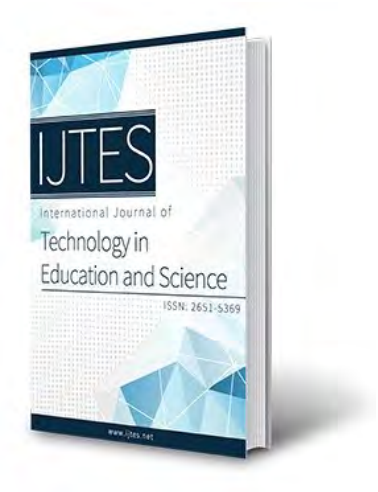

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The Global Research Trends on the Growth of Remote Learning in Higher Education Institutions: A Bibliometric Analysis

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To cite this article:

Ndibalema, P. (2022). The global research trends on the growth of remote learning in higher education institutions: A bibliometric analysis. *International Journal of Technology in Education and Science (IJTES), 6*(2), 218-236. https://doi.org/10.46328/ijtes.332

IJTES
International Journal of Technology in Education and Science
2022, Vol. 6, No. 2, 218-236 https://doi.org/10.46328/ijtes. 332

The Global Research Trends on the Growth of Remote Learning in Higher Education Institutions: A Bibliometric Analysis

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Article Info

Article History

Received:
12 November 2021
Accepted:
12 March 2022

Keywords

Remote learning
Digital inequalities
Bibliometric
E-learning
Digital solutions

Abstract

Remote learning has rapidly emerged as one of the most fundamental approaches in facilitating self-directed learning in Higher Learning Institutions. The purpose of this paper was to conduct a bibliometric study on the global trends in research about remote learning during 1961 to 2021 period. A bibliometric analysis of 719 research articles from the Dimensions database was carried out. The VOSviewer1.6.16 software was used to carry out visual analysis of the publications to establish the network and overlay visualization maps. The results indicate that there has been a steady growth of research articles on remote learning during COVID-19 pandemic of which 'Polytechnic Institute of Porto' was the leading organization in terms of publications. Countries which are most productive include the United States, Russia and the United Kingdom while 'Corter' and 'Kreijns' were the most cited authors and 'Lima' and 'Viegas' were the authors with highest links in terms of collaboration. Regarding the co-occurrence of key words, it was found that keywords such as 'experience', 'COVID', 'internet' 'poverty' 'interaction', 'inequality', 'social emotions' and 'online interactions' had strong association with remote learning. The findings suggest the need for developing countries to allocate adequate funds on remote learning.

Introduction

Given the enormous increase in the world on the demand to develop 21st century skills among students in Higher Education Institutions (HEIs), remote learning has attracted particular attention. Remote learning and digital technologies for learning are considered as some of the driving forces to the acquisition of 21st century skills among learners in HEIs (Meier, 2021). Several 21st century skills such as information and technology literacy, critical thinking and problem solving, entrepreneurship and innovation, social responsibility and leadership, and career awareness, can be promoted through remote learning (Ndibalema, 2020; Şentürk, 2021). The field of remote learning in HEIs has received a growing research interest in recent years due to the outbreak of COVID-19 pandemic. Due to the sudden HEIs shutdown, there has been a sudden transition to remote learning with many concerns such as inappropriateness of instructions which resulted to fear and anxiety among learners (Bahçecioğlu Turan et al., 2021; Gamage et al., 2020; Gautam & Gautam, 2020; Ghazi-Saidi et al., 2020; Ravšelj & Tomaževiˇ, 2020). There is no doubt that for a couple of decades, the concept of 'Remote

learning' has received a remarkable body of research evidence while the trends on evolution have been under researched in some countries despite their implications for students' learning. Some HEIs adopted remote learning during COVID-19 pandemic without proper considerations of research evidence originating from its historical perspectives. Thus, the transition has resulted into technology adoption resistance and other challenges such as, digital divide, lack of preparedness and low digital literacy among both instructors and students (Azubuike et al., 2021; Dhawan, 2020; Lischer et al., 2021). Before the transition to remote learning, some HEIs did not carry out a critical assessment on effective digital solutions to support the same because of insufficient body of research evidence (Pokhrel & Chhetri, 2021). It is on this basis that the current bibliometric analysis in this paper brings on board research evidence regarding the evolution of remote learning to address scientific understanding among future researchers and digital technology adopters.

Trends on the Growth of Remote Learning

The historical growth of remote learning can hardly be traced but its rapid growth began in the late 1990s with the advance of the online technical revolution with an introduction of the internet and personal computers (Kentnor, 2015). However, it is considered to be one of the forms of distance learning of which Bates (2005), Garrison (1985) mention three generations. The first generation (correspondence generation) utilized written and printed texts through postal services as a mode of delivery to home learning environment while the second generation (telecommunications generation) utilized radio and television as instructional media in addition to print materials. The third generation (Computer generation) of distance education utilizes information and communication technologies (ICT) to provide interaction in addition to content delivery (Bates, 2005; Birchall, 1990; Garrison, 1985). This generation is also characterized by networked learning in which learners learn remotely by accessing the learning resources online being facilitated with the internet. According to Anderson and Dron (2011) learning is influenced by connectivism pedagogy which focuses on establishing networked connections and collaborations among instructors and learners in solving problems. It is this generation where distance learning could be seen as 'remote learning' in which learners learn beyond the walls of the classroom through the internet.

In illustrating the evolution of remote learning, there have been publications in the field of educational technology addressing some key indicators on its growth and implications in HEIs. The bibliometric analysis by Sweileh (2021) revealed an increasing growth in the number of publications with time in e-learning while noting a sharp peak in 2020 from European region and the American region with the least contribution from developing countries. Chen et al (2021) note that the growth of smart learning publications reflects a dramatically increasing interest in the field in which scholars, policymakers, and practitioners can develop a better understanding of the past, present, and future academic structure. The findings in the bibliometric analysis by Sobral (2020) indicate an increase of publication rates on mobile learning in HEIs which is a good indicator for continued publications in the field in the future. Likewise, Mustapha et al (2021) note a quick shift to online teaching and learning and digital innovation developments during COVID-19 pandemic.

Although several studies note increased learning opportunities through remote learning such as collaboration, self-directed learning and critical thinking during COVID-19 pandemic (Paudel, 2021; Pokhrel & Chhetri, 2021; Zawacki-Richter, 2021), the approach is still questionable. Ho et al (2021) note that during the outbreak of COVID-19 pandemic, there was insufficient understanding of several remote learning strategies. Some learners in HEIs in sub-Saharan Africa felt terrified and frustrated because of limited internet access at their home (Tanga et al., 2020). It was noted with concern that even in some developed countries, the best models of remote teaching and learning were not available during the outbreak of COVID-19 pandemic (Zawacki-Richter, 2021). A critical reflection from research indicates that the rapid transition to remote learning lacked proper framework due to lack of scientific evidence to support the adoption. Although one could note a tremendous growth of remote learning and popularity during COVID-19, it still lacks proper theoretical grounds being well addressed through research, which raises concerns during its adoption. Therefore, this study examines the research patterns and the current trends to inform the future practices and direction.

Method

This study employed bibliometric data analysis procedures. Bibliometric analysis was considered as an essential tool for assessing and analyzing the output of scientists, cooperation between universities and authors and collaborations between and among countries (Moral-Muñoz et al., 2020). Bibliometric analysis helps in creating real information based on scientific evidence with the purpose to improve services on a specific phenomenon (Ball & Tunger, 2006). Likewise, Parlina and Ramli (2020) note that bibliometric is a set of methods used to carry out the performance analysis among groups of research actors such as researchers, countries, institutions and the impact of their activity. Bibliometric analysis can help researchers to identify elements in the literature, such as the most productive authors, countries, institutions, and journals within an area of study, as well as trends in production and collaboration networks and overlay network visualization map of co-occurrence of key words (Barragán Martín et al., 2021; Brika et al., 2021; Donthu et al., 2021; López-Meneses et al., 2020). It is on this basis that bibliometric analysis was adopted with the purpose to evaluate researchers, institutions and countries productivity on remote learning.

This study was conducted using a scientific database known as “Dimensions”. This is a digital platform that includes citation data, research analytics features and scholarly e-content. The selection of this scientific database was based on the assumption that the system provides a huge amount of data which include the number of citations per publication (Pablo et al., 2019). The dimensions database constitutes overall research landscape and helps to bring a broader context of research, the researcher, a research field, an institution, a country, and many of the other major issues in research that may be of interest to stakeholders in the research world (Hook et al., 2021).

Literature Search Strategy

Literature retrieval was conducted via the Dimensions database on 22 May 2021. The advanced search option was adopted, and the retrieval strategy involved choosing the key words “remote learning” OR “online learning”

OR "e-learning" AND "Higher education". All these keywords were included in the initial search in the Dimensions scientific database. The connectors used for searching all the concepts were "OR" and "AND" with the aim to find research articles on remote learning.

The language was restricted to English original research articles published between 1961 and 2021. Articles in the form of preprints, books, book chapters and proceedings were excluded from the final sample. The search was made once in order to avoid bias that may be caused by new research articles that emerge in the Dimensions database. The preparation of the final sample obtained was (n=719) research articles. The process for data search strategy and extraction is summarized in Figure 1.

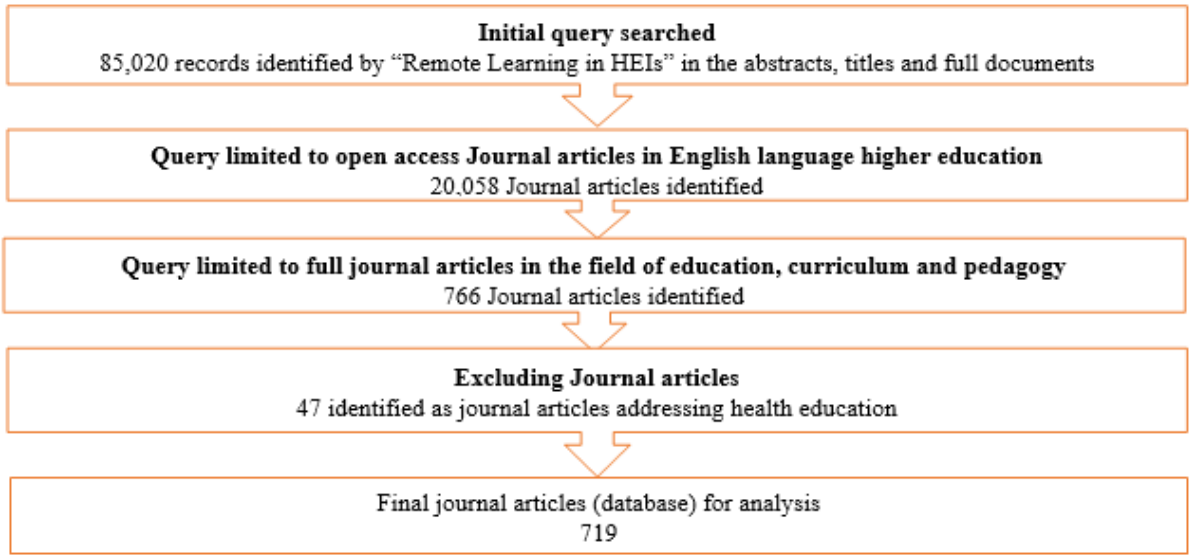

Figure 1. Data Search Strategy and Extraction Process

Data Analysis Procedures

The VOSviewer1.6.16 software was used to carry out visual analysis of the publications. Both network and overlay visualization analysis of co-citation network of authors, most productive journals, most productive organizations, most productive countries and co-occurrence of keywords was conducted through VOSviewer1.6.16 software. Further analysis was done to establish the relationship among authors in terms of collaborations in which several clusters were established across organizations and countries.

Results

General Trends on the Growth of Literature on Remote Learning

The initial search from the dimensions database indicates that there were 719 publications on remote learning 60 years ago (1961 to 2021). The results in Figure 2 show the growth of research articles in remote learning to be at a very low rate from 1961 to 2013 while there is a steady growth from 2014 onwards.

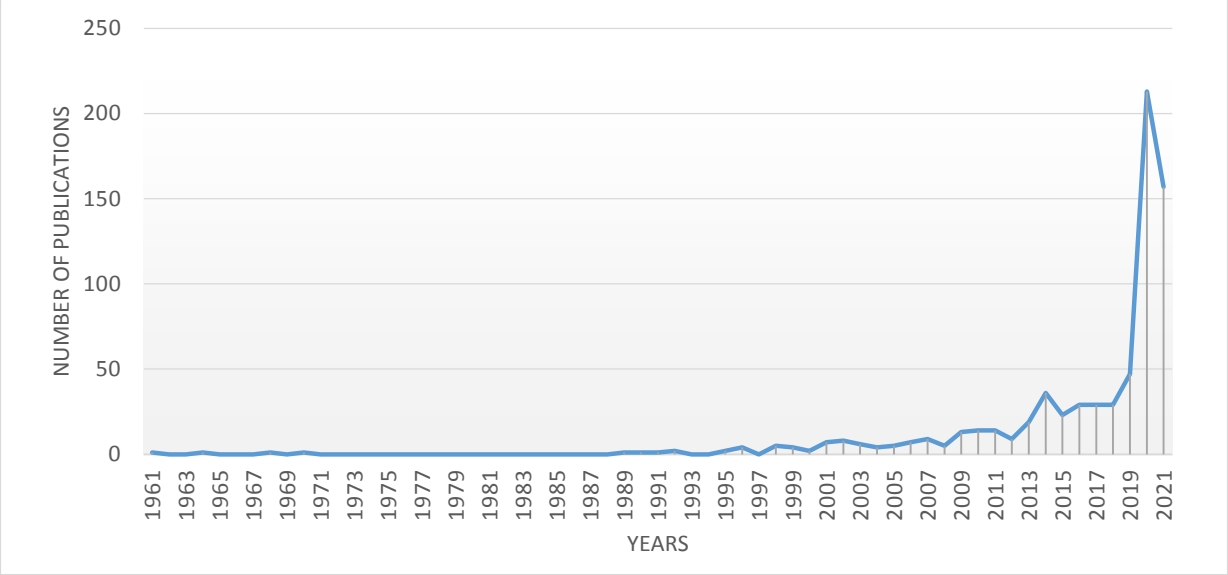

Figure 2. Distribution of Publications by Years

The publication trends indicate that there was a rapid increase in the studies on remote learning. A rapid increase in publishing is noted in the year 2020. One would relate this increase with the outbreak of COVID-19 pandemic where there was the HEIs closure in which remote learning had to take place. This rapid increase predicts the continued trend in publishing in the area of remote learning.

Most Productive Journals with High Pattern Links

The bibliometric analysis was carried out to evaluate network visualization of journals with highest links in terms of citation reflecting on remote learning (see Figure 3).

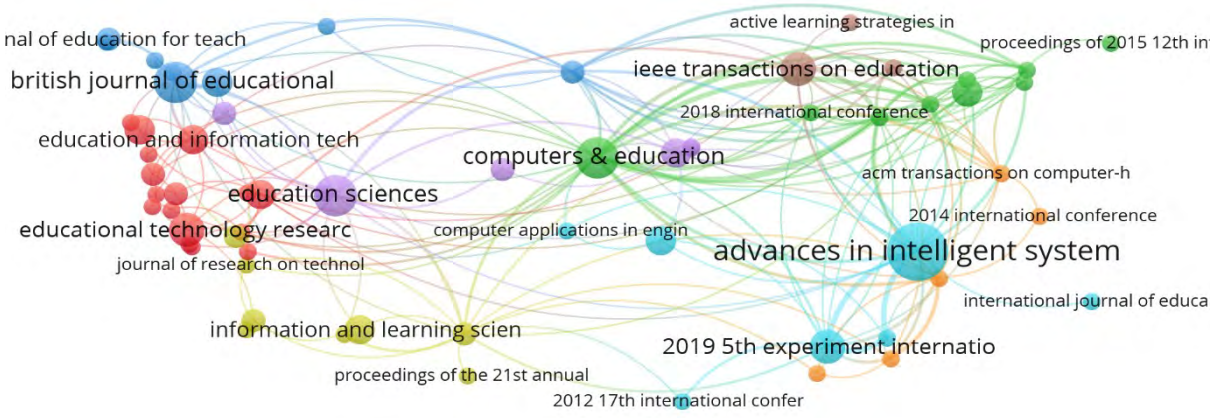

Figure 3. Journals with the Highest Links

Patterns in Figure 3 indicate that resources on remote learning from ‘Computers and Education’, ‘British Journal of Educational Technology’ and ‘Advances in Intelligent System’ have high links in terms of publications and

being referenced by many authors. Based on these findings, therefore, it makes sense to argue that journals with high cite scores are likely to influence authors to submit their manuscripts for publication considerations.

Productivity of Authors and Collaborations

Further bibliometric analysis was made to identify authors with the highest citations and collaborations with other authors in publishing in remote learning. Figure 4 indicates the patterns of most cited authors and strong collaboration with other authors in publishing in remote learning.

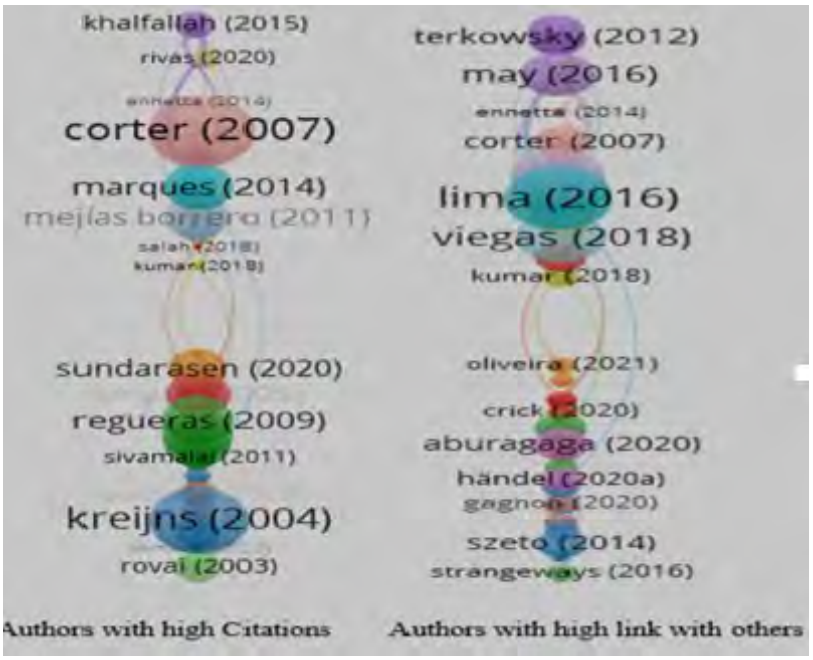

Figure 4. Productivity of Authors and Collaborations

Figure 4 indicates that 'Corter' and 'Kreijns' were the most cited authors in remote learning from the resources retrieved from dimensions database while 'Lima' and 'Viegas' were the authors with highest links in terms of collaboration. The findings indicate that publication collaboration rate was high in the years 2016 and 2020 on remote learning. Likewise, the collaboration is influenced by the geographical location of authors as it can be reflected in Figure 4 where authors such as 'Terkowsky' and May' have strong collaboration because of closeness.

Co-Authorship Patterns between Institutions

The analysis of co-authorship patterns also indicates a strong link between authors across different institutions as presented in Figure 5. Co-authorship depends on the geographical location of the organization. For example, one can notice greater collaboration of authors in "Polytechnic institute of Porto" and "National University of distance learning". The patterns also indicate minimal links in terms of co-authorship between "Purdue University" and "Polytechnic institute of port".

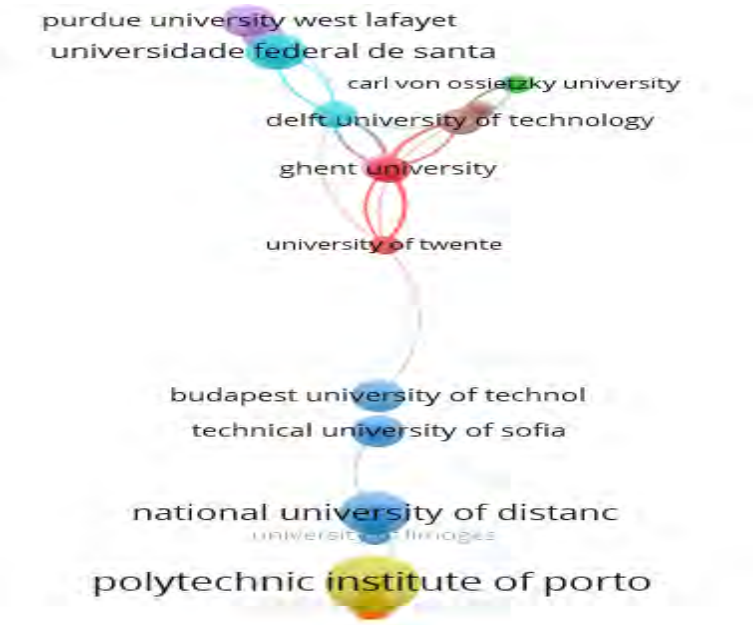

Figure 5. Co-Authorship Patterns between Institutions

Co-authorship between Countries

Further analysis was carried out to examine the co-authorship patterns between countries on remote learning. The findings indicate that there is a strong co-authorship between one country and another as reflected in Figure 6.

Figure 6. Co-authorship between Countries

The patterns in Figure 6 indicate a strong link between authors in terms of co-authorship in countries that are very close in terms of geographical location. Consider the example of the existing patterns between the "United States" and the "United Kingdom"; it is very strong compared with the pattern between the "United States" and "Malaysia" which appears to be very weak as it may be influenced by geographical distance. The patterns on co-authorship between developed countries and sub-Saharan African countries are very limited. The pattern indicates only "South Africa" representing sub-Saharan African countries of which one may conclude that the co-authorship with other authors in other countries is minimal.

Most Productive Countries on Remote Learning

Bibliographic coupling was used to establish the most productive countries in terms of co-authorship across different countries. Figure 7 describes the patterns between countries.

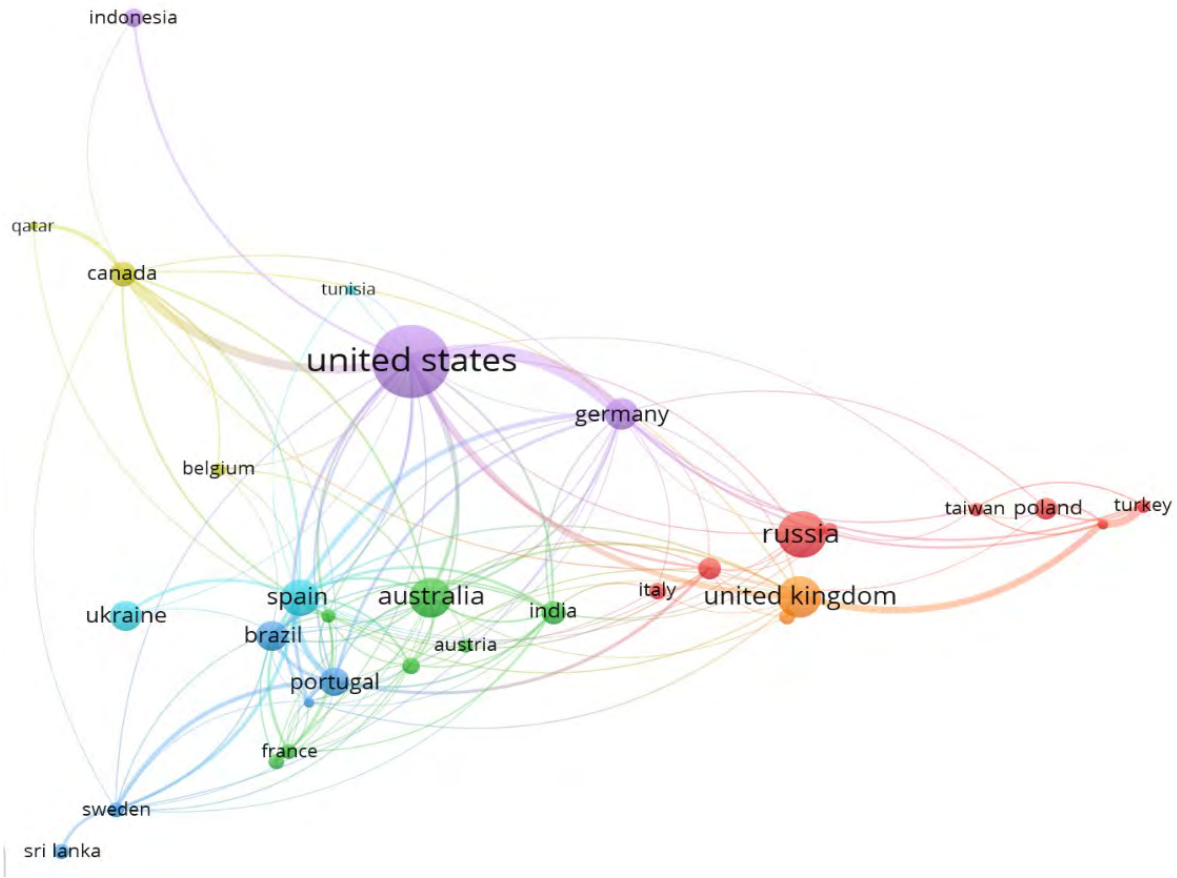

Figure 7. Bibliographic Coupling of Country Authorship Map

The findings indicate that the United States is the top productive country in the field of remote learning as per publications retrieved from the dimensions database. The map also displays a large number of collaborations between countries such as the "United States", "Russia", the "United Kingdom" "Austria" and "Spain". Countries that have strong collaborations are likely to have strong investment in digital solutions that can support remote learning.

Co-occurrence of Keywords about Remote Learning

The co-occurrence analysis was adopted to investigate the popular areas and directions of research on remote learning, particularly how the concept has been researched with associated key terms. The relationship pattern is presented in Figure 8.

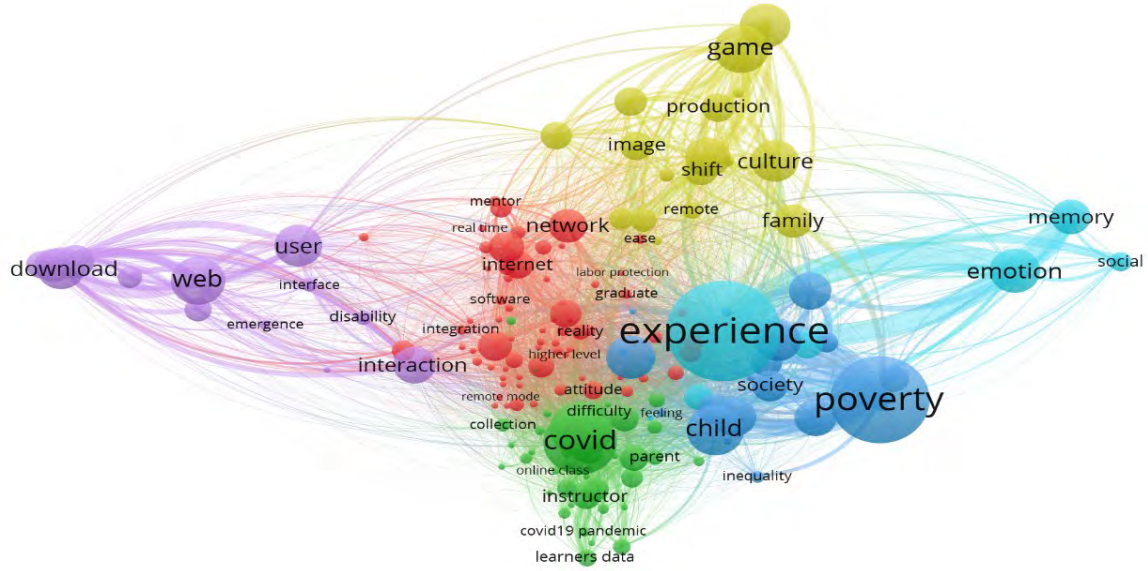

Figure 8. Bibliographic Coupling of Co-Occurrence of Keywords about Remote Learning

The map indicates that key words such as “experience”, “COVID”, “internet” “poverty” and “interaction” had high co-occurrence. This means that remote learning is strongly associated with several factors such as poverty, inequality and internet. Further findings are reflected on approximately to five emerging clusters from the maps that are represented in colors. The Yellow color represents an increased use of multimedia contents such as games and images, while interactivity is represented by purple.

Another cluster is represented by turquoise blue which indicates association between experience and remote learning of which a strong link is reflected on the patterns about the occurrence of “Social emotions” due to lack of experience in using technology. The red cluster indicates conditions necessary to facilitate remote learning of which ‘network and internet’ have strong patterns. The green cluster shows an increased use of online classes during COVID-19 of which there is a strong association between parents and instructors because learning was taking place at home. Another link is represented by sky blue cluster indicating a strong link between poverty and inequalities with remote learning.

Further bibliographic coupling of co-occurrence of keywords was done to explore how keywords about remote learning have evolved over time. Figure 9 shows an overlay network visualization map on keywords and their co-occurrence over time. The map indicates some keywords with appearance in yellow color that were relatively the most recent in literature about remote learning which is about “COVID”, “emotion”, memory and “social”. This could have been influenced by the sudden transition to online learning in HEIs during COVID-19 in 2020.

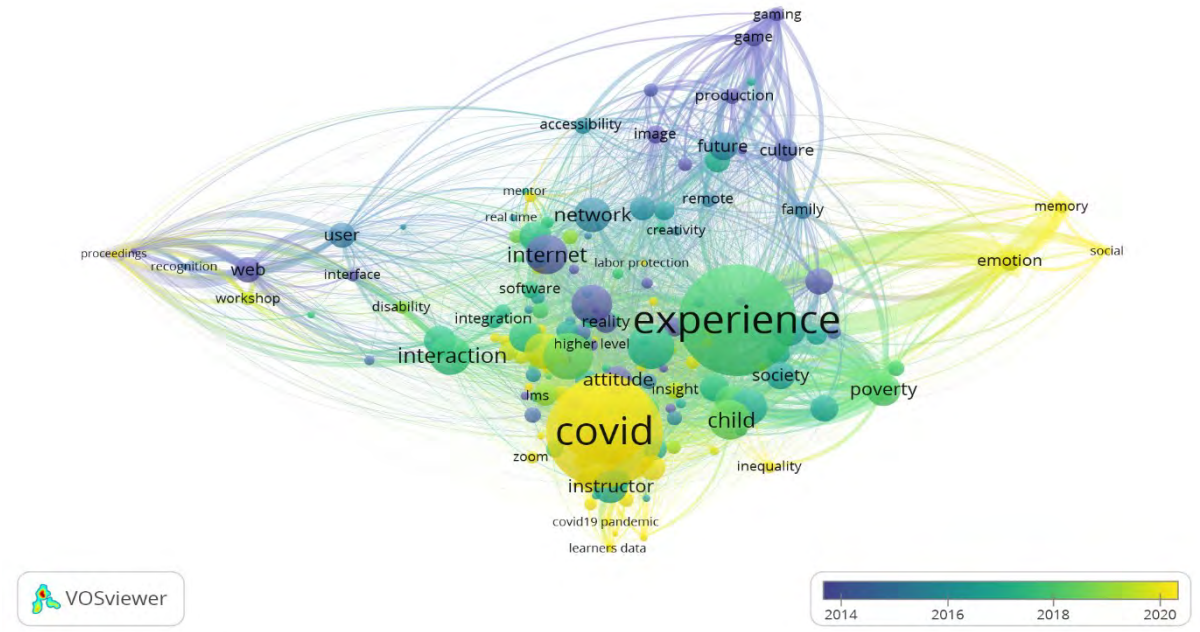

Figure 9. Overlay Network Visualization Map

Discussion

The findings indicate that there has been an increase of publications on remote learning since 1961. The increase of these publications on remote learning over years could imply an increased use of technological integration in HEIs. The results of the current study align with the study findings by Jiménez et al (2019). Furthermore, a bibliometric analysis by Chen et al (2021) revealed an increased research on the topics related to smart learning which includes smart learning analytics, software engineering for e-learning systems, internet of things and cloud computing. This could be perceived that most HEIs are now realizing the need of integrating technology in teaching which is one of the core values of the 21st century. Other researchers on bibliometric analysis using different scientific database have revealed similar findings. They identify the United States, UK, Russia to be the leading countries in publishing research articles on remote learning with a very critical emerging themes on smart learning environment such as "virtual reality," "critical thinking," and "serious games" "sustainable development" "innovation" (Abad-Segura et al., 2020; Agbo et al., 2021; Bond et al., 2020). While the findings of the current study indicated the United States, UK and Russia to be the most popular countries in publishing research articles on remote learning, most developing countries appear to lag behind. Researchers on remote learning in sub-Saharan Africa cite several challenges on ICT integration such as lack of ICT policies in educational institutions, lack of ICT infrastructure; technology affordability and accessibility and lack of public community facilities and skills (Barakabitze et al., 2019; Liesa-Orús et al., 2020; Woyo et al., 2020). Indeed, the prevalence of these challenges raises many concerns regarding the possibilities of supporting remote learning in some HEIs in less developed countries. Therefore, it makes sense to conclude that although some developing countries are lagging behind in remote learning, there are some indicators of a significant increase in publications on this subject in recent years which is a good alarm for more research in the coming years (Jiménez et al., 2019). This view sounds more coherent in this digital age in which educational institutions have an obligation to explore more digital solutions to allow learners to cope with grand challenges.

The findings have also indicated a rapid growth of research about remote learning during COVID-19. The findings have, for example, indicated a strong link between COVID-19 and social emotional challenges in HEIs due to increased use of e-learning. The findings of the current study are in line with the findings from other researchers who note a rapid acceleration of digital transformation in implementing alternative learning delivery during COVID-19 at the global level (Hebebci, 2021; Kang, 2021; Martin et al., 2020; Pokhrel & Chhetri, 2021). Further findings on the key words' occurrence revealed that recent articles on remote learning have a strong link and focused on most factors such as experience, COVID, poverty, internet just to mention a few. This implies that it may be difficult to run remote learning programs if both students and facilitators lack adequate experience on the use of technological solutions in learning as well as lack of reliable access to the internet. Considering the distribution of the key words in recent years as reflected in Figure 9, it appears that experience is a strong factor for remote learning. Most of the literature indicates that when students and facilitators who lacked experience on using technology, faced social emotional challenges during COVID-19 (Ghazi-Saidi et al., 2020; Junus et al., 2021; Xhelili et al., 2021). With the occurrence of several concepts regarding the remote learning during COVID-19, it is an indication of growth of digital solutions to support remote learning. This implies a continued and sustainable light in publications on remote learning as one of the fields of education with high attention.

Although there are indicators of continued growth in remote learning, the truth about obstacles such as poverty and inequalities should not be ignored. The results have indicated that there is a strong link between poverty, inequalities and remote learning. The quick implication one can make is about how these factors such as poverty and inequalities, in this case digital inequalities, have contributed to ineffective adoption of digital solutions that can influence remote learning. Digital inequalities is not a new phenomenon and it can be seen with multiple dimensions reflecting on the accessibility of internet and technological devices. Researching on digital inequalities Castaño-Muñoz (2010) found that students in developed countries have access to internet but the access to technological devices is not sufficient to guarantee equal opportunities for all which contributes to digital inequalities. Most HEIs which had technological inequalities and who resisted to use new technological supports, faced a number challenges to migrate to remote learning during COVID-19 (Rodríguez-Abitia et al., 2020). Digital inequalities is strongly linked with poverty due to inability to access internet, presence of non-functional devices, poor internet connectivity which lead to lower remote learning proficiency among students in HEIs (Katz et al., 2021; Vassilakopoulou & Hustad, 2021). Further findings indicate that students who reported greater financial hardship since the start of the pandemic experienced significantly more connectivity, device, and faculty communication challenges during remote learning, and had significantly lower remote learning proficiency (Katz et al., 2021). This is an indication that remote learning policies in HEIs are less inclusive which might lead to difficulties in achieving the Sustainable Development Goals (SDGs) agenda which emphasize on the diffusion of ICTs in reducing the digital gaps and inequalities in developing knowledge societies (Rodríguez-Abitia et al., 2020). Reducing digital inequalities through digitalization is likely to make universities attractive places for digital native students while increasing the efficiency in learning and interaction between all departments of the educational institution (Chelovechkova et al., 2021). As noted, digital inequalities stand as one of the limitations towards successful integration of technology to enhance remote

learning, but one could notice the prevalence of little evidence, which calls for the need of continued research about it.

Unlike the findings from the current study, Karakose (2021) revealed that majority of the scientific studies on COVID-19 focus on the field of health but give little attention to education. The empirical results from few studies on bibliometric analysis indicate the domination of health sciences publications while social sciences and humanities lag behind significantly (Aristovnik et al., 2020; Guleid et al., 2021). While one can notice an increased rate of publications on COVID-19, Khatter et al (2021) found that most of the studies highlight a preponderance of low-quality case series with few research papers adhering to good standards of reporting. This caution serves as a reminder to many authors and publishers to ensure that high-quality publications matter a lot. The results of this study have also indicated that there is a strong link of co-authorship collaborations among universities, which are close in terms of geographical location. It was noted that researchers on remote learning in the Universities in the "United States" and the "United Kingdom" have a strong collaboration. The results from the current analysis corroborate with the findings by Cancino et al (2017) who found that universities from the US, the UK and Netherlands are the most productive and influential because they account for the most publications with a high number of citations and high h-index. Likewise, Mustapha et al (2021) found that the UK had high publications about digitalization and education compared with the other countries. Wahid et al (2020) also found a strong collaboration on publications about massive online open courses among authors from the United States with colleagues from Malaysia, Saudi Arabia, Japan, Ireland, and Singapore. It is possible to note that most collaborations in publications regarding remote learning are from European countries, which could be perceived that there is a minimal emphasis on the integration of technology in HEIs in other regions such as sub-Saharan Africa. While the Africa agenda of 2063 mentions the need to create a well-educated citizen and skills revolution underpinned by technological innovations, one could notice a glaring mismatch. This is because research, collaborations and innovations that promote remote learning strategies in most HEIs are limited. It is on this basis that Sandnes (2021) recommends that first time authors may be encouraged to collaborate with more experienced researchers within or outside the same institution.

Further results indicate that all the top ten journals on remote learning are from developed countries of which 'Computers and Education' is the leading journal. British Journal of Educational Technology (BJET) and Computers and Education Journal have been leading in publishing articles related to remote learning for many years and it has been influential on the educational technology research community with a high impact in terms of citations (Arici et al., 2019; Chen, Zou, Cheng, et al., 2020; Zawacki-Richter & Latchem, 2018). By reflecting on fifty years of BJET, Chen, Zou and Xie (2020) state that it is in the second place in the area of educational technology and the third place in the area of education as ranked by google scholar. Other researchers have revealed that BJET and Computers and Education Journal to be among the most productive journals on e-learning in higher education with high impact factor (Jiménez et al., 2019; Raman et al., 2021; Talan, 2021). Along this, it has been argued that most of the reputable journals are from the UK, the Netherlands, and the USA (Aristovnik et al., 2020). This is an indication that researchers on remote learning who wish to publish in journals with high impact factor, this journal could be the best option. Writing on where to publish, Makulilo (2021) notes that best journals are indexed in reputable scientific databases such as Web of

Science and Scopus. These journals are highly cited and they add value to the visibility of the university whose staff publish in them. While most reputable and renown journals are from developed countries, it remains a big challenge to developing countries. Indeed, Macháček and Srholec (2021) warn developing countries which devote large resources to support research, but pay less attention to upgrading their research governance capabilities, including research evaluation framework which leads to low quality publications. Having all top ten journals from developed countries is an indication of lack of clear publication policies and strategies in most developing countries. It is perhaps inappropriate to invest a lot of energy in doing research while the dissemination ends in dubious outlets. The results from the bibliometric analysis on most productive journals on remote learning suggest the need to increase competitive journals that could enhance more publications even in developing countries. Knowing the best journals with high impact in terms of citations provides multiple opportunities for researchers to assess and prioritize where to publish.

Conclusion and Recommendations

The results of the bibliometric analysis of research articles on remote learning from dimensions database, suggest a tremendous increase of publications on the area under discussion. While one could note such evolution of remote learning especially during the outbreak of COVID-19 pandemic, little is seen in developing countries. Although the outbreak of COVID-19 is the global challenge, it has contributed to the transition to remote learning in HEIs; the transition from traditional face-to-face sessions in developing countries has been problematic. While many HEIs in developed countries continued with studies during lockdown, in developing countries, they closed their campuses and they had to suspend teaching completely. This is an indication that most developing countries have not invested a lot in digital solutions and research that could enhance remote learning. The prevailing gap suggests that the developed countries allocate adequate funding in promoting remote learning compared with their developing counterparts. Undoubtedly, improving funding towards research and innovations on digital solutions to enhance remote learning is explicitly important if we need to cope with the 21st century needs. Investing in digital solutions has the potential to increase the scientific evidence on remote learning in HEIs.

The main findings indicate that there is an increased growth of publications indicating several factors such as poverty and digital inequalities, which limit proper enhancement of remote learning in HEIs. The results obtained from this bibliographic review provides evidence that most HEIs in developing countries are at the infancy stage of developing technological systems that would enhance remote learning as little evidence exists to show the extent of the investment. This is an indication that HEIs need to rethink, reform their ICT strategies and invest in technological solutions that would enhance remote learning. Further results indicate limited collaborations and innovations that promote remote learning in most of the HEIs. This study arouses interest among researchers to create international collaborations and innovations in research and publications to develop a holistic understanding about remote learning. Clearly, research evidence on global perspectives would bridge the existing digital divide between developed and developing countries.

This bibliographic review was limited to research articles from one scientific database "Dimensions" and the searching of key words was limited to "remote learning" OR "online learning" OR "e-learning" AND "Higher education". Since searching of articles was limited to one scientific database and some key words, some important studies regarding remote learning may have been excluded. On this basis, future studies may focus on other scientific database such "Web of Science" and "Scopus" while extending the choice of key words related to remote learning such as "smart learning", "virtual learning", "Internet of things", "learning analytics", "deep learning", "learning systems" could be used to broaden the occurrence of key themes on the topic. Another potential area for further research could be through systematic review to analyze the content relevant to remote learning in HEIs.

Further research may be conducted to identify other areas relevant to remote learning that address the impact of students' engagement in digital learning environment. There are several emerging issues in using technology for learning such as cyberloafing and cyberbullying that may need further bibliographic study to analyze their effects on students' learning. In spite of the limitations, the results from the current bibliographic review have a significant implication to understand how new technologies may lead into learning efficiency and develop global competitiveness of HEIs. In addition, a more interactive learning environment requires meaningful digital transformation with a critical assessment on effective digital solutions. This study, therefore, provides some insights on the best practices and conditions for HEIs to take into account when embarking on digital transformation.

Acknowledgements

I would like to thank all University of Dodoma staff who were willingly ready to review and give comments in the preliminary write-up of the manuscript.

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