

# Developing a COVID-19 impact assessment model for the education sector

Quality Education  
for All

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## Abstract

**Purpose** – This study aims to develop an impact assessment model that can be used by educational institutions to investigate the effect of Covid-19 on the performance of students and educators.

**Design/methodology/approach** – A systematic literature review was used to identify the models used to assess the impact of Covid-19 in the education sector. Most of these models used structural equation modelling (SEM), and hence, the developed conceptual model was based on SEM. The model was validated through a pilot study conducted in Zimbabwe's education system. Questionnaires were sent to different educational institutions, and 69 responses were obtained, and they were analysed utilising SMART PLS 4.

**Findings** – The models in the literature are all different and hence create confusion in finding the best model to use. The authors developed a standard measurement model with lockdown, curfew, online learning and performance latent variables. The pilot study results indicated that curfew, lockdown and online learning affect performance.

**Research limitations/implications** – The study focused on developing a measurement model for the education sector; however, this model cannot be used for other industries, such as manufacturing and agriculture, without further research.

**Originality/value** – The models in the literature concentrated more on online learning. This study included lockdown and curfew, as they cannot be left out when examining the effects of Covid-19. This allows educational institutions to fully examine the impacts of Covid-19 on the performance of students and educators.

**Keywords** Covid-19, Conceptual model, Education system, Online learning, Lockdown curfew

**Paper type** Conceptual paper

## 1. Introduction

COVID-19 caused a lot of economic, social, and political challenges worldwide. All the service sectors were affected including the education sector as learners and educators could



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not perform their usual tasks the way they used to do (Zinyemba *et al.*, 2021). With the introduction of lockdowns and curfews, educational institutions had to adopt information and communication technologies to keep providing services to students. Over the past years, even before the outbreak of Coronavirus, there has been a paradigm shift from face-to-face learning to online learning through the use of various platforms in developed countries and this was recognised as the best alternative method of learning (Vurayai, 2021). However, in most developing countries, online lessons were introduced due to the demise of COVID-19 (Matsvange *et al.*, 2021).

Due to lockdown restrictions, 150 countries closed educational institutions worldwide, as of 25 March 2020, affecting 80% of the students (Matsvange *et al.*, 2021). Curfew also prevented students from accessing the learning facilities and collaborating with their mates through discussions and this affected their performance. The education systems took a new twist, from face-to-face lessons to virtual lessons (Mutambisi *et al.*, 2021) and it was upon the educational institutions to embrace the new methodologies. Students were using various learning platforms such as Google Meet, Microsoft Teams, Zoom, Ruzivo, Moodle, WhatsApp, Facebook, Skype and Twitter (Zvomuya, 2021). These changes disrupted the once comfortable and traditional learning ways and caused a lot of uncertainties. In many higher educational institutions, students displayed their dissatisfaction with such changes as they noted that access to virtual learning portals was a challenge (Matsvange *et al.*, 2021; Mutambisi *et al.*, 2021).

Although virtual learning was introduced, the institutions were not ready as they cited several challenges. This creates a question of how lockdown, curfew and online learning have impacted the performance of students and educators. This can only be answered if there is a standard measurement model that can be used by these institutions to investigate the impact of lockdown, curfew and online learning as predecessor variables to performance. Various models have been developed to address the issues of the COVID-19 pandemic, for example, models by Mustafa *et al.* (2021) and Samat *et al.* (2020). Although different models have been developed, according to the authors' knowledge, no research has been done to evaluate the direct influence of lockdown, curfew and online learning on performance and establish the relationships between these three variables. This leads to the following research questions:

- RQ1. What performance measurement models are being used to assess the effect of Covid-19 in the education sector?
- RQ2. What performance measurement model can the educational system adopt to directly assess the impact of lockdown, curfew and online learning on performance?

COVID-19 affected the students' and educators' performance in various ways as there was a disruption of learning activities, work-related learning assessment, internal assessment and mentorship. Lack of the skills required for virtual learning by educators and students, poor and expensive internet services and lack of resources all affected the adoption of online learning (Zvomuya, 2021) with the effects more pronounced in rural and peri-urban areas (Rwodzi and Sibanda, 2021). In Africa, the impacts of COVID-19 on the education system include an increase in inequalities, marginalisation, and school dropouts (Vurayai, 2021).

## 2. Conceptual overview

This section highlights the models that have been developed to understand how COVID-19 affected the education system. This helps the readers to understand what models have been developed and what variables are common or different. It also discusses the theories underpinning this study.

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## 2.1 Impact analysis models

A literature review on the various models used in evaluating the effects of COVID-19 on the education system is presented. According to [Maware and Adetunji \(2018\)](#), impact assessment models can be categorised into four categories. However, the review of the articles on the impact of COVID-19 on education showed that the researchers only utilised three of these models which are quantitative, qualitative and simulation-based models (see [Table 1](#)). Therefore, we explained those three only.

**2.1.1 Qualitative models.** These models are based on the experience, opinion and behaviour of the people. They seek to answer questions like “why” and “how” giving a deeper insight ([Fossey et al., 2002](#)). They usually involve interviews, observations and focus groups for data collection. Furthermore, there are fewer company restrictions faced as the responses are based on the opinion of respondents and not data from the company. The qualitative models offer a deep understanding of human behaviour, comprehension of complicated situations and the ability to identify trends, patterns and relationships that quantitative models might overlook ([Vaughan, 2021](#)). Qualitative models are also useful when addressing issues where historical data is limited ([Sutton and Austin, 2015](#)) such as in the case of Covid 19. However, this method depends on personal opinion hence the data can be biased. Also, the process of data collection and analysis is time-consuming, replication of the results proves difficult, and it may be difficult to generalise the findings for a larger population ([Vaughan, 2021](#)). To reduce bias, it is advocated to use multiple data sources ([Machingura et al., 2024b](#)) and ensuring transparency in research.

**2.1.2 Quantitative models.** These models can be used to analyse complex data to produce meaningful interpretations. Unlike the qualitative models, these models are more objective, and they do not rely on the opinion of respondents ([Gelo et al., 2008](#)). The results obtained can be generalised for large populations and have lesser data bias when compared to qualitative models. The data is numeric and measurable, and the results are presented in numeric form ([Holton and Burnett, 2005](#)). The main limitation is in getting the data from institutions as they tend to protect their information. Also, it uses controlled experiments which may ignore human behaviour, hence it may not be comprehensive.

**2.1.3 Simulation-based models.** Simulation models the system’s behaviour as a sequence of events that occur at discrete points in time ([Sargent, 2010](#)). Generally, simulation is cheap and safe as it allows one to create a model before building the real thing. People can test and experiment how the system perform, allowing them to modify and improve it before building it ([Maware and Adetunji, 2018](#)). One can slow or speed it up to visualise changes that may occur over short and long periods. However, simulation can be time consuming as the model may require many modifications before producing meaningful results and this can make it expensive. Like quantitative models, not every situation can be assessed using simulation models as it does not pay attention to human behaviour hence, not comprehensive.

## 2.2 Impact of measurement models

Worldwide researchers become more interested in understanding and exploring the issues around COVID-19 in the education system so that they devise solutions to the problems caused by the pandemic. To thoroughly investigate these issues, different measurement models have been developed as shown in [Table 1](#). However, these models are fundamentally distinct from one another, making it challenging for those who want to assess the impact of COVID-19 to decide which model to utilise. With different models, it is problematic to compare the impacts of COVID-19 at different education institutions or education levels as they adopted different strategies to reduce the impacts of COVID-19. This creates confusion in fully understanding these impacts and the extent of such impacts in different organisations. Therefore, it is crucial

**Table 1.** COVID-19 impact assessment models

Author	Model type	Instrument	Country	Focus	Constructs/variables
<a href="#">Bao et al. (2020)</a>	Qualitative	Multiple linear regression SEM	USA	Modelling the gain in reading ability in kindergarten children	Teaching and professional behaviour, course instructional planning and methodology, online connectivity and availability, student engagement methods and online learning
<a href="#">Mustafa et al. (2021)</a>			Pakistan	Exploring the factors that influence online learning	
<a href="#">Mathur and Singh (2020)</a>		SEM	India	Perspectives of education practices during the Covid-19 period	Helpfulness, complications, role of institutions, future scope, satisfied during Covid-19 and continue after Covid-19
<a href="#">Samat et al. (2020)</a>		SEM	Malaysia	Understanding online distance learning during the Covid-19 period	Performance, expectancy, effort expectancy, social influence, facilitating condition, intrinsic value, behavioural intention and use behaviour
<a href="#">Shahzad et al. (2021)</a>		SEM	Malaysian	Comparing females and males on how they are affected by Covid-19	Information quality, system quality, service quality, intention to use/use, user satisfaction and net benefits
<a href="#">Ceessay (2021)</a>		Multiple linear regression	Africa	How COVID-19 has affected staff training and development	Mandatory testing in schools, reopening of schools, work from home, measures uses online/offline distance learning and staff development and training
<a href="#">Chaturvedi et al. (2021a)</a>		Fisher's exact test	India	Covid-19 effects on students' education in India	
<a href="#">El-Sayad et al. (2021)</a>		SEM	Egypt	Students' perception towards online learning and student satisfaction	Academic self-efficacy, perceived usefulness, teaching presence, behavioural engagement, emotional engagement, cognitive engagement and student satisfaction

*(continued)*

**Table 1.** Continued

Author	Model type	Instrument	Country	Focus	Constructs/variables
Noori (2021)		ANOVA, regression	Afghanistan	Impact of Covid-19 on students' learning	Teaching, students' feeling, learning, students' goals and students' achievement
Nikou and Maslov (2021)		SEM	Finland	Students' perspectives on E-learning	Perceived usefulness, perceived ease of use, intention to participate in E-learning, awareness of Covid-19, perceived challenges and perceived educational institutions preparedness
Wang and Huang (2021)		Multiple regression	Unspecified	Covid-19 impact on sustainable education	Learner attitude towards computer, learner computer anxiety, learner internet self, efficacy usefulness, ease of use, system availability, internet availability, instructor response timeliness, instructor attitude toward E-learning, learning climate, learner interaction and E-learner satisfaction
Valls Martinez <i>et al.</i> (2021)		SEM	Spain	Learning mathematics during Covid-19 times	Autonomy, usage, challenge, effectiveness, depth and format
Fuchs-Schündeln <i>et al.</i> (2022)	Quantitative method	Partial equilibrium model	Germany	Welfare effects of Covid-19 on the closure of schools	
Azevedo <i>et al.</i> (2021)	Simulation	Discrete event simulation	Unspecified	Understanding the potential impacts of Covid-19 using simulation	Learning-adjusted years of schooling, average learning loss and share of learners below minimum proficiency level

**Source(s):** Authors' own work

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for a standard measurement model to be developed which can explore the impact of COVID-19 in different educational institutions and at different education levels.

### 2.3 Underpinning theories

The study is based on crisis management in education and transformative learning theories. The transformative learning theory outlines that the process of learning starts when the learners are in a position of discomfort caused by some transformation (Mezirow, 1997). It mentions that the changes in the learning process create transformation in behaviour, attitude and understanding as learners usually experience challenging tasks, hence there is a need for critical thinking to understand the learning process (Hashemi *et al.*, 2021). Transformative learning is conscience expansion through the adoption of the change in situation (Noori, 2021). The demise of the COVID-19 pandemic caused cognitive dissonance in the education sector resulting in a transformation and shift in the paradigm (Scully-Russ *et al.*, 2022). Young *et al.* (2022) outlined that transformative learning was necessary due to the COVID-19 outbreak. Based on this theory, educational institutions were obliged to confront a puzzling predicament (King, 2021). According to Vipler *et al.* (2022), usually, the disorienting dilemmas are unique among learners, however for COVID-19, it is a dilemma for many people. The theory is applicable to this paper as the study aims to develop a model that assesses student performance during an abrupt transformation from face-to-face learning to online learning.

The possibility of transformational learning depends on the response given to the pandemic (Scully-Russ *et al.*, 2022). In response to COVID-19, lockdowns and curfews were introduced, hence, the students could not access the learning institutions. As a result, education institutions responded by introducing online learning. However, there was no time for learners and educators to undergo the necessary training (Chaturvedi *et al.*, 2021b). Also, online learning was unusual, disoriented and undesirable for most of these institutions as they were not prepared, and this could have impacted the learning process and performance (Watermeyer *et al.*, 2021). Due to this abrupt change, the roles of academics and learners shifted as they adopted new ways (Mabwe *et al.*, 2023). Also, transformative learning occurs when the students interact with the environment, hence they may have challenges in accessing the resources and required facilities which might be limited in some countries (Noori, 2021). Most countries, especially developing ones, do not have supporting functions to adopt online learning methods, thus, the transformation process might have been very challenging. Such restrictions may affect the performance of students. Thus, the policy makers should understand that transformation needs appropriate resources for it to be a success. In this case, reliable and affordable internet services, gadgets such as laptops and mobile phones and resources for the training and education of students and educators. This needs decision makers to understand the problem faced and craft a solution needed to alleviate the problem considering the resources required before the transformation process.

Whenever there is transformation, the performance of students and educators is likely to change, either it increases or decreases. It is important to understand how this transformation affected the student's performance. Thus, this transformation is linked to online learning, curfew and lockdown, in the fact that curfew and lockdown forced a transformation in the learning process from face-to-face to online learning. Thus, it is only this transformation from face-to-face to online learning that enabled learners to resume their learning.

Crisis management in education covers every facet of anticipating, averting, managing, and recovering from a crisis. It looks at the methods that need to be adopted in responding to the crisis (Papaevangelou, 2021). It covers the establishment of crisis-related measures and situations to implement the needed crisis-response mechanism (MacNeil and Topping, 2007). According to Papaevangelou (2021), crisis management in education can be applied through

the three main stages which are the diagnosis of the problem, recovery strategy selection and making changes and monitoring the situation. The COVID-19 pandemic brought a crisis to the whole world including the education system, forcing them to adopt online learning due to curfews and lockdowns. Crisis management therefore plays a critical role in such situations in crafting a solution to the disruption of the learning process. This paper seeks to evaluate if the solutions that were implemented in response to COVID-19 were successful. This helps policy makers by monitoring if the interventions they have implemented are successful or if they need fine-tuning. Also, it assists in the event of future pandemics as they would have crafted the guidelines for responding to the crisis in the education sector.

### 3. Methodology

#### 3.1 Article selection

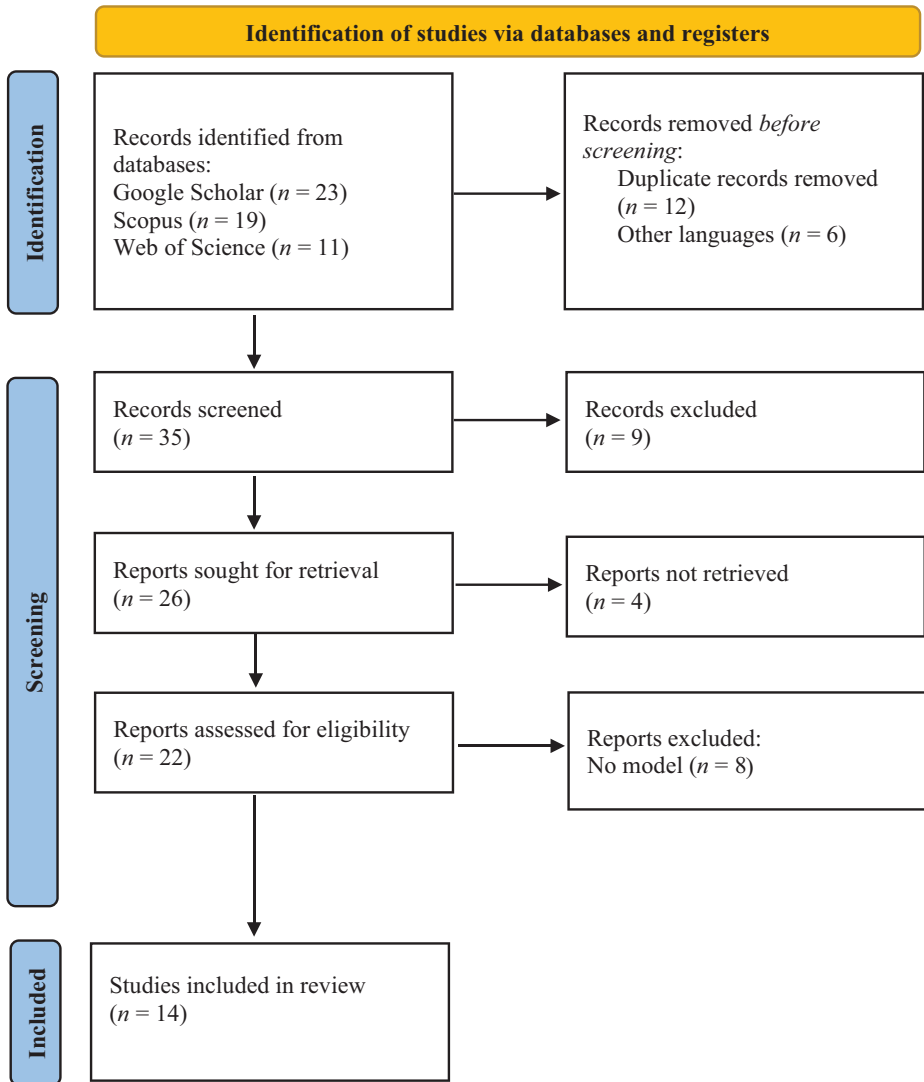
A systematic literature review (SLR) was conducted to identify the different COVID-19 impact assessment models. The papers were identified from the Web of Science, Google Scholar and Scopus databases. The keywords used were COVID-19, Coronavirus, education, model and online/virtual learning/E-learning. The Boolean operators “OR” and “AND” were used during the search process to identify the articles of interest. The search string was as follows (“Covid 19” OR “Coronavirus”) AND (“education”) AND (“model\*”) AND (“online learning”) OR (“virtual learning” OR “E-learning”). The wild card \* was used to get different versions of the keywords. Articles that have models showing how the education system was affected by COVID-19 were considered.

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines by [Page et al. \(2021\)](#) were employed in the screening of articles as shown in [Figure 1](#). Initially, 23 articles were selected from Google Scholar, 19 from Scopus and 11 from Web of Science making a total of 53 articles. 12 articles were excluded because they were duplicates. Language exclusion permitted the removal of 6 articles because they were not written in English. Title and abstract screening were used to screen the remaining 35 articles, and 9 articles were eliminated. Availability of full text for download was used to further screen the articles and 4 articles were excluded as they could not be retrieved. Full-text analysis was used to assess the eligibility of the remaining articles. In total, eight articles were eliminated as they focused on the impact of COVID-19 and the education system without developing any model. As a result, 14 articles were selected as shown in [Table 1](#).

#### 3.2 Quality assessment

Quality assessment of the 14 articles was performed to eliminate study bias ([Kitchenham et al., 2009](#)). In this study, we utilised the quality checklist in [Table 2](#) developed by [Van Dinter et al. \(2021\)](#). The quality assessment criteria were selected based on how they affected the review quality. A scale of 1–0 was used, where 1 = met criterion and 0 = criterion not met. A 0.5 point was given for the criterion that was stated vaguely or if the criterion was not placed in the expected place. [Van Dinter et al. \(2021\)](#) stated that studies that have scores lower than 4 should be eliminated. However, in this study, no article had a low score, as the obtained score ranged from 4.5 to 7.5 indicating that they all had high scores.

Each reviewer extracted the data from a paper individually and then the two data extraction forms were compared and any disagreements were discussed as done by [Breerton et al. \(2007\)](#). The selected articles were analysed through manual coding to identify relevant information such as model type, country of study and the variables used. Of these 14 articles, 12 were based on qualitative models, 1 on quantitative models and 1 on simulation-based models. As shown in [Figure 2](#), 50% of the articles on qualitative models used SEM, hence this motivated the authors to develop a model based on SEM.



Source(s): Authors' own work

Figure 1. Article selection

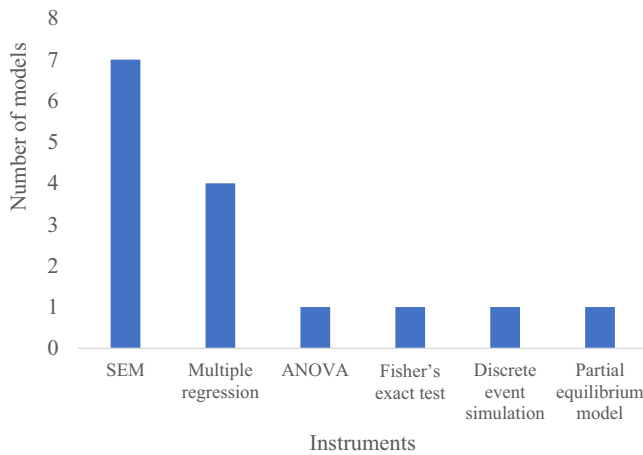
### 3.3 About structural equation modelling

SEM is a statistical modelling method used for multivariate data analysis based on factor and path analysis allowing the estimation of linear relationships. It permits the investigation of many relationships between multiple observed and latent variables and between latent variables themselves (Hair *et al.*, 2021). Observed variables are variables that are directly measured, for example, questions from the questionnaires. Latent variables are those

**Table 2.** Quality assessment

Criteria no.	Quality criteria
1	Aims indicated clearly
2	Scope and experimental design are stated clearly
3	Variables likely to be reliable and valid
4	The study process adequately documented
5	The study questions were answered
6	Negative results were presented
7	The main results were clearly stated
8	The conclusions are reliable and related to the study's aim

**Source(s):** Authors' own work



**Source(s):** Authors' own work

**Figure 2.** Number of models for each instrument

variables that cannot be directly measured and they are estimated from several observed variables, for example, perceptions and attitudes which are common in education system studies (Leguina, 2015). SEM can be used to evaluate the proposed relationships in complex models that have many linear equations. Many other methods such as multiple regression would require many tests as they are performed on equation by equation basis (Tomarken and Waller, 2005). Unlike methods such as ANOVA, SEM can analyse very complex models involving higher and lower-order latent variables giving the relationships between them using the multi-level hierarchical data (Tomarken and Waller, 2005). It also provides various methods of dealing with missing data. According to (Nachtigall *et al.*, 2003), SEM integrates several common methods such as multiple regression, correlation, ANOVA, MANOVA, and factor analysis, amongst others. As a result, the use of SEM in the education sector has increased (Leguina, 2015). However, the drawback of SEM is the sample size. Although no issues have been identified on small sample sizes, the precision of the model is increased by large sample sizes (Hair *et al.*, 2017).

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SEM has two alternatives; covariance-based structural equation modelling (CB-SEM) and partial least squares structural equation modelling (PLS-SEM). Large samples and normally distributed data are best served by CB-SEM, according to (Wong, 2013). However, as many academics recognise, it might be challenging to obtain a data set that satisfies these requirements. PLS-SEM does not make any presumptions about how the data is distributed; hence, it can be used to replace CB-SEM (Machingura *et al.*, 2024a). Since its launch in 2005, PLS-SEM popularity has grown since it can be used freely for sample sizes up to 100, it also provides a user-friendly interface and extensive reporting options (Wong, 2013).

### 3.4 Multiple regression

This is a statistical method employed to predict the values of the dependent variables from the independent variables. By using this method, analysts can ascertain the model's variance as well as the proportional contributions of each independent variable to the overall variance. According to Nunkoo and Ramkissoon (2012) the method is superior to SEM on that it is difficult to choose SEM software packages to use. However, the authors noted that SEM has advantages over multiple regression in modelling measurement errors and unexplained variations, evaluating correlations simultaneously, connecting micro- and macro-perspectives, and developing the best-fitting model and theories (Keith, 2019).

### 3.5 ANOVA

ANOVA is a statistical test employed to examine how the means of more than two groups differ from one another. It is an essential tool for researchers working with several experimental groups and one or more control groups (Kim, 2017). ANOVA, however, is unable to offer comprehensive details regarding the variations between the different study groups (McHugh, 2011). Unlike regression and SEM, ANOVA does not explore the relationship between variables to establish whether they are supported or not.

### 3.6 Fisher's exact test

It is a hypothesis test employed to explore the connection between two binary variables in a contingency table (Upton, 1992). It is helpful for small sample sizes. It is employed in place of the chi-square test in situations where one or more cells' anticipated frequency is less than five (Nowacki, 2017). It is used when there are two nominal variables and when you want to establish if the proportions between two variables are different.

### 3.7 Pilot study

A pilot study was conducted to validate the model and guide researchers on how they can implement the model. A questionnaire was prepared to evaluate the impact of curfew, lockdown and online learning on performance. It used a five-point Likert scale with 5 denoting strongly agree and 1 strongly disagree. The questionnaire was distributed to universities and secondary schools in Zimbabwe through a Google link. In total, 69 responses were obtained, and these were analysed using SMART PLS 4.

## 4. Model development

A conceptual model was developed to help educational institutions assess the extent to which they have been affected by COVID-19. Thus, the developed model is made of four latent variables, namely lockdown, curfew, online learning and performance. Lockdown, curfew, and online learning are exogenous variables while performance is an endogenous variable. Responding to COVID-19 effects, countries introduced lockdown, curfew, and online

learning. Thus, these variables were chosen because these were the major changes that resulted from COVID-19. However, this model can be modified to suit the objectives of the different researchers. For instance, one might choose to make lockdown and curfew as higher-order latent variables and other factors such as socioeconomic conditions and mental health lower-order latent variables. Thus, this model can be employed to examine the relationship between these four variables and the degree to which the exogenous variables affect the performance of students and educators. The proposed conceptual model is outlined in Figure 3.

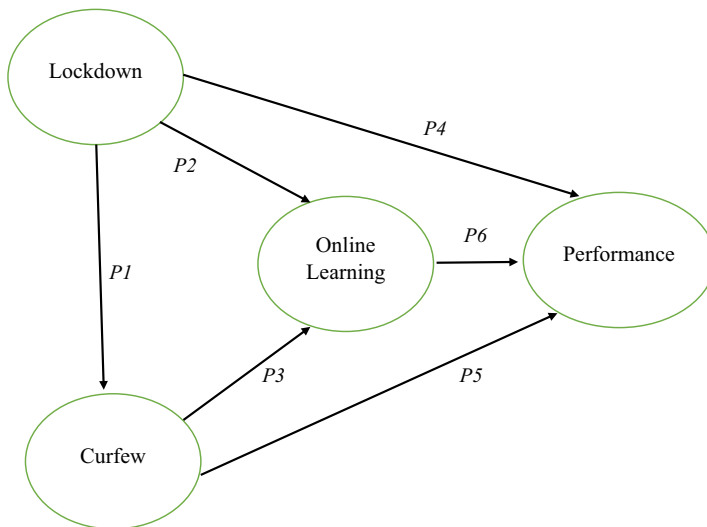
The adoption of lockdown measures came with a lot of restrictions. For instance, curfew restrictions were adopted to reduce the spread of the Coronavirus. Travel between cities was prohibited, and business operating hours were shortened. Therefore, the lockdown is responsible for the curfew that prevented many students and teachers from travelling to their educational institutions. Therefore, the following proposition is made:

*P1.* Lockdown has a direct relationship with curfew.

The educational institutes had to close due to the lockdown. Because students and their educators could not break the lockdown restrictions, the majority of the education populace turned to online study. The only way these institutions could provide services to the students was through online methods. Therefore, it is the lockdown which prompted educational institutions to start offering lessons online. Therefore, the following proposition is made:

*P2.* Lockdown has a direct relationship with online learning.

Students and teachers had limited access to university resources because of the curfew, which was associated with travel restrictions and reduced business hours. As a result, educational institutions started using online teaching techniques. The government encouraged students



Source(s): Authors' own work

Figure 3. COVID-19 impact assessment model

and educators to adopt online tools such as Google Classroom and WhatsApp. Thus, the curfew was essential in the introduction of online education. Therefore, the following proposition is made:

*P3. Curfew has a direct relationship with online learning*

According to a study conducted in 142 nations, COVID-19 caused school standards to decline (Brown 2020). The continuation of research and learning was hampered by the closure of educational institutions and the outlawing of all meetings. According to Apostol's research (2020), the majority of Romanian pupils reported that lockdowns and curfew restrictions had a detrimental impact on their ability to learn. Teachers and students found it challenging to get to their institutions due to the lockdown and curfew restrictions. Additionally, the students indicated that their grades were impacted by the disruption of face-to-face learning (Tarkar, 2020). According to Jena (2020), the changes brought about by COVID-19 harmed the educational system and sharply reduced the criteria for educational excellence. Therefore, the following proposition is made:

*P4. Lockdown has a direct relationship with the students' and educators' performance.*

*P5. Curfew has a direct relationship with the students' and educators' performance.*

An important learning strategy used in the effort to guarantee the fulfilment of the right to education was online education. However, online learning had many shortcomings such as the need for infrastructure, dependable internet, electricity, computers, and mobile devices (Zvomuya, 2021). Many pupils, particularly those in remote locations, did not have access to all of these amenities. Only 22% of students were able to attend online classes because the internet was extremely slow and unstable (Emon *et al.*, 2020). Additionally, training is important to provide instructors and students with the skills and information they need. This posed a problem because many governments were devoting the majority of their resources to fighting COVID-19. Also, both educators and students are accustomed to face-to-face learning, and some activities, like practicals, are better suited to in-person than online. Therefore, the following proposition is made:

*P6. Online learning has a direct relationship with the students' and educators' performance.*

## 5. Results

### 5.1 Measurement scale

This section presents the pilot study results analysed using SMART PLS 4. Firstly, the assessment of the measurement scale was performed to evaluate if the data was suitable for further analysis. The model was assessed for internal reliability and consistency using composite reliability and Cronbach's alpha (Hair *et al.*, 2017). All values were above 0.7, hence acceptable. Convergent validity was measured using average variance extracted (AVE) and all values were above 0.5 hence acceptable (see Table 3).

Fornell-Lacker criterion was utilised in assessing the discriminant validity which compares the square root of the AVE to the correlation of the constructs (Fornell and Larcker, 1981). As shown in Table 4, the correlations were lower than the square root of the AVE, hence, acceptable.

### 5.2 Model assessment

As shown in Figure 4, the values of the coefficient of determination ( $R^2$ ) were 0.424, 0.586 and 0.665 for curfew, poor performance and online learning, respectively. Therefore, they all

**Table 3.** Reliability and validity

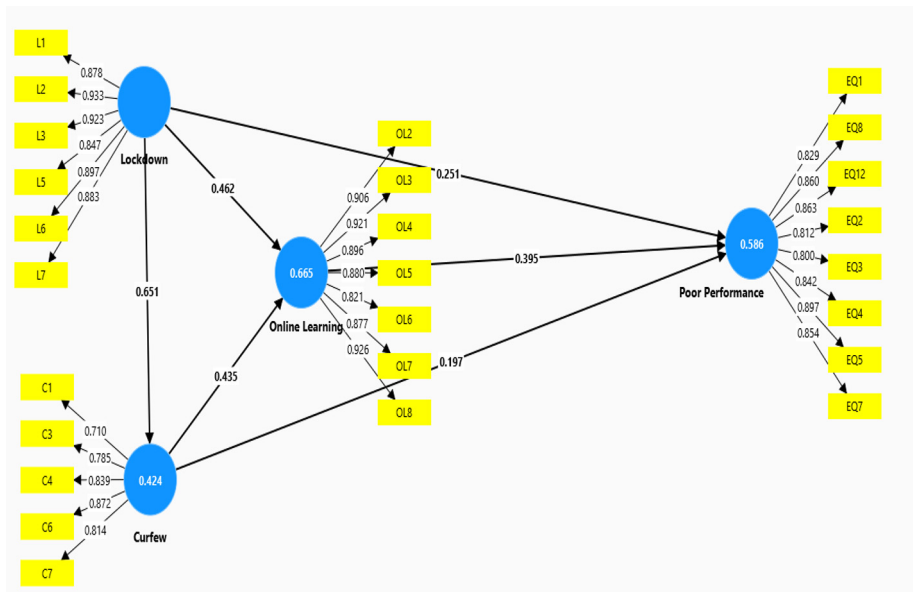
Latent variable	Cronbach's alpha	Composite reliability	AVE
Curfew	0.863	0.867	0.649
Lockdown	0.950	0.952	0.799
Online learning	0.956	0.958	0.792
Poor performance	0.943	0.949	0.714

Source(s): Authors' own work

**Table 4.** Fornell–Lacker criterion

Latent variable	Curfew	Lockdown	Online learning	Poor performance
Curfew	0.806			
Lockdown	0.651	0.894		
Online learning	0.736	0.746	0.890	
Poor performance	0.652	0.674	0.728	0.845

Source(s): Authors' own work



Source(s): Authors' own work

**Figure 4.** Measurement model

had a large effect as the values are above 0.26 (Cohen, 1988). Bootstrapping was performed to assess if the proposed relationships were supported or not. As shown in Table 5, all the proposed relationships are supported as the t-statistics were greater than 1.96 and the *p-values* were lower than 0.05 (Machingura et al., 2024c). This shows that lockdown, curfew, and online learning lead to a decrease in performance.

**6. Discussion**

The study focused on the development of a conceptual model to assess how curfew, lockdown and online learning affect the performance of students and educators. The model was validated through a pilot study of the data collected in Zimbabwe. The results indicated that these three variables have an influence on performance. Thus, they caused a decrease in the performance of students. This is true for Zimbabwe which is a developing country without reliable internet services, affected by electricity shortages and funding to support with required gadgets. This agrees with Chandasiri (2020) who noted that internet challenges caused a decrease in student grades. Mustafa et al. (2021) further supports this by noting that the effectiveness of online learning was hampered by internet availability.

Stukalo and Simakhova (2020) further deliberated that most of the educators lack experience in online teaching making it difficult to yield the required results. Mustafa et al. (2021) further emphasised that some students would prefer using online tools different from what their educators would prefer creating a conundrum. Also, using online tools such as WhatsApp and Facebook would disrupt the students as sometimes, they would want to attend non-learning activities during the learning period.

The implementation of this model is hindered by several barriers. For instance, some educational institutions do not have the required resources especially those in developing countries and in rural areas. Resources are required for purchasing gadgets to use during online learning, these include laptops and smartphones. Also, online learning requires fast, reliable and affordable internet services which is limited for many remote areas (Rwodzi and Sibanda, 2021). Thus, there is a need to improve access to internet services so that all learners have equal opportunities. The other barrier faced in some countries is the availability of electricity as some countries are affected by load-shedding making it difficult to engage in online learning. Hence, there is a need to invest in electricity availability and also consider implementing other sources of energy such as renewable energies like solar. Also, implementation of the model can suffer from institutional resistance as students and their educators are used to their old ways and introducing new things might face resistance. For quite a long time now, face-to-face learning has been used by most institutions, hence, trying new things might be viewed as an unnecessary move. For the transition from face-to-face learning to online learning, there is a need to overcome these barriers through training of

**Table 5.** Decision on relationships

Effect of	Effect on	Proposition	t-statistics	<i>p</i> -value	Decision
Curfew	Online learning	P3	3.304	0.001	Supported
Curfew	Poor performance	P5	1.995	0.044	Supported
Lockdown	Curfew	P1	6.528	0.000	Supported
Lockdown	Online learning	P2	3.227	0.001	Supported
Lockdown	Poor performance	P4	2.103	0.037	Supported
Online learning	Poor performance	P6	2.467	0.014	Supported

**Source(s):** Authors' own work

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educators and students and providing the required resources. To use the model, educational institutions need to collect data from educators and students using a questionnaire with questions focusing on each variable. For example, on performance, questions could cover the pass rate of students, understanding of concepts, and student's grades, amongst others. Analysis can be done using SEM utilising software such as SMART PLS and AMOS as demonstrated in the pilot study.

## 7. Conclusion

The study developed a conceptual model that can be adopted by educational institutions to investigate the extent to which COVID-19 has affected the performance of educators and students. This model has three exogenous variables which are lockdown, curfew, and online learning, and one endogenous variable which is performance. The author started by reviewing the literature to determine the COVID-19 impact assessment models that were developed in other studies. The models found are all different, hence creating confusion among the educational institutions on which model to use. Many of the papers in the literature used SEM, as a result, the authors developed a standard measurement model for different educational institutions based on SEM. A pilot study was conducted to validate the model. Data was collected from the Zimbabwe education sector and analysed using SMART PLS 4. The results indicated that curfew, lockdown and online learning caused in decrease in performance.

### 7.1 Implications

The research sheds more light on those educational institutions that were sceptical about exploring the effects of COVID-19 because they were not sure which model to use. Now, these institutions can use this model as it applies to different institutions. Also, governments can now facilitate the assessment of COVID-19 impacts using this model. Many models that are there concentrate much on online learning and less on lockdown and curfew, hence, such models may not give a comprehensive reflection of how COVID-19 has affected educational institutions. This model also explores the relationships between lockdown, curfew, online learning and performance, thus, educational institutions can now assess how these variables influence one another. It is now possible to compare the individual impact of lockdown, curfew and online learning to their combined impact, thus, outlining a clear picture of how these variables have affected performance. Also, the mediatory role of online learning and curfew can be investigated to fully understand their role towards performance. With this model, it is possible for educational institutions and governments to fully examine the extent to which schools, colleges, and universities were affected, allowing them to prepare for other unforeseen future pandemics.

Educational institutions should also understand that the applicability of the model might be impacted by different factors such as infrastructure, technology access, and funding between institutions. Countries with institutions with better infrastructure such as electricity availability are likely to yield better performance through online learning compared to those with limited infrastructure. The same is true in relation to technological access, as those organisations with advanced technology can easily adopt online learning as they have the required resources. For example, those institutions with reliable internet services are likely to learn better and produce better results compared to those with limited internet services. Also, those institutions with funding are likely to support their students with resources required such as computers and smartphones putting them at an advantage compared to those without funding. They are also able to train the learners and educators on the new online learning methods and they may be able to perform better than those without training. As a result, institutions in urban areas are

likely to perform better compared to those in rural areas as they have better access to the required facilities. Also, those in higher education are likely to adopt and understand online learning better compared to those in lower grades such as kindergarten and primary schools. To better explore this, researchers can further this study by performing a comparative analysis between rural and urban schools and between higher education, kindergarten and primary schools. The comparative analysis can be expanded to include the opinions of different stakeholders such as students, educators and administrators. This will help to understand if the views of these stakeholders are similar or not, thus yielding a comprehensive analysis. The demise of the pandemic created a different mentality and it seems educational institutions have started embracing online learning. The short-term changes include having organisations adopt a hybrid learning system where they use both online and face-to-face learning. Some institutions are foreseen to create two classes, one for online learning and one for face-to-face learning. For countries with easy access to technology and better infrastructure, it could be possible for them to shift from face-to-face learning to online learning. However, countries that do not have the infrastructure and institutions in rural areas, would simply revert back to face-to-face learning after the pandemic.

### 7.2 Research limitations and future research questions

This paper presents a conceptual model for assessing the impact of COVID-19 on the education system, hence, the model needs to be tested to validate it. The study also presents results from a pilot study. Thus, researchers can continue with this study by gathering more data and analysing it through SEM to further validate the applicability of the model. This model is meant for the education sector only and it does not include other important sectors such as manufacturing, agriculture, and construction. It is therefore important to expand this model and include other important sectors. The model is generalised and not country-specific or educational-level-specific. Thus, in validating this model, future research can be carried out focusing on specific education levels such as primary or secondary, or tertiary. Also, the same can be done on different countries and the results compared among these countries, thus, cross-country comparison. There are many moderating variables that can be included in this model. For example, prior experience with online learning could moderate the relationships proposed in this model. Those students with prior experience are better equipped to perform better as they are used to online tools and will have fewer challenges in adapting to these requirements. Also, access to technology is another important moderating variable that can be integrated into the model. In most countries, the internet is expensive, slow and timely down (Koul and Bapat, 2020). Chandasiri (2020) highlighted that internet problems affect the learning processes and pass rate of learners as most of the time internet fails to support online tools such as Google Meet. Hence, there is a need to explore the extent to which access to technology moderates the proposed relationships. Also, further exploration can be done by assessing the impact of hybrid learning on the performance of the students. Also, other researchers can explore the role of mental health in student performance and integrate it into this model.

### References

- Apostol, C. (2020), "Coronavirus—a new international economic crisis", *European Finance, Business and Regulation, EUFIRE*, Vol. 2020, pp. 641-655.
- Azevedo, J.P., Hasan, A., Goldemberg, D., Geven, K. and Iqbal, S.A. (2021), "Simulating the potential impacts of COVID-19 school closures on schooling and learning outcomes: a set of global estimates", *The World Bank Research Observer*, Vol. 36 No. 1, pp. 1-40.

- Bao, X., Qu, H., Zhang, R. and Hogan, T.P. (2020), "Modeling reading ability gain in kindergarten children during COVID-19 school closures", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 17, p. 6371.
- Breerton, P., Kitchenham, B.A., Budgen, D., Turner, M. and Khalil, M. (2007), "Lessons from applying the systematic literature review process within the software engineering domain", *Journal of Systems and Software*, Vol. 80 No. 4, pp. 571-583.
- Brown, G.T. (2020), "Schooling beyond COVID-19: an unevenly distributed future", *Frontiers in Education*, Vol. 5, p. 82.
- Ceesay, E.K. (2021), "Potential impact of COVID-19 outbreak on education, staff development and training in Africa", *Research in Globalization*, Vol. 3, p. 100049.
- Chandasiri, O. (2020), "The COVID-19: impact on education", *Journal of Asian and African Social Science and Humanities*, Vol. 6 No. 2, pp. 37-42.
- Chaturvedi, S., Purohit, S. and Verma, M. (2021a), "Effective teaching practices for success during COVID 19 pandemic: towards phygital learning", *Frontiers in Education*, Frontiers Media SA, p. 646557.
- Chaturvedi, K., Vishwakarma, D.K. and Singh, N. (2021b), "COVID-19 and its impact on education, social life and mental health of students: a survey", *Children and Youth Services Review*, Vol. 121, p. 105866.
- Cohen, J. (1988), *Statistical Power Analysis for the Behavioral Sciences*, Erlbaum, H. (Ed.).
- El-Sayad, G., Md Saad, N.H. and Thurasamy, R. (2021), "How higher education students in Egypt perceived online learning engagement and satisfaction during the COVID-19 pandemic", *Journal of Computers in Education*, Vol. 8 No. 4, pp. 527-550.
- Emon, E.K.H., Alif, A.R. and Islam, M.S. (2020), "Impact of COVID-19 on the institutional education system and its associated students in Bangladesh", *Asian Journal of Education and Social Studies*, Vol. 11 No. 2, pp. 34-46.
- Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.
- Fossey, E., Harvey, C., McDermott, F. and Davidson, L. (2002), "Understanding and evaluating qualitative research", *Australian and New Zealand Journal of Psychiatry*, Vol. 36 No. 6, pp. 717-732.
- Fuchs-Schündeln, N., Krueger, D., Ludwig, A. and Popova, I. (2022), "The long-term distributional and welfare effects of covid-19 school closures", *The Economic Journal*, Vol. 132 No. 645, pp. 1647-1683.
- Gelo, O., Braakmann, D. and Benetka, G. (2008), "Quantitative and qualitative research: beyond the debate", *Integrative Psychological and Behavioral Science*, Vol. 42 No. 3, pp. 266-290.
- Hair, J.F., Jr, Hult, G.T.M., Ringle, C. and Sarstedt, M. (2017), "A primer on partial least squares structural equation modeling (PLS-SEM)", Sage Publications', Thousand Oaks, CA.
- Hair, J., Jr, Hair, J.F., Jr, Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2021), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Sage publications.
- Hashemi, A., Akramy, S.A., Orfan, S.N. and Noori, A.Q. (2021), "Afghan EFL students' perceptions of critical thinking and problem-solving skills", *Language in India*, Vol. 21 No. 8, pp. 121-131.
- Holton, E.F. and Burnett, M.F. (2005), "The basics of quantitative research", *Research in Organizations: Foundations and Methods of Inquiry*, pp. 29-44.
- Jena, P.K. (2020), "Impact of covid-19 on higher education in India", *International Journal of Advanced Education and Research (IJAER)*, Vol. 5.
- Keith, T.Z. (2019), *Multiple Regression and beyond: An Introduction to Multiple Regression and Structural Equation Modeling*, Routledge.
- Kim, T.K. (2017), "Understanding one-way ANOVA using conceptual figures", *Korean Journal of Anesthesiology*, Vol. 70 No. 1, pp. 22-26.

- King, J. (2021), "A call for higher education to critically reflect on the coronavirus disorientation", *Transformative Teacher-Scholar*, available at: <https://blogs.uco.edu/tts/a-call-for-higher-education-to-critically-reflect-on-the-coronavirus-disorientation/>
- Kitchenham, B., Brereton, O.P., Budgen, D., Turner, M., Bailey, J. and Linkman, S. (2009), "Systematic literature reviews in software engineering—a systematic literature review", *Information and Software Technology*, Vol. 51 No. 1, pp. 7-15.
- Koul, P.P. and Bapat, O.J. (2020), "Impact of COVID-19 on education sector in India", *Journal of Critical Reviews*, Vol. 7 No. 11, pp. 3919-3930.
- Leguina, A. (2015), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Taylor and Francis.
- McHugh, M.L. (2011), "Multiple comparison analysis testing in ANOVA", *Biochemia Medica*, Vol. 21 No. 3, pp. 203-209.
- MacNeil, W. and Topping, K. (2007), "Crisis management in schools: evidence based", *The Journal of Educational Enquiry*, Vol. 7 No. 1.
- Mabwe, K., Chiyaka, E.T. and Sithole, A. (2023), "Assessing academics' COVID-19-induced emergency remote teaching experiences using transformative learning theory", *Journal of Transformative Education*, Vol. 22 No. 1, p. 15413446231155433.
- Machingura, T., Adetunji, O. and Maware, C. (2024a), "A hierarchical complementary lean-green model and its impact on operational performance of manufacturing organisations", *International Journal of Quality and Reliability Management*, Vol. 41 No. 2, pp. 425-446.
- Machingura, T., Adetunji, O. and Maware, C. (2024b), "The mediatory role of the environmental performance function within the lean-green manufacturing sustainability complex", *The TQM Journal*.
- Machingura, T., Adetunji, O., Muyavu, A.T. and Maware, C. (2024c), "Can human lean practices affect business performance? Evidence from Zimbabwe service industries", *The TQM Journal*, Vol. 36 No. 9, pp. 413-436.
- Mathur, S. and Singh, A. (2020), "The perception of teachers on unlocking technology by redesigning education system during and after COVID-19 pandemic lockdown", *Educational Practices during the COVID-19 Viral Outbreak: International Perspectives*, p. 181.
- Matsvange, M., Mugomba, J. and Sithole, S. (2021), "Early childhood development trainee teachers' perceptions on E-learning implementation during the COVID-19 era in Harare metropolitan district, Zimbabwe", *Middle Eastern Journal of Research in Education and Social Sciences*, Vol. 2 No. 3, pp. 97-110.
- Maware, C. and Adetunji, O. (2018), *Lean Impact Analysis Assessment Models: Development of a Lean Measurement Structural Model*.
- Mezirow, J. (1997), "Transformative learning: theory to practice", *New Directions for Adult and Continuing Education*, Vol. 1997 No. 74, pp. 5-12.
- Mustafa, F., Khurshed, A., Rizvi, S.M.U., Zahid, A. and Akhtar, A. (2021), "Factors influencing online learning of university students under the covid-19 pandemic", *IJERI: International Journal of Educational Research and Innovation*, No. 15, pp. 342-359.
- Mutambisi, S., Murasi, D.D. and Mazodze, C. (2021), "The impact of the covid-19 pandemic on student affairs practitioners: a reflective case study from Bindura university of science education in Zimbabwe", *Journal for Students Affairs in Africa*, Vol. 9 No. 1, pp. 183-195.
- Nachtigall, C., Kroehne, U., Funke, F. and Steyer, R. (2003), "Pros and cons of structural equation modeling", *Methods Psychological Research Online*, Vol. 8 No. 2, pp. 1-22.
- Nikou, S. and Maslov, I. (2021), "An analysis of students' perspectives on e-learning participation—the case of COVID-19 pandemic", *The International Journal of Information and Learning Technology*, Vol. 38 No. 3, pp. 299-315.

- Noori, A.Q. (2021), "The impact of COVID-19 pandemic on students' learning in higher education in Afghanistan", *Heliyon*, Vol. 7 No. 10, pp. 1-8.
- Nowacki, A. (2017), "Chi-square and fisher's exact tests", *Cleveland Clinic Journal of Medicine*, Vol. 84 No. 9 suppl 2, p. e20-5
- Nunkoo, R. and Ramkissoon, H. (2012), "Structural equation modelling and regression analysis in tourism research", *Current Issues in Tourism*, Vol. 15 No. 8, pp. 777-802.
- Page, M.J., Mckenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J.M., Hróbjartsson, A., Lalu, M.M., Li, T., Loder, E.W., Mayo-wilson, E., Mcdonald, S., Mcguinness, L.A., Stewart, L.A., Thomas, J., Tricco, A.C., Welch, V.A., Whiting, P. and Moher, D. (2021), "The PRISMA 2020 statement: an updated guideline for reporting systematic reviews", *BMJ*, Vol. 88, p. 105906.
- Papaevangelou, O. (2021), "Crisis management and theories in education", *International Journal of Multidisciplinary Research and Growth Evaluation*, Vol. 2 No. 1, pp. 127-130.
- Rwodzi, A. and Sibanda, T. (2021), "The 'new normal' learning and teaching modes in educational institutions in the COVID (IZED) era: an appraisal of Zimbabwe and Botswana", *Patrolling Epistemic Borders in a World of Borderless Pandemics: Epistemological Policemen in COVID-19 Afflicted 21st Century*, p. 183.
- Samat, M.F., Awang, N.A., Hussin, S.N.A. and Nawi, F.A.M. (2020), "Online distance learning amidst COVID-19 pandemic among university students: a practicality of partial least squares structural equation modelling approach", *Asian Journal of University Education*, Vol. 16 No. 3, pp. 220-233.
- Sargent, R.G. (2010), "Verification and validation of simulation models", *Proceedings of the 2010 Winter Simulation Conference. IEEE*, pp. 166-183.
- Scully-Russ, E., Cseh, M., Hakimi, L., Philip, J., Lundgren, H. and Ralston, D. (2022), "So you say our work is essential: essential workers and the potential for transformative learning in the wake of COVID-19 social and economic disruption", *New Directions for Adult and Continuing Education*, Vol. 2022 Nos 173/174, pp. 93-103.
- Shahzad, A., Hassan, R., Aremu, A.Y., Hussain, A. and Lodhi, R.N. (2021), "Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female", *Quality and Quantity*, Vol. 55 No. 3, pp. 805-826.
- Stukalo, N. and Simakhova, A. (2020), "COVID-19 impact on Ukrainian higher education", *Universal Journal of Educational Research*, Vol. 8 No. 8, pp. 3673-3678.
- Sutton, J. and Austin, Z. (2015), "Qualitative research: data collection, analysis, and management", *The Canadian Journal of Hospital Pharmacy*, Vol. 68 No. 3, p. 226.
- Tarkar, P. (2020), "Impact of COVID-19 pandemic on education system", *International Journal of Advanced Science and Technology*, Vol. 29 No. 9, pp. 3812-3814.
- Tomarken, A.J. and Waller, N.G. (2005), "Structural equation modeling: strengths, limitations, and misconceptions", *Annual Review of Clinical Psychology*, Vol. 1 No. 1, pp. 31-65.
- Upton, G.J. (1992), "Fisher's exact test", *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, Vol. 155 No. 3, pp. 395-402.
- Valls Martinez, M. D C., Martín-Cervantes, P.A., Sanchez Perez, A.M. and Martinez Victoria, M. D C. (2021), "Learning mathematics of financial operations during the COVID-19 era: an assessment with partial least squares structural equation modeling", *Mathematics*, Vol. 9 No. 17, p. 2120.
- Van Dinter, R., Tekinerdogan, B. and Catal, C. (2021), "Automation of systematic literature reviews: a systematic literature review", *Information and Software Technology*, Vol. 136, p. 106589.
- Vaughan, T. (2021), "10 Advantages and disadvantages of qualitative research", available at: <https://www.poppulo.com/blog/10-advantages-and-disadvantages-of-qualitative-research> (accessed 23 January 2025).

- Vipler, B., Snyder, B., McCall-Hosenfeld, J., Haidet, P., Peyrot, M. and Stuckey, H. (2022), "Transformative learning of medical trainees during the COVID-19 pandemic: a mixed methods study", *Plos One*, Vol. 17 No. 9, p. e0274683.
- Vurayai, S. (2021), "The covid-19 pandemic, online learning, and the ubiquity of pedagogic and assessment dysphoria in higher education in Zimbabwe", *African Perspectives of Research in Teaching and Learning*, Vol. 5 No. 2, pp. 115-126.
- Wang, Q. and Huang, R. (2021), "The impact of COVID-19 pandemic on sustainable development goals", – *Environmental Research*, Vol. 202, p. 111637.
- Watermeyer, R., Crick, T., Knight, C. and Goodall, J. (2021), "COVID-19 and digital disruption in UK universities: afflictions and affordances of emergency online migration", *Higher Education*, Vol. 81 No. 3, pp. 623-641.
- Wong, K.K.-K. (2013), "Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS", *Marketing Bulletin*, Vol. 24 No. 1, pp. 1-32.
- Young, A.-M., Ni Dhuinn, M., Mitchell, E., Ó Conaill, N. and Uí Choistealbha, J. (2022), "Disorienting dilemmas and transformative learning for school placement teacher educators during COVID-19: challenges and possibilities", *Journal of Education for Teaching*, Vol. 48 No. 4, pp. 459-474.
- Zinyemba, L., Nhongo, K. and Zinyemba, A. (2021), "COVID-19 induced online learning: the Zimbabwean experience", *African Journal of Social Work*, Vol. 11 No. 4, pp. 223-230.
- Zvomuya, W. (2021), "The impact of COVID-19 pandemic on social work education and practice", *African Journal of Social Work*, Vol. 11 No. 4, pp. 189-200.

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