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DIGITAL EDUCATION FOR SUSTAINABLE DEVELOPMENT IN EARLY CHILDHOOD CLASSROOMS OF ZIMBABWE

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A B S T R A C T

Since the advent of COVID 19, education systems worldwide have increased their investment towards digital education from primary school to university level. Several governments had prioritized their educational agendas to adapt strategies or policies around digital teaching and learning for sustainable development. In Zimbabwe, the heritage-based education 5.0 philosophy recently introduced by the Minister of Higher Education advocates for digital education which aims at transforming the economy for sustainable development. With the increasing call for digital education by government and ministry, it is important to critically examine the current teacher practices on digital education in early childhood classrooms (ECD). The study adopted an interpretive paradigm and a multiple case study design involving three teachers from three different schools. Data was solicited from three ECD teachers from three different schools through face-to-face semi structured interviews and document analysis. Despite teachers' remarkable efforts to implement digital education in ECD classrooms, the process was marred by a myriad of challenges. On a positive note, exposing young learners to digital education developed well-rounded abilities relevant to their future careers and personal lives. In addition, sustainable development equips learners with the knowledge, values, and skills necessary to address global challenges and contribute to a more sustainable future.

1. Introduction

Generally, education is seen as the primary strategy employed by people to expose people to new experiences and practices which transform their lives. More specifically digital education can be implemented in schools to equip people with knowledge and competencies that increase their productivity (Haleem *et al.,* 2022). Since the advent of COVID-19, education systems worldwide have increased their investment in the integration of information and communication technology (ICT) (Fernández-Gutiérrez *et al.,* 2020). Currently, developing countries are prioritising their educational agendas to adapt strategies or policies around digital teaching and learning (European Commission, 2020; Timotheou *et al.,l* 2022). During the pandemic, teaching across education levels including ECD was forced to move online (Daniel, 2020). Online teaching and learning accelerated the use of digital technologies generating questions regarding the process, the nature, the extent, and the effectiveness of digitalization in schools (Timotheou, 2022). Whilst digitalization offers great possibilities for fundamental improvement in schools (OECD, 2021) and touches many aspects of a school's development (Delcker & Ifenthaler, 2021; Timotheou, 2022), research suggests that it is a complex process that requires the technical aspects of technology and infrastructure (Pettersson, 2021, Timotheou, 2022). Recent studies have shown that despite the investment made in introducing digital

education in schools, particularly in ECD classrooms, the results have not been promising, and the intended outcomes have not yet been achieved (Timotheou *et al.,* 2022; Haleem *et al.,* 2022). Against this background, the study was carried out to determine the implementation of digital education for sustainable development in ECD classrooms in Zimbabwe.

2. Research Questions

The study was guided by the following research questions:

1. What are the current teacher practices in the implementation of digital education in ECD classrooms?
2. How are ECD teachers implementing digital education for sustainable development in ECD classrooms?
3. Are there any benefits of implementing digital education for sustainable development in ECD classrooms?

3. Literature Review

This section is an attempt to provide a clear understanding of the current state of knowledge on digital education for sustainable development under the following sub-headings: digital education in early childhood classrooms, ways of using digital technology in children's learning and sustainable development in ECD classrooms.

3.1 Digital education in early childhood classrooms

Existing literature has different meanings and explanations for digital education. These include digital technology, digital tools, digital resources and ICT (Information, communication technology). These are interactive books, Digital technology includes digital tools and devices as well as digital resources and media (Haleem, 2022). Digital tools refer to various types of computers and tablets, interactive screens, cameras, equipment for programming, and other types of digital production. Digital resources refer to the digital content used together with the children, both online content and apps or software that can be installed (Undheim, 2022). Digital education becomes the process of using digital resources and tools for teaching and learning purposes. Examples of digital resources are educational apps, interactive e-books, and virtual manipulatives. Educational apps like the Endless Alphabet assist children to learn letters, phonics, and vocabulary. The app uses games, puzzles, and songs to teach foundational skills such as listening, reading and speaking. Interactive e-books include; audio books and learning videos which capture the interests of young children. It helps them to learn the letters of the alphabet. The virtual manipulatives help young children to develop number sense and mathematics skills through games and activities.

ICT in education refers to the use of tools and services that handle and communicate information for supporting learning and instruction. It can include computers, networks, software, mobile phones, televisions, and other electronic media. It assists teachers and learners to communicate, create and disseminate, store and manage information. In essence, digital education has brought changes to the nature and scope of education(Edwards *et al.,* 2020; Fielding, *et al.,* 2023) and can complement more traditional resources to support children's investigations and explorations in early learning contexts (Johnston, 2019). However, with the increasing use of digital technology in society, it is important to critically examine and reconsider how children use and engage with technology, at home and in early childhood centres (Undheim, 2022).

3.2 Ways of using digital technology in children's learning

With the rise of technology and its pervasive presence in young children's lives, it is important to establish how teachers can integrate it into teaching and learning. Today's children are referred to as "digital natives" because they have grown up in a world where technology is a ubiquitous part of their environment (Coban et al 2022). On the same note, the findings of a study by Fleer (2020) highlighted that children used digital technology in distributed ways across the various activities in ECEC settings. It is therefore important to explore the various ways of using digital technology because, for many children growing up today, digital technology is as natural as any other artefact or tool (Edwards *et al.,* 2020).

Fleer (2020) identified exploratory learning through the project method as the best way of implementing digital technology. Fleer's study on digital play through Hedegaard's model of child development, the teachers encouraged the children to observe and discover their surroundings by using tablets, digital microscopes and trail cameras, as well as to engage in collaborative meaning-making with their peers. The digital microscope enabled the children to look closely at soil samples from the compost bin and water samples from their outdoor play area (Fleer 2020), while the trail camera enabled the children to capture images of the wildlife in the local forest. Through the use of digital technology, the teachers empowered the children to be actors in their inquiry by giving them time and room to explore (Fleer 2020).

Technology can be used as a tool or investigation, enabling ECD teachers to provide images of different aspects of space such as information on planet names to verify and complement ideas provided by the children as well as information in other reference material (Fielding & Murcia 2020). Children develop conceptual scientific knowledge through using their senses in everyday experiences (Hamlin and

Wisneski, 2012). Stephen and Plowman (2003) conclude that digital technology can be a valuable addition to teachers' practices, but this depends on teachers' pedagogical knowledge and expertise.

There is a plethora of interactive educational apps available for various subjects (Ulum, 2022). These apps often use gamification to make learning more engaging and effective. For example, platforms like Khan Academy and Coursera for Kids offer interactive lessons, videos, and quizzes across a wide range of subjects and age groups (Ulum, 2022; Undheim, 2022). By incorporating these apps in teaching and learning, digital technology can be seen as supporting children's achievement and engagement in complex activities. During these lessons, teachers provide proximal support and guidance when children explore, create, play, and learn with the technology (Undheim, 2022).

The use of technology provides children with a vast array of information at their fingertips. This can be incredibly beneficial for education and learning, as it can help to foster curiosity and encourage children to explore new topics and ideas. On the one hand, technology can support learning and provide access to educational resources and information (European Commission, 2022). The integration of technology into the curriculum allows children to learn about their world and various other subjects.

Digital education in schools has made communication easier and more accessible for children and teachers. For example, children who struggle with social skills are provided with a platform to build relationships and practice their communication skills. During the preschool years, young children are developing a sense of initiative and creativity (Kalati & Kim, 2022). They are curious about the world around them and about learning. They are exploring their ability to create and communicate using a variety of media. Against this background, it is important to note that technology has opened up new avenues for creativity and self-expression among children (Timotheou *et al.,* 2022). For example, children can create digital art, music and videos, or participate in virtual worlds where they can build, create, and explore.

Digital tools offer interactive and engaging learning experiences, making education more enjoyable and encouraging active participation among young learners (Su & Yang, 2022). Young children's concentration span is very low so they need tools and resources which are interesting and engaging. Digital tools offer hands-on learning. The interactive nature of digital tools allows young learners to connect with peers and educators globally, fostering cross-cultural understanding and collaboration. With digital tools and resources, parents and caregivers support their child's learning journey and promote positive digital behaviours at home(Johnston *et al.,* 2018). The engagement empowers young

learners to actively participate at home and in local initiatives and contribute to positive changes. Interactive community engagements enhance empathy and compassion in young learners as they understand the challenges faced by their communities.

3.3 Sustainable development in ECD classrooms

The Brundtland Commission's goal and definition of sustainable development is: "the development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs" (Shumba, 2018 pp89). The goal is in line with the 2030 Agenda for Sustainable Development which comprises integrated and indivisible 17 Sustainable Development Goals (SDGs). The fourth sustainable development goal (SDG4), i.e. quality education, is intended to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all and has been appointed as the universal education goal (UNESCO, 2017b). The study focused on target 4.7 emphasizes education for sustainable development (ESD). Within the SDG framework, the target of ESD is to ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, human rights and gender equality (UNESCO, 2016; Jetly & Singh, 2020). In this regard, digital education for sustainable development is an appropriate educational program to educate people from an early age to meet the demands of the evolving technological landscape.

Integrating sustainable development principles into education systems helps to create awareness, develop skills, and foster attitudes that support the long-term well-being of both people and the planet (Shumba, 2018). Similarly, introducing sustainable development in ECD classes raises awareness among learners about the environmental, social, and economic challenges facing the world. Teaching digital literacy in schools is among the economic and social challenges that most countries are battling with during this 21st-century era. Sustainable development encourages the development of critical thinking, problem-solving, and decision-making skills in learners. These skills are essential for addressing complex sustainability challenges. Several authors advocate that these digital literacy skills linked to sustainable development must be taught from the early childhood level (Keane *et al.,* 2023; Luo *et al.,* 2021; Al Abdullatif, 2022). As it has been alluded to earlier, integrating sustainability into education promotes creativity and innovation. Through effective implementation of digital education, learners develop new technologies, processes, and systems that contribute to sustainable development (Zhukova *et al.,* 2020; Shumba, 2018).

4. Methodology

The section was divided into six segments which are: research approach, research design, data collection methods, research participants, data collection methods and data analysis.

4.1 Research approach

The interpretive design was chosen for its emphasis on the importance of studying social phenomena within their specific cultural, historical, and social contexts (Creswell & Poth, 2018). Intepretivism emphasizes the subjective nature of human experiences and the importance of understanding social phenomena through the meanings and interpretations that individuals attach to them (Marshall & Rossman, 2016). The philosophy enabled the researcher to understand individual ECD teachers' experiences, beliefs and values in implementing digital education for sustainable development in ECD classrooms.

The design involves the study of multiple cases to gain insights into a particular phenomenon, issue, or problem. This approach allowed the researcher to compare and contrast three different schools, identify patterns, and develop a deeper understanding of digital education in ECD classrooms (Creswell & Poth, 2018). Rich, detailed descriptions of each case were provided and the complexity and uniqueness of individual experiences were captured. The researcher studied three schools focusing on ECD learning centres and according to Algozzine & Hancock (2016), the evidence that is generated from a multiple case study is strong and reliable.

Three ECD teachers from three different schools were purposively sampled to take part in the study (Creswell & Poth, 2018). In this study, the interest of the researcher was to understand how teachers were teaching digital education in ECD classrooms. The three qualified teachers with over 5 years of experience were selected. The study considered factors such as the ability to recall facts, understand and relate to real-life experiences as well as the capacity to logically reason and communicate thoughts in an appropriate scholarly language (Mukherji &Albon, 2015).

4.2. Data Collection Methods

Data was solicited from three ECD teachers from three different schools through face-to-face semi-structured interviews and document analysis.

4.2.1 Face-to-face semi-structured Interviews

These types of interviews were the most germane to research that sought to address questions that demanded in-depth and individual responses (Marshall & Rossman, 2016). Semi-structured interviews

were most useful as they gave insight into how ECD teachers were implementing digital education in their lessons. Semi-structured interviewing was most useful for gaining an in-depth understanding of the study where different insights, behaviours, approaches, and practices of the three teachers were anticipated (Yin, 2017). In addition, semi-structured interviews were used to elicit information from ECD teachers to achieve a holistic understanding of their views on the relationship between digital education and sustainable development. Before the interview, the participants were briefed thoroughly and reassured of their rights and responsibilities in the research (Miles, Huberman & Saldana, 2014). The interviews with ECD teachers were conducted in the classrooms after learners.

4.2.2 Document analysis

The study analysed the documents that ECD teachers used in the teaching and learning process which include: ECD syllabi, the Curriculum Framework and the schemes of work. The ECD syllabi were important in that they served to set forth the topics, concepts, and key ideas of what is to be taught during the course. The syllabus contains the suggested pedagogy and the assessment to be done to determine the achievement of both the aims and objectives of the course. The rationale for using document analysis is that they provided background information on the implementation of digital education in the teaching and learning of ECD learners (Tight, 2017). In this study, document analysis was a way to ensure the study was critical and comprehensive because it pointed to questions that needed to be asked and to situations that needed to be observed (Bowen, 2009).

4.3 Data analysis

The thematic approach and content analysis were adopted as methods of analysing and interpreting data. Data from semi-structured interviews were thematically analysed. Thematic analysis was chosen because it provided a way of looking for patterns in the data and connecting them into meaningful categories and themes that capture the topic under study (Yin, 2017). The process of data analysis involved reading the collected data several times, taking note of common ideas and coding them throughout the text (Bartlett & Vavrus, 2016). It involved "identifying, coding, categorizing, classifying, and labelling the primary patterns in the data" to "determine what is significant" (Ridder, 2016; 71). Finally, the codes were grouped into similar clusters to create a meaningful theme. The three major themes were pre-determined as they corresponded with the subsidiary questions.

Content analysis assisted in exploring large amounts of textual information from the schemes of work and syllabus to determine trends and patterns of words used as well as their frequency, relationships, and structures (Marks & Yardley, 2004). Analysed textual data from the syllabi and schemes of work were systematically coded. The content analysis helped in selecting relevant codes that finally fit into the themes and discarded the codes that did not have anything to do with the research questions. The

final research report reflected primary evidence generated from the identified documents.

5. Findings and Discussion

The main objective of the study was to explore the implementation of digital education for sustainable development by teachers in ECD classrooms. The analysis and discussions of the findings are presented in the following sections under the emerging themes that were also predetermined by participants' narratives and related literature. Data was presented in the following themes: current practices in the implementation of digital education in ECD classrooms, ways of implementing digital education for sustainable development in ECD classrooms, benefits of implementing digital education in ECD classrooms and the relationship between digital education and sustainable development.

5.1 Current practices in the implementation of digital education in ECD classrooms

Research findings suggest that the current curriculum advocates for the teaching of technology from early childhood development (The Curriculum Framework for Primary and Secondary Education (2015-2022). The Curriculum Framework spells technological skills as one of the learner exit profiles that learners should possess as a result of their learning experiences (p 17). In addition, the curriculum framework identifies digital literacy as a cross-cutting theme in the education system of Zimbabwe. One of the aims of the curriculum is to embrace ICT (information and communication technology) and e-learning to foster life-long skills. According to the curriculum framework, ICT is one of the learning areas at infant (ECD –grade 2) which exposes learners to the manipulation of ICT tools and the development of skills through games (p. 32). Learners also learn about electrical appliances' purposes and care. Guided by these aims and goals of the curriculum framework, teachers are obliged to implement digital literacy in early childhood development.

Teachers agreed that they are implementing digital education in their lessons as guided by the Curriculum framework. Teacher C said she created a WhatsApp group platform involving all parents of the learners. She sends homework on the platform so that parents assist their children at home. According to her, parents communicate effectively on the WhatsApp platform, except few parents without smartphones. She added that effective communication between the teacher and parents encourages teamwork, and collaboration and improves interaction. She narrated that parents can share ideas and knowledge on learners' needs and upbringing.

Teacher B explained that she integrates technology into all her lessons. For example, when teaching languages, she downloads videos on letter sounds of the alphabet and saves them on the computer (laptop). She will play the videos during the lesson. According to her report, such lessons are interesting and enjoyed by learners. In science lessons, she shows learners actual pictures from the computer

instead of showing them models. For example, on the topic of landforms, learners viewed pictures of mountains, hills, and oceans on the computer. Computer lessons were live, interesting and motivating. Young children have low attention span but teaching with computers improves learners' concentration span. However, she stated that consistent power cuts continuously disrupt most of her lessons because the school lacked power backup.

At Teacher D's school, ICT is taught as a separate subject. She teaches about electrical appliances like laptops, stoves, and cell phones among others. She was quick to narrate the challenges she was facing during the implementation due to inadequate appliances at the school. According to her, the teaching of concepts becomes difficult since learners share computers and the learner-computer ratio was 1:6. Data gathered suggest that teachers were implementing digital education as guided by the curriculum framework. The study found that digital education had numerous names. These include ICT, digital literacy or digital education. The different names refer to the teaching of technology using digital tools in schools. However, the implementation of digital education seems to be coupled with some challenges of inadequate computers, and lack of power among others. Teachers were putting effort into teaching lessons using technology as guided by the curriculum framework. The findings suggest that online teaching using computers was interesting and motivating and seemed to develop learners' concentration span. Furthermore, online collaboration tools, discussion forums, and shared documents enabled children and parents to work together on assigned assignments (homework), solve problems collaboratively, and exchange ideas with classmates in virtual environments.

It emerged from curriculum documents that technology fosters life-long learning. Technology allows learners to continuously learn even out of the classroom throughout their lives. Secondly, manipulation of ICT tools enhances skills such as hand-eye coordination, and gross and fine motor skills. In addition, (Zhukova et al 2020) reiterate that digital tools provide platforms for creativity and innovation, allowing young learners to express themselves through digital art, storytelling, coding, and other creative endeavours. Teachers reported that besides skills development, teaching using computers was interesting and motivating to learners. During observations, technology lessons were always live and participatory.

Teachers argued that despite assisting learners with homework, digital education encouraged collaboration between them and parents. Both parties worked together in assisting learners to read. According to (Undheim, 2022), online learning platforms encourage parents and teachers to collaborate, experiment, and bring their ideas to fruition, driving economic growth and innovation. In addition, digital education facilitates global collaboration, knowledge sharing, and exchange of best practices

among teachers and parents of young children.

It has also emerged that teachers are implementing digital education in schools differently. The difference may be caused by interpreting the syllabus of the framework differently. It can be mentioned that teachers need training in syllabus implementation. To fill this gap, Roofe, *et al* (2021) advocate for appropriate training incorporating practical classroom experience. Planning is important to enable teachers to plan appropriately for their lessons. It implies therefore that teachers need staff development workshops and training on syllabus interpretation and implementation of digital education in teaching.

5.2 Ways of implementing digital education for sustainable development in ECD classrooms

Implementing digital education in early childhood development brings variety to the teaching process. It also supports child development and enhances learning experiences for young children. The three teachers echoed that they were employing different ways of teaching using technology in the classrooms. The ways include; using WhatsApp platforms for communication, and creating ICT learning areas among others.

During the interviews, Teacher D alluded that she had created an ICT learning area in the classroom. In that area, there were models of digital learning devices which are tablets, computers, electrical stoves, cell phones, laptops and others. She added that some of the toy materials were bought by parents in support of digital learning. Leaners visited the learning area during ICT lessons and performed various activities. However, she reiterated that the learning materials were inadequate considering the number of learners in the classroom leading to learners scrambling for the few materials.

Teacher B, who integrates technology in all the subjects in the curriculum, explains that play incorporates digital tools into lesson plans and activities across different subject areas. She added that using computers for literacy, numeracy, and science in teaching young children encouraged collaborative learning. Technological tools allow learners to learn in groups and pairs. In addition, Teacher C highlighted that teaching with computers accommodated learners from diverse backgrounds.

Teacher C reported that besides creating Whats app groups for communication with parents, she also used the observation app to record anecdotal notes and observations of children's behaviour, interactions, and developmental milestones. According to her, the tool can streamline the documentation process and provide a comprehensive view of each child's strengths, interests, and areas for growth. In addition, the app allowed her to track the individual performance of learners, identify

learning gaps, and tailor instruction to meet each child's needs effectively. The whole process of incorporating digital education in the classroom made the teaching and learning process easy. She noted that the major challenge is that resources are not being provided by the school citing that teachers, including her, use personal laptops and tablets for assessing learners' work. She narrated that this lack of support by school administrators is hindering the implementation process. She identified a lack of adequate knowledge on using digital tools or apps for assessment as a challenge in executing her duty as a professional teacher.

It emerged from the findings that digital education can be implemented through the erection of an ICT area within the classroom. Learners visited the area during lessons to manipulate various gadgets displayed in the area. The creation of this area calls for the teacher's creativity and innovation in developing relevant and age-appropriate models. On the same note, digital education exposes learners to a vast array of educational resources, including e-books, interactive websites, educational apps, and multimedia content, enriching the learning experience (Tang, 2022). Introducing digital education at an early age helps prevent technological disparities by ensuring that all learners, regardless of background, have access to digital tools and opportunities (Kalati & Kim, 2022). The use of digital tools supports flexible learning environments, allowing young learners to access educational content anytime, anywhere, and on various devices (Ulum, 2022). Digital education can be adapted to meet the needs of learners with diverse abilities and learning styles, fostering inclusivity in the learning environment.

5.3 Benefits of implementing digital education for sustainable development in ECD classrooms

Implementing digital education in teaching young children offers various benefits that can enhance their learning experiences and support their overall development. The study gathered that Teacher D who developed the ICT learning area in the classroom had this to say:

> *The ICT learning area in this classroom offers interactive learning experiences among learners. Learners visit the area to manipulate objects, share ideas and make discoveries in a hands-on, immersive environment. During the interaction process, learners develop gross and fine motor skills, language and vocabulary skills.*

Teacher C reported that digital education makes the teaching and learning process easy if the teachers are well-trained. She added that the process paves the way for personalized learning experiences tailored to meet each child's unique needs, interests and learning styles. Individualized learning allows learners to stay engaged and focused on their studies when learning through digital media. Teacher C advocated that all ECD teachers need to be trained to integrate ICT tools in the teaching and learning process.

Teacher B supported the implementation of digital education in ECD classrooms citing that it develops skills in learners. She said:

> *Children learn basic digital literacy skills which include: operating tablets, computers, and phones. This foundational skill is crucial as technology becomes increasingly integrated into their everyday life. In addition, interactive digital tools like computers enhance cognitive development through activities that promote critical thinking, problem-solving, and decision-making. For example, games require learners to follow instructions, recognize patterns, and solve puzzles. Using touch screens, keyboards, and mice helps improve fine motor skills and hand-eye coordination. These physical interactions with digital devices are important for developing dexterity and precision in young learners*.

The study discovered that integrating digital education into early childhood classrooms is a balanced approach that supports the total development of learners. Implementing digital education in early childhood classrooms fosters a variety of skills in young learners. Skills identified by teachers were: critical thinking, problem-solving skills, collaboration fine and gross motor among others. The skills are developed as young learners navigate and analyze information, evaluate online content, and engage in interactive activities. For example, critical thinking skills are developed as learners analyse complex activities and evaluate different perspectives during class activities designed by the teacher. Learners develop problem-solving skills as they explore solutions to real-world sustainability challenges, fostering creativity and innovation. With these skills, learners are furnished with lifelong skills which will enable them to solve real-life problems in future (Haleem, *et al*., 2022; Petterson, 2021). In addition, learners will be able to contribute to the development of a foundation for future career readiness in fields that increasingly require technological proficiency (Su & Yang, 2022).

5.4 The relationship between digital education and sustainable development

The study discovered that there is a relationship between digital education and sustainable development. During interviews, Teacher C was quick to say that digital education is a welcoming development in primary school. Children will not be limited to books only but extend their horizons and learn what is happening in other countries or worldwide through accessing the internet. The teacher further alluded that digital education provides opportunities for young children to access quality education regardless of geographical location or socioeconomic status. The digital learning platforms enable learners to access educational resources and opportunities that may not be available locally, thereby promoting inclusive and equitable education, which is a key component of sustainable development.

Teacher B responded that teaching learners with computers is lifelong. Through the use of technology, children acquire skills or information that they might need in future. She added that nowadays, learners encounter technology daily. Therefore, the idea of planning interesting lessons with hands-on activities is a sustainable approach because learners cannot easily forget what they have done.

Teacher A said:

> *Some people are making a living through social media, e.g. Facebook and Twitter among others. We need training and knowledge on using social media to earn money as teachers. Digital education should be taken seriously in schools so that it can be our side hustle. If we are well trained, we can include social media to earn extra money as well as to teach young learners. We need the skills and expertise during this era where everything has gone digital.*

Teachers agreed that both sustainable development and digital education are relevant themes in early childhood development. It is important to introduce or expose learners to digital education to fulfil sustainable development goals (Johnston, 2019; Johnston *et al.,* 2018). In addition, participation in online apps equips learners with the knowledge, skills, and competencies needed to participate effectively in the workforce and contribute to economic growth and development (Vuorikari *et al.,* 2020; Zhukova *et al.,* 2020). Digital resources like assessment apps reduce the consumption of paper, leading to lower environmental impact and promoting sustainable consumption and production patterns.

6. Conclusion

The implementation of digital education for sustainable development is in line with Sustainable Development Goals (SDGs). Goal number 4; quality education aims for every child to receive completely free, equitable and quality education. Quality education encompasses the teaching and learning of sustainable development where digital education is included. In addition, current goals and aims of early childhood education in Zimbabwe embrace digital literacy as a cross-cutting theme in the curriculum (The Curriculum Framework for Primary and Secondary Education (2015-2022); UNESCO, 2020; Fielding & Murcia, 2022). Digital education and sustainable development are also contemporary themes in the 21st century. Contemporary scholars on education during post COVID -19 era advocate for schools to be digitally compliant from an early age (Daniel, 2020; Delker & Ifenthaler, 2021; Kalati & Kim, 2022) to enhance the development of skills in young learners.

Despite being interesting and motivating, digital education exposes learners to numerous advantages. These include: equipping learners with the knowledge, values, and ideas necessary to address global challenges and contribute to a more sustainable future. Digital education is an inclusive approach which caters for learners from diverse backgrounds and different learning styles. To maintain quality education, schools have to increase their investment in the integration of digital education in schools (European Commission, 2020). As such, there is a need to establish policies, infrastructure, as well as digital competence of teachers to support the effective integration of technology in teaching and learning practices.

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