

Digital Learning Strategies Within Universities In Developing Countries: A Systematic Literature Review

Ms. Ruth Nthenya Wambua^a

^a rwambua@uonbi.ac.ke

^aDoctoral Student, United States International University, P. O. Box 14634, Nairobi 00800, Kenya

Abstract

The purpose of this study is to provide a comprehensive systematic literature review of digital learning strategies within universities (institutions of higher learning) in developing countries. Further, the paper seeks to identify gaps for further research, as well as point out future research agenda for digital learning strategies within universities in developing countries.

A structured literature review method was used in this study. Journal articles published between year 2011 and 2021 were reviewed to inform this study. A total of 16 articles were identified and reviewed.

From the findings, strategies for digital learning are not to be ignored for optimal delivery of digital learning both for the student and for the instructor. Future research should leverage big data produced from the use of the learning platforms and investigate how the incorporation of advanced learning technologies could advance institutional value.

Keywords: Developing countries; digital learning strategies; online learning strategies; universities; systematic literature review; learning strategies; eLearning strategies

1. Introduction

Digital learning, virtual learning, eLearning, or online learning are used interchangeably, whereby learning content, services, and support, are digitally delivered and involves intensive usage of Information, Communication and Technology (ICT) to serve, facilitate and revolutionize the learning process, El-bakry, H.M. and Mastorakis, 2015. The digital learning environment is both self-regulated and collaborative, Paechter et al., 2010, and with an intention of supporting learning, Clark and Mayer, 2015.

Overall, digital learning depicts an instructional environment created through the utilization of learning strategies, Siemens, 2014 and tools that act as digital learning enablers for performance improvement, Sanderson, 2002. Presently, and considering the emergence of COVID-19 pandemic, universities majorly moved to digital learning for continued learning, Babatunde Adedoyin and Soykan, 2020, which was a total contrast to the traditional educational models of closed lectures and classroom discussions. With the uptake of digital learning, there was therefore need for universities to create long-term institutional strategies for high-quality education, and in line with the emergent technologies such as the Internet of Things (IoT), Virtual Learning and Machine Learning, among other research trends, that are considered to support learning, Babori et al., 2021.

With the increasing technological adoption in the education sector and among most universities in developing countries, the design and development of learning environments continues to improve in support of digital learning with more and more learning technologies being adopted. Instructional strategies like discussions, group projects, cooperative learning, simulations, and interactive multimedia, Davis et al., 2018a, which effectively leverage learning at scale, and align with appropriate theoretic foundations, support the construction of knowledge, the development of self-efficacy and competency in learning, according to Johnson, 2021 are being implemented.

On the other hand, there is the Massive Open Online Courses (MOOC), which leverages on the internet to allow for shared resources, ideas and experiences, communication, and the creation of new information in an interconnected world. Hence enabling openness and participation in networks that offers a refreshing change of perspective and is essential as a principle of connective learning, Gómez-Zermeño, 2020.

Previous systematic literature reviews have highlighted eLearning capabilities, Giannakos et al., 2021, Islam Sarker et al., 2019, (Audrin and Audrin, 2022, digital transformation in universities, Benavides et al., 2020, Sun et al., 2018, Oliva-Cordova et al., 2021, as well as required competencies for digital learning, Revuelta-Domínguez et al., 2022, Bong and Chen, 2021. However, at the time of this study, we did not find any systematic literature review on digital learning strategies within universities in developing countries.

Driven by the identified gaps, this study seeks to provide a comprehensive systematic literature review of digital learning strategies within universities in developing countries for the past 10 years (2011-2021), through answering the following research questions:

- Q1. What is the status of development of literature on digital learning strategies within universities in developing countries?
- Q2. What are the research gaps on digital learning strategies within universities in developing countries?
- Q3. What is the future research agenda for digital learning strategies within universities in developing countries?

The study is organized in sections, whereby the introduction section is followed by a review of literature. Thereafter is the research method section, then discussion, limitations of the study and concludes with the discussion section.

1.1. Foundations of digital learning

Within the learning models, eLearning/digital learning is integral. First, the traditional model of learning is whereby learners attend classes physically/in-person, and among the scenarios of instructing used is online presentations which is a good example of a case where eLearning has been incorporated in the traditional model. On the other hand, is the distance learning model where the instructor and the students are separated by time, location, or both, and applies, among other strategies, the use of electronic courseware (eCourseware), which again informs eLearning, Ahmad et al., 2010. Lastly, the blended model which combines the traditional model of learning with varied eLearning solutions, Sitnikov et al., 2010.

According to Porter, 1995, the essence of strategy formulation is coping with competition. The formulated strategy gives a step-by-step plan of action in accomplishing the desired output. Considering the advancement of technology over the years, and following the effects of COVID-19, the adoption of ICT and more so digital learning in universities is on a rise, Ruiz-Martínez and Ruiz-Martínez, 2021. In respect to learning which makes one of the major core businesses of a

university, Bayuo et al., 2020, all educational systems within the university should be designed to promote knowledge, Pange and Pange, 2011. Consequently, learning theories exist as strategy to inform eLearning. Furthermore, the choice of or preference for one particular theoretical approach will have major implications on the way that technology is used to support learning, Bates, 2015.

Psychology may be defined as the way learning is defined, studied, and understood, Fosnot and Perry, 1996. Therefore, learning theories are psychologies of learning in that they define the way learning is defined, studied, and understood. For example, behaviourist learning theory detects the behaviours that can be considered indicatives of learning and can be estimated. Further, cognitive learning theory informs that learning is an internal process and information is stored in memory. On the other hand, is the constructivist learning theory whereby learning is an active process in which learners construct new ideas or concepts based upon their current or past knowledge and is based on the principle that through activity students discover their own truths Cooperstein and Kocevar-Weidinger, 2004. Lastly is the active learning theory where learners are involved in the learning process to achieve a better understanding of the educational content.

According to Johnson, 2021, successful education in career programs require a hybrid theoretic model that includes behaviorism, social cognitive theory, and constructivism. For instance, the Competency-Based Education (CBE) theory is an educational theory that evolved as a hybrid model with roots in behaviorism, constructivism, experiential learning, and social cognitive theory. The theory adopts key concepts of existing educational theories to create a method for constructing knowledge and modifying behavior by allowing students to work at their own pace, receive credit for previous experience, and retake tests and resubmit assignments until competencies are achieved. Essentially, this is done until students achieve mastery in critical technical skills and learning objectives, Gravina, 2017.

According to Siemens, 2014, these theories do not address learning that occurs outside of people (learning that is stored and manipulated by technology). They also fail to describe how learning happens within organizations. Consequently, calling for consistent exploration of digital learning and its strategies, Steffens, 2015.

1.2. Digital learning strategies within universities in developing countries

With most universities adopting digital learning, information on what exact milestones should be attained for an efficient learning environment remains scanty, in addition to the varied levels of implementation across universities due to the varied cultural differences, technological muscle and experience (Aslam et al., 2020). Consequently, there is need for improved understanding of how digital learning is growing in developing countries. Such understanding affects the speed and efficiency with which progress is consolidated and scaled up as well as may address the perennial challenges that hinder the provision of proper digital learning services in many learning environments in developing countries. Moreover, Collaboration, digital literacy, critical thinking, and problem solving are core competencies for the twenty-first learner, Kitchens and Barker, 2016, and appropriate strategies should be ensured on the learning environments for effectiveness, Wambua & Ondiek, 2022.

Despite the competency gaps in developing world contexts, universities work to maximize their outputs within the constraints of economic reality for competitive advantage, Bezuidenhout, 2018, which includes the provision of digital learning. Its therefore of paramount importance to ensure that the right digital learning strategies are enforced, so that the provided platforms are usable by majority learners, Wambua and Oboko, 2015, and are of optimal benefit to the university. This study therefore highlights the digital learning strategies within universities in developing countries

to guide and inform related research.

2. Research methods

2.1. Data sources and search strategy

In this study, a structured literature method was used to code and analyze studies published between 2011 and 2021. The literature search was conducted using IEEE, ScienceDirect, EBSCOhost databases because of their credibility.

To retrieve relevant literature, intitle was used in line with the identified search strings across the noted databases. Further, the Boolean operators AND and OR were used during the searches. The following are the search strings (Str1,2,3) applied:

Str1: intitle (“digital learning strategies:” OR “online learning strategies:” OR “virtual learning strategies:” OR “eLearning strategies:”) AND (“university:” OR “institution of higher learning:”) AND (“developing country:” OR “developing economy:”)

Str2: intitle (“digital learning strategies:” OR “online learning strategies:” OR “virtual learning strategies:” OR “eLearning strategies:”) AND (“universities:” OR “institution of higher learning:”)

Str3: intitle (“digital learning strategies:” OR “online learning strategies:” OR “virtual learning strategies:” OR “eLearning strategies:”) AND “universities:” AND “developing countries:”

Based on these search strings, a total of 14 articles were identified (IEEE=6, ScienceDirect=3, EBSCOhost=5).

Further refinement was done to identify any other studies that might have been missed for inclusion in the review. This involved scanning through the list of references from the 14 identified articles and searching Google Scholar because of its accessibility and potential to uncover research from developing country researchers that might be published in avenues not listed in the established databases used for this study. From this refinement, additional 3 papers were identified from Google Scholar. Thus, the total number of articles that were identified for screening was 17.

2.2. Screening

The following inclusion and exclusion criteria was used:

- i. Publication type was peer-reviewed journal articles where full-text was available
- ii. Publication period was papers published within the past 10 years (2011 to 2021)
- iii. Language was English
- iv. Relevance to the research questions, where focus was on digital learning strategies within universities in developing countries
- v. Geographic location considered was developing countries.

Following the determination of eligibility of the papers using the inclusion and exclusion criteria above, 2 papers were eliminated because their full texts were not available, whereas another 1 was eliminated for not being a peer-reviewed journal article. Thus, in this review, the total number of qualified articles included in the analysis was 14. The following illustration (Fig. 1.) below shows the summary of the screening process applied in this study.

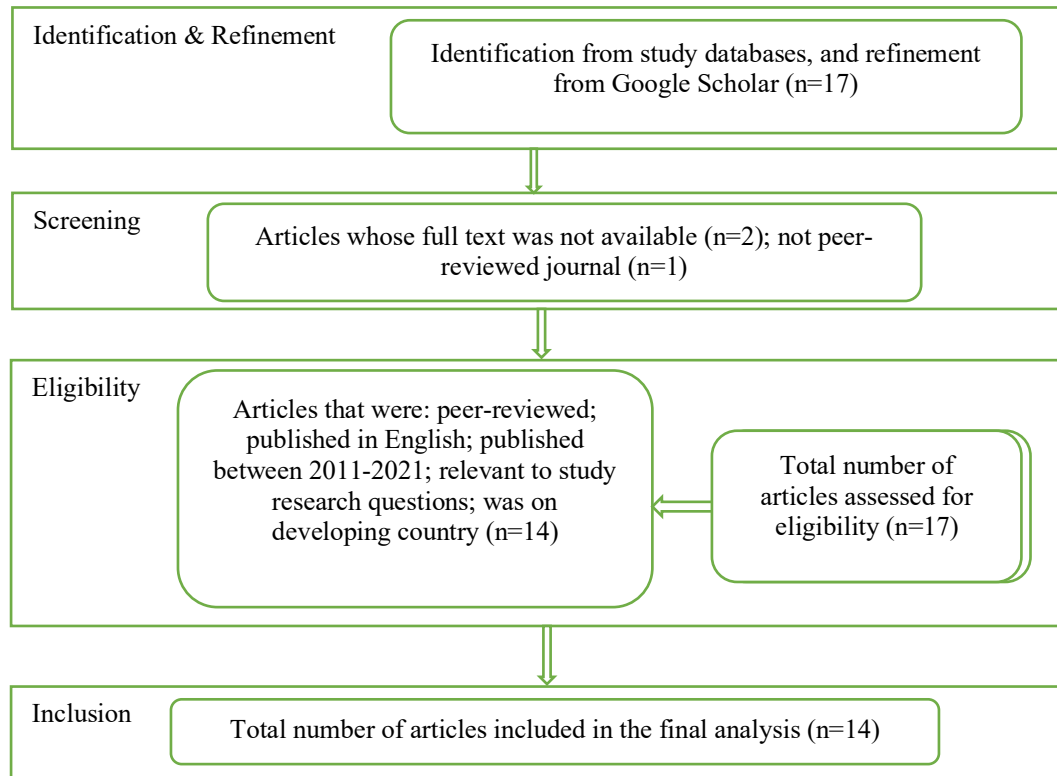


Fig. 1. Summary of the screening process applied in this study

2.3. Data extraction and synthesis

In this study, we used a *four-staged process* to extract the descriptive data from the literature included in the review, Arongo and Backhouse, 2021. First, the *overall coding framework* was agreed on by the researchers. This involved deciding on the data to be extracted. The following categories used for coding were based on the study objectives:

- i. Journal, author(s), and year of publication
- ii. Research method used
- iii. Key research area /study focus

Once this was done, this framework was subjected to *piloting*. Four (4) articles were randomly selected and used in the piloting stage. There were no ambiguities or inconsistencies reported from the piloting. Following the finalization of the piloting of the data extraction form, the form was then independently used to *extract the data*, thus increasing the reliability of this study. Additionally, by independently doing the extraction, data errors and potential biases were reduced. Finally, the extracted data by the reviewers was *synthesized* and the ambiguities or differences that emerged were discussed and resolved.

3. Results

Q1. What is the status of development of literature on digital learning strategies within universities in developing countries?

With this research question, we sought to understand the status of development of literature on digital learning strategies within universities in developing countries. To answer the question, we reviewed the number of papers published per year during the study period (2011-2021), and the key research focus of each paper.

The total number of publications considered for this study was 14 (Table 1). Additionally, from Fig. 2., the number of publications over the study period does not depict steady growth. The number of publications were as follows: years; 2021 (7 publications), 2020 (1 publications), 2019 (1 publication), 2018 (3 publications), 2016 (1 publication). There were no recorded publications for years; 2017, 2015, 2013, 2012, 2011. Following the spread of publications over the study period, research on digital learning strategies within universities in developing countries seems to be gaining traction. Unlike the previous years (2011 – 2017) which barely had publications, noted uptake of publications is noted from 2018, with 2021 (post COVID-19) recording the highest number of publications.

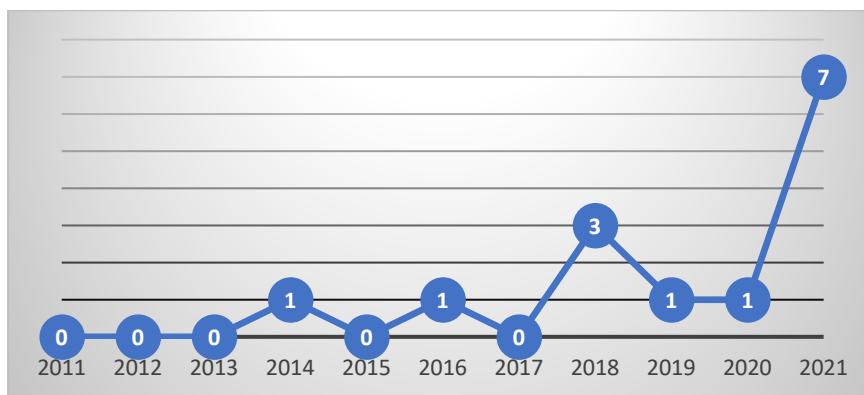


Fig. 2. Publication count per year

Regarding key research focus, digital learning is yet to be fully embraced within universities in developing countries, though there is noted use and effort to bring out its possible benefits. For instance, Kitchens and Barker, 2016 discusses the opportunities and the importance of online and face-to-face student support, whereas Bezuidenhout, 2018 brings out the issue of competency gaps and the implications for capacity building of academic staff in developing world contexts and other contexts where resources are scarce. On the other hand, varied digital learning experiences are reported, Lam et al., 2014.

Progressively, varied case studies and reviews point to improvements and more uptake of digital learning strategies within universities in developing countries. To start with, Gómez-Zermeño, 2020 identified effective learning strategies for creating online leadership and policy courses for specified undergraduate nursing students, whereas Johnson, 2021 outlined instructional strategies that aligned with the noted nuclear medicine program's theoretic foundation. Further, Hudson et al., 2021a identified effective learning strategies for creating online leadership and policy courses for noted undergraduate nursing students. These developments show uptake of digital learning in identified fields and with noted efforts to adjust for optimal performance.

Table 1. Summary of publications over the study period (2011 -2021)

#	Publication Year	Author	Title
1	2016	Kitchens, Rhonda K.; Barker, Mary Ellen	Synthesizing Pedagogies and Engaging Students: Creating Blended eLearning Strategies for Library Research and Writing Instruction
2	2018	Bezuidenhout, Adèle	Analysing the importance-competence gap of distance educators with the increased utilisation of online learning strategies in a developing world context
3	2014	Lam, Paul; McNaught, Carmel; Lee, Jack; Chan, Mavis	Disciplinary difference in students' use of technology, experience in using eLearning strategies and perceptions towards eLearning
4	2021	Hudson, Emilie; Clavel, Nathalie; Kilpatrick, Kelley; Lavoie-Tremblay, Mélanie	Effective online learning strategies for leadership and policy undergraduate courses for nursing students: a rapid review
5	2020	Gómez-Zermeño, Marcela Georgina	Massive open online courses as a digital learning strategy of education for sustainable development
6	2021	Johnson, Sara L.	Online Learning Strategies and Practical Tips for Nuclear Medicine Instructors
7	2018	Davis, Dan; Chen, Guanliang; Hauff, Claudia; Houben, Geert Jan	Activating learning at scale: A review of innovations in online learning strategies
8	2021	Kennedy, Natacha	Agentic learning: the pedagogical implications of young trans people's online learning strategies
9	2021	Rasheed, Rasheed Abubakar; Kamsin, Amirrudin; Abdullah, Nor Aniza	An approach for scaffolding students peer-learning self-regulation strategy in the online component of blended learning
10	2021	Rang, Wei; Yang, Donglin; Cheng, Dazhao; Wang, Yu	Data Life Aware Model Updating Strategy for Stream-Based Online Deep Learning
11	2018	Mugahed Al-Rahmi, Waleed; Alias, Norma; Shahizan Othman, Mohd; Alzahrani, Ahmed Ibrahim; Alfarraj, Osama; Saged, Ali Ali; Shamsiah, Nur; Rahman, Abdul	Use of E-Learning by University Students in Malaysian Higher Educational Institutions: A Case in Universiti Teknologi Malaysia
12	2021	Dai, Zhicheng; Sun, Chengzhang; Zhao, Liang	Assessment of Smart Learning Environments in Higher Educational Institutions: A Study Using AHP-FCE and GA-BP Methods
13	2019	Asadi, Shahla; Abdullah, Rusli; Yah, Yusmadi	Understanding Institutional Repository in Higher Learning Institutions: A Systematic Literature Review and Directions for Future Research

14	2021	Ruiz-Martínez, Pedro M; Ruiz-Martínez, Antonio	Improving a Virtual Campus for teaching and learning during COVID-19 and beyond guided by a digital transformation strategy
----	------	--	---

On the other hand, we note the evolution of the ICT ecosystem around the post COVID-19 years with varied adaptations such as online deep learning, Rang et al., 2021, learning at scale and use of Massive Open Online Courses as a digital learning strategy to promote education for sustainable development, Gómez-Zermeño, 2020, smart learning environments, Dai et al., 2021 and virtual campuses, Ruiz-Martínez and Ruiz-Martínez, 2021. Therefore, considering the reviewed literature, and the noted advancements in technology, there is need for consistent publishing to highlight digital learning strategies for continual improvements and transformation of digital learning within universities in developing countries.

Q2. What are the research gaps on digital learning strategies within universities in developing countries?

From literature, the level of digital learning strategies implementation within universities in developing countries (characterized by scarce resources) is still low, Bezuidenhout, 2018. To answer the research question on research gaps, the study discusses the digital strategies highlighted, the research methods and the theoretical underpinnings used in the study articles.

3.1. Digital strategies

Among the digital learning strategies that have been implemented to support learning is *course design strategies* whereby courses are organized in the LMS in varied ways that are user friendly and considering visual presentation. *Content chunking* has also been greatly considered, whereby content is broken into smaller pieces, making it easier for students to focus in-depth on the topic and prioritize information, Kitchens and Barker, 2016. Another strategy in digital learning that has been considered is the *use of varying instructional material*, to support learning for all learning styles.

On the other hand, *incorporating instructional technology* into online learning platforms is a great strategy. Further, *instructor feedback* from using provisioned digital platforms has worked to highlight pointers for improvement. *ADA compliance* and students' ability to navigate the online content and locate necessary assignments and materials is also as important, in guiding on indicators of *quality online course delivery*, Johnson, 2021.

For sustainable development and to ensure that universities in developing countries remain competitive and are growing toward the international standards, *consistent benchmarking* and incorporation of *related learning technologies* is required. Consistent technological innovations that support digital learning and *reduce competence gaps*, according to Bezuidenhout, 2018 should be continuously reviewed and incorporated.

3.2. Research methods

The reviewed articles used varied methodological approaches in their study. Fig. 3. Shows a summary of the research methodologies used in the reviewed papers, whereby qualitative method was greatly used, making 86% of the methodologies, whereas quantitative method followed at 14%.

Qualitative methods employed included case studies, Gómez-Zermeño, 2020, Johnson, 2021, reviews, Hudson et al., 2021a, Ruiz-Martínez and Ruiz-Martínez, 2021, Asadi et al., 2019, Davis et al., 2018b, peer-learning groups, Rasheed et al., 2021 and use of interviews, Kennedy, 2021.

Bezuidenhout, 2018 and Lam et al., 2014 used quantitative research methods.

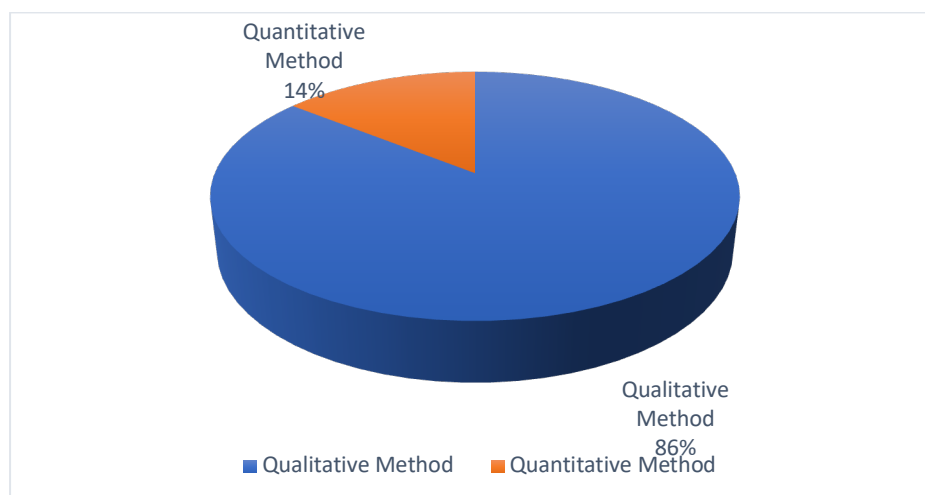


Fig. 3. Research methodologies used

3.3. Theoretical underpinnings

Considering theoretical underpinnings, out of the 14 articles reviewed, only 2 articles explicitly used previous theories. Mugahed Al-Rahmi et al., 2018 used the theory of a technology acceptance model and employed the structural equation modeling approach with a SmartPLS software to investigate students' adoption process, whereas Bezuidenhout, 2018 used the systems theory in analysing the importance-competence gap of distance educators with the increased utilisation of online learning strategies in a developing world context.

4. Discussion

This study section presents the third research question for this study:

Q3. What is the future research agenda for digital learning strategies within universities in developing countries?

United nations Educational, Scientific and Cultural Organization (UNESCO), in its emerging sustainable development trends, notes: Education as a fundamental human right; Education as a public good; Education as foundation for the human fulfilment, peace and sustainable development, economic growth, decent work, gender equality, and responsible global citizenship; Education as a contributor to reducing inequality and poverty, UNESCO, 2020. On the other hand, the United Nations, in its Sustainable Development Goals is the goal on Education whose objective is to achieve quality and equitable education for all, United Nations, 2020. Considering this, it is of great importance that the future research agenda for digital learning strategies within universities in developing countries *aligns to set international standards*.

In addition, research around digital learning strategies should greatly consider *learning at scale*, Davis et al., 2018b which has a greater coverage and of competitive advantage. Moreover, there is need of a better focus to *self-regulated learning*, whose competency is needed from every student. Further, *peer learning* in technology-mediated environments such as MOOCs is also needed as relatively few studies have focused on peer learning self-regulation strategies, Rasheed et al.,

2021.

Strategies for digital learning are not to be ignored for optimal delivery of digital learning both for the student and for the instructor. Regular *virtual trainings* by educational institutes, as well as *overcoming issues around internet connectivity and electricity*, are recommended, Aslam et al., 2020. Further, *virtual learning strategies in line with government policies and Higher Education Commission's recommendations* should be considered by developing countries. This works to ensure that service delivery is within the confines of law within a given jurisdiction, as well as ensuring an informed contribution to the Government's objectives for education in that country. These government objectives include raising education standards; improving quality; removing barriers to learning and participation in learning; preparing for employment; upskilling in the workplace and ultimately, ensuring that every learner achieves their full potential.

Progressively, countries should develop *systems* that are friendly and supports online learning applications without much coding modifications and hardware resources, Rang et al., 2021 for profitability and sustainability. To add on this is that continuous technological and methodological changes to guarantee *instructional continuity*, Ruiz-Martínez and Ruiz-Martínez, 2021 should be ensured, as well as adapting to technological processes that best fit the cyber environment, Shen et al., 2008.

5. Limitations

We submit that the methodology used in this study has some limitations. For example, by confining our search to journal articles and only considering those published in English, studies that were published using other avenues such as conferences and books, and those published in other languages were excluded (as this was part of our search criteria).

Given that researchers in developing countries may find it easier to publish in other avenues and that many developing countries use languages other than English, there may well be research that has been missed in this study.

Despite the limitations, this paper provides a comprehensive and systematic literature review of digital learning strategies within universities in developing countries.

6. Conclusion

While there may be disciplinary differences in the adoption of eLearning, all students have a similar and positive view about the need for the use of technology for teaching and learning, Lam et al., 2014. Further, the need for rigorous evaluation of learning activities, Hudson et al., 2021b is not to be ignored. Student intentions to use eLearning, Mugahed Al-Rahmi et al., 2018 is a great factor that should be consistently reviewed, as well as the need for continued review of learning theories and the impact of technology and new sciences on learning, Steffens, 2015 to ensure quality education.

Traditional classrooms have been unable to support the development of teaching models within formation technology. The smart learning environment constructed via information technologies, such as artificial intelligence, virtual reality, and the Internet of Things (IoT), is intelligent, interconnected, and convenient, which enables it to perceive, diagnose, and analyse the learning process, Dai et al., 2021. There is therefore need to leverage big data produced from the use of these learning environments and investigate how the incorporation of advanced learning technologies could advance institutional value.

Conclusively, digital learning is here to stay, and consistent research should go into improving digital learning strategies as well as highlighting what is working both locally and globally. Strategic alignment that leverages on Information Technology is important for transforming organizations, Chan & Reich, 2007.

7. References

- Ahmad, S., Mustafa, A., Awan, Z., Ahmad, B., & Bano, A. (2010). *E-Courseware Design and Implementation Issues and Strategies* (Vol. 2).
- Arongo, J. R., & Backhouse, J. (2021). Knowledge management in local governments in developing countries: a systematic literature review. In *VINE Journal of Information and Knowledge Management Systems*. Emerald Group Holdings Ltd. <https://doi.org/10.1108/VJKMS-12-2020-0215>
- Asadi, S., Abdullah, R., & Yah, Y. (n.d.). *Understanding Institutional Repository in Higher Learning Institutions: A Systematic Literature Review and Directions for Future Research*. <https://doi.org/10.1109/ACCESS.2019.2897729>
- Aslam, T., Rizvi, S. M. A. S., & Ahmad, J. (2020). Virtual Learning Strategies during Covid-19: A Case Study of The University of Lahore, Pakistan. *Liberal Arts and Social Sciences International Journal (LASSIJ)*, 4(2), 427–441. <https://doi.org/10.47264/idea.lassij/4.2.33>
- Audrin, C., & Audrin, B. (2022). Key factors in digital literacy in learning and education: a systematic literature review using text mining. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-021-10832-5>
- Babatunde Adedoyin, O., & Soykan, E. (2020). *Covid-19 pandemic and online learning: the challenges and opportunities*. <https://doi.org/10.1080/10494820.2020.1813180>
- Babori, A., Mella, B., babori, M., & ac ma Khalid GHOU LAM, uhp. (2021). Elearning 4.0 for higher education: literature review, trends and perspectives; Elearning 4.0 for higher education: literature review, trends and perspectives. *2021 International Conference on Digital Age & Technological Advances for Sustainable Development (ICDATA)*. <https://doi.org/10.1109/ICDATA52997.2021.00032>
- Bates, A. W. (Tony). (2015). Teaching in a digital age. *Journal of Chemical Information and Modeling*, 53(9), 1689–1699. <https://doi.org/10.1017/CBO9781107415324.004>
- Bayuo, B. B., Chaminade, C., & Göransson, B. (2020). Unpacking the role of universities in the emergence, development and impact of social innovations – A systematic review of the literature. *Technological Forecasting and Social Change*, 155, 120030. <https://doi.org/10.1016/J.TECHFORE.2020.120030>
- Benavides, L. M. C., Arias, J. A. T., Serna, M. D. A., Bedoya, J. W. B., & Burgos, D. (2020). Digital transformation in higher education institutions: A systematic literature review. In *Sensors (Switzerland)* (Vol. 20, Issue 11, pp. 1–23). MDPI AG. <https://doi.org/10.3390/s20113291>
- Bezuidenhout, A. (2018). Analysing the importance-competence gap of distance educators with the increased utilisation of online learning strategies in a developing world context. *International Review of Research in Open and Distance Learning*, 19(3), 263–281. <https://doi.org/10.19173/irrodl.v19i3.3585>
- Bong, W. K., & Chen, W. (2021). Increasing faculty's competence in digital accessibility for inclusive education: a systematic literature review. In *International Journal of Inclusive Education*. Routledge. <https://doi.org/10.1080/13603116.2021.1937344>
- Chan, Y. E., & Reich, B. H. (2007). IT alignment: What have we learned? *Journal of Information Technology*, 22(4), 297–315. <https://doi.org/10.1057/palgrave.jit.2000109>
- Clark, R. C., & Mayer, R. E. (n.d.). *E-learning and the science of instruction: proven guidelines for consumers and designers of multimedia learning*. Retrieved October 4, 2018, from [https://books.google.co.ke/books?hl=en&lr=&id=v1uzCgAAQBAJ&oi=fnd&pg=PR17&dq=Clar,+R.+C.,+%26+Mayer,+R.+E.+\(2016\).+E-Learning+and+the+Science+of+Instruction:+Proven+Guidelines+for+Consumers+and+Designers](https://books.google.co.ke/books?hl=en&lr=&id=v1uzCgAAQBAJ&oi=fnd&pg=PR17&dq=Clar,+R.+C.,+%26+Mayer,+R.+E.+(2016).+E-Learning+and+the+Science+of+Instruction:+Proven+Guidelines+for+Consumers+and+Designers)

- +of+Multimedia+Learning.+John+Wiley+%26+Sons.&ots=TM
- Cooperstein, S. E., & Kocevar-Weidinger, E. (2004). Beyond active learning: a constructivist approach to learning. *Reference Services Review*, 32(2), 141–148.
<https://doi.org/10.1108/00907320410537658>
- Dai, Z., Sun, C., & Zhao, L. (n.d.). *Assessment of Smart Learning Environments in Higher Educational Institutions: A Study Using AHP-FCE and GA-BP Methods*.
<https://doi.org/10.1109/ACCESS.2021.3062680>
- Davis, D., Chen, G., Hauff, C., & Houben, G. J. (2018a). Activating learning at scale: A review of innovations in online learning strategies. *Computers & Education*, 125, 327–344.
<https://doi.org/10.1016/J.COMPEDU.2018.05.019>
- Davis, D., Chen, G., Hauff, C., & Houben, G. J. (2018b). Activating learning at scale: A review of innovations in online learning strategies. *Computers & Education*, 125, 327–344.
<https://doi.org/10.1016/J.COMPEDU.2018.05.019>
- El-bakry, H.M. & Mastorakis, N. (2015). E-Learning and Management Information Systems for E-universities. *13th WSEAS International Conference on Computers*, April, 555–565.
- Fosnot, C. T., & Perry, R. S. (1996). Constructivism: A Psychological Theory of Learning. *Constructivism, Theory, Perspectives and Practice*, 8–33.
http://faculty.arts.ubc.ca/emeyers/LIBR535/readings/Fosnot&Perry_2005.pdf
- Giannakos, M. N., Mikalef, P., & Pappas, I. O. (2021). Systematic Literature Review of E-Learning Capabilities to Enhance Organizational Learning. *Information Systems Frontiers*.
<https://doi.org/10.1007/s10796-020-10097-2>
- Gómez-Zermeño, M. G. (2020). Massive open online courses as a digital learning strategy of education for sustainable development. *Journal of Sustainable Development of Energy, Water and Environment Systems*, 8(3), 577–589. <https://doi.org/10.13044/j.sdewes.d7.0311>
- Gravina, E. W. (2017). Competency-Based Education and Its Effect on Nursing Education: A Literature Review. *Teaching and Learning in Nursing*, 12(2), 117–121.
<https://doi.org/10.1016/J.TELN.2016.11.004>
- Hudson, E., Clavel, N., Kilpatrick, K., & Lavoie-Tremblay, M. (2021a). Effective online learning strategies for leadership and policy undergraduate courses for nursing students: a rapid review. *Journal of Professional Nursing*, 37(6), 1079–1085.
<https://doi.org/10.1016/J.PROFNURS.2021.08.012>
- Hudson, E., Clavel, N., Kilpatrick, K., & Lavoie-Tremblay, M. (2021b). Effective online learning strategies for leadership and policy undergraduate courses for nursing students: a rapid review. *Journal of Professional Nursing*, 37(6), 1079–1085.
<https://doi.org/10.1016/J.PROFNURS.2021.08.012>
- Islam Sarker, M. N., Wu, M., Cao, Q., Alam, G. M. M., & Li, D. (2019). Leveraging Digital Technology for Better Learning and Education: A Systematic Literature Review. In *International Journal of Information and Education Technology* (Vol. 9, Issue 7, pp. 453–461). International Journal of Information and Education Technology. <https://doi.org/10.18178/ijiet.2019.9.7.1246>
- Johnson, S. L. (2021). Online Learning Strategies and Practical Tips for Nuclear Medicine Instructors. *Journal of Nuclear Medicine Technology*, 49(3), 269–274.
<https://doi.org/10.2967/JNMT.120.251991>
- Kennedy, N. (2021). *Agentic learning: the pedagogical implications of young trans people's online learning strategies*. <https://doi.org/10.1080/14681366.2021.1912162>
- Kitchens, R. K., & Barker, M. E. (2016). Synthesizing Pedagogies and Engaging Students: Creating Blended eLearning Strategies for Library Research and Writing Instruction. *Reference Librarian*, 57(4), 323–335. <https://doi.org/10.1080/02763877.2016.1141152>
- Lam, P., McNaught, C., Lee, J., & Chan, M. (2014). Disciplinary difference in students' use of technology, experience in using eLearning strategies and perceptions towards eLearning. *Computers & Education*, 73, 111–120. <https://doi.org/10.1016/J.COMPEDU.2013.12.015>
- Mugahed Al-Rahmi, W., Alias, N., Shahizan Othman, M., Alzahrani, A. I., Alfarraj, O., Saged, A. A.,

- Shamsiah, N., & Rahman, A. (n.d.). *Use of E-Learning by University Students in Malaysian Higher Educational Institutions: A Case in Universiti Teknologi Malaysia*.
<https://doi.org/10.1109/ACCESS.2018.2802325>
- Nthenya Wambua, R., & Collins Oduor Ondiek, Dr. (2022). Implications of Internet of Things (IoT) on the Education for students with disabilities: A Systematic Literature Review. *International Journal of Research Publications*, 102(1). <https://doi.org/10.47119/IJRP1001021620223320>
- Oliva-Cordova, L. M., Garcia-Cabot, A., & Amado-Salvatierra, H. R. (2021). Learning Analytics to Support Teaching Skills: A Systematic Literature Review. In *IEEE Access* (Vol. 9, pp. 58351–58363). Institute of Electrical and Electronics Engineers Inc.
<https://doi.org/10.1109/ACCESS.2021.3070294>
- Paechter, M., Maier, B., & Macher, D. (2010). Students' expectations of, and experiences in e-learning: Their relation to learning achievements and course satisfaction. *Computers & Education*, 54(1), 222–229. <https://doi.org/10.1016/J.COMPEDU.2009.08.005>
- Pange, A., & Pange, J. (2011). Is E-learning Based on Learning Theories? A Literature Review. *International Journal of Educational and Pedagogical Sciences*, 5(8), 932–936.
- Porter, M. E. (1995). *How competitive forces shape strategy*. 133–134.
- Rang, W., Yang, D., Cheng, D., & Wang, Y. (2021). Data Life Aware Model Updating Strategy for Stream-Based Online Deep Learning; Data Life Aware Model Updating Strategy for Stream-Based Online Deep Learning. *IEEE Transactions on Parallel and Distributed Systems*, 32.
<https://doi.org/10.1109/TPDS.2021.3071939>
- Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2021). An approach for scaffolding students peer-learning self-regulation strategy in the online component of blended learning. *IEEE Access*, 9, 30721–30738. <https://doi.org/10.1109/ACCESS.2021.3059916>
- Revuelta-Domínguez, F.-I., Guerra-Antequera, J., González-Pérez, A., Pedrera-Rodríguez, M.-I., & González-Fernández, A. (2022). Digital Teaching Competence: A Systematic Review. *Sustainability*, 14(11), 6428. <https://doi.org/10.3390/su14116428>
- Ruiz-Martínez, P. M., & Ruiz-Martínez, A. (2021). Improving a Virtual Campus for teaching and learning during COVID-19 and beyond guided by a digital transformation strategy; Improving a Virtual Campus for teaching and learning during COVID-19 and beyond guided by a digital transformation strategy. *2021 XI International Conference on Virtual Campus (JICV)*.
<https://doi.org/10.1109/JICV53222.2021.9600287>
- Sanderson, P. E. (2002). E-Learning: strategies for delivering knowledge in the digital age. *The Internet and Higher Education*. [https://doi.org/10.1016/S1096-7516\(02\)00082-9](https://doi.org/10.1016/S1096-7516(02)00082-9)
- Shen, -Jia, Hiltz, S. R., & Bieber, M. (2008). Learning Strategies in Online Collaborative Examinations. *IEEE TRANSACTIONS ON PROFESSIONAL COMMUNICATION*, 51(1), 63.
<https://doi.org/10.1109/TPC.2007.2000053>
- Siemens, G. (2014). Connectivism: A Learning Theory for the Digital Age. *International Journal of Instructional Technology and Distance Learning*, 1, 1–8. <https://doi.org/10.1.1.87.3793>
- Sitnikov, S., Kruk, B., Zhuravleva, O., & Chupakhina, N. (2010). Corporate E-learning Strategy. *International Journal of Advanced Corporate Learning (IJAC)*.
<https://doi.org/10.3991/ijac.v3i4.1462>
- Steffens, K. (2015). *Competences, Learning Theories and MOOCs: Recent Developments in Lifelong Learning*. <https://doi.org/10.1111/ejed.12102>
- Sun, L., Siklander, P., & Ruokamo, H. (n.d.). How to trigger students' interest in digital learning environments: A systematic literature review. In *Seminar.net-International journal of media, technology and lifelong learning* (Vol. 14).
- Wambua, R. N., & Oboko, R. (2015). *ELearning for Persons with Visual Disabilities*. 247–267.
<https://doi.org/10.4018/978-1-4666-8363-1.ch012>