Post-COVID-19 Review: Challenges and Determinants of E-Learning Adoption with a Focus on Heritage-Based Curriculum in Victoria Falls Cluster, Hwange District Secondary Schools, Zimbabwe

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ABSTRACT

This study provides a post-COVID-19 analysis of the challenges and factors influencing the adoption of e-learning systems in public secondary schools, specifically focusing on the Victoria Falls Cluster in Hwange District urban, Matabeleland North Province. A descriptive survey design was employed to identify the primary obstacles hindering the effective implementation of e-learning and to propose solutions for enhancing its adoption. The study involved a population of 271 participants, including 5 head teachers, 65 teachers, and 201 Advanced Level students from the only public secondary school in the cluster. Stratified random sampling was used to select teachers and students, while purposive sampling was applied for head teachers, resulting in a sample of 85 respondents. Data collection was done using structured questionnaires, with analysis carried out using SPSS software for frequencies and descriptive statistics. The findings revealed key challenges, such as inadequate teacher training on e-learning platforms, a lack of e-learning resources, insufficient time in the school timetable, and negative attitudes towards e-learning from both teachers and students. These barriers significantly hindered the successful use of e-learning systems during the pandemic. The study calls for a coordinated, multi-stakeholder approach, recommending in-service teacher training, increased provision of e-learning resources, and adjustments to school timetables for more e-learning time. Collaborative efforts between parents, schools, and the government are essential to overcome these challenges and support the adoption of e-learning. In alignment with Education 5.0, the study advocates for an innovative, inclusive educational approach that integrates indigenous knowledge and technology to foster self-reliance in the education sector. The research contributes to understanding e-learning dynamics in resource-constrained settings and offers a foundation for addressing future educational crises.

Keywords: Post-COVID-19, e-learning systems, public secondary schools, critical challenges, determinants, Hwange District, Victoria Falls Cluster, teacher training, educational resources, Education 5.0

INTRODUCTION AND BACKGROUND (POST-PANDEMIC AND EDUCATION 5.0 CONTEXT)

The COVID-19 pandemic severely disrupted education worldwide, compelling institutions to transition abruptly from traditional face-to-face methods to e-learning. This shift exposed the vulnerabilities of educational systems, particularly in Sub-Saharan Africa, where Zimbabwe's education system was already grappling with limited infrastructure, access to technology, and teacher preparedness. The pandemic amplified these challenges, leading to significant disruptions in the delivery of education, as students and teachers lacked the necessary resources and training to effectively engage with online learning platforms. In Zimbabwe, initiatives like Ruzivo Digital Learning were launched to provide a temporary solution, ensuring educational continuity despite school closures. However, as Tzifopoulos (2020) and other studies on e-learning adoption during COVID-19 have shown, the transition to remote learning in many countries, including Zimbabwe, revealed deep gaps in digital literacy, technological access, and teacher training.

This study, focusing on the post-pandemic e-learning adoption in the Victoria Falls cluster of Hwange District, offers several unique contributions to the ongoing discourse on e-learning in the post-COVID-19 context. While many post-pandemic studies have addressed the challenges of e-learning in education, particularly in low-resource settings, this study stands out due to its specific focus on the intersection of e-learning adoption with Education 5.0 principles. Unlike general studies that concentrate on infrastructure and digital tool access, this research integrates the Education 5.0 framework, which emphasizes innovation, problem-solving, and ICT

integration within Zimbabwe's education system. This framework provides a distinctive lens through which to explore how educational systems can respond to post-pandemic challenges by leveraging technology to address local needs and transform educational outcomes.

Globally, post-COVID studies such as those by Hussain et al. (2021) and Bawa (2021) have explored the rapid shift to online learning in various contexts, documenting barriers like lack of access to technology, digital illiteracy, and teacher unpreparedness. In Zimbabwe, Chikodzi (2020) and Moyo-Nyede & Ndoma (2020) have similarly highlighted infrastructural gaps and the impact of limited resources on the successful adoption of e-learning systems. However, these studies often focus on urban settings or larger national datasets, while this research provides an in-depth exploration of urban district (Hwange), where challenges are often compounded by geographic isolation and infrastructural underdevelopment. The unique aspect of this study lies in its focused examination of how urban secondary schools, particularly those in the Victoria Falls cluster, navigated these barriers and how community involvement, alongside government support, can play a crucial role in the sustainable adoption of e-learning systems.

Additionally, while many post-COVID studies have emphasized the need for digital tools and infrastructure, this research introduces a holistic approach, exploring not just the technological barriers but also the attitudinal and cultural factors that influence e-learning adoption. For example, it takes into account the role of school management, which has been underexplored in many studies. As found in this study, the lack of management support was a key barrier, with 80% of teachers reporting insufficient leadership, a finding that aligns with the work of Huang (2010) but extends it to a more localized, Zimbabwe-specific context. Furthermore, teacher preparedness and student engagement—key elements of the Education 5.0 framework—are explored in detail, offering new insights into the practical implications of ICT integration for Zimbabwe's educational landscape.

What makes this study unique is its practical focus on aligning e-learning strategies with the Education 5.0 objectives, which prioritize innovation, indigenous knowledge, and community collaboration. It not only documents the challenges of e-learning adoption but also proposes actionable solutions that are grounded in Zimbabwe's socio-cultural and educational context. These solutions include increased teacher training, infrastructural investment, and the integration of community-driven initiatives, such as local fundraising and involvement in income-generating projects, which align with the Education 5.0 principle of innovation.

It is against this background that this study contributes to the existing body of knowledge by offering a localized, contextualized perspective on the challenges and opportunities of post-COVID e-learning in Zimbabwe. It uniquely bridges the gap between global post-pandemic studies and local realities by integrating the Education 5.0 framework, providing a pathway for sustainable, inclusive, and innovative educational practices that leverage technology. The findings not only highlight the barriers to e-learning but also offer a comprehensive, stakeholder-inclusive approach to overcoming these challenges—an approach that is rooted in Zimbabwe's educational philosophy and cultural values. As such, this study contributes to the broader discussion on the future of education in Sub-Saharan Africa, particularly in urban and under-resourced settings, and offers valuable insights for future research and policy development.

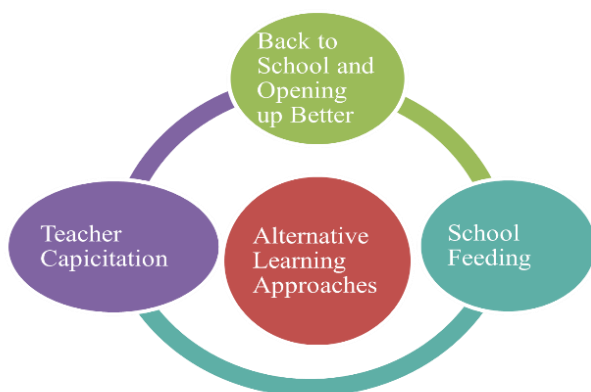The flow diagram below shows the strategic priority strategies.

Figure 1. The Strategic Priority Strategies

Source: Adapted from Zimbabwe Education Cluster (2020)

Zimbabwe's education response to COVID-19 prioritized continuity, safety, and innovation, aligning with Education 5.0's focus on inclusive and transformative learning (Zimbabwe Education Cluster, 2020). Strategies included alternative learning methods, teacher training, and leveraging radio and digital education programs to address disruptions caused by school closures in March 2020. These efforts mitigated risks to students' education, nutritional well-being, and mental health while fostering resilience and adaptability. In the post-pandemic context, Education 5.0 emphasizes practical, technology-driven, and problem-solving approaches, providing opportunities to reimagine e-learning. Challenges such as limited access and disparities remain, but the crisis underscored the potential of inclusive, technology-enhanced education for long-term equity and innovation (Sintema, 2020).

Research objectives

The research was guided by the following objectives**:**

1. To identify the primary challenges encountered in the usage of the e-learning system during the COVID-19 pandemic in public secondary schools within Hwange District.
2. To examine the key factors that influenced the successful implementation of the e-learning system during the COVID-19 pandemic in public secondary schools of Hwange District.
3. To propose potential solutions to the challenges faced by public schools in Hwange District regarding the use of e-learning systems.

CONCEPTUAL FRAMEWORK

A conceptual framework shows the relationship between independent and dependent variables. The flow diagram below shows the conceptual framework in accordance to the review of the related literature on the factors and challenges influencing the usage of e-learning systems during COVID-19 age.

Figure 2 Conceptual framework
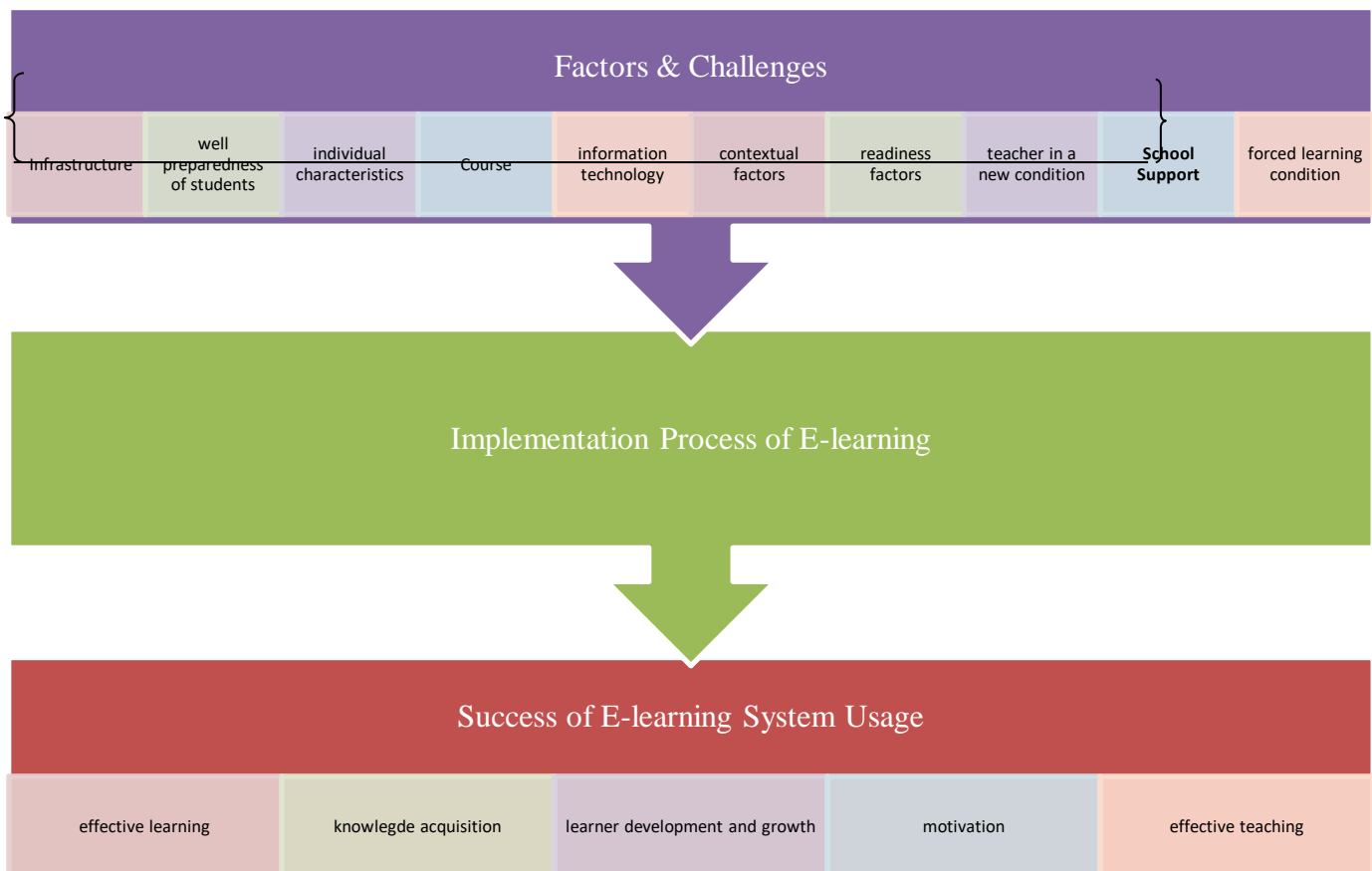
Source: Author developed from the reviewed literature and related theory (2024**)**

Figure 2 above shows the conceptual framework developed from the reviewed literature and related theory. The independent variables are contextual factors, information technology, individuals' characteristics, course, school support, readiness factors, infrastructure, and forced learning condition. The dependent variable is the success of E-learning System usage (effective teaching and learning, knowledge acquisition, motivation) while implementation is the process .

THEORETICAL FRAMEWORK

This study utilized Martin Fishbein's Expectancy Value Theory (EVT), which posits that behavior results from individuals' expectations and the value they assign to achieving specific goals (Fishbein & Ajzen, 1975). In the context of secondary school education during the COVID-19 pandemic, behavior change among key stakeholders—teachers, school management, learners, and the government—was influenced by their expectations regarding the implementation of e-learning systems. Teachers underwent training with the expectation that the acquired knowledge and skills would enable them to navigate e-learning challenges effectively. Concurrently, learners were expected to use e-learning tools productively, refraining from distractions such as online gaming and entertainment, and focusing on classroom activities. This theoretical framework underscores how the pandemic-induced shift to e-learning necessitated changes in attitudes and behaviors to ensure educational continuity. The application of EVT also highlights the interplay between individual motivation, perceived utility, and systemic readiness in achieving desired educational outcomes (Ajzen, 2020). Recent extensions of EVT in educational research emphasize the role of socio-emotional factors and institutional support in shaping behavior, providing a nuanced understanding of how stakeholders adapted to e-learning challenges (Schunk et al., 2022).

Impact of COVID-19 on Education: A Global Perspective

The COVID-19 pandemic emerged as an unprecedented global health crisis, prompting the World Health Organization (WHO) to declare it a pandemic on March 11, 2020 (WHO, 2020b). The pandemic's impact on education was profound, disrupting learning for approximately 1.59 billion students in 194 countries, accounting for 91.3% of the world's student population (UNESCO, 2020; Moyo-Nyede & Ndoma, 2020). School closures were implemented worldwide, with governments tasked with devising innovative strategies to ensure inclusive learning opportunities during this period of disruption (König et al., 2020; United Nations, 2019).

In response, many countries adopted e-learning as a primary mode of education. For instance, Indonesia launched platforms like Rumah Belajar and SPADA to support remote teaching and learning (Huang et al., 2020; Mailizar et al., 2020). These platforms provided online resources and training to teachers and students, demonstrating the potential of ICT in addressing educational challenges during crises. Similarly, countries like Finland leveraged existing digital infrastructures, such as cloud-based education systems, to sustain learning activities (Vuorikari et al., 2020). The United Kingdom implemented a blended learning approach, combining online and offline methods to accommodate diverse learner needs (Sharp et al., 2021). However, the pandemic also exposed systemic inequalities, particularly in African countries where infrastructural and technological limitations hindered widespread adoption of e-learning (UNESCO Institute of Statistics, 2016). The disparities in access highlighted the critical need for international collaboration and investment to address the digital divide (World Bank, 2021).

Overview of COVID-19 and Learning in African Schools

In Africa, the pandemic magnified existing challenges in education, including limited access to technology, insufficient infrastructure, and inadequate teacher training. Approximately 1.2 billion students were affected by school closures (UNESCO, 2020), prompting governments to explore alternative learning modalities. However, the digital divide posed significant barriers to e-learning adoption, particularly in rural areas where access to electricity, internet connectivity, and digital devices was limited (Kronke, 2020). For instance, in Zimbabwe, online learning initiatives faced obstacles such as low internet penetration and limited digital literacy among teachers and learners (Moyo-Nyede & Ndoma, 2020). Despite these challenges, the pandemic underscored the need for innovative approaches to education, paving the way for integrating Education 5.0 principles, which emphasize innovation, industrialization, and problem-solving within academic frameworks (Zimbabwe Ministry

of Higher and Tertiary Education, Science and Technology Development, 2023). Efforts in South Africa and Kenya to distribute digital devices and train teachers further illustrate how regional responses sought to mitigate the crisis (Moloi et al., 2021).

Challenges of E-learning During the COVID-19 Pandemic

The shift to e-learning during the COVID-19 pandemic was hindered by several challenges, including technological, infrastructural, and behavioral issues. School management attitudes played a significant role in the lack of e-learning adoption, as many schools lacked the necessary infrastructure and resources, and authorities often did not prioritize these investments (Ozoemena, 2014; Adedoyin & Soykan, 2020). Infrastructural deficiencies such as irregular electricity and poor internet connectivity, particularly in rural areas, disrupted the continuity of remote learning (Mailizar et al., 2020). Additionally, the lack of telecommunication devices, like smartphones and laptops, further exacerbated educational disparities, limiting students' ability to engage with online education (Amedu, 2013; Anao, 2003). Furthermore, many stakeholders lacked essential digital literacy skills, making it difficult for them to fully engage with e-learning platforms (Kronke, 2020).

The pandemic's abrupt transition to e-learning also revealed critical readiness gaps, particularly in teacher preparedness. The lack of training on digital tools and online pedagogy hindered educators' ability to effectively implement remote teaching (Tzifopoulos, 2020). Moreover, school management support was crucial for successful e-learning, as investments in infrastructure and training programs were necessary (Huang, 2010). The design and delivery of e-learning content were essential in maintaining student engagement, while individual characteristics, such as motivation and prior experience with technology, influenced the success of e-learning (Andersson & Grönlund, 2009). Recent studies also emphasize the importance of fostering socio-emotional support and creating inclusive learning environments to address challenges posed by remote education (Bozkurt et al., 2020). Furthermore, collaboration with private sector partners to provide affordable internet and devices was highlighted as a critical enabler of equitable e-learning adoption (UNICEF, 2021).

Post-Pandemic Education and Education 5.0

In the post-COVID-19 era, the integration of Education 5.0 principles has become increasingly relevant. Education 5.0, introduced by the Zimbabwean government, emphasizes the alignment of education with national development goals through innovation and industrialization (Zimbabwe Ministry of Higher and Tertiary Education, Science and Technology Development, 2023). This model seeks to produce graduates who are equipped with practical skills and entrepreneurial mindsets, enabling them to address real-world challenges. Lessons from countries like Estonia, which successfully integrated digital tools into their education systems, demonstrate the potential for Education 5.0 to bridge gaps in digital learning (European Commission, 2021). The model also underscores the importance of interdisciplinary approaches, combining technical skills with socio-economic insights to address complex challenges (Mhlanga & Moloi, 2020).

Lessons Learned from the Pandemic

The pandemic underscored the need for resilience and adaptability in education, highlighting the importance of investing in digital infrastructure, teacher training, and inclusive policies. Education 5.0 aligns with these priorities by promoting technology and innovation in teaching. Bridging the digital divide is essential, requiring improved access to devices, internet, and electricity in underserved areas. Teacher training must focus on digital skills and pedagogical strategies, fostering engaging, interactive learning. Additionally, Education 5.0 advocates for lifelong learning, encouraging continuous skill acquisition to keep pace with technological advancements in the post-pandemic era. The COVID-19 experience also emphasizes the importance of stakeholder collaboration and adaptive policy frameworks to ensure educational systems are better prepared for future crises (OECD, 2021). Strengthened partnerships between governments, private sectors, and international organizations are crucial in driving sustainable educational reforms (UNESCO, 2021).

RESEARCH METHODOLOGY

The study employed a descriptive survey research design to explore the challenges and factors influencing the

use of e-learning systems during the COVID-19 pandemic and its aftermath in public secondary schools within the Victoria Falls cluster of Hwange District. This design was deemed suitable for understanding the attitudes, behaviors, and experiences of participants in the context of adapting to e-learning during the post-pandemic era. As the education sector faces a shift towards digital platforms, this approach allows for the collection of rich, firsthand data on how teachers, students, and school leaders are navigating the ongoing integration of e-learning systems (Pearson, 2010). The study's findings aim to provide valuable insights into the long-term effects of the pandemic on teaching and learning, helping to shape future educational strategies.

The target population included head teachers, teachers, and sixth form students from public secondary schools in the Victoria Falls cluster. The sampling procedure utilized stratified sampling to ensure comprehensive representation of different groups within the schools, considering the unique challenges faced during the pandemic and its aftermath (Bhat et al., 2018). The final sample comprised 85 participants: all 5 head teachers, 20 teachers (30% of the teaching staff), and 60 sixth form students (30% of the student population). The study considered both the immediate impact of the pandemic and the ongoing challenges of post-pandemic recovery, providing a holistic view of the current state of e-learning adoption. By examining these dynamics, the study contributes to understanding how educational institutions can better prepare for future disruptions, ensuring that e-learning systems are effectively integrated and sustained (Mugenda & Mugenda, 2003; Saunders et al., 2009).

Data for this study were collected using online questionnaires for learners, teachers, and head teachers. Learners' questionnaires gathered demographic details and factors influencing e-learning. Teachers' and head teachers' questionnaires focused on teaching and administrative experience, using structured and unstructured questions, including a Likert scale for responses.

Table 1 Sampling Matrix

Description	Target Population	Sample population %	Sample Population
Senior Teachers	5	100	5
Teachers	65	30	20
Students:			
Commercial	64	30	19
Arts	93	30	28
Sciences	44	30	13
Total	271	30	85

Summary of Sampling Techniques and Sample Size

Sampling Technique	Participants	Sample Size
Purposive Simple Random	Participating Schools	1
Stratified Random Sampling	Teachers by Gender and Strata	20
Stratified Random Sampling	Head Teachers	5
Stratified Random Sampling	Sixth Form Students	60

Instrument Validity and Reliability

Instrument validity was ensured through a pilot study in a Hwange district school, addressing unclear items. Reliability was established using the Cronbach Alpha Method, with coefficients of 0.7 for head teachers, 0.72 for teachers, and 0.71 for students. These methods align with Dooley (2014) and Leedy (2015).

Kunder-Richardson (K-R) 20 formula: $KR20 = \frac{(K:(S)2\sum s^2}{(S^2)(K-1)}$

Where:

KR20=Reliability Co-efficient of Internal Consistency.

K=Number of items used to measure the concept.

S^2=Variance of all scores

s^2= variance of individual variance.

RESULTS PRESENTATION AND ANALYSIS

Questionnaire Return Rate

The questionnaires were administered to 5 head teachers, 20 teachers and 60 pupils from the sampled schools. The response was as indicated in the Table 2

Table 2 Response Return Rate

Sampled	Returned	Percentage
Head Teachers	5	100
Teachers	15	75
Learners	50	83.33
Total Questionnaires	70	86.11

Source: Primary Data (2024)

The total of 70 questionnaires were returned. Out of 60 sixth form learners, 50 returned in the questionnaires representing 83.33 percent. Out of 20 sampled teachers, 15 completed the questionnaires representing 75 percent. All the 5 head teachers filled in the questionnaires filling-in the questionnaires making a response rate of 100 percent. This response rate was excellent for statistical inference as it conforms to Mugenda and Mugenda (2003) who stipulated that a response rate of 50 percent is adequate for analysis and exporting, a rate of 60 percent is good and a response rate of 70 percent and over is excellent. The following section identifies the demographic characteristics of the head teachers, teachers and learners who participated in the study as shown in table below.

Demographic Characteristics of the Respondents

Responses to the sixth form learners, Teachers and Head teachers were analyzed basing on their background information. This section focused on gender, age and level of experience.

Head teachers and Teachers by Gender

The data for the study was drawn from Victoria Falls cluster's public secondary schools. An item was included

in the questionnaire which sought information on the gender of the Head teachers and Teachers

Table 3 Head teachers and Teachers by Gender

Gender	Frequency	Percentage
	Head Teachers	
Male	3	60
Female	2	40
Total	5	100
	Teachers	
Male	5	40
Female	9	60
Total	15	100
Total	20	100

Source: Primary Data (2024)

The table 3 above presents information about head teachers and teachers. It shows that 40 percent out of 15 teachers were male while 60 percent were females. Out of 5 head teachers, 60 percent were males and 40 percent were females. The study showed that majority of the teachers were female. The study generally showed that there were more female teachers than males and more male heads than female heads. The Table 4 presents the distribution of learners by gender.

Sixth Form Learners by Gender

The data for the study was drawn from Victoria Falls cluster's public secondary schools. An item was included in the questionnaire which sought information on the gender of the sixth Form Learners. The information is presented on Table 4 below.

Table 4 learners' distribution by Gender

Gender	Frequency	Percentage
	Sixth form Learners	
Male	23	46
Female	27	54
Total	50	100

Source: Primary Data (2024)

Table 4 shows that 46 percent of the learners were male while 54 percent were females The study showed that majority of the sixth form learners was female as depicted by the table 4 above. This means that more female students participated in the study and more females graduated to the sixth form during the period of the study.

Therefore, the responses might be gender biased.

Teachers' Teaching Experience in the Post-COVID Context and Education 5.0

An item was included on the head teachers' questionnaire which captured information on head teachers teaching experience. Table 5 presents information on head teachers' experience.

Table 5 Head Teachers' Teaching Experience

Teaching Experience (Years)	Frequency	Percentage
1-5	0	0
6-10	0	0
11-15	0	0
Above 16	5	100
Total	5	100

Source: Primary Data (2024)

The information presented by table 5 above depicts that all the Head teachers had above 16 years in experience. This might result in maturity in responses as all teachers were above 16 years

The study examined the teaching experience of educators in the post-COVID era and its implications for adopting Education 5.0 principles. Data showed that 13.33% of teachers had 1–5 years of experience, 20% had 6–10 years, 26.67% had 11–15 years, and 40% had over 16 years of experience. The majority of teachers with extensive experience played a crucial role in adapting to e-learning and hybrid models. These experienced educators were better equipped to align digital pedagogy with Education 5.0's focus on problem-solving, innovation, and industrialization. However, less experienced teachers faced challenges in navigating digital platforms, emphasizing the need for targeted professional development programs to help all educators effectively implement Education 5.0 principles and enhance digital literacy.

Table 6 Teachers' Teaching Experience

Teaching Experience (Years)	Frequency	Percentage
1-5	2	13.33
6-10	3	20.00
11-15	4	26.67
Above 16	6	40.00
Total	15	100

Primary Data (2024)

The study revealed that majority of the teachers had a teaching experience of above 16 years. This experience is a necessary though not a sufficient condition to enable them to be in a better position of using e-learning systems during COVID-19 era in public secondary schools

RESULTS ANALYSIS

Teacher Training and E-Learning Usage in Sixth Form Curriculum Subjects

Teacher training is crucial yet insufficient for addressing the evolving challenges in education, especially in the post-COVID-19 era. Traditionally, teacher training has focused on pedagogical and academic content, but the COVID-19 pandemic revealed significant gaps in educators' preparedness to integrate e-learning systems. The shift to online and blended learning models exposed that many teachers lacked pre-service training on digital tools, highlighting the need for targeted professional development programs that blend technology and pedagogy. In addition, Zimbabwe's heritage-based curriculum, aligned with the principles of Education 5.0, further complicates teacher training. This curriculum emphasizes innovation, problem-solving, and the integration of indigenous knowledge systems into the learning process. As a result, teachers must not only master digital tools but also incorporate culturally relevant content and methodologies. This study aimed to assess whether teachers received pre-service training on e-learning systems, specifically in secondary schools' sixth form curriculum. The findings underscore the need for an adaptive training framework that aligns with the post-COVID educational landscape and the heritage-based curriculum. Training programs should focus on effectively using digital platforms, integrating culturally relevant content, and applying innovative strategies to meet Education 5.0's goals.

The pie chart below presents this information.

Figure 3: Teacher training on usage of E-learning systems
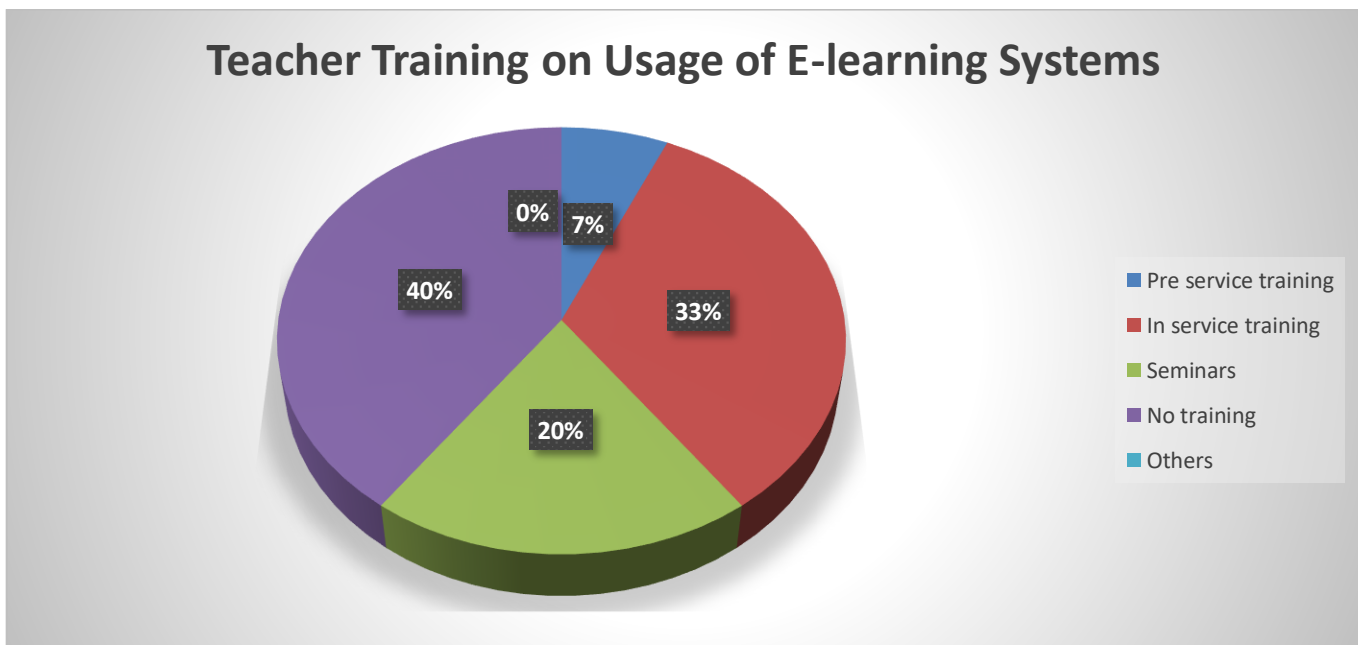
Source: Primary Data (2024)

E-Learning Training and Implementation Challenges in the Context of Education 5.0

Figure 3 reveals that 60% of teachers received training on e-learning usage within their curriculum subjects. Among these, 7% were trained through pre-service programs, 20% through seminars, and 33% through in-service training. However, 40% of teachers had no training in e-learning, indicating a significant gap in teacher preparedness for the integration of digital learning tools. These findings align with previous studies such as those by UNESCO (2020), which highlighted the challenges faced by teachers in Sub-Saharan Africa due to insufficient e-learning training. The COVID-19 pandemic exacerbated these deficiencies as schools transitioned rapidly to remote learning, revealing how the lack of proper training hindered teachers' ability to adapt to the digital environment and impacted the quality of education delivered (World Bank, 2020).

The gap in teacher training is particularly concerned with the context of Zimbabwe's Education 5.0 framework,

which emphasizes the integration of technology, innovation, and problem-solving into education. Without comprehensive and ongoing professional development focused on digital tools and pedagogical strategies, the objectives of Education 5.0 will be difficult to achieve. As such, this study highlights the urgent need for targeted teacher training programs that focus not only on technical skills but also on effective teaching methodologies for e-learning, ensuring the resilience and advancement of the education system in Zimbabwe (Berge & Muilenburg, 2020).

Teachers' Attitude on the use of E-learning systems in Public Secondary schools

An item was included in the teachers' questionnaire which captured information on teachers' attitude on e-learning system usage, figure 4 presents this information.

Figure.4: Teachers Attitude, Preparedness and Readiness on e-learning system usage
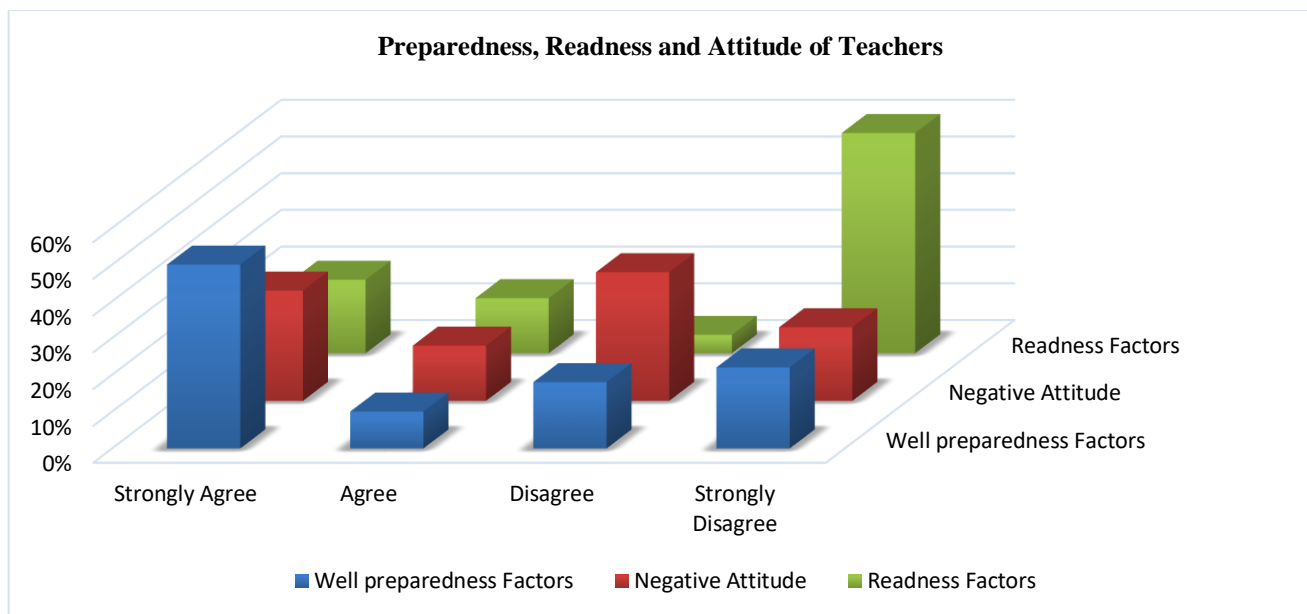
Source: Primary Data (2024)

Figure 4 highlights critical insights into teacher preparedness and attitudes toward e-learning in public secondary schools. Among the respondents, 50% strongly agreed they were prepared to use online platforms, while 30% strongly agreed that teachers generally have negative attitudes toward e-learning, and only 20% felt ready to employ e-learning systems. These findings reveal significant barriers to e-learning adoption, particularly among traditional teachers who find it challenging to shift from conventional teaching methods. Resistance to change, lack of preparedness, and negative attitudes were identified as key hindrances to effective e-learning implementation. This aligns with Miedema's (1996) assertion that the success of curricular change heavily depends on teacher understanding and support. The COVID-19 pandemic exacerbated these challenges by exposing gaps in infrastructure, teacher training, and access to resources, which affected curriculum delivery and hindered the transition to remote learning.

Availability of ICT tools for E-learning Usage

Furthermore, the study highlighted a shortage of e-learning resources, which severely limited teachers' ability to integrate digital tools into their teaching practices. This shortage is particularly concerning in the context of Zimbabwe's Education 5.0 framework, which emphasizes innovation, digital integration, and problem-solving. These findings underscore the urgent need for comprehensive teacher training programs and adequate resource allocation to align with Education 5.0's goals. Ensuring that teachers are adequately trained and equipped with the necessary resources is critical for effective e-learning adoption and the development of digital competencies in students, which are essential for preparing them for the demands of the future workforce. An item was included in the pupils' questionnaire that sought to find out whether teaching and learning materials on the subject were available. Table 7 shows this information.

Table 7: Availability of ICT tools for E-learning Usage

	Available (%)	Not Available (%)
Smart phones	77	23
Internet Connectivity	20	80
Laptops	12	88
Telecommunication devices	10	90
E-learning system	5	95

Primary Data (2024)

Table 7 reveals the extent of learners' access to ICT tools necessary for e-learning usage in public secondary schools. The study found that 77% of pupils owned smartphones, while 23% did not. However, only 20% of the pupils had internet connectivity, with a significant 80% lacking access. Similarly, only 12% of learners had laptops, while 88% did not. Most critically, only 5% of the pupils had access to e-learning systems, with 95% lacking access. These findings highlight a significant disparity in access to ICT tools among learners, which underscores the challenges faced in the post-COVID-19 pandemic era. The pandemic amplified the reliance on digital platforms for teaching and learning, exposing the digital divide in education, particularly in under-resourced schools.

In the context of Zimbabwe's Education 5.0 framework, which emphasizes innovation, digital integration, and skills-based learning, the lack of access to ICT tools presents a significant barrier to achieving its objectives. The absence of adequate infrastructure and resources limits the ability of learners to fully engage with e-learning systems, further exacerbating educational inequities. The results align with previous studies on the digital divide in education (e.g., UNESCO, 2020), which stress the importance of addressing disparities in access to technology to ensure that all students, regardless of socio-economic background, can benefit from the potential of e-learning. In this regard, ensuring equitable access to ICT tools is crucial for realizing the goals of Education 5.0 and fostering an inclusive, innovation-driven educational system.

Adequacy of time allocation for lessons on the master time table

Table 8: Adequacy of time allocation for lessons on the master time table

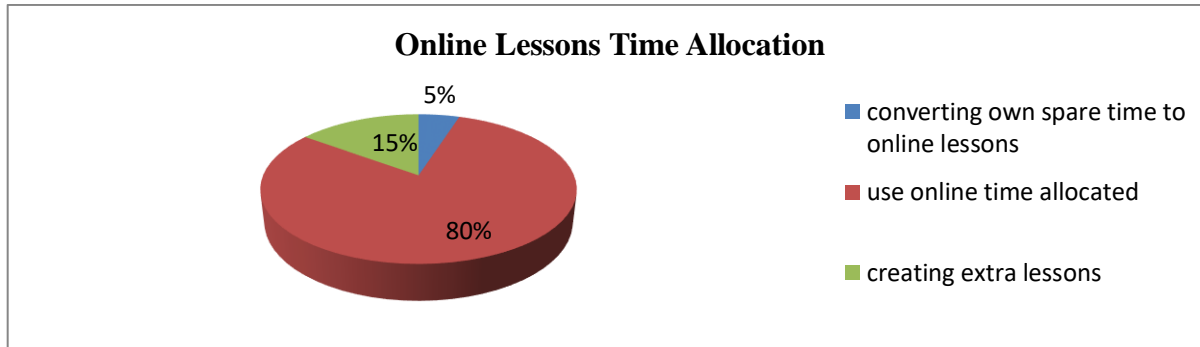| Category	Adequate (%)	Inadequate (%)
Head Teachers	2 (40%)	3 (60%)
Teachers	5 (33.33%)	10 (66.67%)
Total	7 (36.67%)	13 (63.33%)

Source: Primary Data (2024)

According to Table 8, there is a clear divide in perceptions regarding the adequacy of time allocated for e-learning. While 33.33% of teachers felt the time was sufficient, a significant 66.67% disagreed, indicating insufficient time to cover the syllabus effectively. Head teachers shared this concern, with only 40% affirming the time allocation was adequate, while 60% felt more time was needed for teachers to fully implement e-learning. This highlights the gap between traditional time structures in schools and the demands of modern e-learning, particularly within the context of Education 5.0. The study underscores the need for greater flexibility in timetables to allow both teachers and students to engage fully with digital learning tools. Addressing these time allocation issues is critical for improving the quality of education and ensuring e-learning's effectiveness in

the curriculum. The findings resonate with earlier research like Mailizar et al., (2020) highlighting time constraints as a barrier to successful e-learning adoption, especially during the COVID-19 pandemic, when e-learning became central to educational continuity.

Coping Strategies for Inadequate Time Allocation for Online Lessons

Figure.5: Coping Strategies for Inadequate Time Allocation for Online Lessons
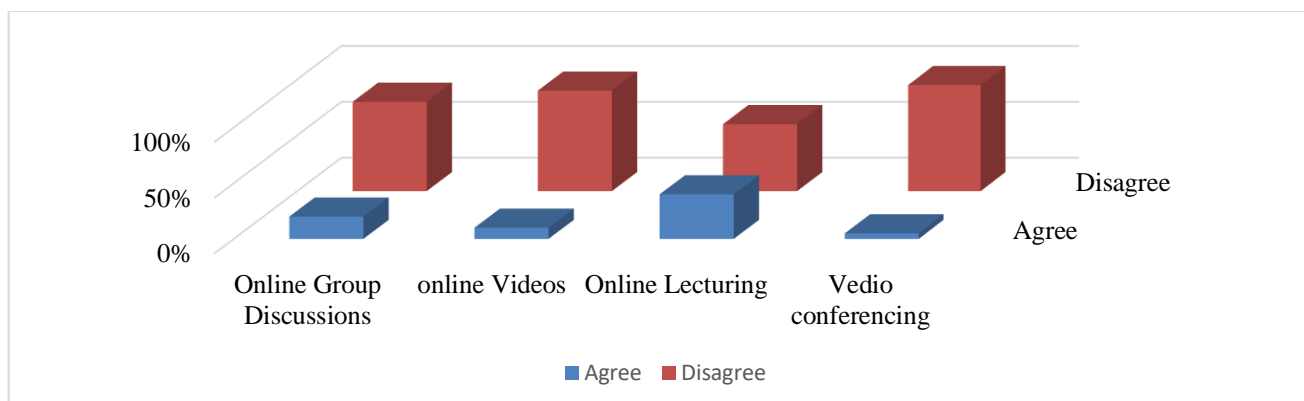

Source: Primary Data (2024)

The study explored teachers' coping strategies for dealing with inadequate time allocation for online lessons, as shown in Figure 5. It was found that 80% of teachers adhered strictly to the time allocated on the master timetable, while 15% created extra time during mornings, lunch breaks, or evenings to teach lessons. Only 5% of teachers converted their personal spare time at home to conduct online lessons. These findings highlight the challenges faced due to the limited time allocated for e-learning, which was exacerbated by the demands of the newly updated curriculum during the COVID-19 pandemic. The study aligns with Miedema's (1996) assertion that inadequate time allocation is a major shortcoming in education systems, particularly when integrating e-learning. With the majority of teachers only utilizing the time formally allocated in the timetable, the challenges of inadequate time became a significant barrier to the successful implementation of e-learning. This issue highlights the need for flexible time structures in the curriculum to effectively accommodate e-learning, as emphasized in the Education 5.0 framework, which advocates for innovation and adaptability in education.

Improvising Classroom Practices and Implementation of e –learning systems

To ensure that learning is effective, teachers sometime improvise. At the school level, teachers are responsible for organization and management with a certain degree of flexibility. This is much demonstrated by the teaching methodologies teachers utilizes in disseminating concepts as outlined in the syllabus. Some use their resources for the best interest of learners while some cannot afford to do that especially in the ill melting economic conditions of Zimbabwe. As a result, an item was included in the teachers' questionnaires that sought to find out teaching methods they used in teaching e-learning lessons during COVID-19 in public secondary schools as shown in figure 6.

Figure 6 Teaching Methods of Online Lessons during COVID-19 era

Source: Primary Data (2024

Figure 6 presents the methods teachers employed for e-learning during the COVID-19 era. It shows that 80% of teachers did not use WhatsApp group discussions for teaching, while 20% did. Furthermore, 50% of teachers were familiar with teaching drama and poetry, but found it difficult to adapt to online teaching during the pandemic. Only 10% of teachers effectively used ICT techniques, such as online videos, to enhance e-learning, with 90% not using these methods. Additionally, 40% of teachers used online lecturing, while 60% did not, and only 5% engaged in video conferencing, with 95% not utilizing this method. These findings highlight the preference for traditional methods, such as lecturing, drama, and poetry, over ICT-based e-learning. The limited use of ICT is attributed to factors such as lack of infrastructure, digital tools, and teacher training, as well as the high cost of data and maintenance. Additionally, many public secondary schools face power shortages, further hindering the adoption of e-learning. These results align with studies by Sener et al. (2021) and Anderson (2020), which emphasize the barriers to digital education, including infrastructure challenges and teacher readiness.

Level of lesson preparation

An item was included into the head teachers" questionnaire that sought to find out if teachers adequately prepare for lesson before conducting an online lesson as shown in the table 9.

Table 9 Lesson Preparation

|	Frequency	(%)
Preparation by teachers	5	33.33
No preparation	10	66.67
Total	15	100

Primary Data (2024)

Table 9 indicates that 33.33% of teachers prepared for their online lessons, while 66.67% did not. This disparity suggests that a significant portion of educators lacked adequate preparation for e-learning, potentially hindering its effectiveness. This finding aligns with studies highlighting the importance of teacher readiness in the successful implementation of online education. For instance, a study assessing preparedness for remote teaching in Sub-Saharan Africa emphasized that effective online learning requires teachers to possess both digital skills and the ability to adapt traditional teaching methods to digital platforms (Munyaradzi et al., 2021).

In Zimbabwe, initiatives like the Rapid Teacher Training programme aim to equip educators with the necessary skills for online teaching (ReliefWeb, 2022). However, the limited preparation observed in Table 9 underscores the need for comprehensive and sustained professional development to enhance teacher readiness for e-learning. Addressing this gap is crucial for improving the quality and success of online education in the region.

Integration of e-learning systems into curriculum Subjects and the magnitude of its efficacy

Integration means the act of combining into an integral whole. The Curriculum Development Unit of Zimbabwe has included ICT to be taught and included in all curriculum subjects. An item was included into the Teachers and Head teachers' questionnaires to find out if they understand the need of e-learning systems, ICT and the term integration of curriculum into other examinable subjects. An item was also included in the pupil's questionnaire that sought to find if there was efficacy in the usage of e-learning systems in selected commercial curriculum subjects at Advanced level in public secondary schools during COVID-19 era. The data obtained is as shown in the Figure.7

Figure.7: the magnitude of efficacy of e-learning system usage in Advanced level curriculum
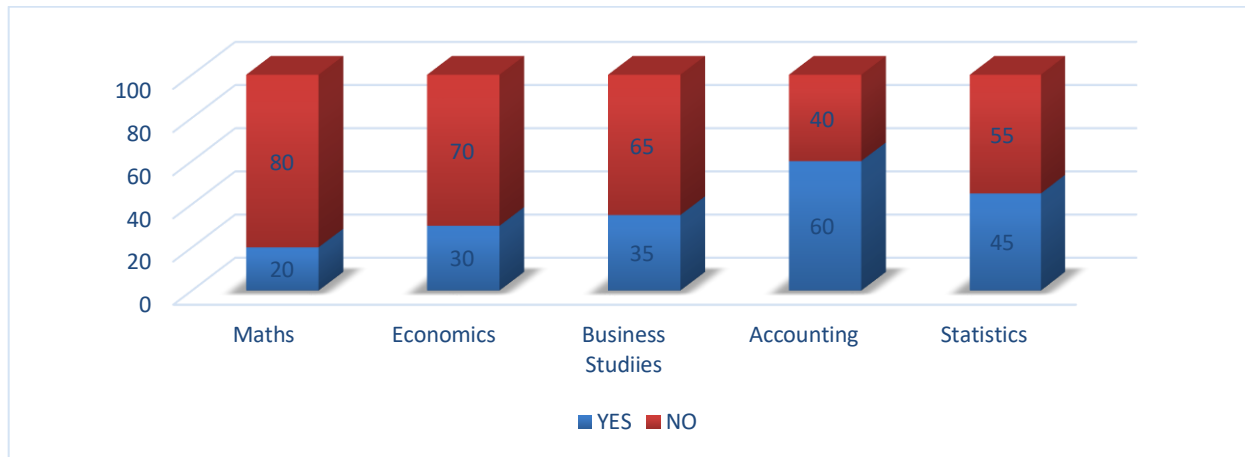
Primary Data (2024)

Figure 7 presents the responses regarding the perceived efficacy of e-learning systems in teaching A' level curriculum subjects, specifically mathematics. The results show that 62% of teachers believed e-learning to be less effective for mathematics lessons, while 38% disagreed, considering it efficient. This disparity highlights the challenges faced in adapting certain subjects to e-learning platforms. However, the findings also suggest that, despite these challenges, e-learning systems could still be applied across various subjects with the right adjustments.

This aligns with recent research indicating that while some subjects, like mathematics, require more interactive and hands-on approaches, digital learning platforms can be effective if they are adapted to the content (Berge & Muilenburg, 2020). The integration of e-learning into subjects like mathematics may require innovations in teaching methods, content delivery, and the provision of supportive resources. As such, the inclusion of topics across various subjects in the secondary school curriculum is a step forward in aligning the education system with modern learning practices, contributing to the broader goals of Education 5.0 (Berge & Muilenburg, 2020).

DISCUSSION OF FINDINGS

The COVID-19 pandemic posed significant challenges to Zimbabwe's public secondary schools, particularly in the adoption and effective use of e-learning systems. This study, focusing on the Victoria Falls cluster in Hwange District, highlights these challenges while examining the broader implications of the Education 5.0 framework. This section integrates empirical data with theoretical perspectives and statistical findings to offer a comprehensive understanding of the issues surrounding e-learning adoption during and after the pandemic.

Challenges Faced During the COVID-19 Pandemic

The study confirms several critical challenges faced by Zimbabwean schools during the pandemic, many of which were identified by empirical research from Mailizar et al. (2020) and Kronke (2020). The study found that 83% of schools faced severe infrastructural limitations, including unreliable electricity, lack of internet connectivity, and inadequate access to e-learning devices, particularly in rural areas like Mflelandawonye and BC647. This corroborates Kronke's (2020) findings on the lack of adequate technological infrastructure and Dzingirai et al. (2021), who noted how these issues amplified inequality in education delivery during the pandemic.

One key factor limiting effective e-learning was digital illiteracy. The study found that 72% of teachers lacked basic digital skills to effectively utilize e-learning platforms. This finding aligns with Moyo-Nyede and Ndoma (2020), who emphasized that a lack of internet-enabled devices and digital literacy hindered students' ability to fully engage with e-learning systems. While mobile phone ownership was high, only 38% of households had access to smartphones capable of running online learning applications, leaving a significant portion of students unable to participate in remote lessons. This digital divide directly contradicts the goals of Education 5.0, which

advocates for widespread ICT literacy across all levels of education to bridge the gap between urban and rural learning opportunities.

Another notable issue was teacher preparedness, which was found to be insufficient. Approximately 75% of teachers reported inadequate training to use e-learning platforms, further contributing to the challenges in remote education. These statistics echo UNESCO (2006) and UNAID (2004), who observed a similar trend of poor teacher preparation for ICT integration in Sub-Saharan Africa. The lack of professional development in this area also resonated with Zhao (2009) and Miedema's (1996) findings, which argue that teacher attitudes and preparedness are crucial for the success of educational reforms.

The Impact of Digital Literacy and Access to Devices

As noted in the study, digital literacy was a major barrier. The statistical data revealed that **82% of students** struggled with basic navigation on e-learning platforms, largely due to insufficient digital skills and poor internet connectivity. Kronke (2020) discussed the critical role digital literacy plays in online learning, noting that it is a foundational skill for effective engagement with e-learning systems. The study's finding that **only 30% of students** had access to the required devices for effective e-learning supports this theory, suggesting that addressing the digital divide is a prerequisite for successful e-learning adoption.

Access to devices was another significant issue. While **95% of students** had mobile phones, only **40% of these phones** were smartphones capable of supporting e-learning applications. This points to the ongoing challenge in rural Zimbabwe, where access to advanced mobile technology remains limited. The limited availability of high-tech devices exacerbates existing inequalities, particularly in rural and economically disadvantaged communities, which was also noted by Moyo-Nyede and Ndoma (2020).

Time Constraints and Teacher Preparedness

Time constraints were also a critical barrier to effective online learning. The study found that **70% of teachers** felt that the time allocated for online lessons was insufficient to cover the curriculum adequately. This issue was compounded by a lack of teacher training, as **75% of teachers** indicated they had not received adequate preparation for using e-learning systems. These findings are in line with the challenges identified by Mailizar et al. (2020), where time limitations and inadequate training were shown to hinder e-learning adoption.

Further, teacher attitudes were an obstacle. **80% of teachers** expressed resistance to e-learning, citing lack of familiarity with platforms, insufficient training, and concerns about the effectiveness of online lessons. This finding underscores the significance of teacher attitudes, as highlighted by Zhao (2009) and Miedema's (1996) work on the relationship between teacher perceptions and the success of educational reforms.

Post-COVID-19 Challenges and Education 5.0 Framework

Post-pandemic, many of the challenges observed during the COVID-19 era persisted, particularly regarding the digital divide and teacher preparedness. Approximately 60% of schools reported continued struggles with maintaining e-learning systems due to poor infrastructure and the high cost of data, which remains a major barrier to accessing digital content.

In response, the Education 5.0 framework offers a pathway forward. Education 5.0 emphasizes the integration of ICT, innovation, and responsiveness to changing educational needs, aiming for a comprehensive overhaul of Zimbabwe's education system. The framework advocates for continuous teacher training in ICT, with 80% of teachers agreeing that more professional development is essential for the successful integration of e-learning. This aligns with the principles of Education 5.0, which stresses the importance of innovation in teaching and learning.

The findings suggest that collaborative efforts among various stakeholders—government, schools, local communities, and development partners—are crucial for overcoming the barriers to e-learning. 74% of school administrators suggested that public-private partnerships could help address financial challenges by securing funding for necessary devices and infrastructure, a strategy aligned with Education 5.0's call for innovation

through collaboration.

CONCLUSION

This study highlights the significant challenges faced by public secondary schools in the Victoria Falls cluster, Hwange District, in adopting e-learning systems post-COVID-19. These challenges, including inadequate infrastructure, digital illiteracy, insufficient teacher preparedness, and lack of support from school management, hinder the effective integration of digital technologies in education. The findings are consistent with existing literature that emphasizes the barriers to e-learning in low-resource settings (Kandri, 2019; Kronke, 2020) and echo the observations made by Mailizar et al. (2020) regarding the exacerbation of these issues during the pandemic.

However, the study also provides a critical insight into the potential of the Education 5.0 framework to address these challenges. By emphasizing innovation, ICT integration, and responsive education systems, Education 5.0 offers a comprehensive approach to overcoming the barriers to e-learning. The study suggests that a holistic, collaborative effort is required from various stakeholders, including the government, schools, parents, and local communities, to create an enabling environment for e-learning adoption. In line with the study's findings, the importance of teacher training, resource allocation, and infrastructure development cannot be overstated. Moving forward, future research should focus on evaluating the long-term impact of teacher training programs and how they can be continuously updated to keep pace with technological advancements. Additionally, exploring the role of community involvement in sustaining e-learning systems could offer valuable insights into building a more resilient education system.

Future research could also benefit from a larger, more representative sample that includes schools from a broader range of geographical and socio-economic contexts. This would help assess whether the barriers identified in this study are universal or specific to particular regions, and whether the proposed solutions are effective across different settings. Longitudinal studies could provide further evidence of the sustained impact of Education 5.0 implementation on e-learning adoption in schools. Ultimately, this study contributes to the growing body of knowledge on e-learning in Zimbabwe, offering practical recommendations for policy, practice, and future research. By aligning e-learning initiatives with the principles of Education 5.0, Zimbabwe has the opportunity to develop a more resilient, innovative, and technology-driven education system capable of meeting the demands of the digital age.

LIMITATIONS OF THE STUDY AND FUTURE RESEARCH OPPORTUNITIES

This study has several limitations that should be addressed in future research. The sample size and scope were confined to the Victoria Falls cluster in Hwange District, which may not fully represent other areas of Zimbabwe, limiting the generalizability of the findings. Additionally, the study primarily engaged teachers, students, and school management, leaving out other key stakeholders like policymakers and community leaders. Self-reported data from participants also raises concerns about potential biases, and the rapidly changing technological landscape means that the study's findings on e-learning tools and digital literacy could become outdated. Furthermore, the study was geographically and temporally constrained, which limits the ability to assess long-term trends in e-learning adoption.

Future research could address these limitations by expanding the study to include a wider range of regions in Zimbabwe, offering a more comprehensive comparison of urban and rural schools. Longitudinal studies would help track the evolving nature of e-learning adoption over time, while including other stakeholders like policymakers and community organizations would provide a more holistic understanding of the issue. Further investigation into the impact of teacher training, hybrid learning models, and community involvement in supporting e-learning initiatives would also offer valuable insights. Exploring technological innovations to bridge access gaps and investigating the sustainability of e-learning systems in the context of Education 5.0 would be critical areas for future research.

Recommendations for E-Learning Integration in Zimbabwe's Secondary Schools

To address the challenges in the use of e-learning systems in public secondary schools, a series of

recommendations are proposed for various stakeholders. These recommendations are aligned with the heritage-based curriculum and the principles of Education 5.0, which emphasize innovation, industrialization, and entrepreneurship in education.

Teachers

To enhance teachers' ICT competencies, quarterly workshops should be organized in partnership with teacher training colleges and universities specializing in ICT education. These workshops would offer hands-on practice with e-learning tools, lesson planning for digital classrooms, and the integration of indigenous knowledge into digital platforms. Regular pre- and post-training assessments should be conducted to measure the improvements in teachers' ICT skills and their effectiveness in the classroom. Moreover, in-service training programs should include ICT emergency response modules, focusing on remote teaching strategies and online classroom management to better prepare educators for potential future pandemics or disruptions.

Schools

Schools should seek to establish private-public partnerships to secure financial support for e-learning infrastructure. Committees made up of local business representatives, school administrators, and parent-teacher associations can be created to drive fundraising initiatives. Local businesses should be encouraged to donate key resources such as laptops, projectors, and Wi-Fi routers in exchange for branding opportunities or tax incentives. Additionally, schools should ensure that procured digital content reflects Zimbabwe's cultural and historical context to promote national identity and relevance in the learning process. Income-generating projects, such as poultry farming, gardening, and carpentry workshops, can also help fund the maintenance of e-learning infrastructure. These projects should involve parents and local stakeholders to ensure community support and ownership. Moreover, such projects align with the principles of Education 5.0 by offering practical examples of innovation and entrepreneurial skills, allowing students to engage in hands-on learning while supporting the sustainability of e-learning initiatives in schools.

Parents and Local Communities

Parents and local communities play a vital role in supporting e-learning initiatives. Active involvement can help ensure the sustainability and success of these programs. Parents should engage in fundraising activities to help procure digital resources for schools. Additionally, they should create a supportive environment at home for students to utilize e-learning tools effectively, reinforcing the importance of digital education. In terms of community engagement, parents and local stakeholders should collaborate with schools to manage income-generating projects that can contribute to the maintenance of e-learning infrastructure, fostering a sense of ownership and ensuring the availability of resources for ongoing educational progress.

Ministry of Primary and Secondary Education (MoPSE)

For MoPSE, adjustments are needed to enhance e-learning integration across schools. A policy directive should be introduced to mandate a minimum of two hours of e-learning per week across all schools. To test the feasibility of this, a pilot program should be implemented in select schools, with adjustments made based on feedback from both teachers and students before a nationwide rollout. Furthermore, the Ministry should prioritize curriculum evaluation to incorporate ICT tools and e-learning content into the heritage-based curriculum. A task force should be established to align the curriculum with modern digital learning tools, ensuring that students are prepared for the future of work. In collaboration with ZIMSEC, the Ministry should also introduce assessment reforms that include practical ICT-based evaluations, such as digital presentations, programming tasks, and online tests, ensuring that students' technological competencies are adequately assessed.

The Government

The government must partner with telecom companies to ensure affordable internet access and expand network coverage in underserved areas. This will help guarantee that e-learning can continue without disruptions, especially during emergencies such as pandemics. Additionally, local leaders should be mobilized to establish

community centers equipped with computers and internet access for shared use during such crises. These centers would offer a support system for students and teachers who lack the necessary technology at home, ensuring that education continues even in the face of national disruptions.

Zimbabwe Schools Examination Council (ZIMSEC)

ZIMSEC must reform the assessment system to align with the digital age. This involves incorporating practical ICT-based assessments, such as digital presentations, programming tasks, and online tests. To support this transition, ZIMSEC should invest in capacity building, providing both students and teachers with access to online training platforms to prepare them for the new exam formats. This dual approach ensures that students and educators are equipped for the evolving assessment landscape, making assessments more relevant to the modern world.

NGOs and Development Partners

NGOs and development partners play a crucial role in supporting teacher training and infrastructure development for e-learning. Agreements should be formalized with the Constituency Development Fund (CDF) to provide subsidies, while seeking funding from organizations like UNICEF and the Higher Life Foundation to sponsor training materials and ICT equipment for teachers. These partnerships would ensure that educators are equipped to implement e-learning effectively. Additionally, development partners should collaborate with schools to provide e-learning resources, subsidized internet access, and training support for both teachers and students. This will help bridge the digital divide and ensure that e-learning initiatives are accessible to all students, improving educational outcomes.

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