HONG KONG JOURNAL OF SOCIAL SCIENCES

香港社會科學學報

第一的第 60 期 (2022 春/夏) Vol. 60 Autumn/Winter 2022

Open Access Article https://doi.org/10.55463/hkjss.issn.1021-3619.60.25

Suspending Contact without Stopping Learning: Technological Response of the South African Higher Education to the COVID-19 Pandemic Challenges

Dorothy Kanyemba*, Costa Hofisi

Public Management, North-West University, Vanderbijlpark, South Africa

Received: August 15, 2022 ▪ Reviewed: September 5, 2022

▪ Accepted: September 21, 2022 ▪ Published: January 5, 2023

Abstract:
The COVID-19 Pandemic is an emergency that requires higher education administrators to design responses that mitigate the challenges of saving lives, simultaneously saving their academic years through non-disruption of educational programs. This study aims to examine how one university and one TVET college in South Africa responded to the teaching and learning challenges imposed by COVID-19 during the 2021-2021 academic cycle. The study followed an exploratory sequential mixed-method approach, viewed through the lens of the Diffusion of Innovation Theory. The methodology involved gathering quantitative data using a survey questionnaire, conducting a qualitative inquiry through interviews, followed by a comparative analysis of how the university and TVET college use the technology to mitigate the COVID-19 challenges. Analysis performed using SPSS Version 27 software and thematic content analysis brought out descriptive data regarding coping mechanisms of the two institutions. Results revealed that the university was ready for a migration to online and remote pedagogy, and a TVET college was still struggling to adjust to the requirements of the digitally driven pedagogy, despite both being under the same higher education system in the country. Wide gaps in accessibility to resources, digital efficacy levels, and supportive ICT infrastructure exist between the two institutions. These findings should provide insight to higher education administrators and policy makers on the need for appropriate interventions that support effective technological adaptations and implementation of remote teaching and learning across all higher education institutions, to fit them in the digitally driven educational environments of the COVID-19 era and beyond. The study recommends digital upskilling of the TVET staff, establishment of partnerships with Internet service providers and reviewing funding models for higher education ICT infrastructure development. This study contributes to the existing literature on higher education administration by identifying challenges hampering TVET institutions' progress toward technologically driven teaching and learning environments of the 21st century and beyond.

Keywords: COVID-19 pandemic, digital infrastructure, information, communication.

在不停止学习的情况下暂停联系：南非高等教育对新冠肺炎大流行挑战的技术响应

摘要：
新冠肺炎大流行是一种紧急情况，要求高等教育管理者设计应对措施，以减轻拯救生命的挑战，同时通过不中断教育计划来挽救他们的学年。本研究旨在研究南非的一所大学和一所职业技术教育与培训学院如何应对 2021-2021 学年期间 新冠肺炎带来的教学和学习挑战。该研究采用探索性顺序混合方法，从创新扩散理论的角度来看。该方法涉及使用调查问卷收集定量数据，通过访谈进行定性调查，然后比较分析大学和 TVET 学院如何使用该技术来缓解 新冠肺炎挑战。使用 SPSS 版本 27 软件和主题内容分析进行的分析得出了关于两个机构应对机制的描述性数据。结果显示，该大学已准备好迁移到在线和远程教学法，而职业技术教育与培训学院仍在努力适应数字驱动教学法的要求，尽管两者都在该国的同一高等教育体系下。两个机构之间在资源可访问性、数字效率水平和支持性信息通信技术基础设施方面存在巨大差距。这些调查结果应让高等教育管理者和政策制定者了解需要采取适当的干预措施，以支持有效的技术调整和在所有高等教育机构中实施远程教学，以适应 新冠肺炎的数字驱动教育环境 时代及以后。该研究建议提高职业技术教育与培训员工的数字技能，与互联网服务提供商建立合作伙伴关系，并审查高等教育信息通信技术基础设施发展的融资模式。本研究通过识别阻碍职业技术教育与培训机构在 21 世纪及以后的技术驱动教学环境中取得进展的挑战，为现有的高等教育管理文献做出了贡献。

关键词：新冠肺炎大流行、数字基础设施、信息、通信。

1. Introduction

In the past few decades, higher education institutions (HEI) have been repeatedly affected by emergencies and disasters, making emergency management an integral part of higher education administration. The current COVID-19 pandemic is one such emergency that has placed higher education administrators in a difficult position of saving lives while preserving academic years by not interrupting their educational programs (Crawford et al., 2020). The pandemic is an adaptive and transformative challenge that requires leaders to design strategies that mitigate the threat with consideration of specific contexts. UNESCO (2020) observed that it has affected 91% of the world's student population and educators, with almost 9.8 million African students experiencing disruptions in their studies.

A desktop study by Crawford et al. (2020) revealed that higher education providers developed various pedagogical approaches and offered innovative ways of managing intra-periods to save the academic year, with most of the countries using online education models. Daniel (2020) believes that many governments ordered the halting of the traditional method of tuition, forcing educational institutions to shift toward online methods almost overnight. Higher education administrators also, had to ensure the non-disruption of learning programs at the same time preventing the spread of the virus by ramping up their ability to teach remotely (Ali, 2020). South African higher education minister, Dr. Nzimande, ordered the closure of all HEIs from March 2020 on an alert level 5 lockdown, and urged the use of digital and online teaching methods to sustain programs during and after the lockdown (Government of SA, 2020; Chothia, 2020). Hence, faculties had to rush to adopt online teaching and learning environments, being mindful of technologies and websites that staff and students could easily access. Wu (2020) believes that this pandemic brought with it a test of organizational agility, with many including South African universities, taking initiatives to move content and pedagogy to online environments.

The effects of the plague on Africa's higher education institutions cannot be ignored. In their study on Africa's challenges, apprehensions and responses to the COVID-19 threat, Tamrat and Teffera (2020) determined that going online has not been easy on a continent where only 24% of the population have internet access, marred by poor connectivity, excessive costs, and frequent power interruptions. Nevertheless, reaching out to millions of marginalized students through alternative means and approaches should be a national priority in such trying times (Pinto and Leite, 2020), so that no student is left behind.

Zhang et al. (2020) observed that this transition to new modes of delivery was not a walk-in-the-park for all types of higher education systems but rather had a huge impact on poorly resourced institutions and on socially disadvantaged students, as limited access to technology and the internet negatively affected their ability to engage in an online environment. Daniel (2020) and Zhang et al. (2020) have observed the need for institutions, instructors, and students of this time, to continue looking for flexible means of fixing damages caused by disruptions to learning trajectories, warned that this pandemic emergency is not a time for implementing institutional plans for distance learning that are meant to be implemented over years or months. Daniel (2020) therefore advises teachers to work with what they understand and know; most importantly, adjust real-time classroom teaching by taking advantage of asynchronous teaching and learning. The expansion of online education is likely to increase across all higher

education institutions, with new waves of infections on the increase (Petronzi and Petronzi, 2020). While they argue that society needs flexible education systems, as we face an unpredictable future, however, scholars like Houlden and Veletsianos (2020) questioned higher education preparedness for the forthcoming digital era of learning ushered in by this pandemic.

Literature exists on university institutions' responses to the COVID-19 challenges; however, very few studies have been undertaken on how TVET colleges in developing economies are responding to the same COVID-19 imposed challenges on teaching and learning. It was the purpose of this study to assess the state of preparedness for online and remote teaching and learning in the university and TVET institutions. Researchers had to examine how these two institutions, based on their technological response during the COVID-19 pandemic lockdown, manage knowledge administration when faced with new virus strains that are emerging after the hard lockdown. The study findings are expected to reveal both opportunities and challenges influencing the adoption of remote and online pedagogy among different higher education institutions in South Africa.

2. Research Methods

This study received ethics clearance from the northwest University's ethics committee. The participants confirmed their informed consent to participate before engaging in the study. This article explores a study of two higher education institutions, the methodological responses of one South African university and one TVET college in one province when faced with the COVID-19 pandemic. A descriptive research design, using a sequential mixed method approach to data collection and informed by the Diffusion of Innovation Theory, was used in this study to determine the technology adoption rates of the two institutions. The population for the study consisted of staff and students of one university and one TVET college selected for this study, namely, North West University (Vaal Campus) and Sedibeng College (Vanderbijlpark, and Lekoa Campuses) respectively. The sample consisted of 177 respondents to the survey questionnaire, as well as 18 interview participants consisting of nine students and nine lecturing staff, all selected from the two institutions and making a total sample of 195 participants. The two institutions under study were conveniently sampled as they are within a close range of the researcher. The researcher also used purposive sampling to develop the quantitative and qualitative samples with participants whose characteristics are defined for a purpose that is relevant to the study (Andrade, 2021). A self-designed questionnaire collected quantitative data online from 177 participants made up of students and staff. A follow-up through structured interviews with questions derived from the quantitative data collected qualitative data from 18 participants comprising nine lecturing staff and nine students from both institutions. The qualitative sample was created independently, not from the quantitative sample. Fieldwork was conducted from June 2020 to February 2021 during the COVID-19 Alert Level 3 in South Africa. Frequency counts and percentages were used in data analysis, calculated using SPSS Version 27 to provide descriptive data. The researchers used thematic content analysis to analyze data from interviews. Finally, the research findings of the study were informed by triangulated data from the literature study, quantitative and qualitative surveys. The following codes were applied to easily identify the interview respondents:

i. UNL1 - university lecturer 1
ii. UNS1 - university student 1
iii. TVL1 - TVET lecturer 1
iv. TVS1 - TVET student 1

3. Research Findings and Discussion

3.1. Higher Education Teaching and Learning under the COVID-19 Pandemic in South Africa

3.1.1. Lockdown Teaching and Learning Methods per Institution

One of the survey questions asked about the service delivery methods adopted by higher education institutions to ensure the continuation of teaching and learning despite the closure of learning institutions during the lockdown. Based on a literature review on international practices during the pandemic (E-Learning Africa 2020; Crawford et al., 2020; Zhang et al, 2020; Zhou et al, 2020), the participants were expected to choose between face-to-face, online, blended methods of teaching and learning.

Figure 1 shows the agreement by most TVET college students (56.67%) that no teaching and learning took place in the TVET institution during the COVID-19 Alert Level 5 between March and June 2020 in South Africa. University students indicated that the institution continued with remote teaching and learning during the same period. While 40% of university students indicated using fully online classes, 3.33% had blended learning.

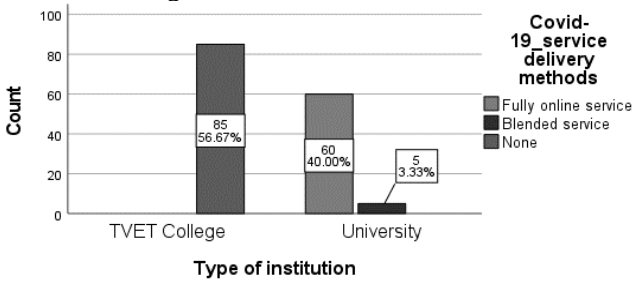

Figure 1. Service delivery methods during the COVID-19 lockdown: Students' responses

TVET interview participants corroborated the quantitative findings. TVS1 said:

We did not have any form of teaching and learning, but just read our books at home. Yes, a portal for e-learning was introduced during the lockdown, not all the students heard about it. I regularly logged in, but no lecturer posted anything on that portal for us. Also, it needs students to have an internet connection for us to access, which most of us cannot afford regularly.

Corroborating the quantitative findings, UNS3 confirmed the continuity of classes by saying:

We did not have much disruption, only that we had to switch immediately to online learning. We finished all our assessments online and our lecturers continued interacting with us on e-Fundi as well as on WhatsApp.

In Figure 2, university students (40.67%) confirmed that the university moved both exams and internal assessments online, making it possible for local and international students who are off-campus to continue with their assessments and write exams in real-time.

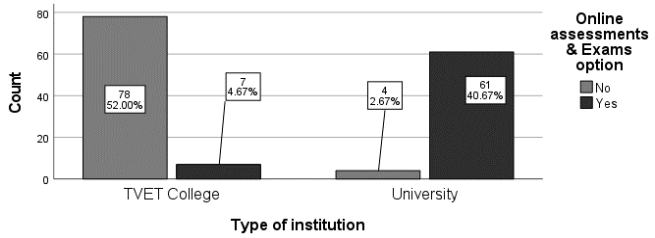

Figure 2. Nature of assessments and exams per institution

However, TVET students (52%) indicated the absence of online assessments in their institution, meaning exams and assessments could only be done in contact environments that were not available at the time.

The suspension of classes did not mean the suspension of learning and teaching for the university, but an opportunity for exploring new pedagogy avenues to facilitate uninterrupted teaching and learning. The fact that the university was already using the e-Fundi portal before the lockdown and availability of internet access is likely the reason why switching to online classes and assessments proved easy for the university staff and students. The recent introduction of the Sedcol Online portal and the absence of such supportive factors like quality internet in the TVET institution contributed to their lack of technological interventions as the institution lacked digital readiness at the onset of the pandemic. These findings agree with Tamrat and Teffera (2020) who observed that, while the need for distance learning was clear from the beginning of the COVID-19 pandemic in most African countries, achieving effective reach to students has proven to be more complex. Rogers (2003) in the Diffusion of Innovation also posits that the degree of complexity of innovation determines largely its adoption rate. This is true in this study as the TVET institution could not reach students remotely during this break due to reasons of resource limitations and lack of a readily available e-learning portal highlighted in some responses above. As the pandemic continues to worsen, TVET institution managers need to start thinking of intervention strategies that will enable remote learning to avoid such disruptions to tuition should the country face yet again a lockdown of this nature.

3.1.2. Post-Lockdown Service Delivery Methods per Institution

In Table 1, the majority of TVET students (96.5%) indicated the return to face-to-face classes after the relaxation of lockdown rules to Level 3, despite the pandemic still being a threat. Neither staff nor students indicated the use of online teaching in the quantitative and qualitative surveys, meaning the college is yet to explore this avenue to enhance pedagogy. On the other hand, 92.3% of the university students indicated that the university mainly remained on online service delivery methods after the lockdown, with blended services used for the other 7.7% of the participants.

Table 1. Teaching and learning methods post-lockdown per institution: Students' responses

Type of institution		Online method	Face-to-face	Blended services	Total
TVET College	Count	0	82	3	85
	Percentage	0.0%	96.5%	3.5%	100%
University	Count	60	0	5	65
	Percentage	92.3%	0.0%	7.7%	100%

Explaining the use of blended services, UNS1 said:

Some programs that require the use of laboratories and other specific resources on-campus combine contact classes with online learning. Contact classes for such are only during the practical sessions and practical assessments, while all theory work is done online.

The results above reveal a wide gap in the university and TVET institutions' use of technology for teaching and learning to address the pandemic challenges. The TVET College is still heavily relying upon on-site classes and examinations while the university has taken advantage of technology to facilitate blended and remote activities in its pedagogy. As Ali (2020) argues, it is high time the TVET institution rethinks its pedagogy, as it is evident now from recurring waves of the COVID-19 infections that remote learning is rapidly becoming the new normal. It is time now that the South African higher education department realizes that investing in educational technology in all types of institutions has become too important to ignore for the sustainable future of quality education.

3.1.3. Most Preferred Service Delivery Method

Considering the challenges faced during the hard lockdown and into post-level 5 lockdown, 56.67% of the total student sample (Figure 3), indicated their preference for blended services, in which face-to-face instruction is complemented by technology-based instruction. Another 22.7% of the students indicated a

preference for face-to-face instruction only and 20.67% preferred fully online services.

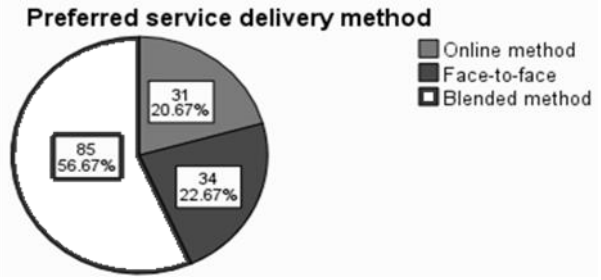

Figure 3. Students' most preferred method of service delivery

The results in Figure 3 and interview responses, showed that preference for blended services is most common in both institutions among both staff and students, a sign that the presence of an instructor is still of importance when ICTs are integrated into pedagogy. Hence, UNS3 argued:

I prefer blended learning to fully online services; at least it allows me physical engagement with the lecturer when I need clarification on certain issues. Fully online services that do not enable one-to-one engagement leave students in the lurch if they don't understand the work posted.

Importantly, as evidenced in Figure 3, 22.67% of students from both institutions still prefer face-to-face teaching and learning despite the challenges they faced during the lockdown period. During the follow-up interview, TVS5 commented:

Considering the challenges of devices, lack of internet access on-campus and at home, we must continue having face-to-face learning. At least we are sure that we will not miss a lot of learning since our lecturers will be available to help all the time. Otherwise, if everything goes online, a number of us will be left behind.

Lack of exposure to resources in the form of suitable electronic devices and internet access is likely the reason for some students' hesitance to accept technology-based education and online learning on its own. Thus, Tamrat and Teferra (2020) encourage institutions to vary alternative means and approaches to teaching and learning to ensure that students with limited access to technology are not left behind, emphasizing the importance of blended learning.

Generally, the university institution is far ahead in its plans to combat challenges imposed by the COVID-19 pandemic on teaching and learning than the TVET College. Regardless of recurring waves of infections, teaching and learning are likely to continue as long as staff and students continue to be supported with relevant infrastructure and resources that facilitate digital communication and online learning. The TVET institution on the other hand looks to be struggling in efforts to adjust to the new requirements of teaching and learning under the unpredictable future posed by the COVID-19 pandemic. Daniels (2020) noted there is a need to pay more attention to the needs of TVET institutions, whose practical nature makes remote learning particularly challenging. This practical nature of the TVET curricula calls for a teaching and learning methodology that blends traditional classroom instruction for practical work, with synchronous video classrooms to support theory presentations, thus creating more relative advantage (Rogers, 2003) of ICT use in the TVET institution. Researchers have also observed that online learning on its own often creates social isolation (Lynch, 2020; Thompson, 2017). Hence, it is important to include synchronous teaching and learning that allows real-time discussions between instructors and students or peer discussions. Thompson (2017), in agreement with Rogers's Diffusion of Innovations, further advises institution managers adopting technologies to improve upon their educational offerings.

3.2. Factors Hampering Effective Remote Teaching and Learning of Higher Education Institutions during the COVID-19 Pandemic

There were common challenges highlighted by the interview and questionnaire respondents from both the university and TVET college in their use of e-Fundi and Sedcol Online portals respectively during and after the hard lockdown.

3.2.1. Lack of Direct Contact with Instructors and Peers Online

A common compatibility concern highlighted by most students is the inability of the LMS portals to facilitate direct interaction between lecturers and students. UNS1 had this to say:

The problem with the portal is that it does not give us a chance to ask the lecturers for clarity directly when one does not understand the notes posted. It would have been more meaningful if it created possibilities of real-time connection with our peers and lecturers through live videos or chats so that we can help each other on the platform.

Mpungose (2019) and Mdletshe (2019) echoed this concern when they observed that while formal e-learning platforms are mostly good at disseminating module content, they lack the necessary social-communication features to allow students to interact with one another and share ideas with their instructors. Students still find the presence of a lecturer valuable, as they need to engage constantly and ask questions. Hence, Rogers' (2003) Diffusion of Innovation Theory suggests that innovations that lack compatibility with user needs and previous systems lead to a lack of user interest in adopting innovations.

Students and staff from both institutions highlighted Web 2.0 technologies like WhatsApp, YouTube, Google Classroom and Facebook Live as more compatible with the students' interaction values, norms, needs and experiences compared to the formal LMS. These technologies are mostly accessible via mobile

devices, which are relatively cheap and common among students. Most students entering higher education are usually competent users of such mobile devices and have very good networking skills acquired through experiential learning (Ali, 2020), making them more compatible with the socio-communicative needs of the new generation of students in this digital age. Tamm (2019) therefore advocates for a combination of synchronous and asynchronous online learning which often involves real-time online chats/interactions, thus making technology an enhancement to pedagogy rather than a replacement of the instructor. However, these two institutions' LMSes remove the instructors' physical presence making them incapable of offering synchronous and asynchronous teaching and learning environments. This study, therefore, proposes the integration of social media platforms in the formal learning platforms of institutions to enable both staff and students to interact and learn through their lived experiences.

3.2.2. Poor Internet Infrastructure and Inadequate Resources

TVET staff and students lamented challenges of poor to no internet connection on campuses and a lack of adequate networked computer as hindering the effective use of the college's e-learning portal. One of the engineering lecturers, (TVL4) commented thus:

It may look like we do not want the initiative to use the portal but such an initiative needs to be supported by the presence of a good internet connection for both staff and students. With our campus' very poor internet connection, the motivation to use the portal wanes off each time you try to connect only to face network errors. Yes, lecturers have mobile routers and data, but what about the students with whom we should connect?

TVET students also shared the same sentiments about the issue of internet connectivity on their campuses. TVS1 was quick to say:

I can't really say we have a Wi-Fi connection that benefits us on this campus. There is one spot where all students gather when they want to access the internet. The network is often not strong enough to allow us to download educational resources. We would be glad if this Wi-Fi is upgraded for our benefit.

The findings from the interviews agreed with those from the quantitative data (Table 2) in that 52.9% of TVET students perceived the internet connection quality of their campuses to be very poor while 66.2% of university students generally showed satisfaction with their institution's internet quality.

Table 2. Internet connection quality per institution

Type of institution		Very poor	Average	Good	Total
TVET College	Count	45	35	5	85
	Percentage	52.9%	41.2%	5.9%	100.0%
University	Count	3	19	43	65
	Percentage	4.6%	29.2%	66.2%	100.0%

This difference in perceptions of internet quality may be due to differences in the types of the Internet used by the institutions. A Ghanaian ICT specialist in the E-Learning Africa Report (2020) hinted that poor internet infrastructure and inadequate resources are factors that widen the gaps in the adoption of technology by different institutions in the same country, thus affecting educational outcomes.

This seems to be the situation affecting different adoption levels by the university and TVET College in this study. TVL5 mentioned that the portal could be a good initiative that could help in addressing the problem caused by reduced contact time with learners due to the COVID-19 pandemic. However, he was quick to point out how this is a challenge to students;

Students are usually the ones to suffer, as we do not have supportive Wi-Fi to enable good internet access. Moreover, the college's student center does not have adequate computers for out-of-class use. This coupled with poor or no internet connection on campus poses a big challenge to the effective utilization of the portal.

Qualitative results also indicate a low bandwidth and speed in the TVET College, making it a challenge for students to access learning materials online even on campus. TVS1 corroborated these findings thus:

Although the campus sometimes has Wi-Fi connection, its quality is not so good. From time to time, we fail to download any materials sent to us by lecturers using WhatsApp.

3.2.3. Lack of Home Internet Access and Adequate Computers

Accessibility of the internet at home by students often determines their adoption of digital technologies for learning purposes. Quantitative analysis revealed 54.7% of all the student sample (Table 3) confirming their use of mobile network data at home, 16.7% use Wi-Fi while 22% have the privilege of both mobile data and Wi-Fi for internet access. However, 6.7% indicated having no form of internet connection sources at home, all of them being TVET Students.

Table 3. Students' internet connection sources at home

Type of institution		Mobile network data	Wi-Fi	Mobile internet data and Wi-Fi	None	Total
TVET College	Count	61	9	5	10	85
	Percentage	71.8%	10.6%	5.9%	11.8%	100.0%
University	Count	21	16	28	0	65

	Continuation of Table 3					
	Percentage	32.3%	24.6%	43.1%	0.0%	100.0%
Total	Count	82	25	33	10	150
	Percentage	54.7%	16.7%	22.0%	6.7%	100.0%

Findings so far reveal that the challenge of internet access and poor ICT infrastructure did not hamper the university's adoption of ICTs as it did in the TVET institution. At an institutional level, challenges of infrastructure and resources did not feature a lot among university participants, indicating the presence of a well-supported environment for technology integration in educational practices in the university. University participants, however, also indicated receiving support in the form of mobile data from their institution. This has contributed a lot to the high uptake of technology-aided teaching and learning. TVET institution management, however, needs to ensure that students and staff remain relevant in the 21st century education environment by focusing on the development of sustainable digital infrastructure and other relevant supporting resources that promote a move to ICT integration in the institution's pedagogy. E-Learning Africa (2020) report thus recommended the creation of an enabling environment through collaborating with internet service providers in order to promote the affordability of services that make remote learning and teaching successful. This is particularly important, especially in developing countries that are experiencing the infancy of e-learning and need a lot of infrastructural support. Higher education department leaders and institutional administrators should therefore consider affordable but strong bandwidth requirements for effective student information systems, and learning management systems to ensure that their students and staff smoothly operate both on and offline.

Mdletshe (2019) also observed that the use of formal LMSs in South African higher education institutions is often impeded by access challenges as not all students have home access to the internet and devices. On a continent with poor connectivity, high data costs, and only 24% of the population having internet access, online education is tough (Tamrat and Teffera, 2020). The high costs of mobile network data across many network providers in South Africa in particular adds to the challenge, as many students cannot afford it.

On the issue of adequacy of computers, university students who stay in off-campus residences partially agreed to the sufficiency of networked computer labs to work in while off-campus. UNS3 stated:

Computers at our off-campus residence are not sufficient as compared to the number of students in residence, but half a loaf is better than nothing. Yes, on campus we really have sufficient labs that are open 24/7, which is a good thing.

While students from the Business Studies department of the TVET college partially agreed to having adequate computer laboratories accessed only during lesson times, interviews with TVET engineering students however revealed a completely different perception of the availability or sufficiency of computer labs to cater for self-study and research. TVS6 had this to say:

We do not have access to computers where we can do our research on campus, especially us engineering students. If only our student center could be equipped with computers for students where we can watch videos of some of the things we learn in class and download extra resources.

It is arguable from the indications above that more computers need to be made available on TVET campuses for out-of-class use. In South Africa, where many households do not have computers and internet access (Moyo, 2019), groups of first-year students in South Africa arrive at higher education institutions with limited access to ICTs and computer illiteracy. Having more networked computers available on campuses would cover the digital gap between those who have and those without resources. Given this scenario, it is therefore important that all course offerings at the higher education level incorporate a computer-related subject at least in the first year in a bid to boost the computer literacy and digital communication skills of all students.

3.2.4. Resistance to Change

Interviews with six TVET lecturers on their strategic interventions towards challenges posed by the recurring waves of the COVID-19 pandemic revealed that most lecturers planned to use WhatsApp if they were to work from home. Only one lecturer indicated plans to use the college portal and Microsoft teams to reach her students. She said:

I have been experimenting with the use of Sedcol Online and Microsoft Teams and I feel they are user-friendly platforms for e-learning. If students have resources like internet bundles and devices, I think this is what I will fall on to reach my students now that we have reduced contact time due to reduced class sizes.

Lecturers have not developed favor for the adoption of other educational technologies but rather prefer using WhatsApp which they are familiar with. Scholars observed that the fear of new technology, exposing ignorance, poor mindset, and low attitude towards technology often made educational instructors resist changes brought by technology integration in their work (Moyo, 2019; Daniel, 2020). However, if lecturers do not spearhead the use of the college portal, there is no way it will gain the support and appreciation of learners. A positive mindset to change is important on the part of the lecturing staff in order for the institutions to make progress towards adoption and better diffusion of technology in educational practices.

3.2.5. Inadequate Training of Staff and Students on the Use of the E-Learning Portal

The issue of inadequate training of TVET College portal users surfaced during interviews, agreeing with the findings from the quantitative survey in Table 4.

Table 4. Staff and students' perception of the online portal use training

			Disagree	Partially agree	Strongly agree	Total
Students	TVET College	Count	81	4	0	85
		Percentage	95.3%	4.7%	0.0%	100.0%
	University	Count	8	28	29	65
		Percentage	12.3%	43.1%	44.6%	100.0%
Staff	TVET College	Count	13	4	0	17
		Percentage	76.5%	23.5%	0.0%	100.0%
	University	Count	2	3	5	10
		Percentage	20.0%	30.0%	50.0%	100.0%

Survey results revealed that 95.3% of TVET students and 76.5% of staff felt that no training was offered to both staff and students on the use of the portal. A further 4.7% of participants from the same institution partially agreed that training was done.

Lecturers interviewed on the challenges of e-learning pointed out inadequate training as a contributing factor to its non-use in the TVET College. TVL4's comment was:

No person received real training on the use of this portal apart from videos posted on the website. The portal was rolled out during the lockdown hence, staff and students alike had to find their own way around its use. Some of us who were born before technology just got lost and gave up.

Nevertheless, the majority of university staff and students (50 % and 44.6%, respectively) strongly agree that training is offered, making university members prepared to use the portal than members of the TVET college. This most probably contributes to the minimal use of the TVET College portal as users lack the confidence in using something they do not properly understand.

Both qualitative and quantitative findings of this study indicated the importance of adopters' understanding of the innovation before they can fully embrace it. Diffusion of Innovation scholars posit that new ideas with less/no complexity tend to be adopted faster than innovations requiring users to develop new skills. If teachers lack expertise in using e-learning tools, they are most likely to resist or avoid using them. Capacity building through training goes a long way to motivate expected users of an innovation to adopt it. Buthelezi (2018) also observed the need for reskilling and upskilling of TVET lecturers to keep abreast with the latest technological developments and deliver blended learning using digital technologies.

The COVID-19 pandemic has posed challenges to higher education institutions' teaching and learning programs. With the onset of the pandemic in South Africa, there has been a paucity of research on how tertiary institutions, particularly, responded to the challenges and cop with continued student engagement during and after lockdowns. This study aimed to examine the mitigations strategies of one South African university and one TVET college in in their attempts to respond to the COVID-19 imposed challenges on teaching and learning.

The institutions in this study have been observed to be responding very differently to the challenges posed by the COVID-19 pandemic. Results revealed evidence of a big digital divide between TVET college and university institutions despite them being under the auspices of the same Department of Higher Education in South Africa. Analysis of data revealed a university that is far ahead in its plans to adjust to the new normal of online and remote learning in a bid to mitigate the COVID-19 imposed challenges and push towards digital teaching and learning environments. However, on the other hand is a TVET college that is still grappling with requirements of a digitally driven pedagogy. The results exposed the TVET college as grossly affected by challenges of poor ICT infrastructure, gross digital divide among students, internet connectivity issue, inadequate digital skills as well as resistance to technological change by its stakeholders. Post-lockdown, the college still largely depends on traditional modes of instruction (face-to-face contact) regardless of the increasing threats from the pandemic. This has revealed gross inequalities between the, TVET college and university institution in terms of resources, ICT infrastructure and support for e-learning, leaving the TVET college in digital slow lane. This can be great insight into the situation prevailing in other TVET sector institutions and should be an eye-opener for both policy makers and institutional leaders on the need to review support goals for such institutions.

The findings also point to a common problem of the non-interactivity of the two institutions' learning management systems. Most students lament the incapability of the portals to offer real-time connection communication with peers and instructors. Thompson (2017) also opined that online remote teaching and learning sometimes presents the threat of isolation as learners feel they are on their own. The need for real-time connectivity by students signifies to some extent, the apprehension brought about by remote learning approaches. Hence, a further finding of the study was the desire for blended teaching and learning approaches by both university and TVET student, in order to ensure

the continued physical presence of instructors.

This study extends previous research on higher education mitigation strategies towards the COVID-19 imposed challenges on academic programs and cycles globally. Tamrat and Teferra (2020), Daniel (2020), and Crawford (2020) in their recent studies reveal the COVID-19 pandemic as an adaptive and transformative challenge requiring quick strategic mitigation plans by higher education leaders in the face of an unpredictable future under the recurring waves of the virus.

UNESCO (2020) observed that almost 9.8 million African students experienced disruptions in their studies due to adaptation challenges. Like many developing countries on the African continent and beyond, not all South African higher education institutions are adapting easily to the new norm of remote and online teaching and learning environments. With institutions forced to migrate to digital methods of delivery, TVET institutions have had programs disrupted as adaptation within a short space of time failed.

4. Conclusion

Implications of findings point to the need for a review of the higher education funding policies as well as review of higher education ICT and digital policy to match it across all institutions and fit learners from the different HEIs into the same 21st century driven education environments. There is great need for a paradigm shift from traditional knowledge administration approaches to more modernized approaches to teaching and learning across all higher education spheres.

Nevertheless, since the adoption of an online strategy is both a technical and pedagogical challenge, this study proposes upskilling TVET lecturers through training in online delivery modes. In the meantime, TVET lecturers are encouraged to explore multimode (blended and remote) teaching and learning approaches as a support for continued teaching and learning during crisis periods so that TVET students do not fall behind.

To improve staff and student access to internet services, the study recommends that institutions and governments establish partnerships with network and ICT service providers. The Department of Higher Education and Training should allocate in its budget more money to TVET colleges to provide ICT facilities and infrastructure as well as revise curricula to match the demand in the digital era. Tapping into the benefits brought by high-speed fiber networks like Megasurf and Openserve that are increasingly expanding coverage in these areas could improve the accessibility and quality of the internet in the institutions.

5. Limitations and Further Study

This study was conducted on two institutions only in a country with 50 TVET colleges and 26 public universities, hence findings cannot be generalized across all higher education institution since the sample used is small enough to be representative of the institutions. The results therefore need to be interpreted with caution. However, the study creates a foundation for further study of South African higher education's technological response to the COVID-19 pandemic challenges on a wider scale in order to have a broad picture of challenges affecting the sector at large. It can also guide further studies in the TVET sector in particular to bring about a better understanding of the sector's opportunities and challenges in this digital era. Since the study did not consider different geographical locations of HEIs from rural and urban perspectives, future study should consider analyzing these factors and their implications of adoption and implementation of innovative teaching approaches ushered by the Fourth Industrial Revolution.

Authors' Contributions

Dorothy Kanyemba: Designing the research instruments, Data collection and analysis, Compiling the research report.

Costa Hofisi: evaluating the research instrument, proof-reading and reviewing the research report.

References

[1] ALI, W. (2020). Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. *Higher Education Studies*, 10(3), 16-25.

[2] ANDRADE, C. (2021). The inconvenient truth about convenience and purposive samples. *Indian Journal of Psychological Medicine*, 43(1), 86-88.

[3] BUTHELEZI Z.G. (2018). Lecturer experiences of TVET College challenges in the post-apartheid era: a case of unintended consequences of educational reform in South Africa. *Journal of Vocational Education and Training*, 70(3), 1-20.

[4] CHOTHIA A. (2020). Coronavirus outbreak closes all South African universities and colleges. https://www.thesouthafrican.com/news/coronavirus-south-african-universities-colleges-closed-nzimande/ Date of access: 10 May 2020.

[5] CRAWFORD, J., BUTLER-HENDERSON, K., RUDOLPH, J., MALKAWI, B., et al. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning and Teaching*, 3(1), 9-20.

[6] DANIEL J. (2020). Education and the COVID-19 Pandemic. https://doi.org/10.1007/s11125-020-09464-3 Date of access: June 2020.

[7] E-LEARNING AFRICA. (2020). The Effect of COVID-19 on Education in Africa and Its Implications for the Use of Technology. A Survey of the Experience of Educators and Technology Specialists. September 2020.

[8] GOVERNMENT, S.A. (2020). Minister Blade

Nzimande: Measures to deal with the Coronavirus COVID-19 in the post-school education and training sector. https://www.gov.za/speeches/minister-higher-education-science-and-innovation-statement-measures-deal-covid-19-threat Date of access: 19 March 2020.

[9] HOULDEN, S., and VELETSIANOS, G. (2020). Coronavirus pushes universities to switch to online classes — but are they ready? The Conversation. https://theconversation.com/coronavirus-pushes-universities-to-switch-to-online-classes-but-are-they-ready-132728 Date of access: 13 May 2020.

[10] LYNCH, M. (2020). E-Learning during a global pandemic. *Asian Journal of Distance Education*, 15(1), 189-195.

[11] MDLETSHE, F.L. (2019). Teaching digital natives: integrating blended learning in creative design for fashion. Master's Thesis. Durban University of Technology.

[12] MOYO, R. (2019). Adoption of information and communication technologies in teaching and learning at a university. South African Journal of Higher Education, 33(5), 42-60.

[13] MPUNGOSE, C.B. (2020). Is Moodle or WhatsApp the preferred e-learning platform at a South African university? First-year students' experiences. *Education and Information Technologies*, 25(2), 927-941.

[14] OECD. (2017a). Digital Government Review of Norway: Boosting the Digital Transformation of the Public Sector. https://doi.org/10.1787/9789264279742-en Date of access: 10 July 2019.

[15] OECD. (2020). The impact of COVID-19 on education insights from education at a glance 2020. Retrieved from OECD website: https://www.oecd.org/education/the-impact-of-covid-19-on-education-insights-education-at-a-glance-2020.pdf

[16] PETRONZI, R., and PETRONZI, D. (2020). The Online and Campus (OaC) Model as a Sustainable Blended Approach to Teaching and Learning in Higher Education: A Response to COVID-19. *Journal of Pedagogical Research*, 4(4), 498-507.

[17] PINTO, M. & LEITE, C. (2020). Digital technologies in support of students learning in Higher Education: literature review. *Digital Education Review*, 343-360.

[18] ROGERS E. (2003). *Diffusion of Innovations*. New York: Free Press.

[19] TAMM, S. (2019). Types of eLearning. https://e-student.org/types-of-e-learning/ Date of access: 20 November 2020.

[20] TAMRAT, W. and TEFERRA, D. (2020). COVID-19 Threat to higher education: Africa's challenges, responses, and apprehensions. *International Higher Education*, 102, 28-30.

[21] THOMPSON, S. (2017). Isolation: A Barrier of Virtual Distance Learning. https://medium.com/@samuelbthompson/isolation-a-barrier-of-virtual-distance-learning-bcfbe95f7f8a Date of access: 12 November 2020.

[22] UNESCO. (2020). COVID-19 Educational Disruption and Response. https://en.unesco.org/covid19/educationresponse Date of access: 8 April 2020.

[23] WU, Z. (2020). How a top Chinese university is responding to coronavirus. https://www.weforum.org/agenda/2020/03/coronavirus-china-the-challenges-of-online-learning-for-universities/ Date of access: 15 May 2020.

[24] ZHANG, W., WANG, Y., YANG, L. and WANG, C. (2020). Suspending Classes Without Stopping Learning: China's Education Emergency Management Policy in the COVID-19 Outbreak: Multidisciplinary Digital Publishing Institute.

[25] ZHONG, R. (2020). *The coronavirus exposes education's digital divide.* The New York Times, March 18.

[26] ZHOU, L., WU, S., ZHOU, M. and LI, F. (2020). School's Out, but Class' On. The Largest Online Education in the World Today: Taking China's Practical Exploration During The COVID-19 Epidemic Prevention and Control As an Example. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3555520 Date of access: April 2020

参考文:

[1] ALI, W. (2020)。高等教育机构的在线和远程学习：鉴于 新冠肺炎大流行的必要性。高等教育研究，10(3), 16-25。

[2] 安德拉德 (2021)。关于便利性和目的性样本的不便真相。印度心理医学杂志，43(1), 86-88。

[3] BUTHELEZI Z.G. (2018)。后种族隔离时代 TVET 大学挑战的讲师经验：南非教育改革的意外后果案例。职业教育与培训杂志，70（3），1-20。

[4] CHOTHIA A. (2020)。 冠状病毒爆发关闭了所有南非大学和学院。 https://www.thesouthafrican.com/news/coronavirus-south-african-universities-colleges-closed-nzimande/ 访问日期：2020 年 5 月 10 日。

[5] CRAWFORD, J.、BUTLER-HENDERSON, K.、RUDOLPH, J.、MALKAWI, B. 等。（2020）。新冠肺炎：20 个国家的高等教育同期数字教学反应。应用学习与教学杂志，3(1), 9-20。

[6] DANIEL,·J. (2020)。教育和 新冠肺炎大流行。 https://doi.org/10.1007/s11125-020-09464-3 访问日期：2020 年 6 月。

[7] 电子学习非洲。（2020）。新冠肺炎对非洲教育的影响及其对技术使用的影响。教育工作者和技术专家的经验调查。2020 年 9 月。

[8] 政府，S.A.（2020）。刀片恩齐曼德部长：在校

后教育和培训部门应对冠状病毒 新冠肺炎 的措施 。 https://www.gov.za/speeches/minister-higher-education-science-and-innovation-statement-measures-deal-covid-19-threat 访问日期：2020 年 3 月 19 日。

[9] HOULDEN, S. 和 VELETSIANOS, G. (2020)。冠状病毒促使大学转向在线课程——但他们准备好了吗？谈话。https://theconversation.com/coronavirus-pushes-universities-to-switch-to-online-classes-but-are-they-ready-132728 访问日期：2020 年 5 月 13 日。

[10] LYNCH, M. (2020)。全球大流行期间的电子学习。亚洲远程教育杂志，15(1), 189-195。

[11] MDLETSHE, F.L.（2019）。教授数字原住民：将混合式学习融入时尚创意设计。硕士论文。德班科技大学。

[12] MOYO, R. (2019)。在大学教学中采用信息和通信技术。南非高等教育杂志，33(5), 42-60。

[13] MPUNGOSE, C.B. (2020)。Moodle 或 WhatsApp 是南非大学首选的电子学习平台吗？一年级学生的经历。教育和信息技术，25(2)，927-941。

[14] 经合组织。 (2017)。挪威数字政府审查：推动公共部门的数字化转型。https://doi.org/10.1787/9789264279742-en 访问日期：2019 年 7 月 10 日。

[15] 经合组织。（2020）。新冠肺炎对 2020 年教育洞察的影响一览。摘自经合组织网站：https://www.oecd.org/education/the-impact-of-covid-19-on-education-insights-education -一目了然-2020.pdf

[16] PETRONZI, R. 和 PETRONZI, D. (2020)。作为高等教育教学的可持续混合方法的在线和校园(OaC)模型：对 新冠肺炎的回应。教学研究杂志，4（4），498-507。

[17] PINTO, M. 和 LEITE, C. (2020)。支持学生在高等教育中学习的数字技术：文献综述。数字教育评论，343-360。

[18] ROGERS, E. (2003)。创新的传播。纽约：新闻自由。

[19] TAMM, S. (2019)。电子学习的类型。https://e-student.org/types-of-e-learning/ 访问日期：2020 年 11 月 20 日。

[20] TAMRAT, W. 和 TEFERRA, D. (2020)。新冠肺炎对高等教育的威胁：非洲的挑战、应对和忧虑。国际高等教育，102, 28-30。

[21] 汤普森 (2017)。隔离：虚拟远程学习的障碍。https://medium.com/@samuelbthompson/isolation-a-barrier-of-virtual-distance-learning-bcfbe95f7f8a 访问日期：2020 年 11 月 12 日。

[22] 教科文组织。（2020）。新冠肺炎教育中断和响应。https://en.unesco.org/covid19/educationresponse 访问日期：2020 年 4 月 8 日。

[23] WU, Z. (2020). 中国一流大学如何应对冠状病毒。https://www.weforum.org/agenda/2020/03/coronavirus-china-the-challenges-of-online-learning-for-universities/ 访问日期：2020 年 5 月 15 日。

[24] ZHANG, W., WANG, Y., YANG, L. 和 WANG, C. (2020)。停课不停学：中国在 新冠肺炎爆发中的教育应急管理政策：多学科数字出版研究所。

[25] ZHONG, R. (2020). 冠状病毒暴露了教育的数字鸿沟。纽约时报，3 月 18 日。

[26] ZHOU, L., WU, S., ZHOU, M. 和 LI, F. (2020)。放学了，但上课了。当今世界最大的在线教育：以中国在新冠肺炎疫情防控期间的实践探索为例。https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3555520 访问日期：2020 年 4 月