

Optimising Open Educational Resources and practises to Enable Inclusive Education

Vol 6, 2024



Published By

The Unit for Distance Education Faculty of Education University of Pretoria, Groenkloof Campus Cnr of George Storrar and Leyds Street, Pretoria, South Africa

Web address: https://upjournals.up.ac.za/index.php/tetfle

Email address: tetflemanager@up.ac.za

ISSN 2788-6298 (Online)

About the Journal

The *Teacher Education through Flexible Learning in Africa* (TETFLE) and other developing contexts online journal is a refereed, open-access e-journal that publishes original research on distance teacher education in Africa. TETFLE aims to create a platform for researchers and practitioners on glocal matters that relate to distance teacher education on the continent. Publications cover issues of content, pedagogical consideration, technology and management in distance education. Exemplar papers with rigour showing research evidence are most appreciated.

TETFLE also publishes review articles and book reviews. The journal currently appears once in a year, with an additional special edition from accepted biennial conference papers, as applicable. The journal is the official journal of the Distance Education and Teachers' Training in Africa (DETA) biennial conference, hosted by the Faculty of Education, University of Pretoria, South Africa.

Indexing

TETFLE is indexed by the Directory of Open Access Journals (DOAJ).



Editorial Team

Editor-in-chief

Folake Ruth Aluko (University of Pretoria)

Associate editors

Mary Ooko (University of Pretoria)

Marie Hyleen Mariaye (University of Mauritius)

Editors of the special issue

Dr Tony Lelliott, South African Institute for Distance Education, Saide

https://www.up.ac.za/cf-deta 2023/article/3125660/workshop-3-self-study-of-teacher-education-a-multidisciplinary-transformative-approach-to-researching-teaching-and-learning

Ms Mohini Baijnath

Ms. Mohini Baijnath, Neil Butcher and Associates.

https://www.linkedin.com/in/mohinibaijnath/?originalSubdomain=ca





Official publication of the Unit for Distance Education Faculty of Education

University of Pretoria

Web address: https://upjournals.up.ac.za/index.php/tetfle

Email address: tetflemanager@up.ac.za

Optimising Open Educational Resources and practises to Enable Inclusive Education

Natasha Madhav

Independent Institute of Education

Email: Nmadhav@iie.ac.za

ORCID identifier: https://orcid.org/0000-0001-8055-0923

DOI: 10.35293/tetfle.v6i1.5040



Abstract

Globalisation, technology, innovation, and ever-changing customer needs have created an explosion of information for learners at Higher Education Institutions (HEIs). Developing science, technology, engineering, and mathematics (STEM) skills in students is critical to achieving the United Nations Sustainable Development Goals. However, although African universities have made progress in the quantity and quality of their research output in STEM subjects, the continent continues to lag behind much of the rest of the world. Therefore, engaging students today requires a paradigm shift to promote inclusivity, empower critical thinking, and allow students and educators to co-create knowledge. HEIs in developing countries such as South Africa still face many challenges arising from the digital divide, budget constraints, and increased power cuts. Advancements in online learning have led to new learning practices of using Open Educational Resources (OER). Information and communication technology (ICT) can provide effective and inclusive access to OER that can be used anytime and anywhere. UNESCO, which has been a precursor in advocating for the adoption of OER, has recognised the potential and efficiency of OER not only to permit remote learning but also to enable lecturer and learner collaboration and engagement. As these technologies continue to develop, we can expect to see even more innovative and effective ways to use them for learning. The study explores an open pedagogical approach that enables inclusivity, promotes access, and influences the use of OER tools and technologies by students in the classroom. The results of the outcome could increase awareness of the potential of using open pedagogical approaches to support teaching and learning activities that can enhance and assist educators in integrating technology and drive more inclusive, learner-centred approaches into the curriculum. However, currently, not many HEIs in South Africa are embracing or using OER and open practices effectively.

Keywords: Innovation, OER, inclusive education, STEM education



Introduction

The advent of the Internet and Web 2.0 has transformed the way people communicate, collaborate, and share information. However, despite the call for transformation at universities, Mkhize and Idahosa (2021) postulate that transformation remains elusive, while at the same time, Higher Education Institutions (HEIs) are expected to find innovative ways to prepare students for the world of work.

Research conducted by Tikly et al. (2018) suggests that low student achievement at the secondary level leads to poor performance at HEIs. To combat this, the African Union has set out targets for enrolment in STEM subjects, which will require addressing the quality of secondary education. Within the South African perspective, Du Toit and Roodt (2009) argue that South Africa requires vital skills in engineering, technology, and education to address future financial, environmental, educational, and health challenges. Technological innovation has become paramount for improving quality of life and eliminating the digital divide. In Africa, after the COVID-19 pandemic, many people still do not have access to education, basic sanitation, clean water, or even appropriate medical care. To address these concerns, the development and sustainability of our economy depend on the ability of HEIs to enable inclusive teaching methodologies and accommodate diverse learning. With HEIs offering both distance and classroom learning after the pandemic, the shift is to find more cost-effective ways of providing learning materials. Adopting Information and Communications Technologies (ICTs) and open pedagogical approaches can provide an inexpensive way to create and disseminate knowledge.

The World Education Forum declared that by 2030, 'Information and communication technologies (ICTs) need to be harnessed to strengthen education systems, knowledge dissemination, access to information, effective and quality learning, and more efficient service delivery' (UNESCO, 2015, p. 8). This paper reports on exploring the benefits of Open Educational Resources (OER) and open pedagogical practices to support learners and enable inclusivity, particularly for learners from more disadvantaged backgrounds.

Literature Review

What is an Open Pedagogy?

Open pedagogy is often pinned as a way to promote inclusivity in the classroom. It is



described as an access-oriented path to learner-driven education that permits learners to create knowledge (DeRosa & Jhangiani, 2018). Wiley (2017) further states that open pedagogies are designed to encourage collaboration, flexibility, and accessibility by leveraging OER that anyone can use and disseminate. Schuwaer (2017) describes an Open Pedagogy as a didactical approach that allows for self-directed learning and encourages the assimilation and management of OER with the intent to improve teaching and learning. Overall, open pedagogy seeks to enhance teaching and learning by removing barriers to access and encouraging a more inclusive, collaborative approach to learning.

State of South African Education

The state of South African higher education is a complex one due to rising costs, inequality, colonial history, and limited access to funding. On 11 February 2021, the University of the Witwatersrand (Wits)¹ Student Representative Council president stated that there would be close to 8,000 students who cannot continue for the 2021 academic year due to their financial situation.

A lack of access to quality educational resources due to factors like cost adversely impacts access to education. In sub-Saharan Africa, textbook scarcity has been noted as a problem since the 1980s (Fredriksen et al., 2015). Although South Africa has an effective publishing industry, students' access to learning materials is a concern, and together with its colonial ties, prescribed learning material is not aligned with South Africa's transformation agenda. This is often coupled with a lack of computer labs, internet access, and power cuts (Mtebe & Raisamo, 2014).

In South Africa, approximately 17% of those who complete their Grade 12 (matriculation) school education, access higher education across 26 publicly funded institutions. Although the dawn of democracy promised equal opportunities for all, the issues of access, funding, graduation rates, quality of graduates, and equity of access are still a concern (Ramrathan, 2013). For a meaningful inclusive curriculum transformation within the South African higher education system, HEIs must find innovative and

¹ The University of the Witwatersrand, Johannesburg, commonly known as Wits University or Wits, is a public university situated in Johannesburg.



transformative approaches in the classroom. Caswell et al. (2008) argue that OER can enable inclusive education by providing free and accessible learning content to learners with limited access to traditional educational resources. UNESCO (2002, p. 24) defines OER as "the open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes". In 2019, UNESCO (2019) further elaborated that OER should be freely available to the public under an open licence that permits reuse, repurposing, adaptation, and redistribution by others.

Social Justice and Higher Education

Social justice has been a pervasive issue throughout the history of humankind due to poverty, inequality, oppression, and differences in religion, ethnicity, wealth, gender, and sexuality. Therefore, students must understand these differences and oppressions experienced by humankind. Much of the discourse is about the role of higher education in building more equal and inclusive societies so that students become productive citizens in their communities. UNESCO (2015) advocates for social justice as the fundamental purpose of education and that it should encompass human dignity, equal rights, social justice, and shared responsibility for a sustainable future. Freire (1972) advocates that learning systems that alienate individuals should be rejected. According to Freire (1972), our education system has played a significant role in maintaining societal oppression and social injustices; it needs to be reformed through suitable education and critical thinking. In attempting to address the issue of social injustice in South Africa, Leibowitz (2017) states that HEIs can achieve social justice by recognising the values, knowledge, and attributes of students from various backgrounds and that knowledge should be freely shared and co-created by educators and learners alike.

In 2013, the Council on Higher Education (CHE) Proposal for Undergraduate Curriculum Reform argued that curriculum transformation was not only related to what is taught and how it is taught but also a systemic change that allows for the introduction of an extended curriculum that is a precondition for achieving the goals of equity of access and equity of outcomes. As Badat (2015) notes concerning the CHE proposal, much-needed academic transformations are required so that we do not deny opportunities to people from socially disadvantaged groups. Ramrathan (2016)



argues that even though curriculum debates have been around for a while, curriculum transformation will only occur once the transformation process includes academics and students. This sentiment is further highlighted by Badat (2017) who argues that the transformation needs to include the worldviews of students and communities among key actors concerned with higher education. Additionally, Essop (2016) calls for an 'epistemological diversity', to encourage open dialogue that should extend beyond the curriculum itself.

Open Pedagogy and the need for transformation

A traditional classroom is generally teacher-centred; the teacher teaches, and the students listen, often resulting in less engagement during the learning process. At the same time, graduates are required to develop knowledge and skills that will allow them to become critical thinkers and problem solvers and achieve higher-level cognitive thinking (Jamieson & Shaw, 2020). Research conducted by many educational experts indicates that a paradigm shift is required to eliminate traditional chalk-and-talk classrooms where students and teachers become co-creators of knowledge through engagement, teamwork, and reflection (Brown & Croft, 2020).

The Education 2030 Framework also highlights a set of strategic approaches to improve the quality of education and encourage learner-centred and collaborative pedagogical approaches. For students and educators to be co-creators of knowledge, students must be invited to self-direct and shape their learning and thoughts in an open learning environment. According to Wiley (2017), an open pedagogical approach encourages the co-creation of knowledge where students and educators can work together to produce learning materials, projects, or research that can be shared openly. This approach not only enhances learning but also contributes to the broader learning educational community. According to Butcher (2015), OER pedagogical practises have great potential to support curriculum transformation. While its transformational value lies in the idea of reusing resources, its potential lies in the ease with which such resources can be hosted in the cloud. Butcher (2015) further highlights that the key differentiator between an OER and any other educational resource is that OER provides access to openly licensed materials in the form of textbooks, course materials, videos, software tools, and interactive simulations available for educational purposes that contribute to lifelong learning and reduce the cost to the learner. UNESCO (2015)



also strongly advocates the drive for innovative pedagogical practices integrating OER to enhance teaching.

Africa and many other countries continue to face serious challenges due to globalisation, the Fourth Industrial Revolution (4IR), and Artificial Intelligence (AI). Research indicates that values and attitudes toward STEM subjects in African countries have contributed to poor performance, therefore, a change is required. Educators in Africa and globally face significant challenges in providing access to high-quality learning materials while containing or reducing costs. The use and reuse of high-quality OER can encourage innovative pedagogical practices that empower learners toward self-directed learning. The open licence and flexibility afford instructors and learners a multitude of resources. McGreal et al. (2013) state that free and open sharing of educational resources is crucial for creating ubiquitous learning networks and reducing the knowledge divide. With South African higher education being in a state of transition, using OER-enabled pedagogies, tools, and technologies should be considered in any discussion around curriculum transformation.

ICT Impact and OER

Innovative tools and technologies have the potential to increase access and remove many of the obstacles faced by learners as well as educators today. However, after the COVID-19 pandemic, there are still many potential challenges that depend on the ICT infrastructure at educational institutions, and ICT has great potential to facilitate effective and inclusive access to educational resources and other learning platforms. They open possibilities to introduce students to OER virtual labs which are digital tools and simulations that provide interactive, accessible, and cost-free learning opportunities in various disciplines that can be accessed anytime and anywhere, including learners from marginalised or disadvantaged societies. Institutions should consider solutions that require no licensing fees but instead, refer to resources that are already hosted on the web.

Downes (2019) argues that we need to explore the concept of 'Open Education Resources' changing from a concept of textbooks and libraries to a concept of exploring web services and applications. For this study, the lecturer adopted the use of virtual OER labs for students to provide hands-on simulations on networking technologies that could supplement the theoretical knowledge learnt in the classroom. Virtual OER labs were



integrated with OER such as tutorials and instructional videos on YouTube to reinforce their understanding of networking concepts and techniques, whilst simultaneously preparing them for the world of work.

Methodology

An interpretive paradigm with an exploratory approach was adopted to address the research questions. The interpretivist paradigm is a philosophical approach that emphasises understanding and interpreting the meaning that individuals attribute to their experience (Mohajan, 2018). Mohajan (2018) further supports the assertion that qualitative research is a suitable approach in the social sciences for accumulating and interpreting non-numerical data and allows researchers to collect rich data and analyse the interpretations given by individuals. This study was used to understand the adoption of virtual labs for teaching purposes to explore factors that might affect OER tools and technologies usage at HEIs. YouTube videos and virtual labs that provide students with hands-on learning were used to explore how students engaged with OER.

This study was qualitative and collected data using focus group interviews with students from a private higher education institution (PHEI). As an initial point of entry into the study, the researcher engaged with the PHEI to introduce the concept of networking labs to supplement the textbook. As students had no access to actual networking devices and physical hardware, the idea of using virtual labs launched an exciting prospect of bringing fun and engagement to the classroom. Consultations also occurred with the academic to gain insight into how the academic usually teaches networking. Generally, the method was to cover the fundamentals to develop a solid understanding of the underlying concepts supplemented by YouTube videos.

The explorative study was then proposed, and ethical clearance was obtained. The qualitative study used semi-structured focus group interviews. The student interviews were aimed at inviting participants to engage and communicate openly about the experience using virtual labs. These interviews aimed to eliminate the point of view of the interviewee. This is particularly relevant in qualitative research, as it relies on conversations between the researcher and their participants and allows the researcher to engage. The interviews ranged between 15 to 20 minutes each.

TETFLE TEACHER EDUCATION THROUGH FLEXIBLE LEARNING IN AFRICA JOURNAL

Participants

The participant focus groups of the exploratory study included two groups of five students each, enrolled in the module called Network Engineering. Ten students volunteered from a pool of 40 when interviews were requested. The ages of people in the student group ranged between 19 and 22 years old. The participants were purposively sampled; only students enrolled in a Network Engineering module at the college were invited to participate. Although the researcher did not ask about the student's economic status, it is noted that many students never use a personal computer.

Qualitative content analysis was employed to decrypt the interview recordings of participating students. Themes emerged and recurring texts were observed and generated in the quantitative phase. The results of the outcome of these objectives could increase awareness of the potential of cloud technology to reduce costs, support self-directed learning, and allow for further exploration of virtual computing labs.

Aim of the research

This research aims to explore the factors affecting the implementation of OER tools and technologies in HEIs, focusing on employing an open pedagogical approach. The research seeks to understand how we can optimise open pedagogical practices to influence the adoption of OER in HEIs and to identify any challenges and opportunities associated with this method.

Research questions

To achieve the aim of the research, the following two questions have been formulated:

- I. What factors influence the implementation of OER tools and technologies, such as virtual labs, when using an open pedagogical approach?
- II. How do students respond to and engage with OER that are implemented through an open pedagogical approach?

Results

The results of the thematic analysis revealed different themes within the responses:



- i. Accessibility and inclusivity
- ii. Challenges with the use of virtual labs
- iii. Learning anytime, anywhere

The following are descriptions of the main themes that emerged from the focus group interviews, including some examples of participant responses.

Accessibility and Inclusivity

The advent of the Web has brought a wholly transformed learning experience to educational institutions, allowing for more cost-effective and efficient computing by centralising the storage, memory, and computing capacity of personal computers and servers. With the tremendous advantages of technology, some participants felt that the experience using OER virtual labs was an easy and smooth journey as it could be accessed from anywhere. This was particularly beneficial for students who lived far from campus and had access to the internet.

Participant A:

I have experienced that using technology in learning makes life easy for us as students. E.g. I can submit my assignments via Google Sites wherever I am. I was also able to use the virtual labs to gain a better understanding of the networking environment.

Participant B:

Once you get used to it, the virtual labs allowed us to get practical experience with networking technologies.

Participant C:

I found it to be efficient and time-saving and you get to expand your computer skills and knowledge. It was an incredible experience, which came with a lot of exposure to modern technology, and alerted me of many things. It is fun to be able to create simulated network environments. I didn't know thus encouraging me into being more involved with the use of technology for academic purposes.

Participant D:

We should use more open educational resources in our curriculums as it will help us with textbook costs. The interactive labs make it easy to understand.



Challenges with the use of virtual labs

A state of poverty results in many learners in South Africa and the rest of Africa being excluded from various learning opportunities. Effective use of virtual labs requires reliable internet access as poor infrastructure can limit the effectiveness and accessibility of virtual labs. Addressing these challenges requires an approach to ensure education becomes more accessible and inclusive for all learners, irrespective of their financial background. OER, however, does enable the extension of educational resources and allows access at a suitable pace for the learners. However, there was evidence that the experience using Virtual Labs had some shortcomings. Some participants had difficulty connecting and navigating through the high-bandwidth virtual labs. This can be due to the lack of access, bandwidth costs, and general computer skills of students whilst lecturers assume that all students are computer literate when they start to embark on an undergraduate programme. The comments from the participants were:

Not bad, just that it was my first time, so I had problems with working on the PC, accessing the Labs and how to upload documents.

Another participant said that:

at first, it is hard to understand what is required of you. Some of the technical terms were confusing.

One question was indirectly based on the participant's usage experience: 'What are the suggestions for improvement if you had to use the Virtual Labs again?'

This question revealed the thoughts of the participants towards the use of OER virtual labs for HEIs. Similar responses were for ICT skills, which was seen earlier in the experience of the participants. Responses included:

- It must be friendly to us as students
- A step-by-step procedure would be necessary for beginners to get used to the labs
- Step-by-step tutorial lessons in class

The focus group sessions revealed that there were challenges with the implementation of using Virtual Labs and navigating through the tutorials. Access to the Internet proved to be a vital component for the students' success using OER. As there is considerable availability of reliable Internet at the PHEI where the study was conducted, this matter may be overlooked. Off-campus where some of the participants reside, there is no such fluxury of the Internet'.



Participant A said:

The issue about this is that some students are travelling to school and back to their households, they do not have data to connect to the Internet, thus getting announcements late.

This statement shows not the unaffordability of data alone; it also expands to the implications of no access. Thus, a participant said outright when asked about challenges:

I don't have data.

Participant E stated that:

due to people not having access to computers at home, it makes learning a bit challenging. I initially struggled with just using a mouse.

A connecting phrase from another participant echoed:

Having no access to the Internet.

These responses highlight the need to ensure that first-year students have basic computer skills to avoid feeling isolated or left out. This observation from the above analysis expresses the importance of not only improving basic computer skills but also that the digital divide still exists. In an attempt to close the digital divide among students, while OER tools and technologies may be 'free', the issue of access and computer literacy must be considered. To drive inclusivity, it is important to collaborate with students from the beginning to consider their voices and needs. In summary, this theme indicates that while much has been done to increase awareness of OER, OER needs to extend beyond retention, reuse, and redistribution; it should be used as a platform to address the inequalities that persist in our educational systems.

During the COVID-19 pandemic, one of the biggest challenges for students studying remotely has been the cost of data and network connectivity, especially for students who moved back to their homes in more remote and rural areas. The switch to remote learning has no doubt exposed inequalities among students, as access to a computer and Wi-Fi is still an expensive commodity for many South African families.

Learning anytime, anywhere

One key advantage of virtual labs is their accessibility, allowing students to engage in learning anytime and anywhere. By integrating technology with classroom learning, these labs enhance flexibility and collaboration. OER tools and technologies indeed come with many advantages. The advantages for students include the ease of use and the ability to work together in virtual labs and share documents and videos on Google



Groups; however, the cost and dependence on an Internet connection and broadband access were essential for continuous learning and collaboration to occur.

Comments from participants include:

that you can submit assignments after completing the lab exercises if you are away from the campus, however, it would be great if we could access these labs in African languages.

Another participant reiterated these phrases:

With OER materials students can learn everywhere outside the classroom thus not delaying academic progress for students, even though it comes with a lot of compromises. It is quite useful because it is easy to access the information and labs when you are home.

The participant was not open or transparent about the word 'compromise'. Another participant said that it:

Allows me to work in the comfort of my own and whenever I'm connected to the Internet.

The question, 'Would you make use of OER virtual labs as a learning tool?' was strongly emphasised to gather the overall experience of the students:

Yes, it is useful and helps a lot, also makes things easier.

From Group 2, another participant concurred:

Yes, it makes learning easier if you are a travelling student.

Some positive responses overall were:

Definitely yes!

Lectures should consider using the Cisco Networking Academy as well.

Yes we do need more open resources, videos, and real-world scenarios to understand the theory Yes! All the time

Yes!

This section ends very abruptly, with a participant response. Instead, please complete this section with a comment relating to the heading

Conclusions

This research aimed to shed some light on the factors that influence the implementation of OER tools and technologies within HEIs, with a particular emphasis on the role of open pedagogical practices. The focus on open pedagogy highlights the potential of collaborative and inclusive teaching practices to optimise the effectiveness of OER in higher education. As we seek to navigate the intricacies of implementing these innovative tools and technologies, we must consider how HEIs can optimise the successful adoption



and integration of OER effectively, particularly for disadvantaged students. From a social justice perspective, HEIs from both the public and private sectors need to explore the immense benefits of using OER tools and technologies to encourage students to become constructors of knowledge that may be relevant for learners and include the different languages and local contexts. Such adaptation is important to ensure that the content is meaningful and engaging and that virtual lab experiences align with the learning objectives of the curriculum.

Other factors to consider are to enable policy and provide the required technical support and access to OER platforms, portals, or websites. Without formal policies, an educator, as well as the researchers, work in isolation and continue to share content informally thereby restricting the ability of resources to be publicly shared. Butcher (2015) states that OER has the potential to bring clarity to educational development and establish a new model for acquiring and publishing learning materials. OER no doubt has the potential to enable educators and institutions to come together in a collaborative space to share materials without cost implications, thereby enabling inclusive education, fostering equal opportunities, and ensuring that everyone has access to quality education.

In this study, we explored ways to optimise the integration of OER tools and technologies in a classroom. Using a case study, we could explore the effectiveness of OER in adopting and creating future virtual learning environments to improve student engagement within STEM subjects. The learners could construct simulated computer networks and explore how computer networks operate. This finding was encouraging as it provided students with hands-on labs and virtual environments to test and experiment with various scenarios where the institution would have had budget constraints to purchase resources. Such simulated labs can also be crucial in exploring and understanding advanced topics such as the 4IR, robotics, AI, and the Internet of Things.

However, as encouraging as the future adoption of OER virtual labs within the Faculty of ICT is, what becomes evident to the researcher is that we cannot assume that all students have access to a basic personal computer or Internet. A key barrier to using OER virtual labs effectively in this study was a lack of internet access and resources such as laptops or personal computers. Hence, academics need to become more aware of the inequalities that persist. In future studies, it is important for academics not just to unpack OER pedagogies and their role in HEIs, but to consider strategies



that can dismantle the digital and knowledge divide. By leveraging OER pedagogies and technologies, educators can create more flexible, inclusive, and engaging learning environments that support diverse educational needs. Students should also be provided with the opportunity to co-create OER resources in their language of choice where they can engage with content that is relevant to their local context, thus working towards opening epistemological access for all.

Areas for Future Research

It is important when designing new learning experiences to acknowledge how students navigate new learning spaces, including the past marginalisation that is still pervasive in South Africa. As academics, researchers, and instructional designers, as we begin to explore new paradigms for student engagement and inclusive education, there are still many questions to be answered. Learning networks must be enabled to support the student experience so that they become confident in adopting new technologies. The potential benefits and implications outlined here are only the beginning. Further areas for exploration include applications and the variety of methods related to diverse content areas; a process which provides students to engage in a learning network and a language of their choice.

References

- Brown, M., & Croft, B. (2020). Social annotation and an inclusive praxis for open pedagogy in the college classroom. *Journal of Interactive Media in Education*, (1),1–8. https://doi.org/10.5334/jime.561
- Butcher, N. (2015). Basic guide to open educational resources (OER). UNESCO https://staging.oer4pacific.org/id/eprint/25/1/2015_UNESCO_COL_A-Basic-Guide-to-OER1.pdf
- Caswell, T., Henson, S., Jensen, M., & Wiley, D. (2008). Open educational resources: Enabling universal education. *International Review of Research in Open and Distributed Learning*, 9(1), 1–11.
- DeRosa, R., & Jhangiani, R. S. (2018). Open pedagogy. In E. Mays (Ed.), A guide to making open textbooks with students. Rebus Community.
- Du Toit, R., & Roodt, J. (2009). Engineers in a developing country: The profession and education of engineering professionals in South Africa. HSRC Press.
- Downes, S. (2020). Evaluation of the UNESCO Recommendation Concerning Open Educational Resources. *The International Journal of Open Educational Resources*, 3(2). https://ijoer.scholasticahq.com/article/25063-evaluation-of-the-unesco-recommendation-concerning-open-educational-resources
- Freire, P. (1972). Pedagogy of the oppressed. Herder and Herder.
- Gartner. (2012). Gartner says the personal cloud will replace the personal computer as the centre of users' digital lives by 2014. Retrieved 17 May 2014 from http://www.gartner.com/it/page.jsp?id=1947315
- Jamieson, M.V., & Shaw, J. M. (2020). Teaching engineering innovation, design, and leadership through a community of practice. *Education for Chemical Engineers*, 31, 54-61.
- Leibowitz, B. (2017). Power, knowledge and learning: Dehegemonising colonial knowledge. *Alternation*, 24(2), 99–119.
- Mohajan, H. K. (2018). Qualitative research methodology in social sciences and related subjects. *Journal of Economic Development, Environment and People*, 7(1), 23–48.
- Mtebe, J. S. & Raisamo, R. (2014). Challenges and instructors' intention to adopt and use open educational resources in Higher Education in Tanzania. The International Review of Research in Open and Distance Learning, 15(1), 294–271. DOI:10.19173/irrodl.v15i1.1687Mell, P. & Grance, T. (2011). The NIST definition of cloud computing. Gaithersburg, MD: National Institute of Standards and Technology.



- Mkhize, Z. & Idahosa, G.E. (2021). Intersectional experiences of Black South African female doctoral students in STEM: Participation, success, and retention. *Agenda Empowering Women for Equity Journal*, 1–13. https://doi.org/10.1080/10130950.2 021.1919533.
- Paviotti, G., D'Angelo, I., Giaconi, C., & Cavicchi, A. (2020). Open pedagogy practices: A case study in undergraduate education. *Journal of e-Learning and Knowledge Society*, 16(4), 1-10.
- Ramrathan, L. (2013). Towards a conceptual framework in understanding student dropout in Higher Education Institutions. *South African Journal of Higher Education* 27(1), 209–220. Schuwer, R. (2017). April open perspective: What is open pedagogy? Retrieved from: https://www.yearofopen.org/april-open-perspective-what-is-open-pedagogy/
- Tikly, L., Joubert, M., Barrett, A. M., Bainton, D., Cameron, L., & Doyle, H. (2018). Supporting secondary school STEM education for sustainable development in Africa. Bristol Working Papers in Education Series (Working Paper 05/2018), University of Bristol. Retrieved August 30, 2020 from https://www.bristol.ac.uk/media-library/sites/education/documents/Supporting%20Secondary%20School%20 STEM%20Education%20for%20Sustainabale%20Development%20in%20Africa. pdf
- Tlili, A., Altinay, F., Huang, R., Altinay, Z., Olivier, J., & Mishra, S. (2022). Are we there yet? A systematic literature review of Open Educational Resources in Africa: A combined content and bibliometric analysis. *PLoS ONE*, 17(1): Article e0262615.
- UNESCO. (2015). *Rethinking education: Towards a global common good?* [Online] https://unesdoc.unesco.org/ark:/48223/pf0000232555 (Accessed June 15, 2019).
- UNESCO. (2015). Incheon Declaration Framework for Action for the implementation of Sustainable Development Goal 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. https://uis.unesco.org/sites/default/files/documents/education-2030-incheon-framework-for-action-implementation-of-sdg4-2016-en 2.pdf
- UNESCO. (2019). Recommendation on Open Educational Resources (OER). Retrieved November 03, 2023 from http://portal.unesco.org/en/ev.php-URL_ID=49556&URL DO=DO TOPIC&URL SECTION=201.html
- Wiley, D. (2017, May 2). OER-enabled pedagogy. https://opencontent.org/blog/archives/5009

