digital devices and applications to enhance their learning. Most of the students (98%) used mobile phones for accessing materials, interacting, and sharing knowledge for educational purposes. On the other hand, some of the varsity students had limited use of laptops and USB flash/external drive. The finding also indicates that only 38% of the selected students used desktop computer to further their learning. Similar findings were observed in Australian universities where majority of students (80%) used smartphones and laptops to support their learning process. Similar findings were also observed by [1, 6, 7]. In other words, there are opportunities for widely applying digital technologies at the University of Dar es Salaam.

The study findings also indicate that not only did the students use the digital devices but they also owned them. In terms of ownership, 90% of the students owned mobile phones, 46% the laptops and two percent computers. They used the devices for accessing and utilising education-related resources for leaning. The low use and ownership of computers was also evident at the University of Makerere [18]. However poverty, excessive costs of technological devices, size and inflexibility made students look for other learning devices. As most of the students had mobile phones, they were able to continue harnessing the potentials associated with digital technologies in knowledge acquisition and generation. In fact, digital technologies supported learning flexibility as they permitted some students to continue learning in selected locations and time. The use of tablets by only 10% of the responding students in the study calls for further action. After all, the device can support students' access and reading of various materials such as e-books, to which the University library subscribes. Encouraging students to possess and use tablets is, therefore, significant for enabling them to study at their own pace and in their own space.

Apparently, digital technologies provided an avenue for students to interact with tutors and among themselves. Further analysis of findings shows that students mainly used digital technologies to nurture academic development. They mainly interacted with course instructors to share their expertise and access relevant learning materials. Students also required support to develop study skills and writing skills. Such skills were required for academic scholarship and, subsequently, in the world of work. The findings also indicate that the students used digital technologies for social matters. Students (84%) demonstrated that they chatted on social issues with colleagues. Hence, interaction and communication helped to enhance culture of collaboration and sharing which is relevant in human nature. In addition to potentially reducing psychological challenges and isolation, which students experience during learning at the university when far from home and family. Several prior studies conducted elsewhere have similarly noted the application of digital technologies for administrative purposes, academic and social purposes [1, 7, 10].

Interactions and communications in the learning context were through applications such as Moodle, YouTube, WhatsApp and Snapchat. The use of WhatsApp groups and YouTube were dominant among some of the students. The study findings allude to the power of social media in learning. Students used social space to exchange learning materials, engage in academic discussions and participate in social chats. As for academic materials, students accessed them in the form of videos, audio and texts. The social space also, permitted the sharing of large files. The same was also noted on the Moodle platform. The use of applications and social media framework to enhance learning in a digital context has also been supported by other studies conducted in Africa and beyond [3, 5, 7, 10, 21]. Students' exposure to several types of digital devices, access to various applications and integration of social media in students learning tends to support the UDSM mission of creating e-university [20]. The continual improvement of digital infrastructure and capacity building of both students and staff were required to realise the planned missions.

There are various both digital and human related challenges which may hinder the effective application of digital technologies among students. The technology-based challenges include poor connectivity, erratic power supply, limited access to UDSM-subscribed learning resources particularly when off-campus and limited access to proper technological devices such as laptops. Some of the challenges were not unique to the country. Notably, many universities particularly in Africa share the same experiences [10, 18, 19]. However, various initiatives are in place to ease and ultimately overcome these challenges. The UDSM has installed Wi-Fi and uses standby generators in case of power cuts to mitigate some of these challenges [10, 11]. Nevertheless, more efforts are necessary to serve the entire UDSM population effectively.

Human-related challenges, on the other hand, are associated with limited interactions, lack of technical expertise and knowledge to use effectively digital technologies for learning. Students want constant interactions when it comes to academic issues. The findings show that students do contact instructors and inquire about learning materials, get feedback on assignments, seek for clarification on difficult areas and support in study and writing skills. Fifty-six percent of the students in this study testified to properly receiving the expected academic support. Conversely, about 40% complained

about limited interaction with instructors in social space. Possibly, instructors experience limited time due to multiple roles in fulltime, face-to-face and online. Meanwhile, students' response of over 50% engagement with course instructors is a positive indicator for future improvement of interactions in social space. The need to develop students' digital practical application skills and knowledge is important to support learning and sustain them to use digital technologies.

6 Conclusion and Recommendations

Overall, digital technologies are widely applied by students at the UDSM. The capacity to identify potential devices for learning, the personal commitment to own some of the potential devices, the use of devices to further learning at the UDSM and integrating the use of social media in learning attests to the awareness, readiness and relevancy of applying digital technologies in learning. However, an improvement in the provision of digital supportive environment with a view to addressing students' challenges within and outside the university must be in place to allow for proper application of digital technologies. Individual empowerment should also be enhanced to foster capacity-building on technology use. Also, technical support is essential in enhancing the application of digital technologies in university learning. Perhaps, removing data charges (Zero-rating) could improve students' access to learning resources within and outside the university. This would reduce costs and accessibility issues. Integrated efforts among the UDSM, the government and other stakeholders are essential in ensuring and boosting access to proper learning devices and internet services. This is crucial for improving the university's learning atmosphere amenable and receptive to digital technologies in knowledge acquisition and learning. Furthermore, it is equally important to support the students' accessing of learning resources outside the university, particularly those available on the mega-data bases to which the university subscribes via COTUL. Awareness of the learning resources to which the university subscribes and the accessibility criteria could further enhance effective use of these resources and support the students' academic development. The findings from this study are transferable and applicable to places with similar characteristics to the studied area. Further research could include a large random sample to generalise findings to a wider context.

References

1. Aliaaidi, K.S., Bagais, O.A., Sharma, R.: Factors influencing usage of university mobile application among university students. *J. Asian Finance Econ. Bus.* **7**(10), 1129–1136 (2020)
2. Al-Mashhadani, M.A., Al-Rawe, M.F.: The future role of mobile learning and smartphones applications in the Iraqi private universities. *Smart Learn. Environ.* **5**(1), 1–11 (2018). <https://doi.org/10.1186/s40561-018-0077-7>
3. DeWitt, D., Alias, N., Siraj, S., Yaakub, M.S., Ayob, J., Ishak, R.: The potential of YouTube for teaching and learning in the performing arts. *Proc. – Soc. Behav. Sci.* **103**, 1118–1126 (2013)
4. Gillett-Swan, J.: The challenges of online learning supporting and engaging the isolated learner. *J. Learn. Des.* **1**(10), 20–30 (2017)

5. Henderson, M., Selwyn, N., Finger, G., Aston, R.: Students' everyday engagement with digital technology in university: exploring patterns of use and 'usefulness.' *J. High. Educ. Policy Manag.* **37**(3), 308–319 (2015). <https://doi.org/10.1080/1360080X.2015.1034424>
6. Ifeanyi, I.P., Chukwuere, J.E.: The impact of using smartphones on the academic performance of undergraduate students. *Knowl. Manag. E-Learn.* **10**(3), 290–308 (2018)
7. Kannadhasan, S., Shanmuganatham, M., Nagarajan, R., Deepa, S.: The role of future e-learning system and higher education. *Int. J. Adv. Res. Sci. Commun. Technol. (IJARSCT)* **12**(2), 261–266 (2020). <https://doi.org/10.48175/IJARSCT-673>
8. Kirkwood, A., Price, L.: Technology-enhanced learning and teaching in higher education: what is 'enhanced' and how do we know? A critical literature review. *Learn. Media Technol.* **39**(1), 6–36 (2014)
9. Mahai, L.: ICT based support for rural students of the open university of Tanzania: perceptions, challenges and prospects. In: *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, Denver, pp. 694–702 (2012)
10. Mtebe, J.S., Fulgence, K., Gallagher, M.S.: COVID-19 and technology enhanced teaching in higher education in sub-Saharan Africa: a case of the University of Dar es Salaam, Tanzania. *J. Learn. Dev.* **8**(2), 383–397 (2021)
11. Mtebe, J.S., Raphael, C.: Students' experiences and challenges of blended Learning at the University of Dar es Salaam, Tanzania. *Int. J. Educ. Dev. Inf. Commun. Technol. (IJEDICT)* **9**(3), 124–136 (2013)
12. Mtebe, J.S., Raphael, C.: A decade of technology enhanced learning at the University of Dar es Salaam, Tanzania: challenges, achievements, and opportunities. *Int. J. Educ. Dev. Inf. Commun. Technol. (IJEDICT)* **13**(2), 103–115 (2017)
13. Murgor, T.K.: Challenges facing adoption of information communication technology in African universities. *J. Educ. Pract.* **6**(25), 62–68 (2015). (IJEDICT) **12**(2), 123–138
14. Muuro, M.E., Wagacha, P.W., Oboko, R., Kihoro, J.: Students' perceived challenges in an online collaborative learning environment: a case of higher learning institutions in Nairobi, Kenya. *Int. Rev. Res. Open Distance Learn.* **15**(6), 132–161 (2014)
15. Raphael, C., Mtebe, J.S.: Instructor support services: an inevitable critical Success factor in blended learning in higher education in Tanzania. *Int. J. Educ. Dev. Inf. Commun. Technol.* **12**(2), 123–138 (2016)
16. Rice, R.E., Katz, J.: Comparing internet and mobile phone usage: digital divides of usage, adoption, and dropouts. *Telecommun. Policy* **27**, 597–623 (2003)
17. Singh, V., Thurman, A.: How many ways can we define online learning? A systematic literature review of definitions of online learning (1988–2018). *Am. J. Distance Educ.* **33**(4), 289–306 (2019)
18. Tulinayo, F.P., Ssentume, P., Najjuma, R.: Digital technologies in resource constrained higher institutions of learning: a study on students' acceptance and usability. *Int. J. Educ. Technol. High. Educ.* **15**(36), 1–19 (2018)
19. UNESCO: Startling digital divides in distance learning emerge (2020). <https://en.unesco.org/news/startling-digital-divides-distance-learning-emerge>
20. UDSM Vision 2061. <https://www.udsm.ac.tz/web/index.php/schools/sol/udsm-vision-2061-1>
21. Venter, P., Van Rensburg, M.J., Davis, A.: Drivers of learning management system use in a South African open and distance learning institution. *Australas. J. Educ. Technol.* **28**(2), 183–198 (2012)