



Resourcing as an Antecedent of Effective Online Learning Adaptation in the Face of COVID-19: The Case of Papua New Guinea University of Technology (PNGUoT)

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Authors' contributions

This work was carried out in collaboration among all authors. Author STD designed the study and wrote the first draft of the manuscript. Author SF performed the statistical analysis. Author PO wrote the protocol, while Author CTN managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

This pandemic has utterly disrupted traditional education systems around the world. Even as a global search for sure-fire innovative solutions to the pandemic rages on, it is increasingly becoming clear that online teaching is no more of an option but, a necessity; changes that were occasioned by COVID-19 might be here to stay! While some are nervous that the abrupt unprecedented pivot to online delivery mode might result in a poor user experience that could stifle sustained growth, others are optimistic that a new normal of learning has emerged with significant takeaways. This study sought to examine how universities are adapting to the new normal of teaching online using a case study of PNGUoT. While acknowledging that the transition to online, asynchronous learning poses just as many challenges for students as it does academics, the study delves into the potential confluence of forces that are antecedents to effective online learning such as institutional policies,

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media, instructors and learners, and seeks to establish whether they can meaningfully predict effective online learning. A systematic search from literature coupled with the study findings suggests a moderately strong positive effect of resourcing on effective online learning thereby rejecting a null hypothesis and accepting its alternate. The study concludes that the adoption of online learning will continue to persist in the post-pandemic era and as such, therefore, stakeholders in the education space must bolster their capabilities to provide quality online learning as a panacea.

Keywords: Resourcing; online learning; PNGUoT; adaptation; COVID-19.

1. INTRODUCTION

The COVID 19 pandemic has created the largest disruption of the education system in history, affecting nearly 1.6 billion learners in more than 190 countries and all continents. Closures of schools and other learning spaces have impacted 94% of the world's students' population, up to 99 percent in low and lower-middle-income countries [1] further, with the outbreak of COVID-19, many universities closed campus and/or shifted to online learning. It was arguably the most unprecedented and sudden shift in the modus operandi of teaching delivery in modern history. One of the problems of this sudden pivot to online learning is that, apart from much more serious infrastructure issues such as health, employment, and social care, it exposes the lack of investment in technology adoption by most institutions, an indication that it had not previously been taken seriously [2]. Many institutions were not well equipped to deliver classes virtually, and students no longer residing on campus faced challenges accessing learning materials due to inaccessible or unreliable internet connections [3]. It is thus undeniable that this crisis has stimulated innovation within the education sector since we have witnessed innovative approaches in support of education and training continuity, especially those that support remote learning using the internet [1]. This suffices even when it is obvious that the internet has become one of the vital ways to make available resources for research and learning for both teachers and students to share and acquire information [4] The US Department of Education argues that online learning has roots in the tradition of distance education which dates back to over 100 years back in the era of correspondence courses. With the coming of the internet, there is a huge possibility of offering rich educational resources in multiple media and the capability to support both real-time and asynchronous quality teaching and learning. According to Srecko et al. [5], online education is a form of distance education where technology mediates the learning process, teaching is

delivered completely using the internet, and students and instructors are not required to be available at the same time and place.

The impressive efforts made in a short time to respond to the shocks in the education systems remind us that change is possible and all actors must thus seize the opportunity to find new ways of addressing the learning crisis and bringing about a set of solutions previously thought of as impossible to implement [1]. According to [6], the adoption of e-learning in education, especially for higher educational institutions has several benefits, and given this reality, e-learning is considered among the best methods of education. Several studies have provided benefits and advantages derived from the adoption of online learning technologies into schools [7,8,9]. It should be noted that most Higher Education Institutions have the technology they need, but they lack the experience and practice George et al. [10]. That could have been addressed long ago, though it is never too late to put things right. It will be tough for lots of academics to teach online if they have little or no experience of it. Without the necessary support or development required in such a small time frame, it is likely to be frustrating and full of potential errors, which makes educators and students feel vulnerable.

Martin [2] opines that one of the functions of face-to-face education is that it does a lot of organizing for a student: here is a timetable, here are locations to be in, here is where the resources can be found, etc. The physical structure of campus is also a time and planning structure and when you move online (depending on how it is realized) a lot of that structure is removed. From ethnographic observation, it is obvious that questioning, debating, and bouncing ideas between teacher and students, as well as exploring concepts in a group setting, is the general modus operandi of the study of teaching adults, otherwise called andragogy. It is a relatively new concept to do this in an online setting, where learning communities lack the

privilege and luxury of face-to-face interaction and communication [2]. The policy-makers reason that if online instruction is no worse than traditional instruction in terms of student outcomes, then online education initiatives could be justified based on cost efficiency or the need to provide access to learners in settings where face-to-face instruction is not feasible. The question of the relative efficacy of online and face-to-face instruction needs to be revisited, especially, in light of today's online learning applications, which can take advantage of a wide range of Web resources, including not only multimedia but also Web-based applications and new collaboration technologies [11]

In Papua New Guinea (PNG), the education of nearly 2.4 million students was disrupted by school closures following the government's COVID-19 mitigation measures [12]. According to an article by DWU Teaching staff [13], the Higher Education (HE) sector in PNG is one of the many required to develop innovative strategies that limit face to face contact and adhere to social distancing restrictions. Whereas Academics new to online teaching, are trained to use the online learning paraphernalia, this is not always the case for students. Mohamed and Simon [12] confirm this when they remain silent on student's plight while asserting that in the context of PNG, teachers are vital to the implementation of education response to COVID-19 and need to be equipped with the knowledge, skills, and resources to support remote learning. According to Czuba [14], PNG Higher education is urgently driven to increase access, quality, and online delivery of educational services.

2. PROBLEM STATEMENT

Even in the pre-pandemic era, the world was already digitalizing and HE was not immune to this transition. The trend was well underway and seemed to be accelerating as universities created departments and senior positions to explore online instruction processes within the academy [10]. As a strategic opportunity in the face of the COVID-19 crisis, DHERST encouraged the HE players in PNG to accelerate their options for increasing enrolment via online learning programs [14], PNGUoT responded to this call by activating its online Education systems and processes; paying for a site-wide subscription for both Zoom App and Camtasia Software for Video creation and editing. The University also partnered with Digicell to provide

a 20 GB of data plan for every student through their sim cards. An ICT audit was also done and efforts were made to address the LAN issues that would subsequently improve internet strength for staff and the general university community. There was also a huge investment in skill improvement in online teaching for staff-with several workshops being facilitated by the Teaching Learning Methods Unit and the Department of Distance Learning (DODL). All these efforts were mounted with the assurance that as observed by George et al. [10], online learning transforms education from instructor-centered (traditional classroom) to student-centered, and can help to achieve the key strategic aspiration of PNGUoT of producing worldclass technocrats for the real world [15] where students have more responsibility for their learning. As reasoned by Koch [16], given that students are now able to choose what to learn, when to learn, and who to learn with, a certain level of self-directedness is necessary to succeed in an online course. In light of the above, this study sought to establish the efficacy of the pivot to online learning at the University of Technology Papua New Guinea in light of the investment that the university had instituted in the wake of covid-19.

2.1 Null Hypothesis

There is no significant effect of resourcing on the effectiveness of online learning at Papua New Guinea University of Technology.

2.2 Conceptual Framework

The Fig. 1 illustrates the most significant factors that frame the educational experience in an online setting. As evidenced below, a significant requirement for seamless adoption of online learning should be resourcing, herein construed as the development and adoption of institutional policies, coupled with academic support for both students and staff. This should be done within a framework of a clear strategic vision. Provision for affordances of technology that support learning should also be put in place. This should come with a robust stable learning management system that can support carefully designed learner-centered teaching with interactive and engaging content, a structured collaboration between peers, and flexible timelines to permit learners to pace their learning.

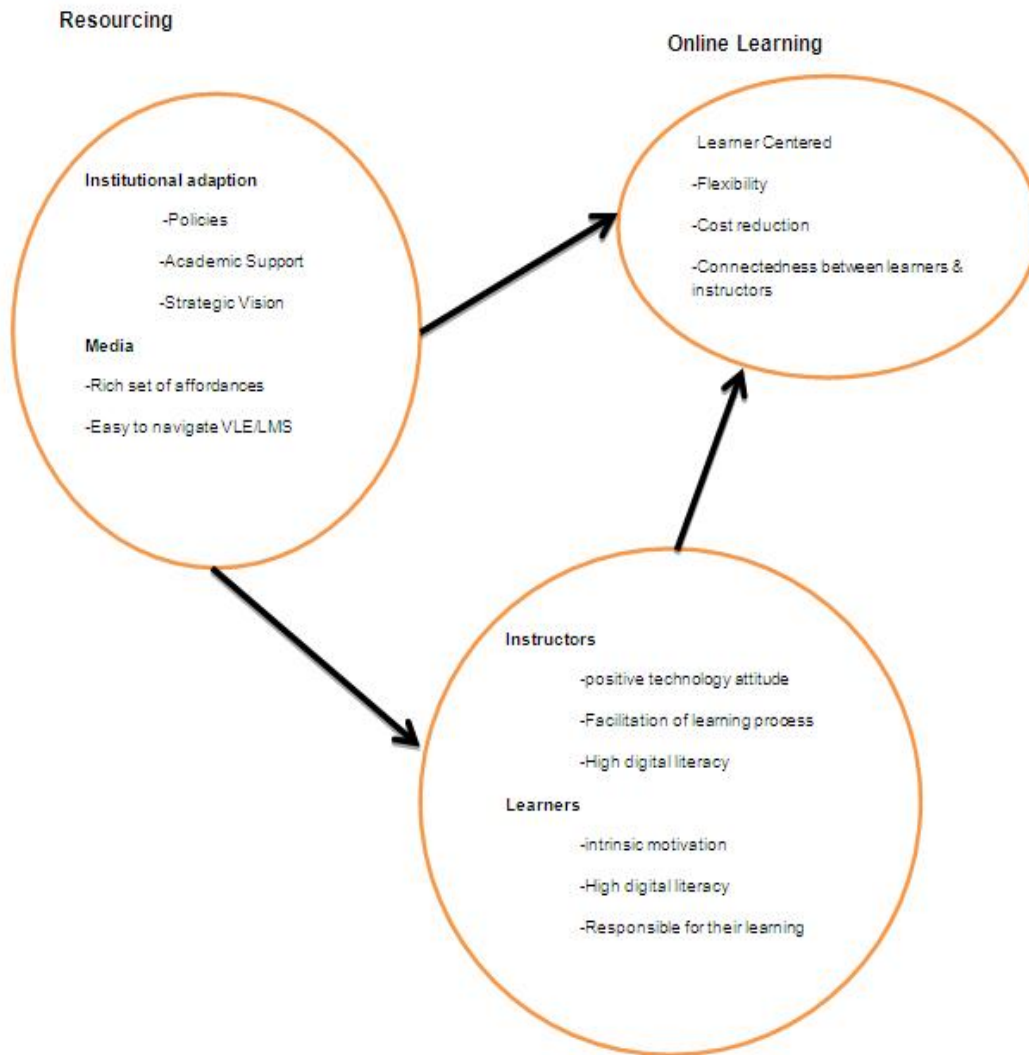


Fig. 1. A conceptual framework showing the effect of resourcing on online learning experience
Adapted from Srecko et al. [5] the history and state of online learning

All these should be done with consideration to costs. There should also be an investment in digital literacy for both instructors and learners. The learners are expected to be intrinsically motivated and take responsibility for their learning. Facilitators' attitudes toward technology would be just as important as their ability to facilitate the learning process by continuously monitoring learners' progress and the availability of ongoing formative feedback as appropriate (Fig. 1). In totality, all facets of a design of this nature can be interpreted in varied ways. For instance, a carefully designed subject imbued with interactive and engaging content might potentially be susceptible to a myriad of

interpretations, and lecturers in various contexts might have varied appreciation and conceptualization of carefully designed and meaningfully engaging resources.

3. LITERATURE REVIEW

3.1 Resourcing and Online Learning

Contemporary research on how resourcing impacts adoption and success in online learning are not in short supply. Resourcing here may begin with policies that support online teaching and learning. Although most

institutions of higher learning have developed policies on online education, they still have to build associated policies for support, course design, and implementation [17]. The most detailed guideline for online learning adoption was advanced by Singh and Hardaker's [18] research. Further, their study suggests that; while deciding on the incorporation of online learning into current practices, the decision-making process must be all-inclusive with a buy-in from all parties involved; a clear strategic vision should guide the entire effort and should be made known to all stakeholders. There should be a cultural configuration with all and sundry within the organization owning its ideation, design implementation, and support. Other studies such as Lous et al. [19], have also found that online teaching succeeded when institutional management acted as role models in creating a culture that promotes and nurtures online learning.

Siemens, Gašević and Dawson [20] state that "instructors' attitude towards technology use and their levels of digital literacy play an important role in shaping overall learning experience". This is also true of the learners, especially those involved in online education. The OECD's report Skills for a Digital World [7] states that the "pervasiveness of digital technologies in daily life is fundamentally changing the way individuals access and elaborate knowledge" (p. 4) and to "ensure that individuals can engage in digital activities and adapt rapidly to new and unexpected occupations and skills needs, a stronger emphasis has to be placed in promoting strong levels of foundation skills, digital literacies, higher-order thinking competencies as well as social and emotional skills" (p. 4). It is therefore unquestionable that building digital capability in both staff and students has been found to have many different dividends.

When it comes to facilitating online learning, an important aspect of teaching in a digital environment is building presence or an online teaching persona. Richardson, Besser, Koehler, Lim, and Strait [21] found that presence is important to student success in online courses and that there are different aspects to building presence including setting the tone; considering the online environment; using sharing as a communication strategy and using feedback as a communication strategy. Garrison and Cleveland-Innes [22] found that there are other important requirements of the online facilitator,

such as: giving clear guidelines to students about the expectations for participation; sustaining participation (via questioning, focussing and modeling); and shaping the direction of learning and progressing meaning-making and understanding.

The Academe tends to agree with Ross and Morrison [23] that the "synergy" of media and pedagogy is what matters. As Schmid et al. [24] noticed that the original argument dates back to the era when technology was barely used for presentation purposes, thus not contributing much to the learning process. When technological affordances are used to support meaningful interaction and engage students in collaboration with their peers and instructors, technology plays an important role in the learning process and even in improving pedagogy [24]. Therefore, pedagogy defines collaborative activities but media enables such activities to occur [21,24].

According to Bonwell and Eison [9], Active learning online, is a learner-centered approach and involves students reading, writing, discussing, or engaging in problems that involve higher-order thinking tasks, such as analysis, synthesis, and evaluation [9]. Teaching in higher education is changing [25]. We are becoming more aware that if we treat our students like passive receptacles of information, we are missing opportunities for effective learning and engagement. The challenge for teachers is to find ways to engage learners to align their current knowledge with the learning goals of a particular course and promote critical thinking and intellectual openness [26]. Employing active learning strategies requires a careful balance between providing appropriate levels of support and challenge [27]; it is a balancing act that is crucial for student engagement and success. An important consideration with any learning, but most importantly with online learning is engagement. How are you going to engage the learners to take this learning journey with you? Factors that are worth considering in this regard include: choosing the most appropriate design and collaborative tools so that students are not passive in the learning experience; scaffolding interactions between learners online, including support for access and motivation, socialization, information exchange, knowledge construction, and development; integrating the digital and physical environments, e.g. online activities helping to continue the discussion/learning in class; integrating digital tools, e.g., the Learning

Management System and other online applications; and using technology in assessment design to enable more authentic assessment.

3.2 The Perspective of Instructors and Students on Online Education

Current research on the perception of instructors and students on online education so much abounds. For example, Carol et al. [28] and Tallent-Runnels et al. [17] studied determinants of students and instructors' satisfaction with the courses offered online and the essence of self-directedness in online students. These studies found that learners tend to appreciate well-designed and frequently updated subjects. A high degree of support from instructors and their involvement in the provision of timely summative feedback also emerged as a determinant [29]. Given the shift in focus of course design from teacher-centered to learner-centered paradigm, it is increasingly becoming imperative that those involved in teaching should practice some form of team teaching [16]. This is because the instructor's role in an online class differs from that in an in-person class. There is a need, however, for more studies to investigate the evolution of teaching within the context of online learning. On the other hand, the lack of unity of time and place in online learning leads to greater interdependence between students and instructors and significantly changes the instructor's role within this "new environment" [16].

Despite issues in access, emerging research on technology use shows that students want to readily embrace a technological shift in higher education and want more technology incorporation within the classroom and in assessment practices. Nonetheless, lately, there seems to be no dearth of research into online education. Gikandi et al. [30], came up with reliability, dishonesty and validity as key concerns when it comes to the integrity of online assessments. Formative and instantaneous feedback and feedforward, critical processes engagement, and opportunity for equitable education emerged as the key dividends driven by online assessments. Online assessments have also been said to foster students' engagement and personal regulation through interactive features such as quizzes, chat-bots, and discussion boards. The greatest pitfall associated with online learning relates to developing personalized

and adaptive learning pathways and the provision of timely, formative and personalized feedback [31]. More empirical studies are needed to inform and strengthen sustainable practice in this area.

Novel educational software systems, such as Learning Management Systems (LMSs) have not only positively influenced the practices of online education. This software has also altered the way traditional universities provide on-campus learning, as well as enabling a mix between the two, which is typically known as blended learning [32] It would be worth noting, however, that the abrupt pivot to online teaching reveals the existence of three gaps: the access gap, (having or not having access to connection and technological devices); the use gap (time of use and its quality); and the gap in teacher skills, (availability of resources, and adaptation of online platforms to support teaching) - this digital gap makes the digital divide wider since its eventuation during a period of covid-19 confinement and limited mobility where people cannot bridge the skill gap with ease [11].

4. METHODOLOGY

Using a descriptive cross-sectional survey design, convenience sampling strategy, and a sample size of 213 respondents; consisting of both university staff and students, the study was conducted using a descriptive research design as recommended by Amin [33]. According to Amin, the method involves observing and describing the behavior of a subject without influencing it in any way. This research design was adopted for this study because of its ability to obtain a general overview of a subject. It was also used because of its suitability at judging the habits of respondents. The study mainly took a triangulation of both quantitative and qualitative approaches. The qualitative aspects of the study aimed at collecting, measuring, and analyzing variables using constructs and themes, Bakkabulindi [34], while the quantitative approach involved the collection, collation, and manipulation of numerical variables. Regression analysis was used to establish the effect of the Dependent variable on the Independent variable.

5. FINDINGS AND DISCUSSION

Coefficient analysis of the effect of Resourcing on online education at PNGUoT aided the study to find out whether the availability of resources contributes to quality online delivery at the Papua

Table 1. Regression Analysis between Resourcing and Online Learning

Variables regressed	Adjusted r^2	F-value	Sig.	Interpretation	Decision on H_0
ResourcingVs Online Learning	.656	18.633	.000	Significant effect	Rejected
Coefficients	Beta	t-value	Sig.		
(Constant)	1.731	6.851	.000	Significant effect	Rejected
Media	.422	6.289	.000	Significant effect	Rejected
Institutional adoption	.498	5.673	.001	Significant effect	Rejected
Instructors	.248	1.809	.005	Significant effect	Rejected
Learners	.159	2.253	.002	Significant effect	Rejected

Source: Primary data, 2020

New Guinea University of Technology. Aspects of resourcing such as proper institutional adoption and consideration of the availability of media, have been previously linked to meaningful online learning, at the analysis stage, other variables close to resourcing such as factors that relate to instructors and learners too were considered within resourcing and jointly correlated with online learning. The results are indicated in the Table 1.

Regression analysis results in Table 1 indicate that the Null hypothesis set at the beginning of the study was rejected and it is alternate accepted implying that there is a moderately positive significant effect of resourcing on online learning. It is evident that resourcing accounted for 65.6% of the Online Learning in PNGUoT and this was indicated by an adjusted r squared of 0.656 leading to an implication that proper resourcing significantly affects the quality of Online Learning that would go on in an academic context. For the coefficients table, results further indicated that of all the aspects of Resourcing, Media accounted for the biggest influence and has a positive effect on online learning in PNGUoT ($\beta=0.498$, $Sig=0.001$), while instructors had the least influence on online learning ($\beta=0.248$, $Sig=0.005$)

However, the study also found that while institutional adoption ranks below Media with ($\beta=0.422$ / $sig.000$), it is closely followed by learners as provided in the matrix above. From the interview responses, it was evident that the majority of the respondents felt that Resourcing strongly impacts online learning and further that the availability of media should be the starting point in ensuring effective online instruction. For example, one respondent noted that *“I think that many factors positively influence online learning but resourcing is chief among them. In the absence of the technology and the relevant*

technical know-how, it would be impossible to even think of studying online.” The respondent further goes ahead to add that *“.....the policy framework, solid support from the management team and effective communication would help realize the effective implementation of online learning as a strategic goal of an institution.”*

The findings on the effect of resourcing on online learning as seen in this study conform with Talent-runnel et al. [17], who equally found a significant positive correlation in their studies and further went ahead to suggest that while deciding on incorporating or adopting online teaching into current practices, such decision-making processes must include all critical stakeholders and of course, it should be undergirded by a strong institutional vision and mission. This position is further supported by [35] and Schmid et al. [24], who posit that when technology is used to support meaningful interaction and engage students in collaboration between peers and instructors, technology begins to play an important role in the learning process and even improves pedagogy.

The findings further corroborate Siemens, Gašević and Dawson [10] who argued that instructors' factors, such as their attitude towards technology use and levels of digital literacy play critical roles in shaping the overall learning experience, and can only be preceded by the learner factor. It is also evident that the findings are not any different from that of Styer [29], who further opines that learners tend to appreciate well-designed and frequently updated subjects. As such, therefore, a high degree of support and their involvement in providing feedback in the online learning context is also emerging as a determinant of quality online teaching.

6. CONCLUSIONS AND RECOMMENDATIONS

The pandemic has brought many challenges to higher education. While educators, administrators, and college leaders are focusing on student needs and solving other pressing problems, they are also looking to the future and reimagining what higher education will be in the years ahead. What will the post-pandemic world look like for teaching and learning? What trends spurred by Covid-19 will last and which will fade away? The fact that different educational administrations have had to carry out a transfer of the educational system from face-to-face teaching to online teaching at a speed of real urgency is causing the use of ICT to have gone from being one methodical resource to a necessary solution for sustainable teaching and learning [25].

As a result of this, the stakeholders in the Education industry must prepare for and embrace the paradigm shift. Those who influence policy, must now channel adequate resources to support ICT intentions in HE. Both hardware and software that support online learning have to be made available to bridge the digital gap and widen participation in a digital ecology. There is an urgent need for a rethink of institutional strategic plans to incorporate investment in online teaching. This however needs a holistic inclusive approach so that there is a buy-in from down up. In the view of [36], instructors need to be reorientated on how to optimize online teaching. This will help them adapt their work methodology to assimilate the context presented by the pandemic. Teacher training must also emphasize ICT in their curriculum to equip the teachers with required competencies as well as requisite pedagogical, ethical, social, and technical aspects that will support their wellness in a digital environment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- UN. Policy Brief: Education during COVID-19 and beyond; 2020. Available: https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf
- Martin Weller. The COVID-19 online pivot: The student perspective, The London School of Economics and Political science; 2020. Available: <https://blogs.lse.ac.uk/impactofsocialsciences/2020/03/12/the-covid-19-online-pivot-adapting-university-teaching-to-social-distancing/>
- USAID. COVID-19 Case study: Malawian Higher Education and Local solutions in Crisis Response; 2021. Available: <https://www.edulinks.org/resources/covid-19-case-study-malawian-higher-education-and-local-solutions-crisis-response;>
- Richardson JC, Besser E, Koehler A, Lim J, Strait M. Instructors' perceptions of instructor presence in online learning environments. *The International Review of Research in Open and Distributed Learning*. 2016;17(4). DOI:10.19173/irrodl.v17i4.2330
- SrećKO JOKSiMOvić, Vitomir Kovanovic, Oleksandra Skrypnyk, Dragan Gasevic, Shane Dawson, George Siemens The history and state of online learning, in Siemens G, Gašević D, Dawson S. *Preparing for the digital university: A review of the history and current state of distance, blended, and online learning*; 2015.
- Arkorful V, Abaidoo N. The role of e-learning, advantages and disadvantages. *International Journal of Instructional Technology and Distance Learning, Ghana*.2015;12(1):29-42.
- OECD. Skills for a digital world: 2016 Ministerial meeting of the digital economy: Background report. *OECD Digital Economy Papers (No. 250)*. OECD Publishing; 2016. Available: <http://dx.doi.org/10.1787/5jlwz83z3wnw-en> Accessed: 12/12/2020
- Garrison DR, Cleveland-Innes M. Facilitating cognitive presence in online learning: Interaction is not enough. *The American Journal of Distance Education*. 2005;19(3):133-148.
- Bonwell CC, Eison JA. *Active learning: Creating excitement in the classroom*. Washington, D.C.: School of Education and Human Development, George Washington University; 1991.
- George Siemen S, Dragan gašević, Shane DawSon. *Preparing for the digital university: A review of the history and*

- current state of distance, blended and online learning; 2015.
Available:<http://linkresearchlab.org/PreparingDigitalUniversity.pdf>
11. US Department of Education, Office of Educational Technology. Transforming American Education; Learning Powered by Technology in National Educational Technologyplan; 2010.
Retrieved:31.12.2020,
Available:<http://www.ed.gov/technology/netp-2010>
 12. Muhammad Tariq Khan. Global partnership for education and simon molendijk, UNICEF Papua New Guinea, Papua New Guinea: Reinventing learning in the time of corona. GPE Transforming Education; 2020.
Available:<https://www.globalpartnership.org/blog/papua-new-guinea-reinventing-learning-time-coronavirus>
Retrieved on 24/12/2020.
 13. DWU Teaching Staff Increasing blended and online learning in PNG universities: The DWU experience, Development Policy Blog; 2020.
Available:<https://devpolicy.org/increasing-blended-and-online-learning-in-png-universities-the-dwu-experience-20200520-2/>
 14. Jan Czuba, Future-proofing access, quality and delivery in Papua New Guinea's Higher Education Sector, DHERST Quarterly Newsletter. 2020;3(1).
 15. Ora Renagi. Welcome to the Papua New Guinea University of Technology.Papua New Guinea University of Technology; 2021.
Available:<https://www.unitech.ac.pg/unitech/welcome>
 16. Koch LF. The nursing educator's role in e-learning: A literature review. Nurse Education Today. 2014;34(11):1382–1387.
DOI:<http://dx.doi.org/10.1016/j.nedt.2014.04.002>
 17. Tallent-runnels MK, Thomas Ja, Lan WY, Cooper S, ahern TC, Shaw SM, Liu X. Teaching Courses Online: A review of the research. Review of Educational Research. 2006;76(1):93–135.
DOI:10.2307/3700584
 18. Singh G, Hardaker G. Barriers and enablers to adoption and diffusion of elearning. Education + Training. 2014;56(2/3):105–121.
DOI: 10.1108/eT-11-2012-0123
 19. Luis E, Gemma FC, Carmen MHL, Hugo G, Jose LAC. Analyzing the impact of COVID-19 on education professionals. Toward a paradigm shift: ICT and neuroeducation as a binomial of action. Sustainability, MDPI, Spain; 2020.
 20. Siemens G, Gašević D, Dawson S. Preparing for the digital university: A review of the history and current state of distance, blended and online learning; 2015.
Available:<http://linkresearchlab.org/PreparingDigitalUniversity.pdf> [pdf, 1.42MB]
Retrieved on 17/12/2020
 21. Richardson JC, Besser E, Koehler A, Lim J, Strait M. Instructors' perceptions of instructor presence in online learning environments. The International Review of Research in Open and Distributed Learning. 2016;17(4).
DOI:10.19173/irrodl.v17i4.2330
 22. Garrison DR, Cleveland-Innes M. Facilitating cognitive presence in online learning: Interaction is not enough. The American Journal of Distance Education. 2005;19(3):133-148.
 23. Ross SM, Morrison GR, Lowther DL. Educational technology research past and present: Balancing rigor and relevance to impact school learning. Contemporary Educational Technology. 2010;1(1):17–35.
Available:<http://aulavirtual.eaie.cvudes.edu.co/publico/lems/L.000.002.Mg/Documentos/anexos/Cap3/1.pdf>
Retrieved on 15/12/2020
 24. Schmid RF, Bernard RM, Borokhovski E, Tamim RM, Abrami PC, Surkes MA, Woods J. The effects of technology use in postsecondary education: A meta-analysis of classroom applications. Computers and Education. 2014;72(0)271–291.
DOI:<http://dx.doi.org/10.1016/j.compedu.2013.11.002>
 25. White PJ, Larson I, Styles K, Yuriev Y, Evans DR, Rangachari PK, Short JL, Exintaris B, Malone DT, Davie B, Eise N, McNamara K, Naidu S. Adopting an active learning approach to teaching in a research-intensive higher education context transformed staff teaching attitudes and behaviours. Higher Education Research and Development. 2016;35(3):619-633.
Available:<http://dx.doi.org/10.1080/07294360.2015.1107887>
 26. McGonigal K. Teaching for transformation: From learning theory to teaching

- strategies. *Speaking of Teaching*. 2005;14(2):1-5.
Available:<http://www.teoeducation.com/teo-photos/albums/userpics/transformation.pdf>[pdf,226KB]
27. Hunt L, Chalmers D. *University teaching in focus: A learning-centred approach*. Camberwell, Australia: ACER Press; 2012.
28. Carroll C, Booth A, Papaioannou D, Sutton A, Wong r. UK health-care professionals' experience of on-line learning techniques: A systematic review of qualitative data. *Journal of Continuing Education in the Health Professions*. 2009;29(4):235–241. DOI:10.1002/chp.20041
29. Styer AJ. A grounded meta-analysis of adult learner motivation in online learning from the perspective of the learner; 2007. Available:<http://search.proquest.com.proxy.lib.sfu.ca/docview/304723729?accountid=13800>
30. Gikandi JW, Morrow D, Davis NE. Online formative assessment in higher education: A review of the literature. *Computers and Education*. 2011;57(4):2333–2351.
31. Siemens G. *Elearnspace activating latent knowledge capacity*; 2014a.
32. Lust, Juarez Collazo, elen, & Clarebout, (), Students' tool-use within a web enhanced course: Explanatory mechanisms of students' tool-use pattern, *Computers in Human Behaviour*; 2012. Available:https://www.researchgate.net/publication/257253214_Students%27_tool-use_within_a_web_enhanced_course_Explanatory_mechanisms_of_students%27_to-ol-use_pattern
33. Amin ME. *Social science research: Conception, methodology and analysis*, Kampala, Makerere University, Uganda; 2005.
34. Bakkabulindi FEK. *Perceived characteristics and adoption of computers among post graduates in the school of education*. Makerere University. Unpublished research proposal writing as a prototype for training M.A higher education in proposal writing as part of introduction to research in higher education, October 13th –December 14th 2008. EAIHESD, School of Education Makerere University Kampala Uganda; 2008.
35. Benard RM, Abrami PC, Lou Y, Borokhovski E, Wade A, et al. How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. *Review of Educational Research*. 2004;74(3):379–439.
36. Jaume D, Willén A. The long-run effects of teacher strikes: Evidence from Argentina. *J. Labor Econ*. 2019;37:1097–1139.

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