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Academic Libraries Support of Mental Health Literacy among Undergraduate Students in Zambia: A Review of Literature

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ABSTRACT

Student Mental Health Literacy has gained prominence following the effects of the Covid-19 Pandemic in the Higher Education sector. This paper was aimed at exploring how Zambian academic libraries can support undergraduate students' Mental Health Literacy (MHL). It specifically sought to find out what their roles, services and potential challenges might be. This was in response to current trends in mostly Western countries where academic libraries are actively promoting mental health literacy among students.

The study systematically reviewed 20 publications published in a five-year period, 2017 – 2022. The publications were traced using three (3) databases, namely Google Scholar, Library and Information Science Abstracts (LISA) and Sage Journals, two (2) scholarly social media platforms i.e. Academia.edu and Research gate and some conference proceedings. Thematic Analysis was used to identify major themes and the synthesized findings were presented in narrative form.

The study revealed that major roles of academic libraries in supporting undergraduate students' MHL included Leader, Participant and Host. The roles were influenced by how much of their expertise the librarians were able to commit to chosen initiatives or services. Services identified included information campaigns, student mental health literacy corners, Library research guides on mental health, Bibliotherapy, mental health literacy training for library staff, mental health literacy talks and seminars, activities to commemorate mental health, making library processes more effective, use of Reference services and SDI. Emerging themes were identified and a conclusion was drawn.

Keywords: *Mental health, Students Literacy, Academic Library, Covid-19, Student wellbeing, Zambia*

1. INTRODUCTION

Mental health is an important aspect of people's lives that enables individuals and communities to relate, cope with stress and thrive in their day-to-day activities. It is also one of the areas of human life hard-hit by the disruptions of the Corona Virus Disease (Covid-19) Pandemic. In higher education for instance, students reported having difficulties coping with Covid19 induced stress in their homes and learning environments; many were unable to remain focused or productive, to the detriment of their academic performance, (Anderson, 2020, Visor, and Wyk, 2021) without any coping mechanisms. This highlights the need for improved Mental Health Literacy (MHL) as a means of building of individual and community resilience in the face of challenging times. In the Zambian higher education sector, it highlights the need for conversations around how academic libraries can potentially support student mental health literacy.

1.1 Mental Health and Mental Health Literacy

Mental Health is a subject not well understood by many communities, as many perceive it as merely being the presence or absence of mental disorders/illness. In reality however, mental health is best understood as existing on a complex spectrum, with experiences ranging from an optimal state of well-being, through episodes of mental distress, to debilitating states of great suffering and emotional pain (World Health Organization, 2022; Visser and Wyk, 2021). Various factors are seen to affect mental health and different individuals respond differently to different factors at different times in their lives.

This necessitates MHL among community members. Similarly, Furnham (2018) conceptualize MHL as and includes: a) the “ability to recognize specific disorders; b) knowledge of risk factors and causes, c) knowledge and beliefs about self-help interventions, d) knowledge and beliefs about professional help available, e) attitudes that promote recognition and appropriate help-seeking, f) knowledge about how to seek mental health information” (Woloshyn and Savage, 2020). When people are empowered with knowledge and beliefs framed by quality information, they are able to make decisions that can help maintain and improve their own mental health and that of others.

1.2 Importance of Mental Health Literacy among Undergraduate Students

It is worth noting that MHL is critical for undergraduate students as they fall in the 14-25 years' age-bracket that is reported to have a higher prevalence of mental health-related problems than the general population (Wao et al., 2022). Additionally, students are surrounded by numerous stress-inducing factors in their social and learning environments. Evidence suggest that during Covid-19 pandemic, these factors were exacerbated by health concerns, disruptions in routines, limited social support, challenges in accessing and adapting to firstly the use of various emergency remote teaching approaches; followed by blended approaches, (Lee et. al, 2021).

Further, mental imbalances arising from poorly managed stress among students lead to challenges in concentration and retention of information, absenteeism, unhealthy and risky behaviors, challenges in maintaining social connections, declining academic performance, dropping out, and increased risk of suicide, (Bladek, 2021). According to Atkinson, (2016) “the recognition of the role that the success of their present students can play in actualizing the goals of Higher Education Institutions has invariably led to HEIs interested in monitoring and evaluating student experience with the aim of finding innovative ways to improve it,” (Artkinson, 2016, In Awala-Ale, 2021:371). Consequently, many colleges and universities in developed countries such as the United States and the United Kingdom (UK) have in the last decade been championing the improvement student wellbeing.

With this growing trend, student mental health in these institutions is no longer left to health services units such as clinics and psychosocial counsellors, but preceded by policy, are aligned or incorporated in the work of various unit's campus-wide,

(Universities UK, 2017; Thorley, 2017). Academic libraries for example are also actively promoting student mental health using various programs and initiatives to spread positive knowledge, beliefs and attitudes supportive of mental wellness among students (Holder and Lannon, 2021).

In Zambia however, as with many African communities, this has not been the case. Here the subject of mental health has until recently, been shrouded in mystery, superstition and highly stigmatized. Ignorance and misunderstanding has characterized many communities' understanding of what mental health is really about, as a result of limited access to accurate information about the risks, causes, treatment and management of mental illness, (Mwambwa-Johnson, 2021). This, according to Ganasen et al (2008), is called 'Mental Health illiteracy', so named because the quality of the information framing people's knowledge and beliefs is clouded by culture, superstition or personal beliefs. The resulting misinformation and stigmatization affects people's uptake of quality information and the already limited mental health services. It also limits the support that people can render to each other in ensuring resilience during difficult times. Thus while some conversation around the subject has begun in some sectors in society, the quality and the effectiveness of the information in enhancing mental health and wellness, especially in higher education, is not known.

1.3 Academic Libraries and Mental Health Literacy

Academic libraries lend their relevance in that they have long been viewed as trusted information providers who facilitate access to quality information resources to its university or college communities, (Kankam and Baffour,2021; Brewster and Cox, 2020a; Brewster and Cox, 2020b) Academic librarians have specialized knowledge and skills in collecting, organizing, repackaging and disseminating information, their range of services and available space. Further, their strategic position in terms of location and influence makes them all-inclusive and impartial “catchment areas” for the entire student population, as opposed to just selected disciplines or those with particular interests (Bladeck, 2021). These characteristics give academic libraries a great amount of leverage in the promotion of Mental Health Literacy among students in colleges and universities.

It can be argued however, that the actualization of these trends in the context of a developing country like Zambia requires a number of changes. This includes changes in terms of financing, formulation and implementation of relevant policy and supporting social and institutional culture. These are factors that have been constant thorns in the flesh when it comes to Academic Libraries' bid to grow, as espoused by Professor Ranganathan's Fifth Law of Library Science: “Libraries are growing organisms.” These are certainly areas of concern that need to be thoroughly considered as scholarly conversations around the subject of how Zambian academic libraries can support student mental health literacy.

1.4 Statement of the Problem

Good mental health plays an important role in the life of undergraduate students as it supports their cognitive, communication, and social functions. It is also linked to enhancing learning and academic performance. Sadly, many undergraduate students are 'mental health illiterate', struggle cope with stress and to remain resilient in perilous times, as seen during the Covid-19 Pandemic. This necessitates promotion of student Mental health literacy programs and initiatives for ensured student wellness and improved learning outcomes. Further, studies from developed countries (Kankam and Baffour,2021; Brewster and Cox, 2020a; Brewster and Cox, 2020b) point to a number of factors place Academic Libraries in a strategic position to support students' mental health literacy.

However, differences in economic, social and cultural contexts pose challenges for the adoption of such initiatives by academic libraries in developing countries. These are compounded by the dearth of literature specific to the African context to support debates on the subject in Zambia. This makes it difficult to appreciate the potential role that Zambian academic libraries can play in supporting Mental Health Literacy in a bid to correct the situation among undergraduate students. This literature review therefore aims at providing some insight and generate discussion around the subject. Specifically, the review would explore how Zambian Academic Libraries can support students' mental health Literacy. Additionally, it will seek to understand academic libraries' potential roles and services in connection with promoting student Mental Health Literacy.

2. RESEARCH METHODOLOGY

A structured literature review approach focused on student mental health initiatives in academic libraries was used. A combination of keywords namely mental health, mental health literacy, academic libraries, library services, university students, college students, undergraduate students, well-being, developing countries and mental health were used to interrogate literature on the subject matter. Further, doing this allowed for exploring relevant citations included in three (3) databases namely Google Scholar, Library and Information Science Abstracts (LISA) and Sage Journals, as well as some conference proceedings in order to capture newly emerging practice. Two (2) scholarly social media platforms namely Academia.edu and Research gate were also used to trace and access publications shared by the growing number of researchers who interact on the platforms.

The search was undertaken in July 2022 and 20 published research, articles, newsletters, books and case studies published between 2017 and 2022 were identified and filtered using pre-determined criteria. Thematic analysis was used and the findings were synthesized into a narrative presentation.

3. FINDINGS

The following were the key findings from the literature review, presented in narrative form under headings that are derived from the themes identified from the literature.

3.1 Mental Health Literacy and Libraries

Brewster and Cox (2022) reference the Stepchange Framework, that underscores and emphasizes legitimizing strategic avenues for universities' support for student mental health. Studies argue that student mental health is influenced by an interplay between where students live, their learning, access to support and sense of community, (Kirsh et al., 2016). Thus, it must be observed that student's mental health should be engrained in all aspects of university life. Conversely, Bladeck (2021) adds that in order for the Stepchange Framework approach to be feasible, related policies and activities need to be incorporated into all aspects of campus culture, including administration, operations, and academics.

It is also worth pointing out that the idea of libraries being learning commons is raised by Ramsey and Aargard (2021) in relation to how academic libraries can support student mental health. The call for academic librarians to rethink how they can prioritize information programming, collection and space use is seen as an appropriate response to efforts aimed at addressing student growth and development. Similarly, doing so is argued to create a holistic and integrative way of improving student wellness as suggested by the Hettler's Wellness Wheel, (Hinchliffe and Wong, 2010).

Additionally, academic Libraries' involvement in supporting student mental health and wellness paints to a shift from just being 'collection-centered' to 'community-centered', (Brewster and Cox, 2020). Their reputation and influence as trusted facilitators of access to quality information, their expertise in human information seeking behavior, information literacy skills as well as knowledge of collecting, organizing and disseminating information resources, make academic libraries 'a good fit' for mental health and wellness initiatives. Kankam and Baffour (2021) and Brewster and Cox (2020a; 2020b) note that when harnessed, these qualities of academic libraries would prove quite valuable in mental health initiatives in universities. Moreover, academic librarians' wide networks can be leveraged to form partnerships and liaisons useful in student mental health literacy initiatives.

Further, students are attracted to libraries by the space, collections, services and the fact that the doors are open to all of them for extended hours, regardless of discipline. This, their accessibility and space are key factors that provide a 'ready market and venue' for student mental health literacy initiatives (Kankam and Darkwa Baffour, 2021).

3.2 Academic Libraries and Student Mental Health Initiatives

Many academic librarians have creatively leveraged their potential to promote or support student wellness in their institutions. Some libraries have taken on the leader role, where they proactively developed/adopted and implemented initiatives (Cox and Brewster, 2020). These libraries took the initiative to creatively address an identified problem or integrate student mental health in their operations and processes. In such cases, planning for the design, implementation and evaluation of the initiatives are often handled by the concerned library. Some examples include Knoxville Libraries at

the University of Tennessee, U.S.A, which offers regular 'game-nights' as de-stressing mechanisms for students during examination periods; Morris Rodney A. Briggs Library at the University of Minnesota provides space for student mindfulness activities among others.

Other academic libraries have taken on a more participatory role, where they have collaborated with stakeholders within or outside campus to implement mental health initiatives they otherwise might not have been able to successfully undertake on their own. (Bladeck, 2021). These libraries shared responsibilities with partners to successfully implement the initiatives. Examples include among others, the Weldon Library at Western University, Canada which partnered with specialized units within the university to provide mental health literacy workshops of staff members and a Wellness Station for students; Montana State University Library collaborated with an Animal therapy organization to animal therapy sessions to students.

Further, some libraries have taken on the host role, to provide the access to their space for activities at the request of stakeholders within or outside campus. This was in cases where the library took part in programmes or activities in alignment with the institution's agenda or and external agenda; often due to its centrality in location, its influence and accessibility. Examples include Teesside University in the UK, hosted campus-wide yoga and related mindfulness activities during the university's Festival of Wellness; Middlesex University Library in the UK hosts Student Learning Assistant (SLA) activities that provide students with peer-learning support and navigating their study time.

Within any of these major roles, the academic libraries chose to leverage their expertise to create, organize or facilitate access to the required mental health information or provide assistance to students within their reach, (Kankam and Baffour, 2021). It is therefore important to note that choice of the major role is influenced by the level or commitment the library is able to provide towards initiatives.

3.3 Academic Library and Student Mental Health and Wellness

3.3.1 Globally Perspective

Holder and Lannon (2021) present multiple views on student wellness initiatives in many North American academic libraries. They contend that other academic libraries either acting alone or through partnerships, can actively support student mental health. These are similar to findings by Cox and Brewster (2020) of wellness initiatives provided by UK university libraries before and after the Covid-19 pandemic.

Cox and Brewster (2021) highlights distinctions between initiatives undertaken prior and during the Pandemic, explaining that whereas before the Pandemic, many academic libraries provided a number of wellness initiative, these were born from the desire to creatively address specific mental health concerns such as examination stress or merely to keep up with trends. However, during the pandemic, wellness initiatives were born out of the need to ease students' access to information resources which had to be accessed virtually arising from lockdowns. Bladeck (2021) describes the implementation of these initiatives as through engagement in partnerships, using their

collections, provision of novel services and innovative use of spaces.

Student mental health and wellbeing initiatives implemented in Academic libraries in the reviewed literature include the use of library space for special study break activities such as arts & crafts, board games, animal therapy, etc., aimed at encouraging students to de-stress during intense study periods such as towards examinations. Wellness Stations, of all sorts were noted as well and ranged from spaces created for exercise or relaxation to those that provided information leaflets, health liaison officers and healthy snacks and beverages, (Eldemire and Shinwari, 2022).

Ramsey and Aargard (2021) points to the need for academic libraries to rethink how the design and use of their spaces reflects current and future needs of students, referencing the trend of students preferring workplaces and social spaces for study than quite cubicles. Some noted initiatives around this include the designation of certain areas for mindfulness activities e.g. meditation or yoga rooms; redesigning study spaces that include active workstations such as cycling desks and treadmills to counterbalance physical inactivity; some areas for sleeping or having technology-free zones to enable students be totally rested. Lenstra (2020) presents a compelling argument for the need for academic libraries to have conversations around physical activities in the library. He highlighted a number novel initiatives being implemented in academic libraries in the UK and in Singapore. They include those just mentioned above and interestingly, the loaning out of bikes and hand weights to students during study breaks.

The idea of collaboration is a common thread in all the review literature, including examples of partnerships with medical experts, academic staff, students, etc., to undertake certain wellness activities. Such collaborative efforts noted include mental health campaigns in the form of workshops, seminars and talks, putting of positive peer messages on murals, etc. Some were undertaken within or around the library, with others using online spaces such as SMS, emails, library websites and social media. These reportedly helped to generate a sense of community and support, reminding students that they were not alone; informing them about the available support resources (Walton, 2018; Bremer, 2019; Thomas and Lovelace, 2019; Bladeck, 2021; Cox and Brewster, 2020; Holder and Lannon, 2021; Brewster and Cox, 2022).

Further, some initiatives leveraged library collections, emphasizing existing mental health resources or creating new ones. Initiatives such as mental health corners, book displays. The creation of mental health Library corners for instance provided students with access to credible information. Some libraries also use selected useful information resources in Bibliotherapy initiatives, a practice commonly used and hailed as an effective tool in the treatment of physical and mental illnesses. (Banker and Patil, 2021).

Additionally, providing information literacy training through short courses was another mental health initiative used at some academic libraries. This was useful as it empowered the students with skills that would help them locate, access, evaluate and apply mental health information, within or outside the library independently. This was

critical as it helped students learn how to manage the challenges of information explosion and misinformation on the subject, (Jameson & Duhon, 2022). Furthermore, collaboration between some libraries and medical experts led to training students in the basics of mental health literacy to in order to equip them for Peer-educator roles in various student mental health and wellness initiatives. Cox and Brewster (2020b) noted with concern that only a few libraries reported initiatives that provided training for Library staff, with those that did focusing mainly on helping staff be more “empathetic” in their interactions with students. This arose from the need to address the general concern of library staffs' feeling of inadequacy when handling students' mental health concerns (Stringer, 2020).

Ramsey and Aagard (2018) notes that libraries have a reputation of being safe places and have been known to provide equal access to information on various subjects, even the seemingly controversial or taboo ones. Thus academic librarians can harness their services and collections to provide quick and easy access to the needed mental health information without the fear of stigmatization. Services such as reference, Selective Dissemination of Information (SDI), Current Awareness Services (CAS), referral services and signposting, were used by some academic libraries to ensure that students had easy access to information they required. The use of both physical and electronic approaches, for instance, use of bulk messaging facilities via SMS and emails to send notifications can helped minimize potential 'library anxiety' they may have experienced otherwise, (Gardijan, 2021).

Despite reporting success, most of these initiatives were evaluated using the number of students who utilized the initiatives or the number of likes or following that social media posts about the initiative would receive, as measurement etc. This has raised concern the actual effectiveness and sustainability of certain initiatives particularly the novelty ones. Cox and Brewster (2020b) maintain that questions arise due to some libraries' failure to define wellbeing and evaluate appropriately the impact of such initiatives, the need to clearly define the nature of the mental health and wellness problem being targeted and the need to locate the solution with the librarians' professional knowledge base. In so doing, libraries will ensure that their initiatives are not only aligned to the whole university approach, but more sustainably integrated as well.

3.4 Academic Libraries and Student Mental Health and Wellness

3.4.1 African Countries Perspective

Awala-ale (2021) study was the only one that provided an African perspective on the matter. The study explored how academic libraries in Nigeria could support student mental health and wellness during the pandemic. It emphasized the need for intentionality and innovation in relation to student mental health literacy activities by libraries.

It also further agreed with Ramsey and Aagard (2018) on the use of the libraries' reputation as safe places that can provide students access to confidential information such as on mental health without fear of stigmatization. Suggested adoption of some of

the initiatives highlighted above, including the consideration of ergonomics when making furniture choices to reduce physical strain on users; restructuring study space to make room for designated sleeping areas (while conceding that the suggestion might not be well received), as well as providing space where students can be allowed to enjoy a healthy snack, giving them a quick break from their studies and an opportunity to socialize.

Among potential challenges noted by Awala-ale (2021) included the absence of enabling policies at institution and national level, stating that Nigerian libraries had not adopted policies that would enable them be actively engaged in promoting student mental health literacy. While the suggested initiatives were not exactly original, the perspectives that informed their choice as highlighted by the author provide some useful talking points that can ignite conversation on the subject in an African academic library setting going.

The literature reviewed presents an interesting look into how some academic libraries are supporting student mental health. While showing a snapshot of libraries engagement in student mental health, it also highlighted some gaps. One very obvious one is the vastly insufficient coverage of the subject in the African context, with only one African study addressed student mental health initiatives. Another is lack of inclusion of academic libraries whose institutions had not embraced the whole-university approach. Further, in reporting successes, the literature neglected to highlight any negative reception of the initiatives and how they were handled.

4. EMERGING NARRATIVE

The conversation around student mental health and the role it plays in academic performance has gained ground in developed countries. The Literature review highlighted three key roles that academic libraries can play in support of student mental health literacy, those being Leader, Participant and Host. The choice of role is largely dependent relevant guiding policies, the type of initiatives being considered and the resources (finances, staffing) available.

The list of ideas for potential initiatives is long, as seen from reviewed literature. However, it is important to note that replication of ideas without considering the differences in contexts might be unwise. It is important to consider questions raised by Cox and Brewster (2020b) in order to implement relevant and sustainable student mental health initiatives.

As for services, information campaigns offer a good starting point as they are useful in beginning the conversation on the subject among the campus population, laying a foundation for future initiatives. These can be undertaken in collaboration with local experts who can provide MHL information tailored to the Zambian context. Information resources can also be produced in collaboration with local authors and made accessible to students through academic libraries. Other services include the creation and provision of Library Research Guides on mental health to guide students to credible information. Connected to this is the provision of mental health workshops and seminars to provide basic training in mental health literacy for staff and students; hosting or participation in activities to commemorate of mental health awareness week; creation of physical and

online mental health literacy corners, etc.; re-designing of libraries' physical and online spaces; making library processes more effective to reduce stressors; use of reference services (within established limits) to identify or address students' mental health concerns; use of SDI and CAS to draw students' attention to mental health resources.

As can be seen, despite the obvious differences in contexts, there is much that developing countries like Zambia learn from student mental health literacy initiatives in developed countries. Conversations around this topic will help academic libraries in the country to design and implement effective initiatives to support students' mental health literacy.

5. CONCLUSION

From the literature, academic librarians' roles in supporting student information literacy were identified as being Leader, Participant and Host. Within each role, librarians could harness their skills in information creation, organization and facilitation of access to promote student mental health literacy. A number of services were also highlighted including the provision of information campaigns, introduction of Mental Health Literacy corners, provision of library research guides on mental health, mental health literacy training for library staff, talks and seminars, commemoration of mental health week with activities in the library, and many more.

- Atkinson, J (2016) *Academic Libraries and Student Support: An Overview*. Quality and the Academic Library, Chandos Publishing, Pages 93-100, ISBN 9780128021057, <https://doi.org/10.1016/B978-0-12-802105-7.00009-9>.
- Awala-Ale, Isabella Idoefemu (2021) Reinventing the Role of Academic Libraries in Nigeria to be Active Contributors to Student wellness in the COVID – 19 Pandemic. *International Journal of Research and Innovation in Social Science (IJRISS)* 5(4), April 2021|ISSN 2454-6186. DOI:<https://dx.doi.org/10.47772/IJRISS.2021.5418>
- Banker and Patil, (2021) *Bibliotherapy: A prototype model for Academic Libraries*. *Library Philosophy and Practice (e-journal)*. <https://digitalcommons.unl.edu/libphilprac/5484/>
- Bremer, Peter (2019) Reflecting on student mental health: Creating a meditation room in a small college library. *College & Research Libraries News*. Jun2019, Vol. 80 Issue 6, p339-342. 4p ISSN 0099-0086 <https://dx.doi.org/10.5860/crln.80.6.339>
- Brewster L & Andrew M. Cox (2022) Taking a 'whole-university' approach to student mental health: the contribution of academic libraries, *Higher Education Research & Development*, <https://dx.doi.org/10.1080/07294360.2022.2043249>
- Brits, Elsabe (2021) High mental health burden for Africa's Youth. *Nature Africa* <https://www.nature.com/articles/d44148-021-00097-y>
- Cox, Andrew and Brewster, Liz (2020a) Library support for student mental health and well-being in the UK: Before and during the COVID-19 pandemic. *The Journal of Academic Librarianship* Volume 46, Issue 6, November 2020. <https://doi.org/10.1016/j.acalib.2020.102256>
- Cox, A. and Brewster, L. (2020b) Services for student wellbeing in academic libraries: three challenges. *New Review of Academic Librarianship*, 27 (2). pp. 149-164. ISSN 1361-4533 <https://doi.org/10.1080/13614533.2019.1678493>
- Cox, Andrew and Brewster, Liz (2021) Aligned but not integrated: UK academic library support to mental health and well-being during COVID-19. *Library Management* Vol. 43 No. 1/2, 2022 pp. 108-127. <https://dx.doi.org/10.1108/LM-09-2021-0075>
- Cox A and Brewster L (2022) Aligned but not integrated: UK academic library support to mental health and well-being during COVID-19. *Library Management*, vol. 43 no. 1/2 ISSN: 0143-5124. <https://doi.org/10.1108/LM-09-2021-0075>
- Eldermire, Erin R., Shinwari, Wasima (2022) Brewing tranquili-tea: Supporting student wellness at an academic library. *College & Research Libraries News*. Jan2022, Vol. 83 Issue 1, p8-12. 5p <https://crln.acrl.org/index.php/crlnews/article/view/25279/33149>
- Furnham, A. and Swami, V., (2018) Mental health literacy: A review of what it is and why it matters. *International Perspectives in Psychology: Research, Practice, Consultation*, 7(4), p.240.
- Gardijan, Nikica, (2021) *Library Anxiety: An Overview of Re-Emerging Phenomena (2021)*. *Library Philosophy and Practice (e-journal)*. 5021. <https://digitalcommons.unl.edu/libphilprac/5021>
- Harward, (2016) in Bladeck, M (2021). Student well-being matters: Academic library support for the whole student. *The Journal of Academic Librarianship*. Volume 47, Issue 3, 2021, 102349, ISSN 0099-1333, <https://doi.org/10.1016/j.acalib.2021.102349>.
- IFLA (2018) *Spaces, Skills and Resources: How Libraries Support Mental Health* <https://blogs.ifla.org/lpa/2018/10/10/spaces-skills-and-resources-how-libraries-support-mental-health/>

- Jameson J., and Duhon L., (2022) A 10-year follow-up survey of US academic libraries highlights the COVID-19 experience and greater interest in health information outreach <https://doi.org/10.1111/hir.12446>
- Janicke Hinchliffe, Lisa, and Melissa Autumn Wong. (2010) “From Services-Centered to Student-Centered: A “Wellness Wheel” Approach to Developing the Library as an Integrative Learning Commons.” In Ramsey E and Mary C. Aagard (2018) *Academic Libraries as Active Contributors to Student Wellness*.
https://scholarworks.boisestate.edu/cgi/viewcontent.cgi?article=1142&context=lib_facpubs
- Kankam P. K, and Baffour, FD, (2021) Why Librarians Matter in the Promotion of Mental Health Literacy in Higher Education. *International Journal of Innovation, Creativity and Change*. 15(1) – Special Edition https://www.ijicc.net/images/Vol_15/Iss_1/15101_Kankam_2021_R.pdf
- Kirsh, B., Friedland, J., Cho, S., Gopalsuntharanathan, N., Orfus, S., Salkovitch, M., Snider, K. and Webber, C., (2016) Experiences of university students living with mental health problems: Interrelations between the self, the social, and the school. *Work*, 53(2), pp.325-335.
- Lee, J., Jeong, H. J.,
Kim, S. Stress (2021) Anxiety, and Depression Among Undergraduate Students during the COVID-19 Pandemic and their Use of Mental Health Services. *Innovative Higher Education* 46, 519–538 (2021).
<https://doi.org/10.1007/s10755-021-09552-y>
- Lenstra, N. (2020). Student wellness through physical activity promotion in the academic library. In S. Holder & A. Lannon (Eds.), *Student wellness and academic libraries: Case studies and activities for promoting health and success* (pp. 223-240). ACRL.
- Maddock, Atkins, and Robinson (2020) *Wellness Overdue? Check In at the Weldon Library Wellness Station: Partnering for Student Wellness*. In S. Holder & A. Lannon (Eds.), *Student wellness and academic libraries: Case studies and activities for promoting health and success* (pp. 223-240). ACRL.
- Mwambwa-Johnson, E Y (2021) *Mental Health Literacy Among Rural and Urban Young Adults in Zambia*, Walden University.
<https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=11324&context=dissertations>
- Nsereko ND and Basa V. Promoting Campus Mental Health Literacy. *Mental Health & Human Resilience International Journal Int J 2017, 1(1): 000105*.
https://www.academia.edu/38137800/Promoting_Campus_Mental_Health_Literacy
- Ramsey E and Aagard Mary C. (2018) *Academic Libraries as Active Contributors to Student Wellness. College & Undergraduate Libraries*,
https://scholarworks.boisestate.edu/cgi/viewcontent.cgi?article=1142&context=lib_facpubs
- Thomas, S., & Lovelace, K. (2019). Ending the Silence: Utilizing Personal Experiences to Enhance a Library Mental Health Initiative. *Journal of Intellectual Freedom & Privacy*, 4(2), 3–4.
<https://doi.org/10.5860/jifp.v4i2.7079>
- Thorley, Craig (2017) Not by degrees: improving student mental health in the UKs universities. The Progressive Policy Think Tank. <https://www.ippr.org/publications/not-by-degrees>
- UN, (2022) COVID-19: Depression, anxiety soared 25 per cent in a year.
<https://www.un.org/sustainabledevelopment/blog/2022/03/covid-19-depression-anxiety-soared-25-per-cent-in-a-year/covid-19-depression-anxiety-soared-25-per-cent-in-a-year-2/>
- Visser, Maretha & Wyk, Eloise Law-van (2021) University students' mental health and emotional wellbeing during the COVID-19 pandemic and ensuing lockdown. *South African Journal of Psychology*. <https://journals.sagepub.com/doi/full/10.1177/00812463211012219>

Walton G,(2018) Supporting Student Wellbeing in the University Library: A Core Service or a Distraction?, *New Review of Academic Librarianship*, 24:2, 121-123,
<https://www.tandfonline.com/doi/full/10.1080/13614533.2017.1418240>

Wao H, Wao M. A and Muriithi I, et al. (2022) Availability, accessibility and activation of mental health services among university students in Africa: a protocol of a mixed-methods systematic review with meta-analysis and meta-synthesis.

WHO (2022) Mental health: strengthening our response <https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response>.

Woloshyn, V. and Savage, M., 2020. Increasing teacher candidates' mental health literacy and stress coping skills through an elective mental health and wellness course. *International Journal of Inclusive Education*, 24(9), pp. 921-935.

Utilization of HINARI Database among Academicians in the Covid 19 Pandemic in Tertiary Institutions in Zambia. Case of Michael Chilufya Medical Library.

By

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ABSTRACT

The Covid-19 pandemic has greatly impacted delivery of education and brought drastic changes in information dissemination globally. The restrictions on movements and physical networking due to Covid-19, has necessitated the emergence of massive use of virtual and online platforms, as new avenues for delivery of services to clients in diverse sectors of economies. Similarly, the pandemic has forced libraries to rethink and redesign the delivery of their services to clients. The study adopted a positivist approach and utilized survey method in soliciting comprehensive insights in regard to utilization of HINARI database at the Michael Chilufya Medical library. The total enumeration technique was used as a sampling technique for the study to select a total of 104 academicians and researchers (81 males and 23 females) as study participants.

The findings of the study revealed that the use of Research4Life programmes namely, HINARI, AGORA, and OARE greatly increased globally during the Covid-19 pandemic where academicians/researchers did not have access to physical information sources. Also showed that academicians mostly used HINARI databases to support online learning. The study also established that inconsistencies in power supply, slow internet access, and lack of information retrieval skills deprived users of effective use of HINARI database during the Covid-19 pandemic. The study recommend that government establishes build a robust IT Infrastructure with adequate supportive externalities such as consistent power supply, provide cheap data subscription to learning institutions for academic utilization and to enhance effective teaching and learning.

Keywords: *Covid-19, Electronic Resources, IT Infrastructure, Research4life, Online Learning*

1. INTRODUCTION

Shindo (2020) argues that libraries across the world have been faced with increasing demand to change the way they conduct business. This demand is partly due to the spread of Covid-19 pandemic and largely due to advances in Information and Communication Technologies (ICTs), which have significantly changed the information needs of users. To effectively provide services to online learners, most libraries have considerably subscribed to new online materials such as to e-journals, e-books, and Research4Life programmes (UCL Library news, 2020). Research4life is an umbrella of private–public partnership of four programs namely HINARI focusing on health, AGORA focusing on agriculture, OARE focusing on environment and ARDI focusing on innovation (Research4life, 2017). The Health Internetwork Access to Research Initiative (HINARI) benefits researchers in over 100 developing countries in

accessing up to 14,000 journals (in 30 different languages), 46,000 e-books, and 100 other information resources in more than 5700 registered institutions (World Health Organization, 2018). As a result of this digital portal, academicians and researchers of developing countries learn about and contribute to improving the status of world health.

The subscription to HINARI databases has become increasingly important for most medical libraries, as a result of the paradigm shift to online education. No doubt, e-resources have some substantial uniqueness that makes them appealing to academicians, researchers and users in general. One of the benefits of e-resources over printed resources is that users all over the world instantly access and use the same information material over the internet without visiting a physical library (Kumar and Kaur, 2017). Further, the use of electronic databases in the library has changed access to scientific information, research activities, and consequently improved community services. These changes are not only in terms of selecting, archiving, and budgeting of digital resources but also that print archived journals took valuable library space. The access to peer-reviewed scientific publications for health researchers is available in developing countries through HINARI providing core journals and other e-resources. HINARI is a vital resource for training students, informing clinicians, alerting scientists, making journal article publishing a reality for researchers, and also to encourage policy-makers in developing countries (World Health Organization, 2018).

It can be argued that as long as HINARI exists in Zambia, academicians/researchers will not face extreme access challenges to information in the Covid-19 era. The statement is based on the fact that academic and medical libraries in higher learning institutions had to rethink and redesign the delivery of information for teaching, learning and research. Covid-19 pandemic negatively impacted on traditional ways of delivering teaching, research and learning in higher education and services provided by libraries. It is for this reason that this survey was done to assess the utilization of Health Inter Network Access to Research Initiative (HINARI) resources in tertiary institutions in Zambia. The study focused on establishing the purpose of use of e-resources by assessing: the usage of HINARI database for research activities in Zambia; the likelihood of accessing HINARI database e-resources among academicians/researchers at Michael Chilufya medical library and establish the benefits of using HINARI database among academicians and researchers.

It is hoped that the study would contribute to the body of knowledge and evidence to inform transformation of service provided in medical libraries. Further, the findings may be useful to inform policy on higher education in Zambia as it would bring out the benefits and challenges of using electronic databases in universities in general and libraries in particular and suggest avenues for government to plan, fund and regulate academic services provided in universities. Further, the findings from this study may help university management at the institution to develop robust strategic plans to address some challenges faced in the Covid-19 era.

2. LITERATURE REVIEW

Electronic databases (e-resources) are those information resources that users can only access through the use of, internet-enabled devices. According to Tan (2011), electronic databases (e-resources) are materials that are in digital forms available by electronic means. Examples of e-resources include electronic journals, online databases (Agora, Jstor, EBSCO host, Ajol, HINARI), electronic books, locally loaded databases, websites, CD-Rom, electronic text, e-abstracting and indexing databases such as MEDLINE, e-News, e-Images, e-Music among others. Electronic resources are valuable for research and scholarly communication because it can be accessed anywhere, more current, and can enhance research and development activities (Haridasan and Khan, 2019).

Several studies have been conducted on the use of electronic resources. For instance, Kumar and Anjaiah (2020) investigated student's use of e-resources in the Kakatiya Institute of Technology, India. Findings of the study reveal that the students are aware of e-resources and utilized the resources mainly for project work, self-improvement, and reading for exam purposes. The study further reveals that e-journals are the most used e-resource, follows by the Internet, e-Databases, and e-books. The least used e-resources among the students are the library open Access Catalogue (OPAC). Gakibayo et al. (2013) examined electronic information resources utilization by students in the Mbarara University library. The findings showed that the Internet search engines, e-books, electronic journals, and databases were the most used e-resources. Hendal (2020) studied Kuwait University faculty's use of electronic resources during the Covid-19 pandemic. The results showed that e-databases and e-journals were mostly used for writing research papers.

In Nigeria, Livina and Mole (2021) investigated the academic staff use of electronic resources in the Nigerian University of Nigeria Libraries during the Covid-19 lockdown. The result showed good use of e-resources by academic staff during this Covid-19 period. The academic staff mostly used the e-resources for writing research papers. Similarly, Bankole and Nasir (2020) examined undergraduate students' perception in the use of electronic sources in the Kwara State University library. The findings showed that electronic journals are the most type of electronic sources available in KWASU Library. However, difficulty in identifying relevant information materials is the most prominent among the challenges confronting the use of in KWASU library.

Wiche and Ogunbodede (2021) investigated student's awareness and use of open education resources in Ignatius Ajuru University of Education, Port-Harcourt. The findings established that the students mostly used YouTube videos, open access journals/databases, open textbooks, etc. It was also discovered that inadequate information literacy skills, poor electricity supply, poor internet connectivity, lack of library sensitization, and lack of support from lecturers on the use of open educational resources (OER) were some of the challenges to the effective use of OER. Ogunbodede et al., (2020) established in their study that majority of the respondents preferred to use e-resources because of its portability, convenience, accessibility and time saving.

Also, Saleh and Kakaki (2019) conducted a study on the utilization of electronic resources by undergraduate students of Agricultural Economic Extension, Kano University of Science

and Technology, Wudil, Nigeria. The study revealed that the majority of the respondents are aware of the availability of many of the electronic resources in the library and utilize many of the online databases and offline databases. Some of the challenges facing the respondents in accessing the electronic resources include poor power supply, low bandwidth and staff and student's lack computer skills. Adeniran (2013) examined the usage of electronic resources by undergraduates at the Redeemer's University library, Mowe, Nigeria. The study revealed that the use of electronic resources has a tremendous impact on the academic performances of the undergraduate students of Redeemer's University; however, there is a need for them to acquire more skills in the use of electronic resources. The study also revealed that undergraduates made use of electronic resources mostly for research, assignment, current awareness, information acquisition, and e-mail and news acquisition. Some of the challenges faced by students in accessing the electronic resources and online learning platforms include lack of constant power supply to charge phones and laptops, high cost of data subscription, slow internet connectivity (Ogunbodede et al., 2021).

Arising from the above, it can be deduced from the literature that a limited number of investigations have been carried out to study the Utilization of HINARI database in the Covid-19 pandemic in tertiary institutions. In a nutshell, most studies in the aforementioned literature focused on e-resources in general not specifically on HINARI resources. Thus, this is likely to be the first original research paper focused on the utilization of HINARI database in the Covid-19 pandemic in tertiary institutions in Zambia, with special reference to Michael Chilufya Medical library.

3. RESEARCH METHODOLOGY

Being a descriptive, the study adopted a positivist approach and utilized survey method in soliciting comprehensive insights in regard to utilization of HINARI database in the Michael Chilufya Medical library. The sampling technique used for the study was the total enumeration technique.

As a non-probability sampling procedure, enumeration technique was ideal for the study as the size of the population was small. Thus, utilization of the entire population comprising academicians and researchers at Michael Chilufya Sata School of Medicine was key to ensure that the phenomenon that the study was trying to understand was successfully explored. Further, survey questionnaires were used as the instruments for collecting data from a total of 104 academicians and researchers (81 males and 23 females) as study participants.

The data collected was analysed using software - IBM SPSS (Statistical Package for Social Sciences) (IBM, 2018). Quantitative data analysis was based on descriptive statistics which was used to calculate the mean, variance and standard deviation of each question item. Thus, on utilization of online databases, a mean response below 2.4 was deemed low-level usage, while the mean response of 2.4 and above was deemed as high-level usage. Similarly, for the challenges, a mean response below 2.4 was deemed as 'not agree', while the mean response of 2.4 and above was adjudged as 'highly agree.'

5. FINDINGS

The findings of this study were presented as follows: the demographic characteristics of respondents, descriptive statistics of the variables from study in relation to library users' awareness of HINARI database, usage of HINARI database upon research activities offered by the Medical library, rating likelihood of accessing as well as their views on the benefits of using HINARI database.

5.1 Demographic characteristics of Study Respondents

5.1.1 Age

In order to appreciate the age profile of respondents, the study found that the majority of study respondents (75%) were in the 40-49 years' age group, while 25% of respondents were in the age group 50-59 years.

5.1.2 Gender

In order to know the gender distribution of respondents, the study found that there were 77.6% male compared to 22.4% females. This could be relatively attributed to gender disparities in higher education where there are more males with higher education attainment compared to their female counterparts. However, it must be noted that all study respondents were selected because the researchers assumed that the group had knowledge on Research4Life programmes offered by the medical library.

5.2 Library users' awareness of HINARI database

The frequency distributions (frequency and percentage) on the five-point Likert-type scale in this study of library users' awareness of HINARI database are presented in Table 1.

Table 1: Library users' awareness of HINARI database

No	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Respondent has not heard about HINARI database	43	50	3	4	5
		41.0%	47.6%	2.9%	3.8%	4.8%
2	Respondent know about HINARI through Library Orientation	11	2	19	53	20
		10.5%	1.9%	18.1%	50.5%	19.0%
3	Through the use of Library	19	25	45	10	6
		18.1%	23.8%	42.9%	9.5%	5.7%
4	Through Library Intranet site	6	5	56	30	8
		5.7%	4.8%	53.3%	28.6%	7.6%
5	Respondent know about HINARI through information literacy programme	77	23	2	0	3
		73.3%	21.9%	1.9%	0.0%	2.9%

Source: Survey Data (2022)

The results indicate that most of the respondents are aware of HINARI database with 53 (50.5%) who Agreed to know what HINARI database are all about and 43 (41%) respondents strongly disagreeing to the statement that they have not heard about HINARI database. In addition, 77 (73.3%) went further to justify their awareness by Agreeing to the fact that they know HINARI database through information literacy programme offered by the Medical Library.

Usage of HINARI database

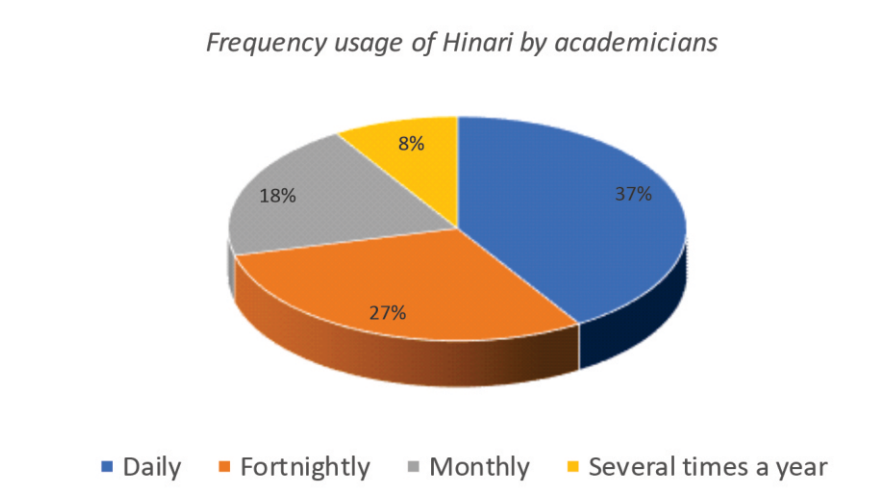


Figure 1: Frequency usage of HINARI database by Academicians

Source: Survey Data (2022)

Figure 1 presents academicians'/researchers usage of HINARI database. It shows that out of 104 respondents, 37% of researchers (37%) use HINARI resources daily, followed by 27% with fortnightly frequency. About (18%) researchers reported monthly use while 8% are using HINARI only several times a year. From the number of daily users, it can be deduced that 80% of responding researchers were using HINARI resources at Medical School.

Further, figure 2 shows that 36% respondent's use HINARI database for downloading full-text articles for preparing teaching materials and 23% for publishing their own journal articles. 20% utilize HINARI for gaining new knowledge on various topics, 7% preparing conference presentations and posters. Only 4% of academicians responding to the questionnaire are browsing the HINARI database proposal writings and requests for funding.

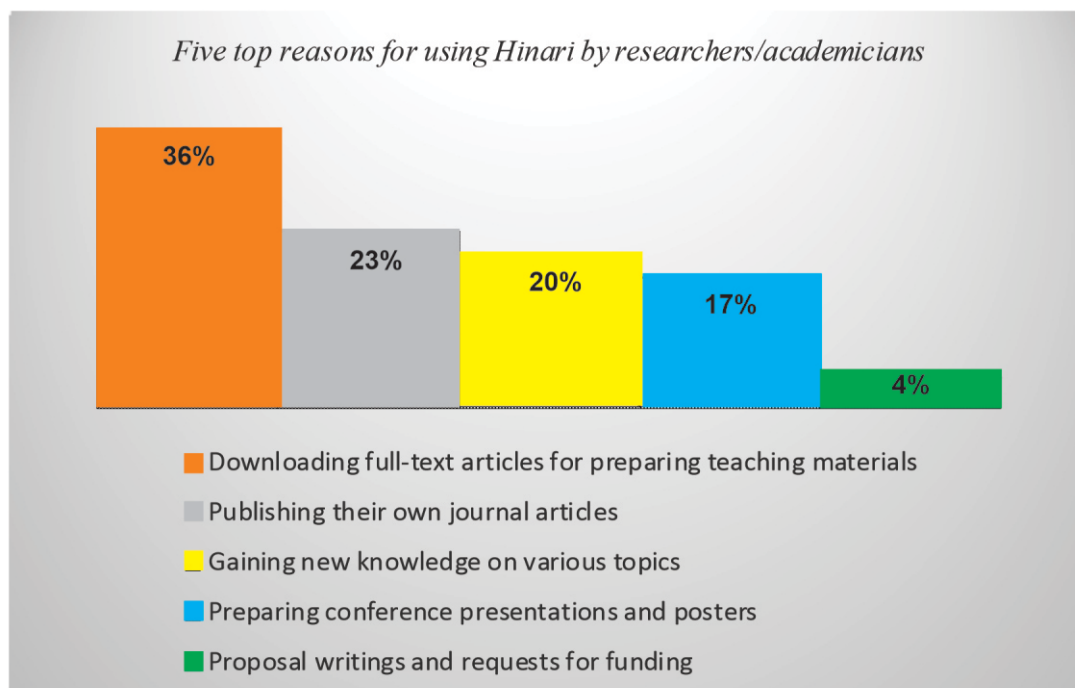


Figure 2: Five top reasons for using HINARI database by Academicians/Researchers

5.3 Rating the likelihood of accessing HINARI database e-resources

Researchers/academicians rated the likelihood of accessing HINARI database e-resources for their research work and for various academic outputs. Figure 3 reveals that 57% of responding researchers/academicians rated HINARI access as “excellent”, 21% as “very good”, 15% as “good”, and 7% researchers as “average”

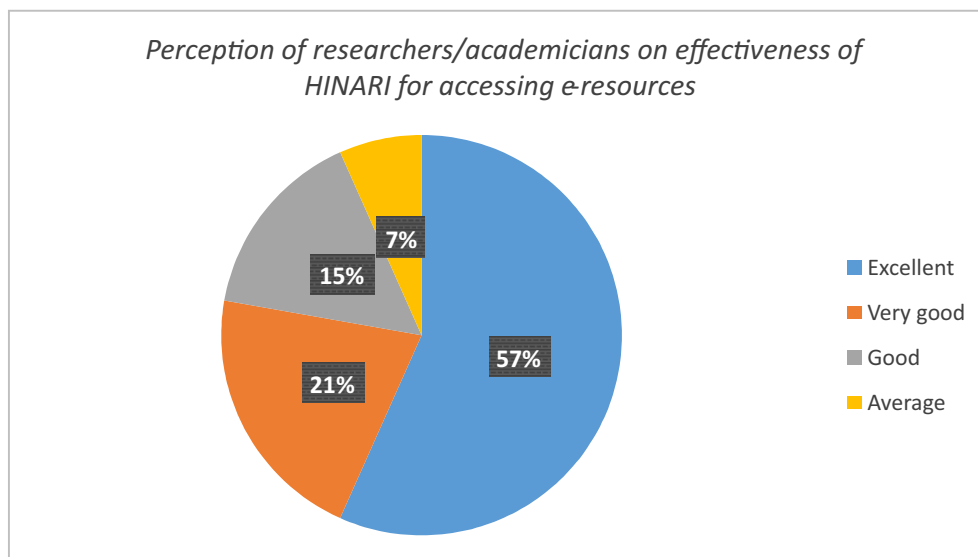


Figure 3: Perception of Academicians/Researchers on Effectiveness of HINARI database

5.4 Different online databases used by researchers/academicians

According to Table 2 show that researchers at Medical school most frequently use PubMed for searching bibliographical information of journal articles followed by HINARI, Google Scholar and OARE databases. However, in most cases of downloading full text e-resources, researchers/academicians use HINARI platform. Sometimes they also use PubMed through HINARI. HINARI e-books are other important sources of information generally used by the researchers. This is evident by 75% researchers who used HINARI for downloading online articles.

Table2: Databases used by researchers/academicians

Databases	Used Regularly	Used Occasionally	Never Used	Mean
PubMed	78(84%)	8(9%)	4(4%)	2.7
HINARI	75(81%)	14(15%)	1(1%)	2.7
Google Scholar	70(75%)	11(12%)	9(10%)	2.6
OARE	65(69%)	19(21%)	6(7%)	2.5
Grand Mean				2.6

5.5 Benefits of using HINARI database among researchers/academicians

Research4Life programmes, HINARI, AGORA, and OARE are used in tertiary institutions in Zambia as a valued tool for advancing current knowledge of science and research. In the past, awareness of the aforementioned programmes was delayed. In the recent past, tertiary institutions in Zambia struggled subscribing to expensive, both printed and online journals

sent from renowned world publishers. As a whole, tertiary institutions in Zambia have benefited by accessing HINARI platform in terms of economy, accessing e-resources, popularizing e-resources, improving ICT facilities and services for research, and advancement of learning and up-to-date teaching resources. In this vein, it is worth noting that Open Access momentum could contribute significantly to economic, scientific and research growth in developing countries by providing access to scholarly materials without the economic barriers that currently exist in closed access scholarly publishing.

5.6 Challenges faced by researchers/academicians in the Use of HINARI database in the Covid-19

Table3: Challenges faced by researchers/academicians

Challenges	SA	A	D	SD	Mean
Slow internet access	44(47%)	38(41%)	6(7%)	1(1%)	3.3
Lack of information retrieval skills	46(50%)	33(36%)	7(8%)	3(3%)	3.2
Inconsistent power supply	42(45%)	39(42%)	8(9%)	1(1%)	3.2
Excessive academic workload	34(37%)	33(35%)	19(21%)	3(3%)	3.0
High cost of data	25(27%)	47(51%)	14(15%)	3(3%)	2.9
Lack of relevant online databases	26(28%)	42(45%)	20(22%)	1(1%)	2.9
Lack of awareness on the availability of e-resources	23(25%)	43(46%)	20(22%)	3(3%)	2.8
Grand Mean					3.1

Table 3 shows the respondent's responses on the challenges to the effective use of HINARI database and other online databases amid the COVID-19 pandemic. All the items in table 3 have mean values that are above the standard mean of 2.4. Similarly, the grand mean (3.1) is greater than the standard mean (2.4), and this demonstrates that all the items in table 3 are the challenges to the effective use of HINARI resources. Most notable among the challenges are slow internet access, lack of information retrieval skills and inconsistent power supply.

6 DISCUSSION OF FINDINGS

Based on the collected and analysed data for the study, the findings show that there is a high level of awareness of HINARI resources and other online databases among academicians and researchers at the Copperbelt University Medical Library. Findings also established that respondents mostly used and downloaded HINARI resources comprising online databases, e-journals and e-books to aid their efforts in preparing teaching materials. This implies that majority of academicians used HINARI resources to support their academic work as a result of the online learning. This study is in conformity with the findings of Kumar and Anjaiah (2020) who also found that e-journals, the Internet, e-databases, and e-books were the most used e-resources by the teaching staff and researchers. It was also evident that HINARI resources influence on the quality and quantity of research activities, output and publications at the medical school. It is also worth noting that HINARI users' perceive the database as lifeblood for strengthening research activities that they cannot imagine work without considering the fact

that the University no longer subscribe to Elsevier Science Direct. Thus, it can be deduced that libraries in higher education have an indispensable role to play as users should be given access to information without dichotomy and discrimination.

Further, with regards to challenges, study respondents agreed that slow internet access at the Medical school, lack of information retrieval skills and inconsistent power supply were the three major challenges to effective use of HINARI resources amid the COVID-19 pandemic. However, the problem of epileptic power supply can be said to be a perennial problem in Zambia. This finding is in conformity with the study of Ogunbodede et al., (2021) who also found that some of the challenges faced by researchers in accessing the electronic resources include poor power supply, high cost of data subscription and slow internet connectivity.

7 CONCLUSION AND RECOMMENDATIONS

The use of Research4Life programmes, HINARI, AGORA, and OARE greatly increased globally amid Covid-19 pandemic where researchers and library users in general couldn't have access to the library physically. The Covid-19 pandemic has changed most of the library services which has made users depend more on e-resources. It was also discovered that the researchers mostly used HINARI online databases to support online learning. The study also established that inconsistent of power supply, slow internet access, and lack of information retrieval skills are the three major challenges in the effective use of e-resources during the Covid-19 pandemic. Based on the finding, the researchers recommended that the government should provide adequate power supply tertiary institutions, build a robust IT Infrastructure and prevail on network providers to provide cheap data subscription so that researchers and library users in general can enjoy more access to the internet for effective learning even while in their offices.

- Adeniran, P. (2013). Usage of electronic resources by undergraduates at the Redeemer's University, Nigeria. *International Journal of Library and Information Science*, 5(10), pp. 319-324. <https://doi.org/10.5897/IJLIS2013.0392>
- Adeniran, P.O. & Onuoha, U.D. (2018). Influence of information literacy skills on postgraduate students' use of electronic resources in private University libraries in South-West, Nigeria. *Communications and Network*, 10, 164-179. <https://doi.org/10.4236/cn.2018.104014>
- Bankole, Q. A. & Nasir, Z. (2020). Empirical analysis of undergraduate students' perception in the use of electronic sources in Kwara State University Library. *International Information & Library Review*. <https://doi.org/10.1080/10572317.2020.1805274>
- Gakibayo, A., Ikoja-Odongo, J.R., & OkelloOburo, C. (2013). Electronic information resources utilization by students in Mbarara university library. *Library Philosophy and Practice*, 859 1- 26. <http://digitalcommons.unl.edu/libphilprac/869>
- Haridasan, S. and Khan, M. (2009). Impact and use of e-resources by social scientists in National Social Science Documentation Centre (NASSDOC), India. *The Electronic Library*, 27(1), 117-133. <https://doi.org/10.1108/02640470910934632>
- Hendal, B. A. (2020). Kuwait University faculty's use of electronic resources during the COVID-19 pandemic. *Digital Library Perspectives*. <https://doi.org/10.1108/DLP-04-2020-0023>
- Kumar, M. A., and Anjaiah, M. (2020). Knowledge, access and effective use of e-resources by the students of kakatiya institute of technology and science (kits), warangal, Telangana state– a case study. *International Journal of Digital Library Services*, 7(3), 51-61.14
- Kumar, R. and Kaur A. (2006). Internet use by teachers and students in engineering colleges of Punjab, Haryana, and Himachal Pradesh States of India: An analysis. *Electronic Journal of Academic and Special Librarianship*, (7)1.
- Livina, D. C. and Mole, A. J. (2021). Academic staff use of electronic resources in Nigerian University Libraries during the COVID-19 lockdown period. *Library Philosophy and Practice (e-journal)*, 5341. <https://digitalcommons.unl.edu/libphilprac/5341>
- Ogunbodede, K. F., Nwachokor, I. M. and Aminikpo, R. N. (2021). Awareness and use of open educational resources by Academic Staff of Federal College of Education Technical Asaba. *Rivers State University Journal of Education (RSUJOE)*, 24 (1):144-153.
- Ogunbodede, K. F., Idubor, I. and Ivwighreghweta, O. (2020). Use of electronic and print resources among lecturers in two private universities in South-South Nigeria. *Journal of Contemporary Issues in Education (JCIE)*, 4(1), 1-11.
- Saleh, A. and Kakaki, H. A. (2019). Utilization of electronic resources by undergraduate students in the department of Agricultural Economic Extension, Kano University of Science and Technology, Wudil, Nigeria. *Library and Information Science Digest*, 12, 61-72.
- Tan, M. (2016). What are electronic resources? <http://libfaq.smu.edu.sg/faq/134702>

An Analysis on the Availability of Qualified Teachers and Computer Laboratories for Teaching Computer Studies in Public Secondary Schools in Zambia: A Case Study of Lusaka City

By

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ABSTRACT

For schools to successfully teach computer studies, they should have among other things, qualified teachers and computer laboratories. This study investigated on the availability of qualified computer studies teachers and computer laboratories in public secondary schools in Lusaka city of Zambia. A mixed-methods approach was employed and 50 schools, out of the 72 public secondary schools in Lusaka city were surveyed. The study has revealed that 76% of computer studies teachers have qualifications in computer studies or information and communication technologies (ICTs) and the majority (55%) holds a diploma. However, there is a higher teacher-pupil ratio of as high as 1:276. The study has further shown that 98% of the schools have computer laboratories and the majority has a lower computer-pupil ratio of 1:2 and 1:3. The results show that many public schools have data projectors and air conditioning units in their computer laboratories. Furthermore, the study shows that 64% of computer laboratories are not connected to the Internet and do not have servers. Given the above findings, it has been recommended that the Government of Zambia recruits more computer studies teachers and that school managers should ensure the availability of facilities such as internet connectivity in the computer laboratories.

Keywords: *Computer Studies Teachers, Computer Laboratories, Educational Resources, Lusaka, ICTs, Zambia*

1 INTRODUCTION

The demands of the 21st century dictate that learners be equipped with the requisite skills to competently engage and perform in the new information age (Mulauzi, et al., 2020). In this regard, graduates of an education system need to possess digital skills. According to the Zambian government, teaching Computer Studies in schools will not only produce graduates with digital skills but also spur innovation, thus, helping the country achieve its 2030 vision (Shafika, 2007). To achieve this, the Zambian Government has reformed the school curriculum to include subjects such as Computer Studies. In 2013, Computer Studies was introduced in secondary schools in Zambia as a subject. The introduction of Computer Studies in Schools has come with many challenges. Many critical educational inputs such as qualified teachers to teach Computer Studies and computer laboratories have been observed not to be available in some schools in Zambia. And where these inputs are available, they are said not to be adequate (Policy Monitoring and Research Centre, 2020). Mulauzi et al. (2020) point out that lack of and/or inadequate information communication technologies (ICTs) infrastructure is a serious obstacle to teaching and learning computer

studies in schools, especially in developing countries such as Zambia. There is consensus on the fact that without adequate provision of trained teachers and computer laboratories, schools cannot satisfactorily teach Computer Studies. Therefore, ICT infrastructure investments and Computer Studies teachers' recruitment are critical to the successful delivering the computer studies curriculum. This study, therefore, sought to analyse the availability of the two critical educational inputs (qualified teachers and computer laboratories) in Zambia's public secondary schools with a focus on Lusaka city.

1.1 Statement of the Problem

Delivering any curriculum requires the availability of educational inputs which include trained teachers and teaching aids in the correct proportions. Since the introduction of Computer Studies as a subject in secondary schools in 2013, teaching this subject has been marred with a lot of challenges relating to the provision of the necessary educational inputs. The Zambian Parliamentary Committee on Education, Science and Technology has observed that the majority of the schools are not equipped with the basic ICT infrastructure necessary for teaching and learning Computer Studies (National Assembly of Zambia, 2019). Further, Mulauzi et al, (2020) observed that the condition of some computer laboratories in schools is not good to support the teaching and learning of computer studies. It has also been observed that the implementation of Computer Studies in schools faces a problem of lack of qualified teachers (Mambwe, 2016). Studies by Mambwe (2016); Policy Monitoring and Research Centre (2020); Mulauzi (2020) have failed to qualify the shortage of the two educational materials in terms of teacher-pupil and pupil-computer ratios. Further, many studies (Kaumba et al., 2021; Muleya et al., 2021) on the challenges of teaching computer studies focus on rural areas, neglecting urban towns such as Lusaka city. It was therefore imperative that a study was conducted in Lusaka city to critically analyze the availability of these two educational inputs, critical to the successful implementation of computers studies curriculum in public secondary schools in Zambia. Lusaka.

1.2 Objectives of the Study

The main objective of the study was to investigate the availability of qualified teachers and computer laboratories needed for the teaching of computer studies in public secondary schools in Lusaka. The study specifically sought to:

- (i) establish the available number of qualified computer studies teachers in schools
- (ii) determine the prevailing teacher-pupils' ratios in computer studies subject,
- (iii) establish the availability of computer laboratories in schools,
- (iv) establish the prevailing the pupil-computer ratio,
- (v) assess the ICT facilities available in computer laboratories.

2 LITERATURE REVIEW

In March 2007, the Zambian government launched its national Information Communication and Technology (ICT) policy. During the launch, the government

emphasized the creation of an innovative, market-responsive, highly competitive, coordinated, and well-regulated ICT industry. To achieve this, the government thought of introducing Computer Studies as a subject to be taught in schools. In 2013, the educational curriculum was reviewed and Computer Studies as a teaching subject was introduced (Mumba, 2016). The introduction of Computer Studies in Zambia was viewed as a major milestone toward creating a digital society in which the use of ICT will permeate all sectors of the economy (Chikumba, 2010). ICT has been viewed as a major tool that spurs national development. Further, ICT is considered to be a tool that could help entrench democratic values in society as it facilitates access to information, hence, fostering participation in the governance of a country (Devia, et al., 2021). Access to information fosters accountability and transparency in the management of public affairs, thus, curbing abuse of resources and corruption. ICT is also a vital tool in fostering the teaching and learning of other subjects in schools. A wide range of educational resources can be accessed through ICT facilities such as the Internet, hence, providing the means to bypass the bottlenecks of access to educational materials (Fu, 2013). In addition, the teaching of Computer Studies to students and children can advance high-order thinking skills such as comprehension, reasoning, problem-solving and creative thinking and enhance employability (Olan'g, 2015). As a result of these and many other benefits of using ICTs, it was salient for the Government of Zambia to begin teaching computer studies as a subject in schools to equip Zambians with ICT skills at an early age in their lives.

2.1 Educational Inputs for Teaching Computer Studies in Schools

Like any other subject, teaching computer studies in school needs various educational inputs. The principal among the inputs is qualified teachers and computer laboratories. According to Olang'a (2015), for successful teaching of computer studies, schools need to mobilize inputs such as qualified teachers, computer laboratories, and textbooks. These educational inputs could be referred to as endogenous inputs because they are school-related inputs that the school has control over. Endogenous inputs include teacher characteristics, student-teacher ratio, student-class room ratio, student-textbook ratio, physical facilities, instructional materials, and school leadership (Ntawiha, 2011). It is important to mention that other educational inputs such as exogenous (which include pupil's background) and financial are cardinal for the teaching of any given subject. These inputs have to be mixed in correct quantities if the intended learning outcomes have to be achieved.

2.2 Qualified Staff in the Delivery of a Curriculum

No matter how good the curriculum could be, the failure of the educational system to recruit qualified teachers to deliver the subject contents to the learners will result in poor educational outputs. A growing number of studies provide conclusive evidence that teacher quality is the primary school-related factor affecting student achievement. Students who are taught by effective and competent teachers excel quickly, while those who are assigned to the least effective teachers lag behind and often never catch up (The United States of America. Congress, 2004). Further,

it has been observed that teacher subject knowledge is greatly associated with student learning (ORCHIDS- The International School, 2021). Well-qualified teachers are important educational input as they possess both theoretical and practical skills in their subject area. Further, qualified teachers know how and when to use various teaching methods and technologies at their disposal. According to ORCHIDS- The International School, 2021 (2021), a qualified teacher can provide various educational resources and connect with the learners easily.

The introduction of computer studies in schools in many sub-Saharan Africa is punctuated by a shortage of qualified teachers. This important educational input (trained teachers) in many countries in the region is in short supply, hence, affecting the effective teaching of computer studies in schools. In Malawi, a study conducted by Chikumba (2010) cited the need for the Government of Malawi to invest in staff as a way to improve the performance of public schools in a computer science subject. He observed that among other things, private schools had more qualified computer studies teachers, hence; they performed better in this subject compared to the public schools. In Tanzania, Olang'a (2015) observed that most schools do not effectively implement computer studies subjects. This is because of a lack of competent qualified teachers. In Zambia, many studies on the implementation of computer studies have highlighted the lack of or inadequate qualified computer studies teachers as one of the major challenges schools are facing in teaching computer studies. Studies by Mambwe (2016); Mulauzi et al, (2020); Policy Monitoring and Research Centre, 2020); Masumba and Mulenga (2019) have established that the shortage of qualified computer studies teachers is one of the major challenges in the teaching of computer studies in schools in Zambia. This problem is said to be acute in rural areas of Zambia. For example, a study conducted by Masumba and Mulenga (2019) in the North-Western province of Zambia among 12 computer studies teachers revealed that only one (1) teacher qualified in computer science. Further, research has shown that in schools where computer science teachers are available, they are over-stretched as they are meant to teach many classes. The teacher-pupil ratio is higher in regard classes of computer science subject. As of 2015, there were 482 computer studies teachers against 96,228 learners, resulting in a pupil-teacher ratio of 199:1 (Policy Monitoring and Research Centre, 2020). This pupil-teacher ratio is very high for successful quality education delivery.

2.3 Computer Laboratories in Schools

In teaching computer studies, a computer laboratory is so critical that its absence can result in producing graduates with only theoretical knowledge. A computer laboratory is a room or space equipped with computers (networked or not) devoted to pedagogical use in a school. A computer laboratory must be safe from any disruptive, non-pedagogical content; pupils and teachers may need authorized access credentials (UNESCO, 2022). It is a nerve centre of computer studies in schools. A computer laboratory is a special place in a school where the computers and all other devices are found. It is also a place where practical or the application of the

knowledge of computer can be utilized. Therefore, in a computer laboratory, students are exposed to the real knowledge of computer applications using both computer hardware and software (Olan'g, 2015). A computer laboratory is also needed for students to practice how to use various computer packages which include Word Processing and Excel (Sharma, 2019). There are three common types of computer laboratories, namely the classical laboratory (with desktop computers), the mobile laptop laboratory (that moves from classroom to classroom), and the mini-laboratory which is located in an individual classroom for a teacher to use in her daily work without having to leave her classroom (Demand Media, Inc., 2011).

In Zambian schools, the practice is to have a fixed computer laboratory structure with desktop computers and other equipment permanently placed in the laboratory. However, some schools have temporal computer laboratories. As of 2018, the country had a total of 2,811 computer laboratories in schools of which, 2,584 were permanent, 113 were temporal (mobile) and 114 were incomplete laboratories (Policy Monitoring and Research Centre, 2020). Studies by Classroom (2018) and Zambia's Ministry of General Education (2019) have revealed that the Zambian educational system has an insufficient number of computer laboratories to support the teaching of computer studies. A study by Mambwe (2016) in Luapula province of Zambia revealed that 17.6% of the surveyed schools had a computer laboratory while 82.4% did not. Further, a study conducted by Nkhoma (2019) in four (4) districts of Zambia among 134 teachers and senior educational officers revealed that many schools lacked ICT facilities which included computer laboratories (Nkhoma, 2019).

In schools with computer laboratories, computers are not enough. A lot of pupils are reported to be sharing one computer. There is a high pupil-to-computer ratio of 10:1 in some parts of the country such as Luapula province. (Mambwe, 2016). In some schools, one computer is shared by more than 10 pupils. This is against the widely accepted pupil computer ratio in schools of 6:1 (The United States of America. National Centre for Educational Statistics, 1999). Furthermore, many schools in Zambia lack other information and communication technology tools such as the Internet. A study by Nsama et al., (2021) among 324 teachers in Lusaka, Copperbelt, and Eastern and Luapula provinces of Zambia revealed that 98.6% of respondents indicated that they had poor internet and other multimedia platforms in their schools.

Apart from having computers, a computer laboratory should have other basic equipment and facilities which include internet connectivity, server hardware, projector/s, and air conditioning units. All devices in a computer laboratory should have access to the Internet (The University of Chicago, 2022). This is to ensure that learners and teachers have access to learning resources available on the Internet. To facilitate the sharing of files, equipment, and software and provide hosting services, a computer laboratory need to have a server. The server can also be used to filter the external information the clients can access, for example, by blocking Facebook and other sites that may be a distraction to the learners (Classroom, 2018). Air conditioning

units are needed to protect the equipment by controlling the temperature in the laboratory. Computer systems that retain optimal cool temperature ranges work faster and more efficiently, and this drastically reduces general wear and tear (General Machanical, 2017). Projectors whether interactive or data projectors are essential to teaching technical subjects such as computer studies. They enable teachers to make PowerPoint presentations thereby allowing learners to take better notes and discern what the teacher is explaining. Projectors enable teaching to be more visually engaging which, in turn, can help to increase attention (Diggins, 2018).

The above studies reviewed in this study have attempted to address the problem under investigation. However, some of the studies have been generally highlighting the challenges of implementing computer studies in school without analyzing the severity of the challenges in urban and rural areas. For example, the studies by Nkhoma (2019); Policy Monitoring and Research Centre (2020); Mulauzi et al, (2020), and Nsama, et al., (2021) have revealed the general lack of qualified computer studies teachers and lack of computer laboratories at the national level. They have neglected to show how acute is the shortage of qualified computer science teachers and the lack of computer laboratories in schools in Zambia among urban and rural schools. Further, studies by Mambwe (2016); Masumba and Mulenga (2019) have highlighted the shortage of qualified teachers to teach computer studies and computer laboratories only in rural areas. They have not tackled the shortage of these two educational resources in urban schools. Further, the above-reviewed studies have not endeavored to survey the availability of equipment and other facilities in computer laboratories that are key to the successful delivery of the computer studies curriculum. Due to the gaps in the reviewed studies, this study was conducted to establish if Lusaka city like other areas in Zambia lacks computer studies teachers and computer laboratories. Furthermore, this study was conducted to establish the extent to which equipment and facilities such as the Internet, servers, air conditioning units, and projectors are available in public schools in Lusaka city.

3 RESEARCH METHODOLOGY

The study was both qualitative and quantitative in design. This implies that both quantitative and qualitative strategies were employed in data collection. A survey approach was employed in which data were collected from a sample of all public secondary schools. A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population (Borg and Gall, 1989). The population of the study comprised 72 public secondary schools. A simple 50 public schools in Lusaka city were randomly selected using a simple random method to take part in the study. The sample was large to ensure the validity of the research findings. Quantitative data was collected using a questionnaire which was answered by a teacher of computer studies or a person in charge of the computer studies section in a school. Qualitative data was collected through interviews to validate quantitative data. Further, qualitative data was analyzed through content analysis technique where the researcher

interviewed then coded and transcribed the data that were checked for emerging themes consistent to the objectives of the study. Additionally, quantitative data were analyzed using software called Statistical Package for Social Sciences (SPSS) and descriptive statistics were generated.

4 FINDINGS

Table 1 presents the characteristics of respondents. In terms of gender, the majority (60%) of the computer studies teachers were males while 40% were females. Further, the majority (50%) of computer studies teachers are aged between 31-40 years.

Table 1: Characteristics of Respondents

Variable	Value	Frequency	Percent (%)
<i>Gender</i>	Male	30	60
	Female	20	40
<i>Age (years)</i>	< 30	12	24
	31 – 40	25	50
	41 – 50	12	24
	51>	1	2

4.1 Training in Computer Studies

Figure 1 shows that the majority (76.0%) of the teachers of computer studies in Lusaka city have received training in Computer Studies or Information and Communication Technologies (ICTs) while 24% indicated not having been trained to teach computer studies or ICTs.

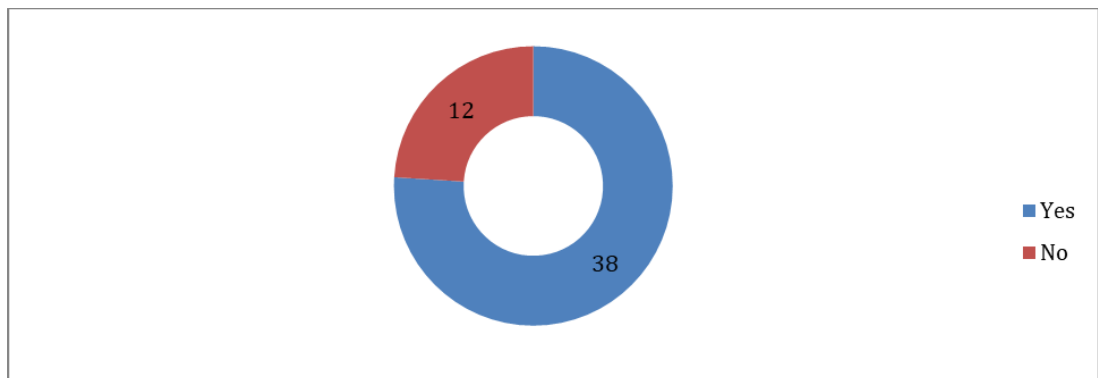


Figure 1: Having Trained in Computer Studies or ICTs

The study findings in Table 3 have revealed that almost all (11) the teachers of computer studies without specialized training in Computer studies or ICTs are found in combined schools. The combined schools in Zambia were initial primary or basic schools which have been upgraded into day secondary schools. They cover both primary and secondary levels of education.

Table 3: Computer Teacher by Training and School Status

		School Status				Total
		<i>Girls Boarding School</i>	<i>Boys Boarding School</i>	<i>Combined Day and Boarding School</i>	<i>Combine d Day School</i>	
Computer Teacher by Training	<i>Yes</i>	0	1	3	34	38
	<i>No</i>	1	0	0	11	12
Total		1	1	3	45	50

The study findings in Table 4 show that many (55.2%) teachers of computer studies possess a diploma qualification in computer studies or ICTs. Further, Table 4, shows that there is a considerable high percentage (42.1%) of teachers with a first degree in computer studies/ICTs who are teaching computer studies in public schools in Lusaka city.

Table 4: Level of Training in Computer Studies

		Level of Training		
		<i>Diploma</i>	<i>Bachelor's Degree</i>	<i>Master's Degree</i>
Having Trained in Computer Studies	<i>Yes</i>	21(55.2%)	16 (42.1 %)	1 (2.6%)
	<i>No</i>	7 (58.33%)	4 (33.3%)	1 (8.3%)
Total		28 (56%)	20 (40%)	2 (4%)

4.2 Teacher- Pupil Ratio in Computer Studies

The teacher-pupil ratio is very high. In almost all the schools in Lusaka, one teacher is teaching more than 146 pupils. In some schools, the teacher-pupil ratio is as high as 1 teacher to 276 pupils (1:276). A teacher named **A** coming from a high-ranked Day Secondary School (a grade 1 school) in Lusaka explained that she teaches five classes of junior secondary level with an average of 55 pupils in each class.

“I teach three grade 8 classes with 55 pupils in each class. I also teach two grade 9 classes, one with 56 pupils and the other class with 55 pupils” said teacher A.

Another teacher named **B** from a Day Secondary School explained that she teaches two classes for G 8 and G9 with 60 and 70 students respectively.

“I handle two classes of computer studies. A grade 8 class with 65 pupils and a grade 9 class with 70 pupils” said teacher B.

Teacher **C** from a Technical Boarding School indicated that the school has eight classes for Junior secondary; 4 grade 8 classes and 4-grade classes with 40 pupils in each class. The teacher further explained that at the senior secondary level (G10, G11, and G12); there is one class of computer studies with 40 pupils in each class. The school only has three computer studies teachers to teach these eleven (11) classes.

4.3 Availability of Computer Laboratories in Schools

The study findings show that almost all the surveyed schools have a computer laboratory. As can be seen in figure 2 below, 49 (98%) of the schools indicated having computer laboratories while one (2%) had no computer laboratory.

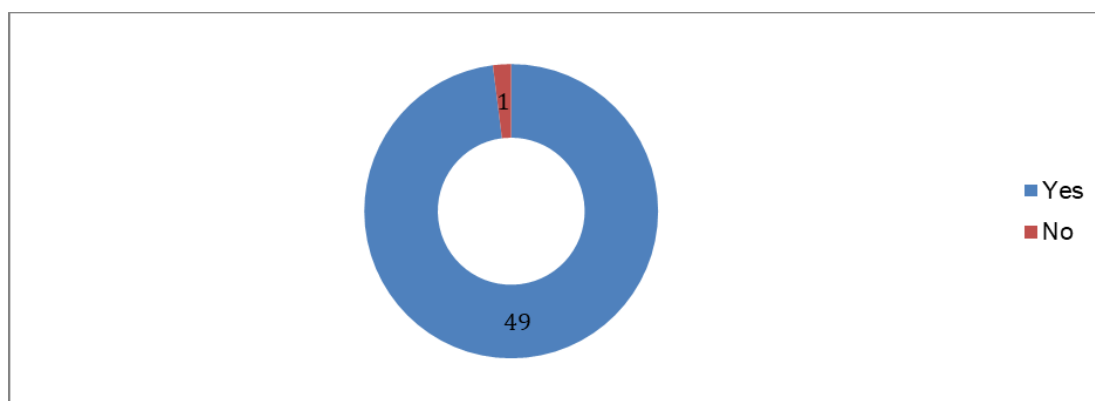


Figure 2: Availability of Computer Laboratories in Schools

As can be seen in Table 5, that 34% of the schools indicated having a computer laboratory with computers in a range of 11-20 while 32% of the schools had computers in the range of 21-30. Very few schools (4%) reported having computers in the range of 1-10.

Table 5: Number of Computers Available in a Computer Laboratory

Range	Frequency	Percent (%)
1 – 10	2	4
11 – 20	17	34
21 – 30	16	32
31 – 40	7	14
41 – 50	5	10.
51 +	2	4
N/A	1	2
Total	50	100

4.4 Computer- Pupil Ratio in Schools

In terms of pupil-computer ratio, Table 6 shows that in many schools, the computer-pupil ratio is good. Many schools are having a situation where one computer is shared by 2 or 3 pupils. However, there is also a high (24%) proportion of schools where more than 7 students are sharing one computer as shown in Table 7.

Table 7: Computer - Pupil Ratio

Computer - Pupil Ratio	Frequency	Percent (%)
1 to 1	2	4
1 to 2	16	32
1 to 3	12	24
1 to 4	3	6
1 to 5	2	4
1 to 6	2	4
1 to 7 +	12	24
N/A	1	2
Total	50	100

The results have further shown that the high computer pupil ratio is higher in combined day secondary schools. As indicated earlier, combined schools were initially constructed to be primary schools but were upgraded to allow the enrolment of secondary school pupils.

Further, the study has revealed that many schools do not have information and communication facilities such as Internet connectivity. As captured in table 6, 64% of the Schools reported not having internet connectivity in their computer laboratories. Further, 76% of schools reported not having computer servers. However, 50% of the schools reported having air conditioning units and while 76% indicated having data projectors in the computer laboratories.

**Table 6: Availability of Information Communication Technology Facilities in
Computer Laboratories**

ICT Facility	Available	Not Available	N/A
Internet Connectivity	17 (34%)	32 (64%)	1 (2%)
Computer Servers	11(22%)	38 (76%)	1 (2%)
Air Conditioning	25 (50%)	24 (48%)	1 (2%)
Projectors	38 (76%)	11(22%)	1 (2%)

5 DISCUSSION OF FINDINGS

The findings above have shown that the majority (76%) of the teachers of computer studies in Lusaka, the capital city of Zambia are trained in computer Studies or ICTs. The majority of teachers possess a diploma qualification in computer studies/ICT. This is contrary to a study by Masumba and Mulenga (2019); Mambwe (2016); Mulauzi et al, (2020) which found that many teachers that teach computer studies in schools are not qualified. This implies that many teachers who teach computer studies in Lusaka have the requisite qualifications to teach the subject. The study has however revealed that the qualified computer studies teachers are not enough to teach the many classes of computers studies classes that exist in Lusaka city public schools. As observed in the findings, the teacher-pupil ratio is very high in computer studies with some schools having one teacher teaching 276 pupils. The over-stretching of this educational resource has resulted in staff burnout

which indirectly affects the quality of education being provided. The teacher-pupil ratio in computer studies in Lusaka city is higher than the country's teacher-pupil ratio in secondary schools reported by the Ministry of General Education for the year 2019 which stood at 1:29.7 (Ministry of Education Zambia, 2019).

It has also been established that many schools in Lusaka that were found not to have qualified computer studies teachers are combined schools. These schools were previously basic and were recently upgraded to the status of day secondary schools. In these combined schools, Mathematics or Commerce teachers are assigned to teach computer studies. Follow-up interviews with some teachers revealed that the lack of computer studies teachers in some public secondary schools is partly due to the administrative inefficiency in the allocation of qualified teachers. In this regard, some teachers who obtained a qualification in computer studies or ICTs are still teaching in primary schools instead of assigning them to secondary schools.

The findings of this study have revealed that almost all (98%) of the public secondary schools in Lusaka have computer laboratories and the majority (67%) of the schools have computers in the range of 11-30. These findings are significant because they contradict the findings by Mambwe (2016) who in Luapula province of Zambia established that more than 82.4% of schools had no computer laboratories. This entails that almost all public secondary schools in Lusaka city do have computer laboratories to facilitate the teaching of computer studies. However, the follow-up interviews with some teachers revealed that some computers in the laboratories are not functional, thereby reducing the number of computers available for pupils to use during practical lessons. The computer-pupil ratio appears to be good in many of the schools surveyed with 56% of schools having 1:2 and 1:3 ratios. This is against the findings of Mambwe (2016) who found the computer-pupil ratio in public schools in Luapula province to be at 1: 10. It is also important to mention that, some (24%) public secondary schools in Lusaka city still have a computer-pupil ratio of as high as 1:7. This implies that in some public schools in Lusaka city, many pupils use one computer during practical lessons. The high computer-pupil ratio hurts the impartation of practical computer /ICT skills. It will result in producing graduates without practical skills needed in the 21st century.

In terms of the availability of ICT facilities and equipment in computer laboratories in public schools in Lusaka city, many (64%) of the computer laboratories are not connected to the Internet. In 2020, the Policy Monitoring and Research Centre observed that many public schools in Zambia had no internet connectivity. This situation seems not to have improved. This implies that pupils and teachers cannot use the computer laboratories to access the Internet to do research, not only in computer studies subjects but also in other subjects. The findings of the study have also shown that very few (22%) schools have computer servers in their computer laboratories. In the absence of servers, schools are unable to among other things, host web-based systems such as school management systems and school websites. Further, without servers, schools cannot share resources such as printers and are unable to control access to undesired websites on the Internet. It is however gratifying to observe that majority (76%) of the schools

have general data projectors in their computer laboratories. According to Davis (2022), data projectors are widely used in classrooms. Data projectors are an essential teaching tool for the successful delivery of practical subjects such as computer studies as they enable teachers to project lessons, thereby, enabling the learners to see what the teacher is talking about. Further, 50 % of computer laboratories in Lusaka have air conditioning units to regulate the temperature in the laboratory. This implies that in half of the surveyed schools, computer equipment is not protected from excessive heat, which may cause malfunction of the equipment in the computer laboratory.

6 CONCLUSION AND RECOMMENDATIONS

It can be said that many public secondary schools surveyed in Lusaka city have qualified teachers to teach computer studies. This is contrary to what is happening in other parts of the country where teachers without prior training in computer studies or ICTs are teaching computer studies in schools. However, there is a high teacher-pupil ratio in schools in Lusaka; few teachers are teaching many pupils. It has also been established that almost all public secondary schools in Lusaka city do have a computer laboratory with the majority having a lower computer-pupil ratio of 1:2 and 1:3. The study has also established that half of the laboratories have air conditioning units to control the temperature and that 76% of the public secondary schools have data projectors for teaching computer studies. However, many laboratories studied have no internet connectivity and do not have server computers. Arising from the above findings, the following recommendations are made:

- (i) The Government of Zambia should ensure that more qualified computer studies teachers are deployed in schools to allow only qualified teachers to teach computer studies and reduce the teacher-pupil ratio.
- (ii) School managers should ensure that all computer laboratories have internet connectivity.
- (iii) School authorities should ensure that computer laboratories have air conditioning units to control the temperature in the laboratories.

Borg, W. & Gall, M., 1989. *Educational Research*. New York: Longman Publishers Ltd.

Brzozowski, M. & Keydar, E. J. (2017) Approaches towards Measuring Success in Public Elementary Schools. In: *Handbook of Research on Managerial Solutions in Non-Profit Organizations*. s.l.: IGI Global, pp. 1-22.

Center for Global Development (2020) *Grade Repetition in Developing Countries: Repeat to Fail or Second Time's a Charm?*. [Online]

Available at: <https://www.cgdev.org/blog/grade-repetition-developing-countries-repeat-fail-or-second-times-charm>

[Accessed 14 February 2022].

Chikumba, P. A. (2010) student Performance in Computer Studies in Secondary Schools in Malawi. In: I. A. R. K. J. A. V. Radu Popescu-Zeletin, ed. *E-Infrastructures and E-Services for Developing Countries*. Berlin: Springer, p. 113–121.

Classroom (2018) *The Equipment Needed for a Computer Lab*. [Online]

Available at: <https://classroom.synonym.com/list-equipment-needed-computer-lab-8388086.html>

[Accessed 1 June 2022].

Cooze, J. (1991) *The Elusive Concept of Efficiency in Education*. [Online]

Available at: <https://www.mun.ca/educ/faculty/mwatch/vol1/cooze.html>

[Accessed 7 February 2022].

Davis, Z., (2022) *Data Projector*. [Online]

Available at: <https://www.pcmag.com/encyclopedia/term/data-projector>

[Accessed 1 June 2022].

Demand Media, Inc (2011) *Computer Labs in Schools*. [Online]

A v a i l a b l e

a t :

http://colccti.colfinder.org/sites/default/files/guyana/resources/KD/KD%20M04U01%20Docs/Computer%20Labs%20in%20Schools%20%20eHow_com.htm#:~:text=The%20traditional%20one%20Droom%20computer,without%20having%20to%20leave%20her

[Accessed 10 May 2022].

Devia, R., Dekab, N. and Devi, R. (2021) Role of Information and Communication Technology (ICT) in Good Governance Process. *Turkish Journal of Computer and Mathematics Education*, 12(10), p. 6387 – 6390.

Diggins, A. (2018) *Projectors: An Educational Mainstay*. [Online]

Available at: <https://edtechnology.co.uk/latest-news/the-show-must-go-on/>

[Accessed 1 June 2022].

Economics Online (2020) *Efficiency*. [Online]

A v a i l a b l e

a t :

https://www.economicsonline.co.uk/business_economics/efficiency.html/#:~:text=There%20are%20several%20types%20of,dynamic%20efficiency%20and%20social%20efficiency

[Accessed 7 February 2022].

Economics.Help (2019) *Dynamic Efficiency*. [Online]

Available at: <https://www.economicshelp.org/microessays/costs/dynamic-efficiency/>

[Accessed 7 February 2022].

Education.stateuniversity.com (2022) *Zambia Educational System: Overview*. [Online]

Available at: <https://education.stateuniversity.com/pages/1698/Zambia-EDUCATIONAL-SYSTEM-OVERVIEW.html>

[Accessed 11 February 2022].

- Fhi360; Education Policy and Data Centre (2018) *National Education Profile_Zambia*, Lusaka: fhi360 and Education Policy and Data Centre.
- Fu, J. S. (2013) ICT in Education: A Critical Literature Review and Its Implications. *International Journal of Education and Development using Information and Communication Technology*, 9(1), pp. 112-125.
- General Mechanical, (2017) *The Importance of Computer Room Air Conditioning Systems in Chicago*. [Online]
Available at: <https://www.genmechanical.com/blog/importance-computer-room-ac>
[Accessed 1 June 2022].
- Ghose, A. (2017) *The efficiency of elementary education in India: Empirical Evidence Using a Nonparametric*. NewDelhi: Springer.
- Helaine, A. (2018) *The Equipment Needed for a Computer Lab*. [Online]
Available at: <https://classroom.synonym.com/list-equipment-needed-computer-lab-8388086.html>
[Accessed 10 May 2022].
- Investopedia, (2020) *Economic Efficiency*. [Online]
Available at: https://www.investopedia.com/terms/e/economic_efficiency.asp
[Accessed 7 February 2022].
- Issahaque, M., (2010) *An Assessment Of The Internal Efficiency Of Basic Education In The Wa Municipality Of The Upper West Region (Thesis)*, Capetown: University of Cape Coast.
- Johnes, J., Portela, M. and Thanassoulis, E., (2017) Efficiency in education. *Journal of the Operational Research Society* (2017) 68(4), p. 331–338.
- Kaumba, M., MPH AHLELE, R.S.S., Muleya, G. and Simui, F., 2021. Disablers and enablers in the uptake of information communication technologies in rural primary schools of Mwinilunga District, Zambia. *Journal of Educational Technology and Online Learning*, 4(1), pp.1-10.
- Levin, H. (1997) Raising school productivity: An x-efficiency approach. *Economics of Education Review*, pp. 303-311.
- Lockheed, M. E. and Hanushek, E., (1994) *Concepts of Educational Efficiency and Effectiveness*, s.l.: HRO.
- Mambwe, G., (2016) *Barriers to Effectively Teach Computer Studies in Selected Government Junior Secondary Schools of Mwanabombwe District of Luapula Province*, Lusaka: The University of Zambia.
- Masumba, C. K. & Mulenga, I. t. M. (2019) Teachers' pedagogical content knowledge for teaching Computer Studies in rural Zambian secondary schools of North-western Province. *Zambia Journal of Library and Information Science*, 3(1 & 2), pp. 90-106.
- McCaffrey, D. (2010) Theoretical Concepts in the Economics of Education. In: *International Encyclopedia of Education (Third Edition)*. s.l.:Elsevier, pp. 193-198.
- Ministry of Education Zambia, (2019) *Educational Statistical Bulletin*, Lusaka: Ministry of Education.
- Mulauzi, F., Walubita, G. & Pumulo, J., (2020) Introduction of Computer Education in the curriculum of Zambian Primary and Secondary Schools; Benefits and Challenges. In: M. K. Banja, ed. *Selected readings in education*. Lusaka: Marvel, pp. 56-71.

- Muleya, G., Kaumba, M., Mphahlele, R. and Simui, F., 2021. Disablers and enablers in the uptake of information communication technologies in rural primary schools of Mwinilunga District, Zambia.
- Mumba, C., (2016) *Computer Studies Curriculum Implementation in Secondary Schools in Mufumbwe District (Thesis)*, Lusaka: The University of Zambia.
- Muntholib, Hidayat & Ariani, . R. (2018) Computer Laboratorium Management to Increase the Information And Communication Technology Skills (ICT) Student Vocation High School in the Whole Province Of Jambi. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 8(3), pp. 66-69.
- Nasib, T. (2017) *Economics of Education: What are the different types of efficiency and how do they relate to education?*. [Online]
Available at: <https://mysominotes.wordpress.com/2017/09/23/economics-of-education-what-are-the-different-types-of-efficiency-and-how-do-they-relate-to-education/#:~:text=Simply%20stated%2C%20efficiency%20is%20realizing,a%20given%20level%20of%20inputs.>
[Accessed 7 February 2022].
- Nath, S. R., (2006) Internal Efficiency of Secondary Educational. *Bangladesh Education Journal Vo.5 No.1*, pp. 27-39.
- National Assembly of Zambia, (2019) *Report of the Committee on Education, Science and Technology for the Third Session of the Twelfth National Assembly*, Lusaka: National Assembly of Zambia.
- Nkhoma, N., (2019) An Investigation on The Challenges of Introduction of Compulsory ICT Education in Schools. *The International Journal of Multi-Disciplinary Research*, pp. 1-13.
- Nsama, P. et al., (2021). Challenges in the Investment of ICT Infrastructure at Secondary School in Zambia, in Promoting Quality. *International Journal of Research and Innovation in Social Science*, 5(7), pp. 269-279.
- Ntawiha, P., (2011) *Educational Inputs and their Implications for Output in Public Secondary Schools in Nyarugenge and Nyamasheke Districts, Rwanda*, Nairobi: Kenyatta University.
- Olan'g, Z. G., (2015) *Effectiveness of Teaching Computer Studies*, Mzumbe: Mzumbe University.
- ORCHIDS- The International School, (2021) *Why a Well Qualified Teacher is Important*. [Online]
Available at: <https://www.orchidsinternationalschool.com/blog/teachers-corner/importance-of-well-qualified-teacher/>
[Accessed 7 August 2022].
- Oxford University Press, (2022) *Oxford Reference*. [Online]
Available at: <https://www.oxfordreference.com/view/10.1093/oi/authority.20110803100309512>
[Accessed 13 February 2022].
- Policy Monitoring and Research Centre (2020) *Implementation Status and Challenges of ICTs In Zambian Schools*, Lusaka: Policy Monitoring and Research Centre.
- The Republic of Zambia.Ministry of Education (2010) *Education Sector: National Implementation Framework III-2011-2015*, Lusaka: Government Printer.
- Shafika, I., (2007) *SURVEY OF ICT AND EDUCATION IN AFRICA: Zambia Country Report*, Lusaka: infoDev.
- Sharma, V. K. (2019) *Importance of Computer Laboratory in School*. [Online]
Available at: <https://www.klientsolutech.com/importance-of-computer-laboratory-in-school/>
[Accessed 10 May 2022].

- The Republic of Zambia. Ministry of General Education, 2019. *The 2019 Educational Statistical Bulletin (ESB)*, Lusaka: Ministry of Education.
- Scholar pro, 2021. *Education System in Zambia*. [Online]
Available at: <https://www.scholaro.com/pro/Countries/Zambia/Education-System>
- The School of Princeton, (2019) *Everything You Need To Know About Student-Teacher Ratios*. [Online]
Available at:
<https://www.hunschool.org/resources/student-teacher-ratios#:~:text=The%20student%2Dteacher%20ratio%20refers.and%20care%20to%20their%20students.>
[Accessed 14 February 2022].
- The United States of America. Congress (2004) *The Importance of Highly Qualified Teachers in Raising Academic Achievement*, Washington: Government Printing Office.
- The University of Chicago (2022) *Computer Laboratory*. [Online]
Available at: <https://oi.uchicago.edu/research/computer-laboratory/computer-laboratory-facilities>
[Accessed 1 June 2022].
- The World Bank, (2022) *Education Statistics (EdStats)*. [Online]
Available at: <https://datatopics.worldbank.org/education/wDHS/hLink#:~:text=Back-Completion%20rate%2C%20primary,children%20of%20official%20graduation%20age.>
[Accessed 13 February 2022].
- UNESCO Institute of Statistics (2009) *Education Indicators: Technical Guidelines*, Paris: UNESCO.
- UNESCO. International Bureau of Education (2022) *External efficiency of education*. [Online]
Available at: <http://www.ibe.unesco.org/en/geqaf/annexes/technical-notes/external-efficiency-education>
[Accessed 7 February 2022].
- UNESCO (2022) *Computer laboratory*. [Online]
Available at:
<http://uis.unesco.org/en/glossary-term/computer-laboratory#:~:text=Definition,may%20need%20authorized%20access%20credentials.> [Accessed 9 May 2022].
- UNESCO's International Institute for Educational Planning, (2022). *Internal efficiency*. [Online]
Available at: <https://learningportal.iiiep.unesco.org/en/glossary/internal-efficiency>
[Accessed 8 February 2022].
- UNFPA & AFIDEP (2015) *Accelerating human capital development to optimise Zambia's chances of harnessing the demographic dividend*, Lusaka: UNFPA & AFIDEP.
- UNICEF (2019) *Zambia Education Budget for 2019*, [Lusaka]: UNICEF.
- The United States of America. National Centre for Educational Statistics (1999) *Internet Access in U.S. Public Schools and Classrooms: 1994-1999*
- Wovo.org (2021) *What are the Types of Computer Laboratory?*. [Online]
Available at: <https://www.wovo.org/what-are-the-types-of-computer-laboratory/#3>
[Accessed 11 May 2022].

Libraries and STEM Education in Zambia: A Case Study of 15 Selected School Libraries

By

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ABSTRACT

In recent years, many technological interventions have surfaced, such as virtual worlds, games and digital laboratories that aspire to link young people's interests in technology and social networks to learning about science, technology, engineering and mathematics (STEM) areas. Despite the tremendous interest surrounding young people and STEM education, the role of school libraries in these initiatives is rarely examined. Using Purposive sampling, the study selected 15 librarians, 15 head teachers, 45 Science, Mathematics and Technology (SMT) teachers and 150 learners, 10 from each of the 15 participating school.

Study findings revealed that libraries in the 15 schools: 1. did not have adequate suitably qualified librarians that would support learners in STEM education. 2. Librarians collaborated with teachers to implement STEM learning activities. 3. Librarians engaged in scientific practices by facilitating the creation of maker-labs. Also the findings revealed that participants were drawn from grade twelve learners only since they have had long experience of study in the STEM subject's areas. Hence, they could give the researchers the data pertaining to the usage of the libraries. The study used structured and semi-structured questionnaires.

The study findings have implications for the Ministry of Education as they would help serve as a basis for decision-making and/or intervention in libraries and promote in STEM learning through libraries to attain aspirations of the Eight National Development Plan (8th NDP). The study concluded the libraries in schools were proactively embracing STEM and were creating spaces for the various learning activities to be conducted.

Keywords: *STEM education, STEM, School Libraries, Technology, Science education, Education*

1 INTRODUCTION

In today's fast changing world that is advocating for and embracing Science, Technology, Engineering and Mathematics (STEM) Education, libraries are great sources of dynamic formats for learning. Studies suggest that libraries offer information collections that include science, mathematics, psychology, computer science, technology, engineering and social science information resources in diverse formats (Nqwira et al., 2020). In conformity with global changing trends in education patterns, libraries in schools and universities in Zambia play a vital role in education by providing conducive environments for accessing information resources by teachers, learners and researchers in order to keep abreast with current knowledge regarding theory and practice in various subject areas. Libraries can also be argued to be avenues for the development and enhancement of literacy and life skills.

Additionally, Zambia, in its eighth national development plan (8NDP) has placed emphasis on providing education and skills development through implementation of a number of strategies. One of the strategies is the enhancement of science, technology and innovations (STIs) achieved through promoting science, technology, engineering and mathematics (STEM) education in secondary schools in Zambia (Ministry of National Development Planning, 2022). It must be pointed out that STEM learning also occurs in informal environments such as science fairs that are organized as JETS fairs, science museums and aquariums provide access to a type of thinking in the form of interactive learning (Ministry of General Education, 2019). However, at the center of the interconnections of strategies to achieve STEM education in Zambia are libraries that must provide accessibility to information for learners in these schools. Therefore, as libraries increase their capacity to offer information to support STEM education, they are expected to adapt their spaces and services to make available necessary information that would promote disciplinary thinking and lifelong learning.

2 LITERATURE REVIEW

2.1 Libraries in STEM education

Science, Technology, Engineering, and Mathematics (STEM) education has been discussed as a critical issue inside and outside of schools, and a large share of funds have been invested to encourage students and to increase educators' interests and efforts in STEM fields (Sintema, 2020). Teachers in traditional classrooms did not encourage student's interest in STEM fields. Moreover, the lecture-type classrooms did not facilitate student's improvement in critical thinking and problem solving skills. According to the 2011 report from the Federal Inventory of STEM Education Fast-Track Action Committee and Committee on STEM Education National Science and Technology Council, of the total 3.4 billion dollars spent by US Federal agencies on STEM education, about 1.1 billion dollars was invested in K-12, and hundreds of programs were implemented within the boundaries of STEM education (Bell et.al, 2009).

Like any other countries, in order to improve STEM education in Zambia, there is great need to increase focus on problem identification and solving so as to tailor outcomes according to the needs and demands of the nation. This can be achieved by improving the links between learning institutions and technology organizations through creating strategies that will allow learners to learn using research with the help of librarian. (Ministry of General Education, 2020). STEM education depends on the ability of librarians to interpret and carefully select information materials correctly to help the learners and teachers. Vasquez, Sneider and Comer (2013) asserts libraries view their role in STEM education as an autonomous one. They select and decide what to give the users from the prescribed curriculum. Since implementation takes place through the interaction of the learner and planned learning opportunities, the role and influence of the librarian in the process is indisputable.

2.2 Libraries as Technology Allies

The potential for school librarians to be technology allies in their institutions is usually under explored. Daily scheduling, lack of planning time, teacher knowledge, and professional development are all limitations that contribute to the lack of technology used by teachers in classrooms. In contrast, school librarians are utilizing emerging technologies in many of the same ways as young people. Green (2014) argues that data by other researchers suggest school librarians are more likely than teachers to communicate and collaborate via digital media tools. With these experiences come unique opportunities for school librarians to become active change agents in their school communities. A few areas that offer potential avenues for innovation include having a voice in education policy, teacher training, and curricular integration for students. School policies may hinder student access to potential learning technologies, but school librarians with technological experience can have an influence in changing these policies. National Research Council. (2012) submits that many US school districts have ill-formed policies on students' social media access due to a lack of experience and understanding of the learning potential of these tools. School librarians can play a vital role in educating administrators and fellow teachers on the potential positive uses of social technologies, online communities, and virtual worlds to enhance STEM learning. In addition, school librarians have a unique opportunity to help shape and develop education policies to broaden student access to new media tools. Another area in which school librarians can provide a voice is through training and modeling innovative technology-enhanced practices to their fellow teachers. Other researchers have argued that lack of teacher knowledge about how to effectively integrate new media tools into the curriculum is a major factor for the lack of innovation in classrooms. School librarians, through their work as instructional partners with teachers, have a ripe opportunity to model new teaching strategies, integrate educational technology, and advocate for exciting change in their schools. with existing school policies or classroom practices (Custer and Daugherty, 2009).

3 RESEARCH METHODOLOGY

3.1 Target Population and Sample

The study was carried out in 15 selected school libraries in Zambia. The study used purposively sampling method to select the schools. The selected schools were from among those that had participated in a capacity building program for teachers of Science, Mathematics and Technology (SMT) and librarians, that was conducted by the Ministry of Education through the Directorate of National Science Centre.

Using Purposive sampling, the study selected 15 librarians, 15 head teachers, 45 Science, Mathematics and Technology (SMT) teachers and 150 learners, 10 from each of the 15 participating school. Participants were drawn from grade twelve learners only since they have had long experience of study in the STEM subject's areas. Further, the participants were selected using a simple random sampling technique used to select the target sample from each class to participate in the focus group discussion

3.2 Data Collection Process

The data collection process consisted of questionnaires and interviews for teachers and librarians while Focus group discussions were also held with the learners in order assess the extent to which they were using the library if any, and investigate changes in their libraries as a result of STEM education.

3.3 Data Analysis

Quantitative data was analyzed using Microsoft Excel Package to generate the graph and the qualitative data was analyzed by coding and synthesizing data.

4 FINDINGS

The Zambian Ministry of Education (1992) stresses that, learning is any change in behavior, information, knowledge, understanding, attitudes, skills or capabilities, which can be retained and which cannot be ascribed to physical growth or to development of inherited behavior patterns. It is the role of education, and librarians to prepare individual learners to live in the 21st society and be able to handle the challenges of life in Zambia (Ministry of Education, 1992). Librarians therefore, should be knowledgeable, effective leaders, innovative and action-oriented role models in classrooms, schools and communities.

The Zambian 'Educating Our Future' document shows that “the amount of time that a learner spends in organized learning activities has bearing on how much they learn and on their subsequent academic performance” (Ministry of Education, 1996:42). Learning and innovation skills including communication and collaboration, critical thinking, problem solving, creativity and innovation are what prepare learners for an increasingly complex life and work environments in today's world.

The findings of the study are as shown in the graph below;

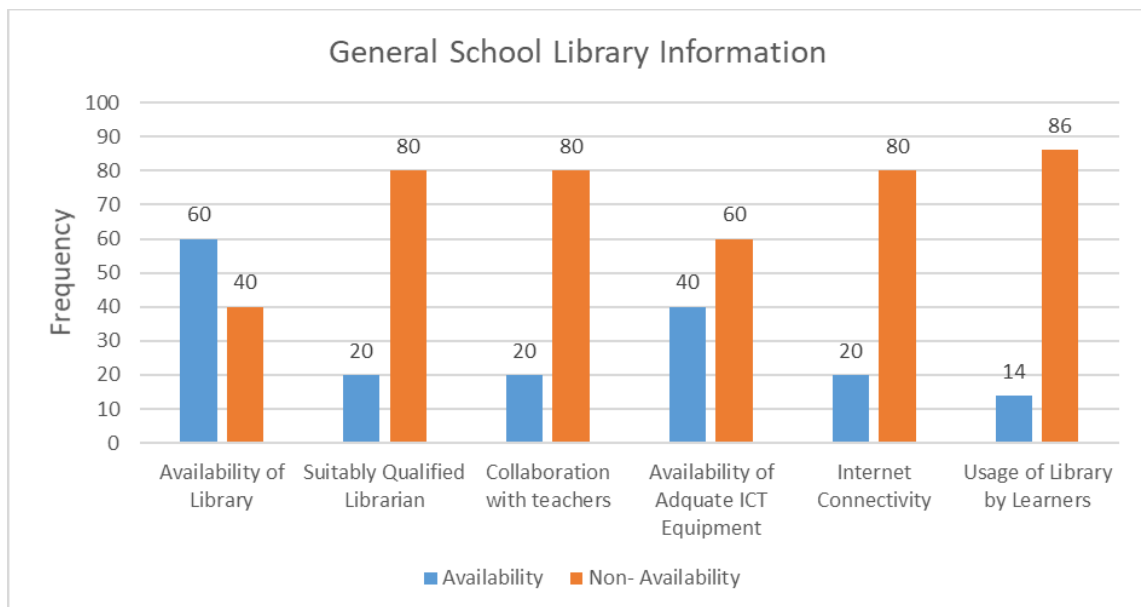


Figure 1: General School Library Information

The results revealed that:

a) Availability of library

[Library Infrastructure](#) in this context means any physical or technology systems that support the operation of Library programs and services. The research revealed that 60 % of the schools had physical library infrastructure, however, even though they had infrastructure available, most had very library furniture i.e. tables, chairs, shelves etc. The study also revealed that a number of had some open source e-books in their collection which they were to supplement the hardcopy information resources.

b) 80.0 % of the schools had no suitably qualified librarians. In this context the not suitably qualified librarians were those that did not have the relevant qualifications in Library and Information Science. Schools had attached teachers to the library to work as the librarian also referred to as 'teacher- librarian'. The challenges revealed by the Teacher librarians during the interview showed that they were overwhelmed with work as they had to attend to their classes and the library too. This in turn resulted in the opening of the library for a few hours only during lunch time for learners to return and borrow the books. In some cases, a pupil was attached to the library to work as the 'Prefect librarian 'in which the challenges faced by the teacher were also faced by the prefect librarian who needed to divide their school time to attend classes and also offer library services to other learners.

The 20% that had suitably qualified librarians revealed that their librarians were actively collaborating with the STEM teachers by aiding them with relevant information resources to support their teaching in various topics and had engaged in the Continuous Professional Development (CPD) programs.

c) 60% of school administrators reported that the ICT equipment was insufficient and not able to meet the school population. ICT equipment which was available included desktop computers, printers and Liquid Crystal Display (LCD) projectors.

d) Furthermore, 20 % of the libraries indicated that they had internet connectivity which was accessed using the routers but faced challenges of poor internet connection from their internet service providers and unstable financial support for data bundles from the administration.

f) 14% of the schools had their learners always use the library for their studying and research purposes. Reasons attributed to the low usage in the findings were operational hours, outdated books and inadequate reading area space. Further, findings indicated that the low usage was also attributed to the lack of library and information skills on the part of those not suitably qualified which affected their competencies of identifying, locating, and using of information resources when offering library services to patrons.

g) Librarians facilitated the process of transitioning from a content collection-only facility to a content creation-inspired maker-labs. The marker-labs are Do It Yourself (DIY) spaces where learners meet to create and invent new things. The goal is to work together to learn, collaborate, and share; and foster innovation through hands-on experimentation. The maker- labs extended learning from the classroom into practical learning in the library by allowing the learners to explore around science by dismantling and reassembling ICT

gadgets as an example. Similarly, it must be pointed out that most participants of the study were drawn from grade twelve learners who seemed to have had longer experience of study in the STEM subject's areas. Hence they could give the researcher the data pertaining to the usage of the libraries.

5 CONCLUSIONS AND RECOMMENDATIONS

The study has determined that libraries were creating conducive environments indispensable for continued STEM learning outside the classroom. The study established that the use of libraries for STEM learning was relatively low and mainly because of inadequate infrastructure and outdated books. Despite learners and teachers having access to the library, the majority did not use the library because of lack of computers and internet to use for their research. The study also showed teachers' willingness to collaborate with librarians through Continuous Professional Development (CPDs) programs was positive as both shared a common interest in who happens to be the learner. Librarians expressed interest to develop skills and knowledge in ICT and STEM education so that they could integrate them in library activities.

The study also observed that learners using the library tend to have less difficulties performing research, STEM activities and collaborative working with their fellow peers compared to those that did not use the library. Further, they perceived using the library for STEM activities using the maker-labs as a good method of learning because they were able to visualize concepts and apply them during the activities in the library.

It must therefore be established that libraries play an important role by creating environments that support STEM learning. It is also worth noting that librarians acknowledge the usefulness of STEM related activities conducted within the libraries that have the potential to enhance development of literacy skills and life skills.

Further, following the revelations in the study, it was recommended that;

- i. Schools must prioritize creation of 21st century libraries
- ii. Government should prioritize the recruitment of suitably qualified librarians
- iii. Libraries must create maker-spaces to encourage and nature innovative STEM activities. *E.g. pupil's projects used as prototypes for practical industrial use*
- iv. Conduct Continuous Professional Development (CPD) programs for librarians to abreast themselves with global trends.

Bell, P., Lewenstein, B., Shouse, A., and Feder, M. (2009) *Learning science in informal environments: People, places, and pursuits*. National Academies Press: Washington, DC.

Custer, R. L. and Daugherty, J. L. (2009) *Professional development for teachers of engineering: Research and related activities*. The Bridge: K-12 Engineering Education.

Dada, Kayode Sunday. (2016) *The role of the library in achieving Vision 2013 Goals: Constructive Engagement of conflict Journal*, Issue 2, No. Retrieved from <http://scalar.usc.edu/works/cec-journal-issue-2/the-role-of-the-library-in-achieving-vision-2030-goals>.

Green, Satasha L. (2014) *STEM Education: How to train 21st Century Teachers*. California: Pearson Publishers.

Ministry of Education. (1992) *Focus on Learning: Strategies for the development of school education in Zambia: report of the team appointed to review investment strategies in education*. Lusaka: Government Printers.

Ministry of Education. (1996) *Educating our future: National policy on Education*, Lusaka: Government Printers.

Ministry of General Education (2019) *Junior Engineers Technicians and Scientists (JETS): Guidelines for Competitions*. Directorate of National Science Center, Lusaka.

Ministry of General Education (2019) *strategic note on STEM Education in Zambia: Guide for implementation of STEM School Education*. Directorate of National Science Centre, Lusaka.

Ministry of National Development Planning (2022) *Eighth National Development Plan: 2022 - 2026*. Ministry of National Development Planning, Lusaka.

National Research Council. (2012) *A framework for k-12 science education: Practices, crosscutting concepts, and core ideas*. National Academies Press. Washington, D.C.

Ngwira, C.M., Sibanda, P., Simpemba, P., Nambala, F.J., Mwiinga, N. and Manyala, R., (2020) December. Increasing STEM Participation in Zambia through Space Science. In *AGU Fall Meeting Abstracts* (Vol. 2020, pp. ED005-03).

Sintema, E.J., 2020. Effect of COVID-19 on the performance of grade 12 students: Implications for STEM education. *Eurasia Journal of Mathematics, Science and Technology Education*, 16(7), p. em1851.

Vasquez J. A., Sneider. G., Comer. M. (2013) *STEM Lessons Essentials - Integrating Science Technology, Engineering and Mathematics*, Heinemann.

Impact of COVID-19 in Higher Education Institutions Mukuba University Experience.

By

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ABSTRACT

Mukuba University is a relatively new university in Zambia, having been transformed from a teacher training college into a university in 2017. As is expected, the university is going through critical transformative stages which include physical and technological infrastructure, development of academic programmes and staffing. Hence, the Covid-19 pandemic could not have come at a worst stage for the university.

Additionally, besides the enormous stress exerted on health systems, the education sector could be considered as one of the most affected by the Covid-19 pandemic. For instance, the teaching and learning processes at Mukuba University are largely physical, i.e. classroom oriented. However, the closure of all learning institutions as a measure to restrain spread of Covid-19 spelt disruption to the two core ends of the university's operations, mode of delivery and mode of access.

The study systematically reviewed university annual reports published at the university from 2019 to 2022. Emerging thematic themes note that the university faced many challenges. It turned to Information and communication technologies for solutions by improving its strategic collaboration with ZAMREN, and local telcos, and, deployed social media and video conferencing platforms to undertake teaching and learning during the Covid-19 pandemic. Even with such a robust undertaking the university still had challenges, namely inadequate ICT infrastructure, adaptation to e-learning and online learning environments. However, the university has taken up on itself to continually invest and improve on its ICTs and other requisite infrastructure as it aims to become a center of excellence.

Conferencing Platforms.

Keywords: *E-learning, Online Learning, NREN Services, Eduroam,, Mobile Phone services, Video*

1 INTRODUCTION

Pandemics always catch nations, institution and people with varying levels of unawareness, even though, with the prevailing technologies, it is possible to make accurate prediction of any disease outbreak. Although predictions of a mammoth influenza pandemic were made as early as 2009, the unprecedented speed at which Covid-19 engulfed the world and its impact could not have been simulated. Collapse of multitudes of national economic sectors have been attributed to the Covid-19 pandemic. The World Health Organization declared Covid19 a Public Health Emergency of International Concern (PHEIC) on January 30, 2020. Initially the infection rate was generally low in Africa, but due to open travels, this status changed even for a land locked country like Zambia by March, 2020.

Apart from the enormous stress exerted on health systems, the education sector could be considered as one of the most affected by the Covid-19 pandemic. Mukuba University is a relatively new university in Zambia, having been transformed from a teacher training college into a university in 2017. It was declared as Public Science, Technology, Engineering and Mathematics (STEM) University. It is located in the Central part of Zambia. It has a student population of about two thousand and academic staff of about fifty. As is expected the university is going through critical transformative stages which include development of physical and technological infrastructure, and, development of academic programmes and staffing. Hence, the Covid-19 pandemic could not have come at a worst stage for the university. This paper outlines challenges the young university faced and how it seized prevailing technologies to provide teaching and learning to its students.

1.1 ICT Infrastructure at Mukuba University

On 18th March, 2020, the Minister of Health in Zambia announced closure of all learning institutions in physical form as a measure to restrain deaths due to Covid-19. The teaching and learning processes at Mukuba University are largely physical, i.e. classroom oriented. The Minister's announcement spelt disruption to the two core ends of the university's operations, mode of delivery and mode of access (Times of Zambia, 2020).

The University had to urgently take stock of and assess available ICT resources in order to provide teaching and learning services in a non-traditional mode, i.e. non classroom mode. The main emphasis was ability to offer e-learning or online learning solutions. Prior to the closure due to the Covid-19 pandemic, the University had been deploying ICT solutions to support its core business of teaching and learning. However, the institution being in a transitional stage, there are no clear policies, strategies and set objectives on ICT infrastructure and services that will help manage the business workflow of the University. It became critical that the University had to prioritize ICT vis-a-vis ICT infrastructure and services, and staffing to provide alternative mode of undertaking its core business of teaching and learning. The University had to address the following challenges that can be attributed to ICT.

1.2 Application Systems

a). Student Information System

The University's Student Information System had deficiencies with regard to integration with Banking Systems, integration with MOODLE and integration with mobile SMS to take full advantage of non-physical interaction as spelt out under the Covid-19 pandemic restrictions.

b). E-Learning Platform

The University has been experimenting with MOODLE and that has been generally accepted by the academic members of staff. However, it was being observed that there was a wide difference in the use of the platform; from non-users to moderately frequent

users. Further, the University had not fully exploited other e-learning supporting platforms such as You Tube, Skype, Zoom, tiktok, virtual labs, WhatsApp, Facebook, etc. in the teaching and learning processes. Suffice to say that some Staff used these platforms, though in an unstructured manner, as means to communicate with students and in some cases use these platforms to deliver lectures. There was need for the University to clearly set Standard Operating Procedures, that include criteria for monitoring and evaluations of implemented e-learning processes and initiatives. A unit in conjunction with the Directorate of Quality Assurance should be set to effectively actualize these modus operandi.

c). University Website

The University's website is created using HTML. Therefore, it was non-interactive as no immediate response could be made to client's demands. For instance, a student would make an enquiry on a programme that may have been advertised on the university website. However, such a request would take some time to be responded to and that proved ineffective to modern day clients with embedded culture of instant response to enquiries in a modern day digital business environments.

Server/Network Services

a). Network Infrastructure

The University had a skeleton Network infrastructure which was vulnerable to cyber-attacks. The network was not widely accessible in student hostels on campus and staff houses within the campus perimeter.

b). Servers

The installed servers had low memory and storage capacities, making installed application slow and ineffective. When a server does not have enough physical RAM, the system will move to using virtual memory, or Swap Memory. This kind of memory is much slower than physical memory, as it uses your HDD or SSD instead. This will likely lead to performance bottlenecks and cause your site or application to run much slower.

c). Bandwidth Connectivity

The University has Internet Bandwidth connectivity of 30Mbps for a population of about 2,000-plus students and 50 staff. This capacity was inadequate and posed serious restrictions in accessing the Internet and cloud services.

d). End-user Devices

Limited or non-availability of end-user devices such as laptops, tablets and smart phones, among students, inhibited a continuous teaching and learning environment (Kalusopa, 2005).

2 OPERATIONS DURING COVID-19 PANDEMIC

Challenges are prerequisites for better or alternative situations. The university had to find alternative modes of doing its businesses to survive beyond this infancy stage. It turned to Information and communication technologies for solutions. However, it had to address the challenges highlighted in the foregoing section.

The government of Zambia on 2nd October, 2021, further eased Covid-19 pandemic restrictions. Physical engagements were allowed with following guidelines, 'golden rules' which focused on maintaining social distance, masking-up, washing of hands, use of hand sanitizers and disinfecting.

During the closures and partial closures brought about by the different waves of Covid-19, the University had had a critical evaluation of requirements for accelerating and adaptation of e-learning and online learning environments.

Top on the critical path was academic staff adaptation in designing their courses in e-learning environments taking into account contact times, tutorials and discussions, assignments, tests and examination, and, access to laboratories. Adoption of MOODLE as an e-learning platform and institute capacity building programmes for effective use the platform. MOODLE's easy flexibility to interface with video conferencing and video sharing platforms was one of the admirable features (Melton and Fenwick, 2019).

The University acquired 20-host ZOOM license to support delivery of lectures through this video conferencing platform. Each host is able to accommodate 300 participants and has unlimited duration for a session, this has enabled lectures with large classes to conduct their lectures. With the huge uptake of the use of the Internet especially uploads as students were accessing digital resources held on the University's server, the demand for more Bandwidth became eminent. Zambia research and education network (ZAMREN), the national research and education network (NREN) for Zambia, was approached to increase the Bandwidth from 30Mbps to 100Mbps, refer to *Fig1* and *Fig2*. The Campus Network has also been expanded to enable students access the Internet at any location within campus. Off campus but within other institutions that are members of ZAMREN, the University students and staff are able to accesses the Internet using their eduroam accounts.

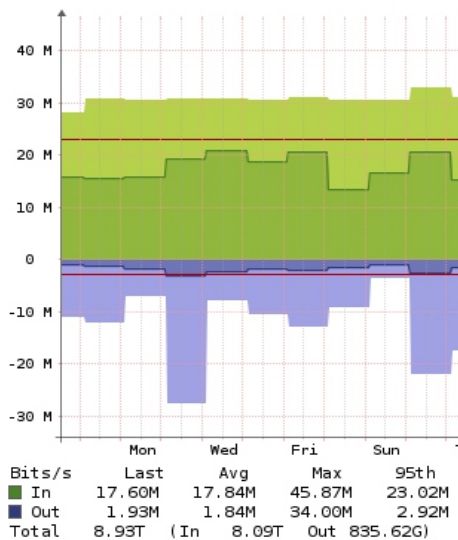


Fig1. Internet Bandwidth Uptake Feb'2020

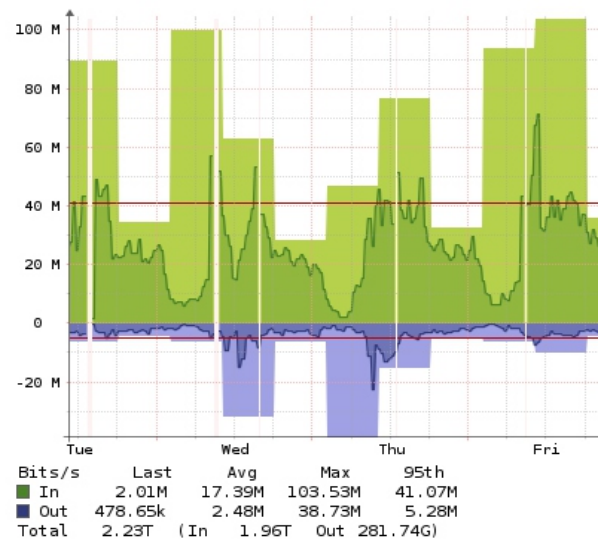


Fig2. Internet Bandwidth Uptake Oct'2021

To enable students access digital resources when not on campus, telcos, namely MTN and ZAMTEL were engaged to provide zero rated internet access to students to access such resources residing on the University's servers. A new Student Information System was installed that supports online application, admission and registration. Engagements were made with Banks to integrate via Application Program interfaces (API's), their systems with our finance system Interfaces to enable payments anytime anywhere. Interface between the student Information System and accounting system was created to enhance student enrolment processes on an online platform such as a university website.

2.1 Post Covid-19 Pandemic Outlook

The Covid-19 pandemic created a massive wake-up call for the University as regards to ability to provide sustainable teaching, e-learning environment. Expansion and deployment of ICT infrastructure and services both insitu and Cloud services will be in the mainstream of the University's operations. Access to digital academic resources will central to the core business of teaching and learning, and as such, will require investment in network services.

It is envisaged that Blended learning will still be one of the modes of education delivery, as such, investment in physical infrastructure and institutional academic staff will be necessary. Additionally, the provision of end-user devices such as tablets or laptops to academic staff to enable them create and work in an e-learning and online learning environments.

a). E-Labs

Being a STEM University, access science and engineering labs for students will be cardinal. As physical labs are being build and lab equipment installed, access to e-labs and science gateways will be of absolute necessity. Virtual laboratories deliver authentic experiences to science and engineering students. This type of learning can easily be shared between universities or industrial partners, leading to dramatic reductions in the costs associated with physical laboratories.

b). Smart Rooms

Modalities of curriculum development and delivery will tilt towards e-learning and online learning. Academic staff will need to be attuned to ICT platforms that support these modes of development. Smart rooms will central for curriculum production environments.

3 CONCLUSION

The experiences narrated in this paper are not peculiar to Mukuba University. The concepts of e-learning and online learning are not new to most universities. This has been articulated since the beginning of the year 2000. However, many universities especially in developing worlds where ICT infrastructure and services are not only limited but expensive, and coupled with erratic power supply, this option was not seriously implemented. Hence, the institutions largely conduct teaching and learning in physical mode.

Most oftentimes, it takes a crisis or threat of extinction to stir organizations to seek alternative solutions, therefore, higher education institution will need to design curriculum, prepare learning strategies and techniques for post Covid-19, and transform the education system itself by scaling online learning infrastructures as a drive to the new ways of teaching and learning. It can be said that the University is in the face of the Covid-19 pandemic, was technically unprepared to provide teaching and learning totally in e-learning or online mode. It took this situation in its stride to revamp and reposition ICT infrastructure and services to enhance its ability operate in the digital environment.

Bingimlas K., (2009) Barriers to the successful integration of ICT in teaching and learning environments: a review of the literature, *Eurasia Journal of Mathematics, Science & Technology Education*, 5 (3), pp. 235–245.

Chipimo P. J, Barradas D. T, Kayeyi N, et al. (2020) *First 100 Persons with Covid-19 – Zambia*, *MMWR Mortal Wkly Rep*

WHO 2020. WHO Corona Disease (Dashboard) .

Chama Sarah, A P Shemi, Evaristo Kangwa and Kaluwasha Henry (2020) *E-learning adoption in Higher Education during COVID-19 Crisis: Challenges and Opportunities*: Paper Presented at the Virtual International Postgraduate Research Conference, 2nd to 3rd December, 2020, hosted by Mukuba University and Copperbelt University-

Dyre J., The Case for National and Research Education Networks, TERENA, 2009

Kalusopa, T., 2005. The challenges of utilizing information communication technologies (ICTs) for the small-scale farmers in Zambia. *Library hi tech*.

Khunga B., NREN and Telecom Companies Synergies: A Case of ZAMREN, Proceedings of IST-Africa Conference-2016, Durban, South Africa, 2016

Melton, M. L. and Fenwick Jr, J., 2019. *Alexa skill voice interface for the moodle learning management system* (Doctoral dissertation, Appalachian State University).

