



Educational Innovations for Coping Up with Covid-19 Situation in South African Universities*

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ABSTRACT

Purpose: In this paper, researcher describe how the educational innovations and creativity affects the efficiency and performance of the Universities in South Africa in their bid to cope with challenges posed by the COVID-19 pandemic since the beginning of the 2020 academic year. **Method:** The researcher used the cross-sectional research design. The data was collected through a survey with the help of a well-developed questionnaire. Respondents were the employees of university of Johannesburg South Africa selected through a simple random sampling technique. A framework of hypotheses was prepared to establish the relationships between the variables Creativity, Efficiency, Performance and Innovation. SEM-PLS was used for the analysis of data.

Findings: We conclude by examining how these educational innovations creativity have been able the assist the Universities in mitigating the adverse effects of what could have resulted in the loss of a significant part of the 2020 academic year. Educational creativity and innovation significantly improve the Universities' performance by enhancing the efficiency of the employees. **Implications for Research and Practice:** It is recommended that the foundation laid through these innovations should be built upon in the future to provide a platform for 'new normal' in teaching and learning in South African Universities particularly as the Higher Educational Institutions are being enabled to accommodate the disruptions in teaching and learning process due to any troublesome situation.

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Introduction

The World Health Organisations (WHO) indicated that COVID-19 was initially reported in Wuhan, Hubei Province in the Peoples Republic of China in December 2019. The outbreak was declared a Public Health Emergency of International concern in January 2020 and the following month, the World Health Organisations described the outbreak as COVID-19. It is an ongoing outbreak of pneumonia that has been linked to a severe acute respiratory syndrome coronavirus 2 (Zu et al., 2020). The reports from the Centre for Disease Control and Prevention (CDC) showed that the virus is deadly and the vaccine for its treatment is yet to be developed (Chesser et al., 2020).

COVID-19 has led to challenging times in every sphere of human endeavours be it social, economic and educational and has also coincidentally led to rapid adoption and integration of ICT as a means of survival. In particular, teaching and learning at various levels – primary, secondary and tertiary, have been adversely affected to the extent that some countries considered cancelling the 2020 academic year. For example, BBC News quoted Kenya’s Education Minister that “The 2020 school calendar year will be considered lost due to COVID-19 restrictions” (Plancher et al., 2020). In a pandemic situations different university around the world started utilizing innovative tools of learning and teaching and embarked on innovative and creative ideas such as Simulation-based training; Virtual Reality (VR) and Augmented Reality (AR); Flipped classrooms; Teleconferencing and Social-media based platforms. Furthermore, various online courses around this subject have been developed in the past few months. Notable among them are the courses titled ‘Emerging respiratory viruses, including COVID-19 methods for detection, prevention, response and control’ and “COVID-19: Tackling the Novel Coronavirus’ developed by the World Health Organization and The London School of Hygiene and Tropical Medicine (LSHTM) in conjunction with Future Learn respectively. The main objective of these short online courses was to address the issue of emerging respiratory viruses and how to respond to them (Lu et al., 2021).

The fourth industrial revolution (4IR), often referred to as digital technology, is gaining much awareness in which computer and internet technologies have transformed all areas of human endeavor (Johal et al., 2018). The World Economic Forum has described 4IR as an integration of many technologies with a capability of blurring the boundaries between the physical, digital and biological spheres. With particular reference to education, the forum described 4IR as the integration of human and new technologies fusing into these three spheres of life. This has brought great challenges to teaching and learning across various academic, technical and vocational disciplines. The adoption of these emerging technologies well as in all other sectors increase the efficiency of teaching and learning through smart systems enabled by the interaction of humans and technology (Lee et al., 2018). Owing to the technological innovations of the 4IR, several new techniques for efficient and effective teaching and learning can be initiated in educational institutions (Abidah et al., 2020). The emergence of the COVID-19 outbreak calls for an urgent review to introduce some of

these techniques of teaching and learning. A few of these are being practiced by a majority of open and distance learning institutions across the world, to improve the process of deployment of these technologies and achieve the purpose of teaching and learning.

However, despite interventions and strategies adopted by universities and colleges across the world as emergency measures to close the gap between teachers and students or between teaching and learning during closures due to the COVID-19 pandemic, it is noticed that it was difficult to cope up with the emergent situations. Not all students could be catered because of the limitations of resources or due to the COVID-19 restrictions. Hence, to cope up with the challenges, individuals as well as governments all over the world need to develop strategies and devise a coping plan to face the challenges posed by the novel coronavirus pandemic. This study is therefore based on the coping theory which is an area of study dealing with the ways by which people respond to particularly stressful situations like the one presented by the COVID-19 pandemic. It describes how educational institutions coped up with the stressed situation of COVID-19 by utilizing innovative and creative techniques of learning and teaching. Multiple researches have also employed coping theory to address the issue of information technology and its users (Liang et al., 2019).

For this study, South African Universities were specifically examined to determine how they developed innovative educational strategies to cope up with what could have resulted in an apparent loss of an academic semester or an academic year in 2020. A few recent studies, for instance, examined the impact of digitalization of education in South Africa in the wake of the COVID-19 pandemic. It was observed that the SA education sector adopted various digital tools to facilitate teaching and learning across primary, secondary and tertiary institutions (Mhlanga et al., 2020).

Literature Review

The University is an institution for teaching, learning and research. A lot of resources are therefore being deployed to ensure that this important function of teaching and learning is being performed satisfactorily. However, traditional teaching and learning methods which involve students and teachers in a classroom controlled by a teacher have been in the center stage for centuries (Coman et al., 2020). Even for distance and open learning students, many universities had already been running open distance and e-learning as a means of delivery of educational content, even before the COVID-19 pandemic era. Some examples are the University of South Africa (UNISA), The Open University, UK and the Indira Gandhi National Open University (IGNOU), India few. However, after the COVID-19, a lot of innovations have taken place in educational institutions. The modes of learning have transformed drastically. Not only the distance learning institutions, even formal and traditional institutions had to deploy their learning material and conduct teaching electronically through their websites or a dedicated learning management system such as Blackboard or Moodle. The use of innovative technology enabled students to interact with teachers and cope

up with study material online, by participating in discussion forums and submit assignments. Teachers could also now record their lectures so that students can listen to them at their convenient times or present them live through a video conferencing platform (Syafi'i, 2020). Throughout this innovative phase of online learning, the coping abilities of teachers and students were tested. Coping is the ability to manage some specific external pressures which seem to be taxing or greater than the resources possessed by such an individual. This definition is also applicable to a group of individuals, educational institutions, corporate bodies and governments who are facing difficult situations. Coping can also be referred to the efforts (conscious or unconscious) made towards providing solutions to problems. Coping skills and strategies differ from one individual to another (Berjot et al., 2011). From the perspective of psychology, coping skills and strategies refer to mechanisms that are proactively deployed to overcome distress, despair, discouragement, despondency, discomfort, disillusionment and defeat. The psychologists identified these mechanisms as thoughts, emotions and actions which are also linked to an individual's personality traits (Chowdhury, 2020).

Coping issues are felt by particularly those students who are pursuing laboratory-based science courses (including medical and engineering courses) and courses that require field trips. It is premised that a careful deployment of emerging digital technologies could serve as a necessary strategy to cope up with this problem and could also bring significant improvement in the art of teaching and learning in this new era. Such a situation has presented a great opportunity for innovation in the education sector be it primary, secondary, college or university levels (Xing et al., 2017). The need for innovation is now evident in the midst of enormous challenges being faced in the education sector during the ongoing COVID-19 pandemic. Universities need to focus on innovation to earn a competitive advantage and cope up with the COVID-19 situation. The global environment is changing very rapidly in which organizations must adapt and use their capabilities very effectively. In this situation, innovation is not only a matter of concern for the academicians and researchers but also for the university management, which must survive in the situation of COVID-19.

Past studies have examined the effect of innovation on performance since the last decade in several different settings. They have found a positive relationship among these variables (Adam et al., 2021). A number of other studies in the recent past have reported that the performance of organizations is also dependent upon the level of creativity or innovation involved in the organizational process. The organizations that use creativity at the internal, as well as external level, can improve the performance of their firm on both short- term and long-term basis. Such organizations can easily survive in difficult conditions like COVID-19 (Davidescu et al., 2020). Creativity is also an important concept that involves an organizational, team and individual perspective. In situations of crisis, the performance and efficiency of the organization are mainly monitored by creativity and innovation (Acar et al., 2019). In the COVID-19 era, the success of organizations is thus mainly dependent upon the factor of

innovation. In order to create this innovation, organizations must collaborate among all stakeholders and ensure their sustainability. Similarly, innovation in universities also give sustainability to them as they need to fulfil the aspirations of students. In short, the efficiency and outcome of an organization are positively affected by innovation (Serdyukov, 2017). These studies have reported creativity as the main antecedent of innovation. As a result, while organization survive the difficult situation by gathering the maximum market share and earn a maximum profit, universities can accomplish their learning objectives.

To harvest creativity and efficiency among organizations, including universities, decision makers must focus on the innovative and novel ideas by which they can provide good quality services to the organization (Gleason et al., 2017). A new idea is the basis of innovation. Every new idea must have the market potential or a wide acceptability. The new idea must also play an important role to overcome competitive pressures and technological challenges. A few organizations use activities like brainstorming to generate new ideas (Bocken et al., 2020).

Thus, organizational efficiency is not possible without innovation and creativity. Organizations need to understand that the creativity of the organization is a very complex concept. Several skills and talent are involved in the emergence of creativity within the organization (Tran, 2017). Employees also play an important role to generate knowledge and new ideas that are important to enhance efficiency. How employees are involved in the creative process plays a decisive role in the success of an organization. Hence, for the success of any organization, only innovative and creative employees should be hired. These creative employees ensure the efficiency of other employees as well and bring creative difference among competing firms.

Thus, based on the above discussion, theoretical framework in figure 1 is developed and it is hypothesized that

H1: Creativity positively affects the efficiency of universities during COVID 19.

H2: Efficiency positively affects the performance of universities during COVID 19

H3: Innovation positively affects the efficiency of universities during COVID 19

H4: Efficiency mediates the relationship of creativity and performance of universities

H5: Efficiency mediates the relationship of Innovation and performance of universities.

Research Design

A quantitative approach was used to conduct this research. The researchers used the cross-sectional research design. A reflective model was used to assess the effects of proposed predicted variables on the outcome variables. In the first step of analysis, Becker et al. (2012) proposed to calculate discriminant validity, composite reliability, AVE and factor loading of the data gathered at the stage of data collection. This first stage is known as the measurement model. The second stage is known as the structural

model. At this stage, the proposed hypothesis of the study is evaluated through bootstrapping procedure J. J. F. Hair et al. (2016).

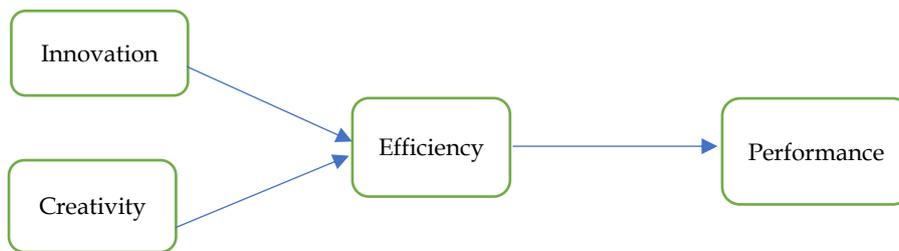


Figure 1. Theoretical framework

Method

Research Design

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Research Sample

The target population was the employees of the University of Johannesburg. A total of 350 respondents were selected through simple random sampling method.

Data Collection Instruments and Procedures

Data was collected by using survey methodology. The researcher distributed online a well-developed and structured questionnaire. A total of 150 usable questionnaires were received. Therefore, the response rate was 42.8% which was sufficient for data analysis.

Data Analysis

The present study utilized Smart PLS-3 application for the data analysis. According to J. J. F. Hair et al. (2016), it is one of the robust statistical tools to examine the structural model. It can efficiently and smoothly determine the cause-effect relationships. Moreover, for predicting variables and developing a statistical model, SEM acts as a powerful tool (Hatamifar et al., 2018).

Results

At the stage of measurement, discriminant validity, convergent validity and internal consistency of the data were calculated. Cronbach alpha and CR were the basis to establish the internal consistency of the data. It is established that the Cronbach alpha and CR of the data must be >0.70 to be in the acceptable range (Mallery, 2003). The results of the data revealed that both CR and composite reliability were well above 0.70 . Thus, internal consistency was established (Fornell et al., 1981). Later, it was required to calculate AVE and factor loading to establish convergent validity. The factor loading >0.50 is considered to be acceptable. Table 1 and Figure 2 presents all the values of factor loading in the acceptable range (J. F. Hair et al., 2010). On the other hand, Fornell et al. (1981) proposed the value of AVE must be >0.50 . The values of AVE mentioned in Table 2 meet these criteria. Thus, convergent validity was also established in the present study.

The next step was to assess the discriminant validity. For this purpose, HTMT approach and Fornell et al. (1981) approach was followed. As per the criteria of Fornell et al. (1981), the value of AVE of a latent variable must be more than the square root of the correlation among the remaining variables. Table 3 presents that the horizontal values are more than the rest of the values. Thus, the discriminant validity of the data was established.

Table 1:

Factor Loading

	Creativity	Efficiency	Innovation	Performance
CR1	0.824			
CR2	0.740			
CR3	0.766			
CR4	0.770			
EF1		0.790		
EF2		0.823		
EF3		0.803		
INO1			0.848	
INO2			0.838	
INO3			0.859	
PER1				0.683
PER2				0.835
PER3				0.804
PER4				0.849
PER5				0.825
PER6				0.597

The results of the HTMT approach also validated the outcomes as suggested by Fornell et al. (1981) and Henseler et al. (2015), who suggested the HTMT values must

be less than <0.90. Table 4 exhibits that this criterion is also fulfilled in the present research.

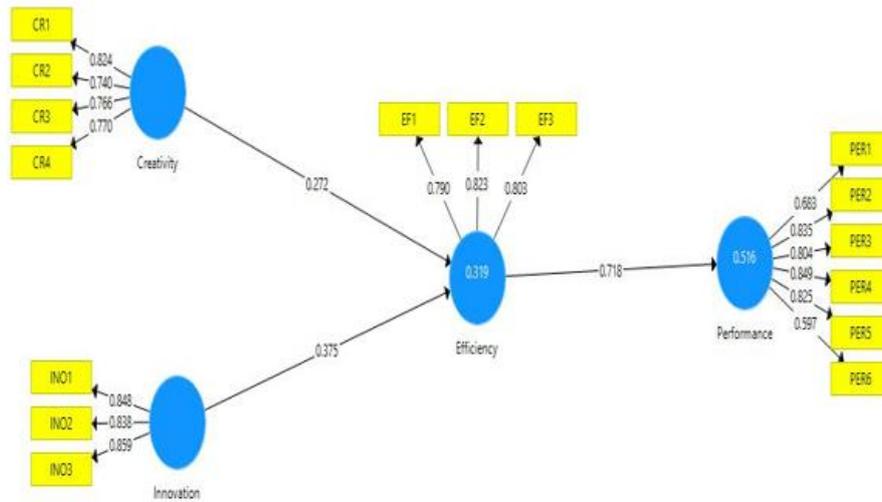


Figure 2. Measurement Model

Table 2

Reliability and Validity

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Creativity	0.779	0.858	0.601
Efficiency	0.730	0.847	0.649
Innovation	0.805	0.885	0.720
Performance	0.860	0.897	0.595

Table 3

Discriminant Validity

	Creativity	Efficiency	Innovation	Performance
Creativity	0.776			
Efficiency	0.465	0.806		
Innovation	0.514	0.515	0.848	
Performance	0.534	0.718	0.665	0.771

Table 4*HTMT*

	Creativity	Efficiency	Innovation	Performance
Creativity				
Efficiency	0.613			
Innovation	0.649	0.671		
Performance	0.644	0.896	0.789	

This structural model was assessed at a later stage through PLS. The coefficient of determination is an important part of structural model evaluation while coefficient of variation is a significant component of the structural model. It is also known as R square (R^2). The value of R^2 more than 0.25 is considered weak, 0.50 is considered moderate and 0.70 and above is considered strong. Table 5 presents the values of the R-square which are in the acceptable range

Table 5*R Square*

	R Square
Efficiency	0.319
Performance	0.516

The structural model is also used to evaluate the relationship among the proposed hypotheses. For this purpose, bootstrapping procedure was adopted with subsamples of 5000. The statistical significance of the proposed hypothesis was assessed based on t-values. Moreover, the value of Beta mentions the direction of the relationship among proposed relationships. It was revealed from the data collected through the analysis of the present study that all proposed direct relationships contained in the hypotheses were found to be statistically significant. It is also evident in the t values, which were more than 1.645 (Table 6). Whereas Figure 3 illustrates the structural model of the present study.

Table 6*Direct Results*

Hypotheses	Beta	SD	T Statistics	P Values	Decision
H1 Creativity -> Efficiency	0.272	0.053	5.114	0.000	Supported
H2 Efficiency -> Performance	0.718	0.030	23.803	0.000	Supported
H3 Innovation -> Efficiency	0.375	0.055	6.761	0.000	Supported

Furthermore, the present study also evaluated the statistical significance of mediating hypothesis. It is evident from Table 7 that efficiency mediates significantly between creativity, innovation, and performance.

Table 7

Indirect Results

Hypotheses	Beta	SD	T- Statistics	P Values	Decision
H4 Creativity -> Efficiency -> Performance	0.195	0.037	5.253	0.000	Supported
H5 Innovation -> Efficiency -> Performance	0.269	0.045	5.917	0.000	Supported

Discussion

In response to the COVID-19 pandemic, most Universities and Colleges across the world resorted to online teaching. In the United States, one of the first universities to move classes online was the University of Washington. In the first week of March, the University Management announced the suspension of face-to-face classes and urged all students to leave the University except international students who may not be able to travel to their countries of origin. In the same month, Stanford University also announced the movement of all courses to an online mode while all programs that involves students and staff travelling abroad were suspended. The New York University also took a strategic decision by shifting all courses with a large number of students to an online platform; though it left the option of cancelling laboratory and field-trip based courses. The University’s campuses in Italy, United Arab Emirate, Florence, Shanghai and Abu Dhabi were also moved to a completely online platform (Blumenstyk, 2020).

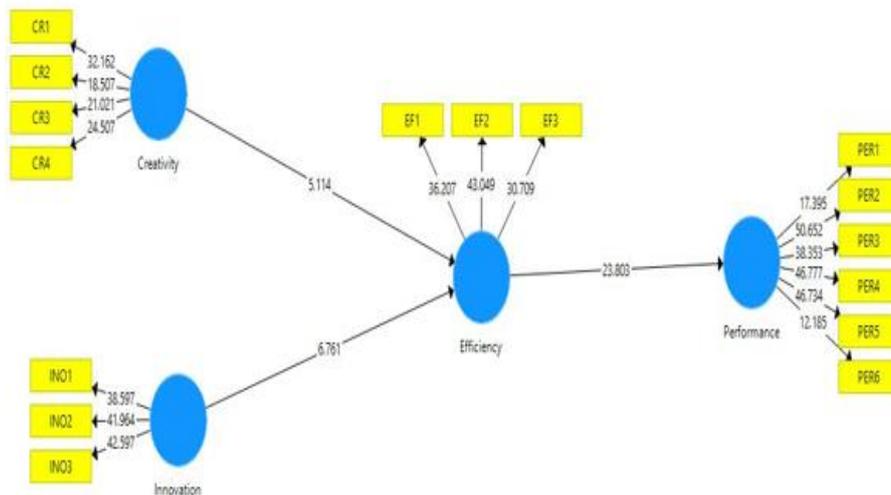


Figure 3. Structural Model

Reports reveal that faculty members in these universities and colleges also responded swiftly by accessing various online resources on remote teaching. For instance, Stanford University revived the use of already existing technologies such as WhatsApp, GroupMe and Slack to facilitate online teaching and learning. The technology institutes and departments within some universities also provided online training to faculty members on the technicalities of pre-recorded lectures and the presentation of online classes via zoom. Others provided training by employing webinar series on the basic principles of video conferencing and the efficient use of resources available on the Learning Management System (LMS) (Blumenstyk, 2020). The shift to online platforms presented some challenges such as equity issues. Some students may have felt disadvantaged on account of lack of internet access or inadequate broadband in their off-campus locations especially those from rural communities. Another challenge was the inadequacy of support services and facilities for online learning and teaching. This was because most institutions had not envisaged a situation in which all courses would be moved online, as it happened during the COVID-19. There was also the challenge of providing adequate training so that teachers and students were able to cope with online teaching and learning seamlessly.

Like other educational institutions around the world, most South African Universities also decided to suspend all contact classes, tests and practical following the announcement of total lockdown commencing on 26th March, 2020. This was necessary because face to face lectures were often held in large classrooms or lecture theatres where students sit in close contact. This was deemed necessary because the continuation of face-to-face classes would increase the probability of transmitting the infectious COVID-19 disease, particularly among students who have underlying diseases such as HIV/AIDs, Tuberculosis, Hypertension, Diabetes and others. Therefore, it was appropriate and only available option with the university managements to switch over to online platform and facilitate the completion of the academic program for the year.

Like other universities, the University of Johannesburg also adopted a few major interventions to cope up with the COVID-19 pandemic. For instance, consequent to the outbreak of the pandemic in March 2020, and abiding by the Declaration of the President of the Republic of South Africa, who declared the country in a 'state of national disaster' under the National Disaster Act, Vice Chancellor of the University of Johannesburg quickly issued directives to the staff and students about suspending all contact sessions. All graduates and undergraduate students were asked to vacate the halls of residence except the foreign students who may not be able to travel to their home countries due to travel restrictions. Having suspended contact classes for all categories of students, the challenge was how to complete the first semester which was scheduled to end by the third week of June 2020. The university took a proactive step, and as records reveal, the University management moved all learning modules to the online platform, facilitating teaching and learning to continue till the end of the semester.

In addition to these measures, new laptops were procured and sent to the deserving students who could not afford a laptop nor had the opportunity to use the computer equipment in a library and various computer laboratories within the campus. This project was largely financed by the South African Government's sponsored National Student Financial Aid Scheme. As a quick intervention strategy, the University of Johannesburg also provided online training for lecturers and tutors. The students were also provided with online training in real-time online learning platforms. This training support both the lecturers and the students to have an understanding of the new terrain which they had to tread so abruptly. The University's online teaching and learning platform called U-Link provided all online support to the faculty members. It facilitated the upload of their lecture notes, prescribed and recommended books, videos and other reading materials. The students interacted with such material, and participated in discussions forums, access and submit assignments. The faculty members could also assess the assignments and provide marks with valuable comments on students' performances. In addition, access to this online learning management was provided at zero-based data cost, which enabled the staff and students to gain access without having to pay for data.

Although the timeline available for adjustment to online teaching was short, the faculty members across the University were able to conduct teaching online fully during the first semester of the 2021 academic year. Occasioned by necessity. Online learning became the 'mother of invention' as far as full online teaching was concerned at the University of Johannesburg, South Africa. The faculty members also conducted full online assessment for the students in both the semesters of the 2021 academic year. However, the preparedness of the students for a full online assessment and how this new strategy will affect their performances vis-à-vis those of previous semesters when they were assessed with paper and ink is another area of further research.

It is important to note that enormous support was provided to both staff and students by the Library, the Information and Communication Technologies Department and the Center for Academic Technologies of the University. The library also provided online support to students by moving all prescribed textbooks online so that students can access them. The Information and Communication Technologies department also provided online support to staff and students during this period. On its part, the center for academic technologies provides training support on online teaching and learning. The University also conducted virtual graduation ceremonies and convocation for students who graduated in the categories of first degrees, masters and doctoral. The graduands were issued digital certificates after the virtual graduation. This is evident of the educational innovations that the University of Johannesburg, South Africa adopted to ensure the efficiency and performance of its teachers and students. The university thus set an example to utilize creativity and innovation in order to maintain its performance level.

The education sector, in general, and universities in particular, are capable of building on the gains of the COVID-19 pandemic and strategically deploy some emerging technologies for teaching and learning. Though there exist many educational

innovations which have been created and utilized successfully to cope up with such situations of crises, the following are a few notable ones:

Simulation-based training

The deployment of simulation-based training is particularly useful in places where the challenges of COVID-19 have restricted interaction between mentors and mentees, e.g., in Medicine and Health Science related programs. Through simulations, medical trainees can practice series of surgical procedures without risk or loss of lives or property (Plancher et al., 2020). This may also apply to programs that require laboratory procedures in science-related disciplines. However, in South Africa, there are at least 30% students who have not been able to get access to any laboratory procedures since the outbreak of the pandemic nor they could procure simulation-based training facility due to lack of resources.

Virtual Reality (VR) and Augmented Reality (AR)

Another innovative technology that can help with constructive teaching and learning during pandemic are Virtual and Augmented Reality. If combined with an online meeting platform, Virtual Reality (VR) can provide close to a real-time experience likened to watching a movie. With VR, students can watch live demonstrations of their lecturers and also interact with them remotely (Plancher et al., 2020). Similarly, Augmented Reality (AR) provides students deeper insights and a better understanding of their courses. AR does not require specialised hardware because it can be experienced with the use of smartphones and tablets. VR makes the object much more real than AR, however, it requires dedicated hardware in the form of a VR headset. With this device, students can observe massive content of any subject in their field of interest, explore the details of the subject matter and provide the opportunity for the learners to have a total sensory experience.

Flipped classroom

Another innovative strategy to implement in periods of crisis is the 'flipped classroom strategy.' This strategy involves the provision of pre-recorded video lectures that could be watched by students in their free time before the actual delivery of these lectures. This is a teaching method that could facilitate profitable intellectual discussion. Assignments could also be given by the teachers and students' solutions submitted through the institution's learning management system (Hew et al., 2018).

Social-media based platform

A study entitled 'Using Technology to maintain the education of residents during COVID-19 Pandemic' reveals how their institution used Social-Media Based Platform- a closed Facebook group entitled 'ABSITE Daily,' standing for 'the American Board of Surgery In-Training Examination' (Chick et al., 2020) This platform gave the opportunity to the residents to discuss surgical topics without meeting in a physical classroom setting. It exposed the residents to practice questions in preparation for ABSITE.

Teleconferencing

A teleconference strategy has proved to be an innovative educational strategy that can be implemented in the same manner as a physical classroom teaching is held. This is achieved through a variety of platforms e.g., Skype, Zoom, GoToMeeting and WebEx, which are commercial online software that could be made available to students through their institutional accounts.

From the above discussion, it is evident that Innovation and creativity are the key drivers of the efficiency and the performance of educational institutions. In the pandemic situation when it was difficult to continue the teaching and learning process, the higher educational institutions saved the academic year of the students by utilizing innovative and creative techniques of teaching and learning.

Conclusion and Recommendations

The findings of this study reiterated that the COVID-19 pandemic provided an opportunity for South African Universities to wake up to the call and embrace the technologies of the Fourth Industrial Revolution and facilitate teaching and learning during the temporary closure of the nation's higher institutions of learning. Even when the pandemic is over, the 'new normal' will continue the use of technology in teaching and learning, thus breaking the barrier in teaching and learning by providing greater access to education, reducing inequality, unemployment and poverty. It is important to note that the educationalists should not see these interventions as temporary but should look at the bigger picture by developing well-focused strategies for a permanent integration of these technologies into teaching and learning at various educational levels. COVID-19 has definitely changed the landscape of teaching and learning, which was made possible by current and emerging technologies being deployed for the delivery of educational content.

The study also revealed the fact that COVID-19 pandemic brought great challenges to various sectors in nations across the world. It afforded individuals and institutions to develop new coping strategies in the form of innovations, particularly with the aid of present and emerging technologies. This is very significant particularly in the education sector of under-developed and developing countries where access to education has been restricted for decades. The South African nation, for instance, has a clear legacy of inequalities arisen from the apartheid regime. It has witnessed intense political conflict and socio-cultural divisions along race, color and class lines over years. However, the post-apartheid government has embarked on the process of transforming the education system from an exclusive to an inclusive system with the main objective of improving access to education for all from primary to the university levels (Ntombela, 2020). As the COVID-19 crisis evolved, it is recommended that there should be re-thinking about the teaching and learning resources and technologies, in a bid to provide a great deal of flexibility in teaching and learning methods.

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