

Teaching and Learning in resource-limited settings in the face of the COVID-19 pandemic

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Abstract

Although the extent of the damage caused by the COVID-19 pandemic in Africa is unknown, its effect on the socioeconomic and geopolitical spheres is becoming palpable. Its impact on communication and social formations is evident as it has shifted such to a more spatial and virtual sphere. The closure of schools does not only interfere with the traditional patterns of socialization but intercepts the academic sequence and plunges ill-prepared educational systems reminiscent of African universities into a cosmos of teaching and learning uncertainties. How prepared are African universities to cope with the threats to its educational systems and adapt or influence the transition? Despite having a teeming youth birth into technology, are they cognitively and technically adept to teach or be taught within the accredited online e-learning platforms? While the safety measures announced by African governments in relation to the closing of educational institutions and the banning of gatherings have a negative impact on the continuation of teaching, learning and research activities of higher education institutions, it could also be seen as an opportunity.

Keywords: COVID-19, e-learning, education, digital divide, Copperbelt

1. INTRODUCTION

The incidence of pneumonia cases that originated from Wuhan, a city in China at the end of 2019, received little public health attention at the outset. The timing of the outbreak coincided with the Chinese Lunar year, and since Wuhan is a large hub with connecting flights and massive rail transit system, the disease quickly spread to other cities in China and internationally to other countries. A new type of virus was identified by the Chinese Center for Disease Control and Prevention as the causative agent for the kind of pneumonia, cough and high fever patients presented with (Chen et al., 2020). It was named 2019 nCoV by World Health Organization but later renamed severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) by the International Committee on Taxonomy of Viruses (World Health

Organization, 2020). In mid-February 2020, WHO announced the epidemic disease caused by SARS-CoV-2 as coronavirus disease 2019 (COVID-19).

Since then more than 31 million of the world's population have tested positive for the SARS-COV-2 virus, with more than 961, 000 deaths. The rate of spreading of the infection poses a great danger to African countries with very fragile health systems and infrastructures (WHO, 2020b). With the first COVID-19 case detected in Algeria, it has spread throughout the whole continent. Africa has recorded over 1,120,722 confirmed COVID-19 cases with more than 24,244 deaths, and still counting (WHO, 2020a). Although the extent of the damage caused by the COVID-19 pandemic in Africa is unknown, its effect on the socioeconomic and geopolitical spheres is becoming palpable. This pandemic does not only threaten human health, social and political patterns but greatly affects the educational systems which has a positive feedback that characteristically and indirectly inhibit the social, economic and political wellbeing of communities, societies and nations. African governments have enforced several preventive and control measures such as; banning public gatherings, closure of schools and public premises that pose a public health threat linked to COVID-19. Others include provision of hand hygienic facilities and hygiene practices in homes and public places, encouraging physical distancing, ban of non-essential foreign travels, mandatory 14-day self-quarantine of travellers from countries with confirmed COVID-19 cases and wearing of facemasks.

The laid-down strategies whether politically or economically motivated or science-driven, prioritize physical isolation. Its impact on communication and social formations is evident as it has shifted such to a more spatial and virtual sphere. The closure of schools does not only interfere with the traditional patterns of socialization but intercepts the academic sequence and plunges ill-prepared educational systems reminiscent of African universities into a cosmos of teaching and learning uncertainties. International organizations mindful of these shifts, have called on universities within the African continent to implement alternative methods of teaching and learning using technology and other distance learning techniques in the wake of the closures of higher education institutions to limit the spread of COVID-19. The World Bank points out that: "education systems must confront issues of inequity front and center. They must also prepare multi-modal responses, capitalizing on existing infrastructure and utilizing a combination of different learning mediums to ensure students are engaged and learning. Emergency remote education can ensure that students continue learning through a variety of avenues. While digital technologies can offer a wide set of capabilities for remote learning,

most education systems in low- and middle-income countries, including schools, children and/or teachers, lack access to high-speed broadband or digital devices needed to fully deploy online learning options. As such, education systems need to consider alternative ways for students to continue learning when they are not in school, like in the current Covid-19 crisis” (The World Bank, 2020). How prepared are African universities to cope with the threats to its educational systems and adapt to or influence the transition? Despite having a teeming youth birth into technology, are they cognitively and technically adept to teach or be taught within the accredited online e-learning platforms? We seek to comment on the preparedness of universities in Africa to adjusting educational patterns in the face of the COVID-19 pandemic, as well as point to the potential academic asphyxiation this pandemic pose to students in resource-limited settings. We hope these few comments will point in the direction of understanding the challenges of teaching and learning in situations as these, available teaching and learning tools and their limitations within resource-limited settings. Comment is also made of the window of opportunities the pandemic brings to improving and transforming education in Africa even for the “common” man. While the safety measures announced by African governments in relation to the closing of educational institutions and the banning of gatherings have a negative impact on the continuation of teaching, learning and research activities of higher education institutions, it could also be seen as an opportunity.

Systems preparedness

Global efforts to support distance education and online learning during this COVID-19 pandemic via the use of technology are colossal. There is no doubt that the pandemic caught many nations not to talk of higher institutions of learning in Africa unprepared. In the midst of this pandemic educators have had to come up with a variety of mitigation measures. One such measure is the development of a variety of teaching practices referred to as emergency remote education, ERE. According to Bozkurt and colleagues ERE is considered as an obligation and not an option because it is about utilizing skills in teaching and learning to survive in times of crisis which include all available resources such as offline and online learning. It is however very important to note that ERE on its own is not considered as a pedagogical concept due to its crash nature (Bozkurt et al, 2020). The COVID-19 pandemic has forced school closures in 191 countries, affecting at least 1.5 billion students and hundreds of millions of university students and lecturers (UNESCO, 2020). A report of the Teacher Task Force, an international alliance coordinated by UNESCO on digitally-based learning reveals that nearly 830 million

learners globally do not have access to a computer and more than 40 per cent have no access to internet access at home (UNESCO, 2020). This disparity in access to computer and internet is a real threat to continuing teaching and learning at such a time of unprecedented educational disruption. This dire situation is particularly evident in low-income countries. Nearly 90 per cent of students in sub-Saharan Africa do not have household computers while 82 per cent are unable to get online (Donou-Adonsou, 2019). Even though 750 million of Africans have access to mobile phone, only a third have smart phones that can support audio-visual online learning. And although having a mobile phone can support young learners, in accessing information or connecting with their teachers, for example, around 56 million live in areas that are not served by mobile networks; almost half in sub-Saharan Africa (Asongu et al., 2019). These statistics explicitly show that the digital divide in sub-Sahara Africa has critically made it difficult for students to get access to a variety of platforms that are being utilised to mitigate the challenges that have risen in the education sector due to COVID-19.

A swift response to such a cataclysm of seismic proportion with ripping tendencies to any robust system requires expertise in online education, faculty and student training as well as more human power in the area of IT personnel to support both the faculty and the students. Societies and institutions are seeking better strategies like mobile ubiquitous learning, which is a learning mode that makes use of mobile technology and enables learning to be performed seamlessly, irrespective of time and space and best suited to the needs, aspirations and unique characteristics of the learner. Learning within this strategy consist of offline and online class activities and heavily relies on mobility, adaptability, accessibility, interactivity, interoperability, immediacy, permanency, pervasiveness, and context awareness. Even though some African universities have implemented some kind of e-learning management system, most had not yet enforced technology-supported teaching and learning, those that do not have e-learning management systems installed on their campuses, are struggling in the heat of the pandemic to introduce technology-based platforms for teaching, learning and research. Available systems in most African countries have inefficient ICT-related infrastructure such as electricity, telecommunications, computers and technically savvy users (Bahrini & Qaffas, 2019). Internet connectivity in tertiary institutions in Africa is inadequate, expensive and poorly managed, hence connectivity, capacity and content, is intricately implicated in the systems ill-preparedness. Resilience must be built into our educational systems, and thus to better effect this emergency remote teaching and learning mitigation plan consideration should be given to

the different learning environments of our students and their access to learning resources, appropriate devices and data. Availability of IT technologies and capacity may not be the only concern, access cost and quality of access due to socioeconomic inequality (Kerres, 2020). We may begin to face usurpation to the right to education in which educational access is governed by access to technologies or compatible technologies. In an attempt to sustain education during this crisis period, most universities have resorted to different shades of learning majorly e-learning.

As we comment on system preparedness, we cannot leave out the effect of this pandemic on assessment. The education system was not well-prepared to handle assessment during this pandemic. To quickly come up with a system which could sufficiently and effectively handle assessment like examinations in universities has been a very big challenge. Some learning institutions began to install systems to handle online examinations but the big challenge has been that the academic staff as well as students had to learn the system in a very short period of time which caused so much panic. These systems which were being installed to handle online exams brought about the question of integrity. How possible is it to administer online exams for thousands of students without students cheating? All in all, COVID-19 has exposed the ill-preparedness of the education sector to handle online exams with integrity. In some Universities students could take the same examination paper at different times within a space of 24 hrs. In such cases it is very difficult to guarantee the integrity of exams. It is even possible for students to make groups and tackle an online examination as if it is an open book examination or assignments because the systems that are being utilized do not have cameras installed to ensure that the candidates would not cheat.

Curricular incongruity

Within the frenzy of transiting to alternative teaching and learning models, the new paradigm of learning advocates e-learning not only for its several benefits, but also because that may be the only “convenient” means and model relevant to sustain learning within this COVID-19 pandemic. It is worthy to note that despite its popularity, the curricula being transited to create e-learning instructions have not been altered and their design is also same as were used in face-to-face settings. Mere regurgitation of materials extracted from books and classroom courses is a major error of e-learning curricula design. Irrespective of the divide on which seasoned educators are found, there is unanimous agreement on the huge differences that exist between e-learning and conventional classroom learning.

The majority of educational environments in African universities operate in traditional patterns and material formulation and presentation by the “older” generation referred to as “digital immigrants”, sizes out the newer generation referred to as the “digital natives”. The question is, are the curricular models for conventional classroom learning suited for e-learning? Is there a need for modification and incorporation of learning-friendly features that enhance comprehension, interaction and feedback assessment in a synchronous fashion? In other words, there is need for curriculum re-design specifically to accommodate online environments. The transition will require institutions to evaluate, redesign or adapt current curricula and develop methods that position the students as moderators of learning aided by tutor. This will require developing teaching materials and presentation in a digitally and student friendly way which attempts to preserve the social context of a classroom as this is critical to effective learning.

Using the Dick and Carey model, e-learning curricula adopted during this period should be evaluated for interface, content, e-learner, and instructor interaction with the e-learner (Dick, 1996). On the basis of this model, in the light of transiting, considering technology may be the first aspect because of access issues and continual change. If the technology is up to date, the learner especially within resource-limited settings may have entry challenges into all aspects of the learning milieu. On the other hand if the technology available several years behind, the training may not be as interesting or interactive as necessary to provide the needed training (Robinson et al., 2020). It is worth adding that the content delivered must not only be technology friendly but also appropriate to the knowledge required to build-in the requisite skills and understanding for the student.

Taking advantage of online learning tools that capture new materials in relevant fields will pace the students and keep them abreast. This should thus be factored in the design for e-learning modules. Very critical is the learner-to-learner interface. As noted, most e-learning platforms merely warehouses for information storage (by the teacher) and retrieval (by the learner). Roberts and colleague suggest that curricula for e-learning must have several communication sources and learners should be incentivized to interact among themselves. While adapting the curriculum to accommodate e-learning this aspect should not be ignored, as idea sharing among peers is an important aspect of learning. The communication among learners and with the instructor must be made easy, in real time and with immediate feedback, without which learners may lose concentration, become disinterested in the process. Feedback can be obtained via assessment of learner interface interaction. Incorporated to the e-learning platforms should be

tools that assess learning satisfaction, related materials explored, tracking time spent in chat rooms and responses to discussion topics. While this transition is abrupt and require quick measures, content delivery and assessment should be analyzed against the learning objectives for clarifications and development (Roberts & Hernandez, 2019).

E-learning within resource-limited settings

With the transfer of academic course materials into virtual platforms, learning has become more active and dynamic compared to traditional in-class learning. The virtual platform centered on the students and their learning, instead of focusing on classroom activities. Access to a vast quantity of resources is possible. This opportunity accommodates different learning styles and allow students to work at their own pace at the same time facilitate learning through a variety of activities. New tools and social media encourage collaboration between students and the community, without barrier to space and time. These same tools allow for the development of virtual communities that can persist after the program/course is done. IT and the Internet can transform processes and institutions, transforming, in consequence, the ways of teaching and learning and opening the door to innovation and new pedagogical theories (Arkorful & Abaidoo, 2015).

Universities especially in Africa are struggling to wrap their fragile IT and teaching systems around the devastating effect of the COVID-19 pandemic in the bid to continue teaching, but the success of these efforts will depend highly on level and quality of digital access. Less than 40% of Africans are online (Jackson, 2016), and with the shift to online classes, students many of who come from low-economic status homes will most likely be less tech savvies. They are educationally vulnerable to be left behind. Many will miss out on this compulsory transition to online education because of the cost of digital devices and data plans. Within limited settings basic available tools are still in use to deliver e-learning to the students, that is WhatsApp and zoom. These are actually very good and learners can easily be reached. Through a WhatsApp group, learners can experience collaborative learning as they interact with other learners which are very good and encouraging because learners are able to learn from each other as well as the instructor. They can also interact with tutors via WhatsApp.

The available online didactic tools within this pandemia have also created a divide in material delivery. On one hand there are videos and pre-prepared materials (which are uploaded on diverse platforms for students to access) and on the other there are online discussions and conferences as well as simulated classroom scenarios where students and teachers can talk in

real time with the additional advantage that such sessions can be recorded and watched again afterwards. The numerous advantages of the latter beckon the question: to what extent do the advantages of being able to converse online offset the disadvantage of "fixed-format" materials, such as video? Does the reviewing of online videos, graphics and other posted educational material and asking related questions help learners especially those who learn by observing and doing?

An opportunity for innovation in teaching and learning

The risk-mitigation measures taken by governments to curb the spread of the coronavirus have led to millions of students to stay at home inconveniencing not only parents and guardians but also governments. Such compulsory inconvenience has prompted educational innovations. The pace at which academic institutions are undergoing transformation is unsatisfactory, with decade-long, lecture-based approaches to teaching and old-fashioned lecture venues. COVID-19 however has become an incentive for educational institutions to search for clever solutions in a flash. In just months, COVID-19 has changed how students are educated around the world. These changes give us a glimpse into how education could change for the better - and the worse - in the long term. Though it may be premature to discuss how the COVID-19 will affect education systems around the world, the prevailing dynamics so far suggest that impact of COVID-19 on education are lasting and will be evident on the trajectory of teaching and learning innovation.

The COVID-19 brouhaha rips open the very foundations and educational strengths of universities especially in Africa. There is a resonating echo of cries to teach online but as highlighted above, the resources available do not sustain learning (Teras et al., 2020). Most universities do not have platforms that present to students a collection of electronic resources, including ebooks, ejournals and academic articles. Emergency remote education offers educators an opportunity to develop other forms of learning which would enable learners continue with learning even when they may lack access to high speed broadband internet that is required to fully implement online learning (Bozkurt et al., 2020). Within this context, using online platforms such as Microsoft teams, Zoom or education television programs in which learners may communicate using designated charge-free hotlines constitute the synchronous methods while use of virtual learning environments where questions can be asked and tasks, activities, and quizzes can be done. In under-resourced contexts, email and messages applications like WhatsApp can be used to communicate with learners asynchronously (Al-

Ohali et al., 2020). This is therefore the time for universities to latch onto available technology and make learning in this present age worthwhile. Options to make learning materials available to students online include uploading teaching materials to moodle for students to download, as well as to cloud services online such as dropbox or google drive. Most of these resources online are free. As has been noted the online learning done in most universities in Africa during this period is non-interactive. It is possible to conduct online discussions on moodle, this can permit for class interaction. To vivify or simulate classroom discussions, synchronous online discussions can be established through Zoom as well as Adobe Connect. Google Meet is software that works on personal computers while Hangout Meet is an application that works on cell phones. Many universities quickly transitioned content to some of these online environments without paying too much attention to online pedagogy (Crawford, 2020). As such, it will be difficult to say if these do guarantee effective interaction and if online classes will give us good feedback from students. This is however an opportunity to maximize the IT services of universities to build capacity of lecturers on how to produce their own videos which can be used as instructional material for distance learning. The shift to incorporate these non-tradition modes of teaching and learning brings about huge amounts of stress and the African education system has had to take into account modalities of dealing with stress which comes to learners, educators and parents in the implementation of ERE. This usually causes stress because during such times there is too much information flowing causing learners to undergo the learning process through media they are not very familiar with (Bozkurt et al, 2020). For example, the Copperbelt University in Zambia began installing the moodle platform in August 2020 on its e-learning platform for the main purpose of administering end of academic year examinations scheduled for September 2020. Now this is a platform which was not familiar to students and almost all faculty members and intensive training was conducted in a space of three days for staff. Many were stressed in trying to learn how to access the moodle platform, how to add resources and how to create course assessments on the platform. Students had to begin learning about techniques of taking exams on the moodle platform which caused a lot of anxiety knowing exams were to be taken within a month's time. One other way in which ERE has opened a new sphere of opportunity is in the area of digital literacy for learners, educators and parents. In digital literacy, there is an element known as critical digital literacy which refers to the set of skills of being able to critically analyze information and evaluating its authenticity (Bozkurt et al, 2020). This is very important as learners are vulnerable to false unsolicited news that is normally forwarded through WhatsApp messages.

The context of resource-limited countries where internet access and bandwidth are an issue puts urgency on public-private partnership. This is an opportunity for universities as well as government agencies to collaborate with telecommunication companies to drive the transformational steam that will provide fast internet services to students at affordable as long as they are accessing education-related platforms. This collaboration is being strengthened and made practical in nations across Africa. Many for-profit educational companies have temporarily made their services available for free (e.g., Pearson) and, similarly, technology companies (e.g., Google) made their freemium services for free to support emergency remote education practices (Williamson et al., 2020). The University of Ghana is offering its students monthly data bundle of 10 GB to access online classes. In South Africa, the University of Witwatersrand in South Africa is collaborating with Vodacom, MTN and Telkom to offer zero-rated access to specific educational websites. The Copperbelt University, Zambia has also partnered with MTN to provide students with 100 MBs everyday to access online student materials on the student portal. Private companies for example tech giants like Microsoft, Facebook, Google and manufacturers like Samsung and e-marketing tycoons like Jak Ma have over the years invested billions into education, the scope has often been limited. This pandemic provides a stage for large-scale collaboration between multinationals and governments for common educational goal. The unfolding of this collaboration will impact on the outcome of education during this pandemic and after. Croizet and colleagues highlight that “education, as an institution, creates the conditions for the construction, reproduction, and legitimation of the stratification of society” (Croizet et. al., 2017) while the private sector according to Espenshade & Radford (2009) in particular, "consolidates advantage among the social groups that are already the most well-to-do. This pandemic has also opened a new window of opportunity for universities to accelerate the plans to use some of these tools which have been known even before the pandemic but less or never utilized at all.

2. CONCLUSION

The COVID-19 pandemic has exposed the weakness not only of health care systems but also the education systems which sits at the foundation of influencing other systems. The transition to virtual classrooms which demands compatible devices and data availability has disadvantaged many students in developing countries as they lack the necessary facilities, as well as finance to meet up to the test. This will further create an inequality in the learning process. While the clarion call from government officials is for every institution to toe the line

of e-learning, the callers fail to create the enabling environment for such transition. While this pandemic may be a set-back, it shows the importance of building resilience to face various threats. To equip the next generation with impeccable skills to be innovative and problem solvers, resilience must be built into our educational systems as well. While much is being done to improve access of learners and teachers to online-learning compatible devices and internet access, there is need to assess the impact and challenges of remote learning on self-directed learning.

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REFERENCES

- Al-Ohali, Y., Alhojailan, M., Palavitsinis, N., Najjar, J., Koutoumanos, A., & AlSuhailani, A. (2020). Human Factors in Digital Transformation of Education: Lessons Learned from the Future Gate at Saudi K-12. *Advances in Intelligent Systems and Computing*. https://doi.org/10.1007/978-3-030-20135-7_5
- Arkorful, V., & Abaidoo, N. (2015). The role of e-learning, advantages and disadvantages of

its adoption in higher education. *International Journal of Instructional Technology and Distance Learning*.

- Asongu, S., le Roux, S., Nwachukwu, J. C., & Pyke, C. (2019). The mobile phone as an argument for good governance in sub-Saharan Africa. *Information Technology and People*. <https://doi.org/10.1108/ITP-01-2018-0011>
- Bahrini, R., & Qaffas, A. A. (2019). Impact of information and communication technology on economic growth: Evidence from developing countries. *Economies*. <https://doi.org/10.3390/economies7010021>
- Bozkurt, A., Jung, I., Xiao, J., Vladimirschi, V., Schuwer, R., Egorov, G., Lambert, S., Al-Freih, M., Pete, J., Olcott Jr., D., Rodes, V., Aranciaga, I., Bali, M., Alvarez Jr., A., Roberts, J., Pazurek, A., Raffaghelli, J., Panagiotou, N., de Coëtlogon, P., ... Paskevicius, M. (2020). A global outlook to the interruption of education due to COVID-19 Pandemic: Navigating in a time of uncertainty and crisis. *Asian Journal of Distance Education*. <https://doi.org/10.5281/zenodo.3878572>
- Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., Qiu, Y., Wang, J., Liu, Y., Wei, Y., Xia, J., Yu, T., Zhang, X., & Zhang, L. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*. [https://doi.org/10.1016/S0140-6736\(20\)30211-7](https://doi.org/10.1016/S0140-6736(20)30211-7)
- COVID-19: 20 countries' higher education intra-period digital pedagogy responses. (2020). *Journal of Applied Learning & Teaching*. <https://doi.org/10.37074/jalt.2020.3.1.7>
- Croizet, J. C., Goudeau, S., Marot, M., & Millet, M. (2017). How do educational contexts contribute to the social class achievement gap: documenting symbolic violence from a social psychological point of view. In *Current Opinion in Psychology*. <https://doi.org/10.1016/j.copsyc.2017.08.025>
- Dick, W. (1996). The Dick and Carey model: Will it survive the decade? *Educational Technology Research and Development*. <https://doi.org/10.1007/BF02300425>
- Donou-Adonsou, F. (2019). Technology, education, and economic growth in Sub-Saharan Africa. *Telecommunications Policy*. <https://doi.org/10.1016/j.telpol.2018.08.005>
- Espenshade, T. J., & Radford, A. W. (2009). No longer separate, not yet equal: Race and class in elite college admission and campus life. In *No Longer Separate, Not Yet Equal: Race and Class in Elite College Admission and Campus Life*.
- Jackson, T. (2016). *The dawn of an African e-commerce goldrush may be a false one*. Quartz.
- Kerres, M. (2020). Against All Odds: Education in Germany Coping with Covid-19.

- Postdigital Science and Education*. <https://doi.org/10.1007/s42438-020-00130-7>
- Roberts, T., & Hernandez, K. (2019). Digital Access is not Binary: The 5’A’s of Technology Access in the Philippines. *Electronic Journal of Information Systems in Developing Countries*. <https://doi.org/10.1002/isd2.12084>
- Robinson, H., Al-Freih, M., & Kilgore, W. (2020). Designing with care: Towards a care-centered model for online learning design. *International Journal of Information and Learning Technology*. <https://doi.org/10.1108/IJILT-10-2019-0098>
- Teras, M., Teras, H., Arinto, P., Brunton, J., Daryono, D., & Subramaniam, T. (2020). COVID-19 and the push to online learning: Reflections from 5 countries. *Digital Culture & Education*.
- The World Bank. (2020). *How countries are using edtech (including online learning, radio, television, texting) to support access to remote learning during the COVID-19 pandemic*. Worldbank.Org.
- UNESCO. (2020). COVID-19 Educational Disruption and Response. *Unesco.Org*.
- WHO. (2020a). Coronavirus (COVID-19) _ WHO _ Regional Office for Africa. In *COVID-19 in the WHO African Region*.
- WHO, W. H. O. (2020b). Coronavirus Disease 2019, Situation Report–192. *A & A Practice*. <https://doi.org/10.1213/xa.0000000000001218>
- Williamson, B., Eynon, R., & Potter, J. (2020). Pandemic politics, pedagogies and practices: digital technologies and distance education during the coronavirus emergency. In *Learning, Media and Technology*. <https://doi.org/10.1080/17439884.2020.1761641>
- World Health Organization. (2020). Naming the coronavirus disease (COVID-19) and the virus that causes it. In *World Health Organization*.